The Bartlett School of Planning
Faculty of the Built Environment
University College London

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Ph.D. Dissertation

ASSESSING THE APPLICABILITY OF
PARTICIPATORY MULTI-CRITERIA ANALYSIS (MCA)
METHODOLOGIES TO THE APPRAISAL OF
MEGA TRANSPORT INFRASTRUCTURE (MTI)

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A dissertation submitted to the Bartlett School of Planning, University College London (UCL) in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Ph.D.) in Infrastructure Planning.

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ABSTRACT

The topic of 'how mega transport projects should be assessed' continues to generate disputes amongst academics, infrastructure specialists, investors and governments alike. This Ph.D. research sought to explore the applicability and effectiveness of participatory MCA methodologies to the (economic, environmental and social) appraisal of such projects. Although very popular amongst academics, participatory MCA methodologies seem to have enjoyed limited practical application and there are no studies assessing their effectiveness. This research entailed several steps, where different methods of investigation and multiple sources of information, both primary and secondary, were combined together in an effort to increase the reliability of the results. Firstly, a comprehensive review of the literature, whose findings were validated and integrated by means of an expert focus group interview, was undertaken in the attempt to determine the key features of mega transport projects. An investigation into transport appraisal practice and traditional appraisal methodologies was then carried out through a comprehensive analysis of the existing literature, complemented with unstructured interviews and informal discussions with some international experts. Successively, an examination of over 60 publications on participatory MCA methodologies was performed with the objective of determining the main attributes and critical aspects of such methods. An analysis of the current trends in mega transport infrastructure planning and decision-making practice was also undertaken based on a series of interviews with several infrastructure practitioners and the analysis of three large-scale port and port-related projects, namely the Alameda freight rail corridor (US), the expansion of the Port of Rotterdam (Holland) and the London Gateway port complex (UK). The London Gateway port complex was also adopted as case study for a practical application of participatory MCA methodologies. Overall, the outcomes of this multi-actor multi-criteria appraisal exercise, together with the findings from the previous steps of research, led to the identification of several (methodological and non-methodological) issues potentially surrounding the practical application of such methods. These issues were ultimately explored through a survey questionnaire carried out amongst specialists and proponents of participatory techniques. The overall conclusion of the thesis is that participatory MCA methodologies represent an under researched area, where some critical themes have received limited consideration; contrasting views still exist on many fundamental aspects; and where, in many cases, the disconnection between theory and practice is apparent. In particular, the key principles, steps and structure of such methods are (directly or indirectly) based on the rational-comprehensive planning model, which hardly reflects the way projects are developed. Therefore, while, in principle, multi-actor multi-criteria procedures might be carried out to complement and integrate the information derived from conventional ex-ante analyses, it is difficult to see how such methods could significantly improve the decision-making process of major transport infrastructure.

Keywords: Mega Transport Infrastructure, Appraisal, Decision-Making, Participatory Processes, Multi-Criteria Analysis.
IMPACT STATEMENT

This Ph.D. research presents significant implications for practice, theory, and subsequent research in the field of mega transport project appraisal and decision-making, and participatory assessment. In particular, the major findings of this research are as follows.

- There are three fundamental aspects which need careful consideration when appraising large-scale transport projects: (1) their inherent complexity, which implies the need for acknowledging the unavoidable existence of multiple contrasting, but legitimate, perspectives concerning a given decision-making situation; (2) their multifold and uneven impacts and consequences, which always generate both winners and losers and make consensus over such projects hard to secure; and (3) their long development cycle, which unavoidably generates many uncertainties regarding the outcomes and the future impacts of these massive undertakings.

- All the various appraisal methodologies (cost-benefit analysis, environmental impact assessment, multi-criteria analysis, etc.) present both strengths and weaknesses and, differently from what commonly assumed, share many similarities and common issues. As a result, the long-standing debate about which method constitutes the best approach to appraisal is absolutely inappropriate and misplaced, and generally reflects a poor understanding of the topic.

- It is almost impossible to capture and proactively describe the reality of mega project planning and decision-making with the help of the rational-comprehensive planning paradigm. Indeed, the development of major projects does not follow a simple and neat path, from project conception to implementation. Such projects emerge progressively through a rather chaotic, unstructured, highly fragmented and largely undetermined process, where hardly any aspect could be entirely and precisely defined at the process outset. Appraisal techniques that presuppose and/or depend upon being part of a technical-rational process are thus unlikely to be effective.

- ‘Participatory MCA’ should be intended as an umbrella term for a number of very different approaches to the involvement of stakeholders in the (multi-criteria) appraisal process. Each approach presents advantages, drawbacks and issues, which demand special attention. Given the lack of research in this area, some conceptual frameworks and classification systems have been proposed to allow a better comprehension of the key features of such methods, possibly guiding also the design of the structure of a multi-actor multi-criteria exercise so as to best suit the requirements of the problem at hand.

Several papers and journal articles regarding the above points will be extracted from this thesis.
STATEMENT OF ORIGINAL AUTHORSHIP

I, Marco Dean, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

London, 15 September 2017
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I am, furthermore, indebted to all the people who have contributed to this thesis and, through various conversations and discussions, have helped me improve my knowledge of the key issues surrounding the planning, appraisal and decision-making of major transport infrastructure projects.

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Chapter 1
Introduction

 [...] more than $500 billion is spent annually worldwide on infrastructure projects - many of these major transport investments – with 40 per cent of them with capital value each of $10 billion or more. Against a backcloth of these developments, how the appraisal of such projects has or should have taken place [...] has become a subject of interest and importance among academics, investors, infrastructure specialists and governments alike [...]. This is the case whether in times and places of economic boom or downturn, and in the developing or developed world.

(Dimitriou, 2016:1)

1.1 Chapter overview
The purpose of this research is to test the applicability and effectiveness of participatory multi-criteria analysis (MCA) methodologies to the appraisal of mega transport infrastructure. On the one hand, especially over the past three decades, these methods, combining deliberative processes with various assessment techniques accounting for multiple decision criteria, have been proposed by a number of authors as a valuable approach to deal with many of the most critical issues affecting our society. These issues cut across the field of natural resources management and sustainability science, technological innovations, health, urban and regional planning and transport project assessment. On the other hand, especially in the transport sector, participatory MCA techniques, developed with the view to improving decision-making for major transport projects, seem to have remained mere academic proposals, so that neither their features nor their effective applicability has been examined in detail.

This introductory chapter includes four further sections. Section 1.2 provides the context for the research. Section 1.3 describes the theoretical background and elaborates on the problem motivating the research. Section 1.4 illustrates the aim of the research, setting also its boundaries. Lastly, Section 1.5 includes the outline of the thesis.
1.2 The research context: large-scale transport infrastructure, the ‘mega project paradox’ and the debate over transport appraisal practice

High quality infrastructure\(^1\) is generally considered a key pillar of international competitiveness (see Word Bank, 1994 and 2015). Therefore, notwithstanding the precise linkage between infrastructure provision and economic development is still open to debate (see Banister and Berechman, 2000; and Prud’homme, 2004), infrastructure investments, in both developed and developing countries, have steadily increased over time. AECOM (a multinational engineering firm) indicates that, currently, more than $500 billion is spent annually worldwide on infrastructure projects (AECOM, 2014). Projections concerning future investments are often hyperbolic. In 2006, the Organization for Economic Co-operation and Development forecasted that the demand for infrastructure projects across the transport, telecommunication, electricity and water sectors would amount to much more than $70 trillion between 2010 and 2030 (OECD, 2006). In spite of the consequences of the economic and financial crisis of 2008, from which there have not yet been any clear signs of recovery, more recent forecasts have also predicted substantial investments in infrastructure throughout the same period (see OECD, 2011; and McKinsey, 2013).

Many studies (see, amongst others, Miller and Lessard, 2000; Flyvbjerg et al., 2003; Allport, 2011; and Greiman, 2013) have also emphasized that, during the last few decades, not only the number but also the size and scope of infrastructure investments have grown exponentially. In our current globalized world, infrastructure is increasingly being built as ‘mega projects’, supported by a mixture of national and international policies and visions as well as international flows of finance, capital, technology and expertise (Graham and Marvin, 2001; Dimitriou, 2009). In the academic literature, mega infrastructure projects are generally described as capital projects, which entail a construction cost of over US$ 1 billion (see, for instance, UMUC and FHWA, 2004; Merrow, 2011; and OMEGA Centre, 2012), although, several alternative definitions for such projects have been proposed and there is still no universal consensus on their key attributes. Mega (or major or large-scale)\(^2\) infrastructure projects encompass all aspects of physical infrastructure provision and include, for instance, big power plants, massive storm surge barriers and closure dams, sophisticated information technology systems and high-profile buildings. However, a substantial amount of present (and also future) investments in infrastructure concern (and are likely to concern) mega transport projects, such as large-scale roads and highways, high-speed rail lines and other strategic rail links, major bridges and tunnels, and colossal airports, ports and train stations (OECD, 2006 and 2011).

\(^1\) Notwithstanding the term ‘infrastructure’ is widely used in public discourse, there is not any clear consensus on either its meaning or which fields are covered by such term. Hereafter, the term ‘infrastructure’ will be used to indicate exclusively physical infrastructure systems such as roads, pipelines, telecommunication cables and buildings, although some authors (see, for instance, Lin, 2010) use this word in a broader sense to encompass also the institutions, regulations, legal frameworks and all the other social, economic and financial arrangements in place in a country.

\(^2\) As a possible general rule, the term ‘mega’ indicates projects whose costs are measured in billions of dollars, whereas ‘major’ designates less important (and thus less expensive) projects, whose costs are measured in hundreds of millions (Flyvbjerg, 2014). However, in practice such distinction is often blurred. Therefore, in this research the terms ‘mega’, ‘major’ and also ‘large-scale’ will be used interchangeably to refer to extremely costly infrastructure projects.
On the one hand, with mega infrastructure projects dominating, perhaps even excessively (see Ponti, 2007; and Cedolin, 2010), development agendas worldwide, it is evident that the possibility of responding to societal needs, and thus creating better living conditions, appears to depend more and more largely on the effective capacity to develop successful major projects (Allport, 2011; Greiman, 2013). On the other hand, decisions on large-scale infrastructure projects are particularly contentious and thus require careful examination before they are finally made. Indeed, such projects are not only extremely expensive investments, but also represent initiatives capable of generating multiple economic, financial, environmental, social, political and technological effects on the traversed territories and the served communities (Hirschman, 1995; OMEGA Centre, 2011). These impacts and consequences however are not always positive. Unsuccessful mega project developments, unable to meet the original expectations and entailing cost overruns, construction delays and various technical problems, benefit shortfalls and severe social, health and environmental consequences have been extensively documented in the international literature (see Hall, 1980; Morris and Hough, 1987; Miller and Lessard, 2000; Altschuller and Luberoff, 2003; Flyvbjerg et al., 2003; Cedolin, 2010; OMEGA Centre, 2011; Samset, 2012). For Flyvbjerg and colleagues (2003), in particular, the fact that in a world, which is becoming more and more focused on major infrastructure, a large number of such projects underperform represents somehow a paradoxical situation.

In the case of mega transport projects, it is frequently contended (see, amongst others, Hall, 1980; Dimitriou, 2009; Schutte, 2010; OMEGA Centre, 2010, 2011 and 2012; Barfod, 2012; Jensen, 2012; Leleur, 2012; Macharis and Nijkamp, 2013; Dimitriou et al., 2016) that one of the main causes for these poor performances can be attributed to rather inadequate ex-ante appraisal methodologies, negatively contributing to channel decisions into narrow frames of thought.

Over the last 50 to 75 years of the 20th century, substantial progress has been made in appraisal practice (Goodman and Hastak, 2006). Nevertheless, the topic of 'how mega transport projects should be (or should have been) appraised' continues to generate disputes amongst academics, infrastructure specialists, investors and governments alike. In particular, a large number of scholars have expressed concern about the excessive importance given to economic-centric tools such as cost-benefit analysis (CBA) (see Parkin and Sharma, 1999; Brown et al., 2001; Alexander, 2006a; Naess, 2006; Metz, 2008; OMEGA Centre, 2010; Dimitriou et al., 2016; Hickman, 2016) and the exclusion of many project stakeholders from the process (Haezendonck, 2007; Macharis et al., 2009; Colomb, 2010; OMEGA Centre, 2011 and 2012; Macharis and Bernardini, 2015; Ward et al., 2016a). In their papers, many of these authors have thus emphasized the need for ensuring a more holistic and transparent assessment of project proposals by employing more extensively multi-criteria analysis methodologies and, at the same time, increasing the participatory character of the appraisal exercise.

3 Following, Freeman (1984) and Cleland (1998), this research adopts a rather broad interpretation of the term 'project stakeholder'. Indeed, for the purpose of this research, project stakeholders encompass not only the parties whose relationship is primarily of a contractual kind (see Shankman, 1999), but also all the individuals and groups who are potentially affected by the project (e.g. local communities) and thus may have an interest in the decision.
1.3 The research background: key issues and knowledge gaps

1.3.1 Key drivers for participatory practices

Participatory and deliberative techniques are understood in this research as a wide range of procedures, which allow those involved in or affected by a decision (i.e. stakeholders) to have an input into that decision⁴ (Smith, 1983; Slocum, 2003). The concept of ‘stakeholder involvement’ is, of course, not new. In the UK, for instance, this can be traced back to at least 1969, when the Skeffington Committee embarked upon the first inquiry into the participation of the public in town planning (Skeffington, 1969). However, recently this issue seems to have become ever more pressing. Nowadays, the belief in deliberative forms of democracy pervades almost all the fields and sub-fields of planning and policy-making, including transport (Bickerstaff et al., 2002). This increased demand for public participation in planning and decision-making processes has originated from many sources as described below.

- **Wicked problems:** more and more frequently, our society has to deal with highly problematic issues, which entail uncertainty and ambiguity not only with reference to the possible solutions to adopt, but even regarding the nature of the problem itself. In particular, the uncertainty of information refers to the lack of knowledge about the issue under examination (see Zimmermann, 2000), while ambiguity of information is a condition represented by the existence of two or more equally plausible interpretations of the same situation (Dewulf et al., 2005). As illustrated in Figure 1.1, issues characterized by uncertainty and ambiguity, which, in the literature, have been frequently referred to as ‘wicked problems’ (see Rittel and Webber, 1973), ‘messes’ (see Ackoff, 1979) and ‘intractable controversies’ (see Schön and Rein, 1994), differ markedly from traditional, ‘tame’ problems. The latter represents purely technical problems, which are solved by a single decision maker or by a group of people, who nevertheless share a common perspective and alignment in their actions (Douglas and Wildavsky, 1983; Roth and Senge, 1996). Such problems are characterized by a high level of knowledge and can be fully solved, breaking them down into parts if necessary, by employing traditional problem-solving approach (i.e. sequential steps involving data collection, data analysis, identification of the problem, formulation of the possible solutions, comparison of these solutions and selection of the best course of action). In contrast, wicked problems constitute situations where the underlying facts are not known with certainty and there is little historical experience to support the analysis (Douglas and Wildavsky, 1983; Roth and Senge, 1996). Consequently, it is not possible to arrive at a complete formulation of the problem. Most often, such problems are also comprised of and intertwined with a great variety of other wicked issues, so that they can hardly be isolated or broken down for separate treatment (Rittel and Webber, 1973).

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⁴ Conceptual ambiguity regarding the meanings of the terms ‘participation’ and ‘deliberation’ abounds, despite decades of analysis and discussion among scholars and practitioners. For instance, according to Cass (2006), the term ‘public participation’ indicates the practice of involving members of the public in the decision-making, but without engaging them in a debate (e.g. a referendum), while ‘deliberation’ defines a process which provides also room for discussions and negotiations. Arnstein (1969), and Rowe and Frewer (2005), on the other hand, consider communication between participants an essential feature of participation. In this work, similarly to many other studies, the terms ‘participatory’ and ‘deliberative’ procedures will be employed interchangeably. However, to avoid confusion, the different levels of public involvement implied by the various procedures described in the following chapters will always be specified.
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Figure 1.1 – ‘Tame’ and ‘wicked’ problems.

Furthermore, wicked problems always occur in a network of different stakeholders, who typically present various belief and value systems. These beliefs and values depend on a number of factors, including the individual histories of actors, their cultural and educational background, their social class affiliation as well as the agenda of the institutions that employ them (Young and Mills, 1980; Schön and Rein, 1994). Stakeholders tend thus to frame the underlying issues in different ways. The way in which the problem is specified determines then, unavoidably, also the selections of the possible responses as well as the criteria against which to judge the correctness of the chosen solution (Rittel and Webber, 1973). Lastly, wicked problems are also characterized by great dynamicity, with actors capable of rapidly dismissing the previous problem formulation in favor of a new perception, redefining what is desirable and what is not, as a result of changes in the context (Funtowicz and Ravetz, 1991; Giampietro, 2003). While, historically, policy and planning responses to wicked problems have relied on centralized and top-down procedures, in more recent years, new strategies have become increasingly popular, especially amongst academics. Such strategies are based on broad participation and the use of

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5 All these features, characterizing ‘wicked problems’ can be seen as the direct consequence of a number of trends, taking place since the last decades of the 20th century. These trends comprise, amongst others, the progressive growth of interactions and interconnections between political, social and economic activities across the globe, fueled by globalization forces (Held, 1995) and facilitated by advancements in information and communications technology (Castells, 1996); fragmentation processes such as regionalization/localization of state territorial organization (Sassen, 2001; Schulz et al., 2001); delegation, devolution, partnerships and privatization (Lundestad, 2004; Dicken, 2011) and other forms of decentralization, through which governments and agencies have experienced a reduction in their decision capacity (Koppenjan and Klijn, 2004); the progress of knowledge and scientific research, which, while opening new avenues for problem solving, have also made people more aware of the uncertainties that surround them (Beck, 1992); and processes of specialization, professionalization, and individualization which have resulted in a high degree of fragmentation of knowledge and methods (Koppenjan and Klijn, 2004).
a wider spectrum of data from a larger and more diverse set of sources in the attempt to tune and connect the different stakeholders’ frames (see Mason and Mitroff, 1981; Rosenhead, 1989; Funtowicz and Ravetz, 1991; Schön and Rein, 1994; Roberts, 2000; and Ney, 2009).

- **Sustainable development**: by increasing the scale of economic activities, globalization processes have placed additional pressure on the environment so that, starting from the latter part of the 1960s a pronounced scientific consensus on the unacceptability of current human way of life has progressively emerged (Ekins, 1994; OECD, 2001). Owing to threats such as resource depletion, climate change and reduction in biodiversity, the notion of ‘sustainable development’ has started to appear on the agenda of policy makers, planners and every other relevant groups within society (Szerszynski *et al*., 1996; Hussen, 2004). In the course of time, mainstream sustainable development thinking has been progressively developed through Garrett Hardin’s classic piece the *Tragedy of the Commons* (Hardin, 1968), the 1972 UN Conference on the Human Environment held in Stockholm, the sophisticated computer modeling study presented in the book *Limits to Growth* (Meadows *et al*., 1972), *The World Conservation Strategy* (IUCN, 1980) as well as several other studies highlighting the possible future environmental risks entailed by the current growth path. However, it was only after 1987, following the report published by the World Commission on Environment and Development (also known as the Brundtland Commission) that the notion of ‘sustainable development’ has really started to come into prominence. In the *Brundtland Report*, ‘sustainable development’ was defined as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987: 45). This definition has thus implied a very important shift: from an idea of sustainability as a primarily ecological concept to an explicit consideration of three distinct aspects, namely, the economic, environmental and social dimensions, entailing different and conflicting objectives (see Figure 1.2). Since then, there has been much debate over the most appropriate framework to represent the relationship between these different dimensions and the relative weights to be placed upon them (Dalal-Clayton and Sadler, 2014). In this respect, proponents of ‘strong sustainability’ argue that environment should be given a higher weight and that non-renewable resources cannot be traded-off against changes in income. By contrast, supporters of ‘weak sustainability’ consider these three dimensions perfectly equivalent to each other and thus allow for a complete trade-off (*i.e.* substitution) between economic, environmental and social factors (Van Pelt, 1993; Munda, 1995 and 2008). Further disputes have also concerned: the most appropriate set of indicators to assess sustainability; the scale at which sustainable development should be achieved and measured (*i.e.* international, national, regional or local); the opportunity for adding further dimensions of sustainability (*e.g.* institutional, financial, etc.); and also the need for reformulating the definition of ‘sustainable development’ itself (Carrol, 2002, in this regard, enumerates over 500 alternative definitions).
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Figure 1.2 – The Sustainability Triangle.

According to some authors (see Low and Gleeson, 2005; and Pacione, 2007), the unintended outcome of this process has been to render ‘sustainable development’ a broad and rather loose term. The operationalization of this concept constitutes, in fact, a typical wicked problem and is characterized by multiple values and interests, subjectivity and conflicting rationality, ambiguity, uncertainty and dynamisms (Funtowicz and Ravetz, 1991; Munda, 1995 and 2008; Giampietro, 2003). For this reason, sustainable development issues are frequently deemed to require more active forms of citizen participation so as to embrace diversity of perspective and allow the integration of diverse forms of knowledge (see Brugmann, 1997; Ukaga 2001; Meppem and Gill, 1998). Ratner (2004), in this regard, defines sustainable development as ‘dialogue of values’, while The Rio Declaration (1992), the Aarhus Convention (1998) and many other important international documents have formally recognized participation as a critical element for pursuing sustainability.

- **Democracy**: participatory processes are also often justified on arguments inspired by the nature of democracy and the belief that in democratic societies each individual has to be informed and should be given the opportunity to express his/her view on important matters, which affect them personally (Sewell and Coppock, 1977; van Asselt et al., 2001).

- **Inadequate practices**: often pressures for more participatory (i.e. direct) democracy are also a reaction to past decisions, which have been judged by citizens and other interested parties as incapable of correctly reflecting the interests and priorities of the different social groups (Sewell and Coppock, 1977; Weblter and Renn 1995; Irvin, 2006; Allain, 2015).
Hence, in this new highly uncertain and interdependent multi-stakeholder context, where unilateral interventions, it is contended, frequently fail to produce effective solutions, communicative or collaborative planning practices, based on inclusive dialogic approaches, multi-party negotiations, and openness to alternative forms of reasoning and expression have emerged as a new mantra among planning scholars (see Forester, 1989 and 1999; Healey, 1998 and 2003; Innes, 1995 and 1996; Innes and Booher, 2003). Participation and deliberation are expected to render the planning process more transparent and democratic, highlight marginalized perspectives, foster mutual and interactive understanding between stakeholders, replace animosity with trust and avoid conflicts or their escalation, identify common interests and shared values, resolve underlying issues and ultimately improve the quality of decision and strengthen its legitimacy (see, amongst others, Mayer, 1997; Slocum, 2003; Creighton, 2005; Involve, 2005, Coenen, 2008; Gluckert et al., 2013).

**1.3.2 Participatory multi-criteria analysis methodologies**

Contrary to what is commonly assumed, multi-criteria analysis (MCA) does not constitute a single specific methodology. Rather, as the International Society on Multiple-Criteria Decision Making points out, MCA has to be intended as an umbrella term for a number of very different methods, techniques and tools, by which multiple objectives and decision criteria (or attributes) can be formally incorporated into the analysis of a problem (see International Society on MCDM, 2004, cited in Gamper et al., 2006).

The origins of MCA lie in the fields of mathematics and operational research (Köksalan et al., 2011). However, since the late 20th century, multi-criteria techniques have ignited an increasing interest amongst researchers and practitioners working in a number of fields, including natural resource management and sustainability science (Wang et al., 2009; Herath and Prato, 2006; Huang et al. 2011), health care decision-making (Thokala et al., 2016), banking, performance evaluation and safety assessment (Aruldoss et al., 2013), urban and regional planning (Nijkamp et al., 1990) and also transport project appraisal and evaluation (Macharis and Bernardini, 2015). The diffusion of MCA can be ascribed, mainly, to a greater awareness of the fact that many contemporary policy problems facing society have a multi-dimensional nature and therefore require the careful examination of a variety of different, often conflicting, perspectives and aspects (Munda, 1995 and 2008).

While MCA has been originally conceived to be employed only by analysts and experts, with little or no participatory mechanisms included, in the course of time, many arguments have been put forward to go beyond this technocratic approach to the analysis. Due to their inherent ability to feature different forms of data and information and account for different types of objectives and appraisal criteria, MCA methodologies have progressively come to be seen as the natural framework for incorporating multiple stakeholders’ interests and priorities into the analysis and for providing a higher level of structure to stakeholder dialogues (Vari, 1995; Banville et al., 1998; Petts and Leach, 2005, Coenen, 2008; Gluckert et al., 2013).

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6 In the literature, multi-criteria analysis is also known as multiple-criteria decision making (MCDM), multiple-criteria decision analysis (MCDA), multi-objective decision analysis (MODA), multiple attribute decision-making (MADM) or multi-dimensional decision-making (MDDM).
2000; Stirling, 2006; Stagl, 2007). Especially over the past three decades, methodologies combining deliberative processes with various assessment techniques accounting for multiple decision criteria have appeared in a rather diffuse way, in many planning and policy fields. Some of the most well-known methods include: the Three-Stage Multi-Criteria Analysis, which has been developed for the assessment of risks and uncertainties surrounding scientific advancements and technological innovations (see Renn et al., 1993); the Stakeholder Multi-Criteria Decision Analysis (see Clark et al., 1998) and the Deliberative Multicriteria Evaluation (see Proctor and Drechsler, 2006), which have both been designed to assist group decision-making on environmental problems; the Multi-Criteria Mapping, which has been employed since the 1990s to investigate alternative policy options for responding to genetically modified foods, obesity, climate change and other controversial policy issues (see Stirling and Mayer, 1999); the Participatory Multicriteria Evaluation, which has been conceived by Stagl (2006) for energy planning and management problems; and the Social Multi-Criteria Evaluation, formulated by Munda (2008) to address sustainable development issues.

Several participatory MCA methodologies have also been expressly proposed for the transport sector. One of the earliest, and perhaps most popular, methods is represented by the Goal-Achievement Matrix, which has been devised by Morris Hill in the late 1960s as part of his doctoral thesis (see Hill, 1966). Conceived to surmount the disadvantages and limitations of CBA in the field of land use and transportation planning, the Morris Hill’s Goal-Achievement Matrix can be considered to have represented a sort of benchmark for many other participatory MCA techniques.

More recently, Klaas De Brucker and Cathy Macharis, in their Ph.D. research, have proposed two alternative MCA methodologies for the assessment of transport infrastructure projects and other transport related problems. These methods, allowing for the explicit inclusion of multiple stakeholders in the analysis, have been termed respectively as Eclectic Multi-Criteria Analysis (De Brucker, 2000) and Multi-Actors Multi-Criteria Analysis (Macharis, 2000).

The OMEGA Centre for Mega Projects in Transport and Development, on the basis of its research findings (see, in particular, OMEGA Centre, 2008, 2011 and 2012) has also made the case for the application of a participatory Policy-Led Multi-Criteria Analysis to the appraisal of large-scale transport infrastructure projects (see OMEGA Centre, 2010; Dimitriou et al., 2016; Ward et al., 2016a).7

Another research group, based at the Technical University of Denmark, has conceived a series of decision support systems for strategic transport planning and transport investment appraisal. These models, amongst which COSIMA, SUSTAIN, and EcoMobility (see Salling, 2008; Leleur, 2012; Barfod, 2012; Jensen, 2012; Jensen et al., 2013; and Barfod and Salling, 2015), combine traditional CBA with a broader multi-criteria appraisal framework and participatory processes.

Other participatory MCA methods, which have been explicitly envisaged for the transport sector (and for which a specific name has not been coined yet) can be found in the works of many authors, including Zhong (2008), D’Este (2009), Lami and colleagues

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7 As research assistant at the OMEGA Centre, over the period 2013-2017, the author of the present work has also been involved in research concerning the Policy-Led Multi-Criteria Analysis.
A recent review of the relevant literature undertaken by Macharis and Bernardini (2015) indicates that, since the 1990s, almost 300 journal articles have been produced on the application of MCA and participatory MCA in transport appraisal.

1.3.3 Real-world applications or mere academic proposals?

On the one hand, the general principles and presumed benefits of multi-actor multi-criteria exercises have been widely espoused by their proponents. On the other hand, especially in the field of transport, potential issues, which may limit the value of such methods, do not seem to have been sufficiently explored by these authors. Presumably, one of the main reasons for this lies in the fact that, to date, empirical testing of participatory MCA methodologies does not appear to have been particularly common (see Table 1.1). In particular:

- After its original conception, the *Goal-Achievement Matrix* has been presented by Hill in several of his works (see, for instance, Hill 1968 and 1973). However, as Lichfield and colleagues (1975) point out, this method has enjoyed limited practical application. Moreover, differently from what originally envisaged by Hill, this method has never been really applied in a participatory manner, thus turning out to be a mere analyst-led tool (Sager, 2003).

- Notwithstanding the *Eclectic Multi-Criteria Analysis* has also been the object of several journal articles and book chapters (see, for instance, De Brucker and Verbeke, 2006 and 2007), no information is available concerning the employment of this method in real appraisal processes.

- So far, the *Policy-Led Multi-Criteria Analysis* has been applied only as part of a role-play appraisal exercise (see Ward et al., 2016b), so that the outcome of the process, although promising, should be weighted carefully.

- There are many papers describing the use of the *Multi-Actors Multi-Criteria Analysis* as decision support system for a large variety of transport problems, including identification of the optimal location for new high-speed train stations and intermodal freight terminals, formulation of port master plans, and development of regional logistics and mobility strategies (see Macharis, 2005 and 2007; Macharis et al. 2009; Macharis et al., 2010; Macharis & Nijkamp 2013). However, no explanation is given concerning whether decisions on these problems have been really taken based on the results of the participatory MCA appraisal exercise.

- Analogously to the *Multi-Actors Multi-Criteria Analysis*, it is also not clear whether COSIMA, SUSTAIN and many other (participatory) MCA techniques proposed for the appraisal of transport projects, represent decision support systems which have enjoyed real-world applications or constitute mere academic proposals (see Annema et al., 2015).

Interesting enough, then, by examining the existing literature on MCA and participatory MCA methods, the rationale for the employment of such techniques to the appraisal of major transport projects, that is the inadequacy of current transport appraisal practice, comes across as a rather under researched area. Indeed, while, as previously
mentioned, many authors contend that analyst-led economic-centric tools (e.g. CBA) play a disproportionately predominant role in the appraisal, very often, the current transport appraisal process is not examined accurately and little references is made to other appraisal tools and techniques, which are normally applied alongside CBA as part of ordinary appraisal procedures. Moreover, despite MCA, as pointed out, comprises a number of very different techniques, in many articles, MCA is erroneously treated a single specific methodology. Very often, the superiority of MCA over CBA appears also to be taken for granted, while a comprehensive comparative analysis of these two appraisal approaches is lacking.

It is also well known that the outcome of an appraisal exercise, although providing the factual basis of the issues for decision, is only of assistance to the political process of decision-making. To put it in simple terms, appraisal is not decision-making (see, amongst others, Lichfield et al. 1975; Parkin and Sharma, 1999). However, studies and research on appraisal tend to pay little attention to this wider decision-making context, where multiple values and different types of strategic, political, ethical and social judgments mix with technical analyses. The large majority of articles on the application of participatory MCA methods to the appraisal of major transport projects report (but, more often, only theorize) purely technical and value-free assessment procedures, unfolding relatively quickly and smoothly and ultimately leading to more robust decisions. However, given the high visibility and often controversial nature of mega projects, this does not seem to represent a safe assumption.

Research issues and gaps can also be found with reference to the object of appraisal, that is mega transport projects. As already indicated, there is no consensus amongst practitioners and experts on the key features of such projects. Moreover, articles on the (possible) application of participatory procedures and MCA techniques to large-scale transport infrastructure tend to be rather vague on the attributes which differentiate large-scale transport projects from conventional ones.

Lastly, a preliminary analysis of the literature on participatory MCA methodologies, extended also to other field of application besides transport, reveals that, although rather similar, the various multi-actor multi-criteria methods differ in terms of various attributes, including:

- number and types of actors involved in the process;
- role of the group decision-making participants and their level of involvement in the process;
- manner in which information is elicited from group decision-making participants; and
- strategies adopted to include group decision-making participants’ perspectives in the multi-criteria framework.

However, quite surprisingly, with the exception of a few cases (see, for instance, Renn et al., 1993; and Stirling and Mayer, 1999), advocates of participatory MCA methods, often, do not offer any explanations or justifications concerning the approach adopted with reference to the above points. As a result, it is totally unclear why and under what circumstances one method would be preferable over the others.
Table 1.1 - Overview of some of the participatory MCA methodologies proposed for the transport sector and major knowledge gaps.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Application to real planning and decision-making processes</th>
<th>Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal-Achievement Matrix</td>
<td>Hill (1966, 1968, 1973, 1985)</td>
<td>Limited (several applications in the UK but generally applied in a non-participatory manner)</td>
<td>• No reference to the wider political decision-making context.</td>
</tr>
<tr>
<td>Eclectic Multi-Criteria Analysis</td>
<td>De Brucker (2000); De Brucker &amp; Verbeke (2006, 2007)</td>
<td>None (apparently only theoretical applications to real case studies)</td>
<td>• Little reference to the transport appraisal process;</td>
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<td></td>
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<td>• No reference to the wider political decision-making context;</td>
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<td>• No analysis of the key features of mega projects;</td>
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<td></td>
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<td></td>
<td>• No clear explanation of the structure of the participatory MCA method.</td>
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<tr>
<td>Multi-Actors Multi-Criteria Analysis</td>
<td>Macharis (2000; 2005, 2007); Macharis et al. (2009); Macharis et al. (2010); Macharis &amp; Nijkamp (2011, 2013); Macharis &amp; Bernardini (2015)</td>
<td>Limited/unclear (several applications especially in Belgium but real implications not clear)</td>
<td>• Little reference to the transport appraisal process;</td>
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<td>• No reference to the wider political decision-making context;</td>
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<td>• Limited analysis of the key features of mega projects;</td>
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<td></td>
<td>• Limited explanation and justification for the structure of the participatory MCA method.</td>
</tr>
<tr>
<td>Policy-Led Multi-Criteria Analysis</td>
<td>OMEGA Centre (2010); Dimitriou et al. (2016); Ward et al. (2016a, 2016b)</td>
<td>None (only used as part of role-play exercises)</td>
<td>• Incomplete description of the transport appraisal process;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Little reference to the wider political decision-making context;</td>
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<td></td>
<td>• Limited explanation and justification for the structure of the participatory MCA method.</td>
</tr>
<tr>
<td>COSIMA, SUSTAIN, EcoMobility, Customised decision support systems and other similar appraisal framework</td>
<td>Salling (2008); Leleur (2012); Barfod (2012); Jensen (2012); Jensen et al. (2013) Barfod &amp; Salling (2015)</td>
<td>Unclear (apparently only theoretical applications to real case studies)</td>
<td>• Little reference to the transport appraisal process;</td>
</tr>
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<td></td>
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<td>• No reference to the wider political decision-making context;</td>
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<td>• No analysis of the key features of mega projects;</td>
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<td>• Limited explanation and justification for the structure of the participatory MCA method.</td>
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</table>

Source: Author’s own elaboration.
1.4 Aim and focus of the research

The above section has clearly highlighted that, notwithstanding the appraisal of mega infrastructure projects represents an hot topic and the development of new participatory multi-criteria appraisal methodologies is perceived by many as a possible solution to the mega project ‘paradox’, major knowledge gaps appear to be present in this area.

Accordingly, the purpose of this research is to investigate the applicability and effectiveness of participatory MCA methodologies to the appraisal of mega transport infrastructure. The value of this research mainly lies in its newness. Indeed, this is one of the first (if not the first) attempt to explore these aspects in practical and objective terms.

In general, ex-ante appraisal can be defined as a systematic and comprehensive process, which is aimed at exploring and assessing, in advance, the characteristics, impacts and possible implications of a given proposal with the view to establishing whether the proposal is worthwhile and it is opportune to proceed with it (see Parkin and Sharma 1999; Goodman and Hastak, 2006; and Samset, 2010). As illustrated in Figure 1.3, multiple dimensions and aspects are investigated through specific procedures before the proposal receives the ‘green light’ and is approved for funding. Analogously to the large majority of participatory MCA methodologies presented above, this research concentrates mainly on the appraisal of the economic, environmental and social effects of project proposals on the traversed territories and the served communities, and other strategic considerations. It disregards instead financial, institutional, legal and other technical aspects, which, although extremely important for the final decision of approval or denial, represents aspects more related to the practical feasibility of project proposals and thus potentially less exposed to value conflicts between stakeholders.

Figure 1.3 – Different types of appraisal.

Source: (Adapted from) Yoe and Orth (1996).
Furthermore, whereas this research attempts to arrive at some generic considerations concerning the potential value of participatory MCA methodologies for the appraisal of different categories of large-scale transport infrastructure, the focus is represented by major container ports and large-scale port-related infrastructure projects in Western countries. Traditionally defined as a place where the mode of transportation changes from waterborne system to land system (see Weigend, 1958; Alexandersson and Norström, 1963), ports have always represented important catalyst for economic development. Ports are at the origin of many major cities. Indeed, the wide range of commercial activities generated by maritime trade had fueled urban development, allowing small trading posts to become major conurbations (Morgan, 1958; Bird, 1973; Meyer, 1999). However, while, for centuries, ports and their cities developed hand in hand, since the second half of the 20th century, due to globalization of the world economy and some major technological breakthroughs, there has been a progressive shift in the port-city relationships, from almost symbiotic to conflictual (Hoyle, 1989; Merk, 2013). On the one hand, the reduction of international trade barriers (see Daniels et al., 2009), delocalization of production (from developed to developing countries) in labour intensive industries (see Dicken, 2011), the introduction of the shipping container (see Levinson, 2006) and the new information and communication technologies (see Kuipers, 2005), the development of the intermodal freight transportation system (Hayuth, 1992), the evolution of logistics and supply chain management (Christopher, 2011) and the advent of major transport and logistics operators (Notteboom and Winklemans, 2001) have all strengthened the position of the maritime industry within the international transport system. At present, more than 80% of world trade is carried by sea (UNCTAD, 2015). In this renewed context, some ports, such as Rotterdam and Antwerp in Europe, Los Angeles, Long Beach and New York-New Jersey in the US, Shanghai and Hong Kong in Asia, have emerged as critical nodes of the global transport and logistics chain (Van Klink, 1998; Robinson, 2002). These ports constitute the main nodal points through which large flows of goods are transshipped onto continental areas and vice versa (see Figure 1.4).

On the other hand, while obviously exposed to international economic, transport, logistics and technological concerns and uncertainties, many of these gateway ports are still embedded in urban areas and regional economies, which are regulated by different variables and actors than those ones present at a global scale (Hall and Jacobs, 2012). Often the goal of increasing port traffic, in the attempt to achieve or maintain a leading position within the maritime freight transport system, entails problematic trade-offs with the objectives of reducing pollution emissions and wastes, preserving biodiversity and ensuring a good quality of life within the city (Ducruet, 2003; Merk and Dang, 2013).

Hence, on account of this increasing mismatch between global and local forces, decisions on major container terminals and other port-related infrastructure projects seem to have become more and more contentious (Van Hooydonk, 2006a and 2006b). Large-scale port projects in major port cities seems thus to represent an interesting case for testing the applicability and effectiveness of multi-actor multi-criteria appraisal methodologies.
1.5 Thesis Structure
The dissertation is divided in 10 chapters. This chapter has set the scene for the research. It also provides the reader with a guidepost through the following chapters:

- Chapter 2 illustrates the research methodology and explains in detail the assumptions and rationale behind each steps of the research process.
- Chapter 3 describes the main attributes of mega transport projects, with particular reference to major ports and large-scale port-related infrastructure projects.
- Chapter 4 provides an overview of the appraisal methodologies most commonly adopted to assess the economic, environmental and social effects of the mega transport projects, namely CBA, economic impact assessment techniques, environmental and social impact assessment procedures and (analyst-led) MCA methods. Throughout the chapter, the underlying principles, and the strengths and weaknesses of each method are discussed.
- Chapter 5 critically analyzes the key features of participatory MCA methods as the advocated approach to better cope with the multiple challenge entailed by the planning and appraisal of mega transport projects.
- Chapter 6 includes an investigation into the current trends in mega transport infrastructure planning and decision-making with the view to exploring the most critical and controversial aspects.
- Chapter 7 offers a critical analysis of the planning and related decision-making processes of three large-scale port-related infrastructure projects:
- the Alameda Corridor, a freight rail line designed to facilitate the movement of containers from the US Ports of Los Angeles and Los Beach to their hinterlands;
- the expansion of the Port of Rotterdam, in Holland, which has been undertaken with the view to increasing by 20% the port’s footprint and doubling its container capacity; and
- the London Gateway port complex, which is constituted by a new deep-sea, highly automated container port, a logistics park and a port rail terminal. The port complex, which is currently under construction, is located 48 kilometers down the River Thames from the UK capital.

• Chapter 8 illustrates a practical application of participatory MCA methods to the appraisal of the London Gateway port complex.

• Chapter 9 presents the results of a survey questionnaire, carried out amongst participatory MCA experts in an effort to explore and address the potential issues and critical aspects surrounding the application of such methods.

• Chapter 10 contains the findings of the research and some final reflections.

On account of the lack of studies that examine the applicability of participatory MCA to the appraisal of major infrastructure projects, this research will not include the conventional literature review chapter near the beginning of the thesis. All the various chapters, however, will draw selectively upon various areas of literature, when appropriate.

The thesis also includes three appendices, which complement the above chapters:

• Appendix A - List of people interviewed;
• Appendix B - Sample Interview Questions; and
• Appendix C - Survey Questionnaire.
Chapter 2
Research Methodology

We have excellent methods for calculating answers – but poor methods to ask the right question.

(Albert Einstein, quoted in Samset, 2010:130)

2.1 Chapter overview
The research reported in this thesis was undertaken between July 2013 and July 2017. This chapter presents the main questions, which this research sought to address. It also discusses in detail the assumptions and rationale for the development of the research strategy, the logic behind the specific techniques employed during the different phases of the research, and the reasons for the selection of the case studies and the people interviewed. Reflections on possible ethical issues are also included in this chapter.

2.2 Research questions and sub-questions
As highlighted in Chapter 1, this research was undertaken with the specific aim to investigate participatory MCA methods as a plausible (complementary or alternative) approach to more traditional methods for the (economic, environmental and social) appraisal of mega transport projects. Specifically, the main overarching question, which this research sought to address, was:

To what extent can the use of participatory MCA methodologies enhance the current appraisal practice of mega transport infrastructure?

As also previously explained, the growing popularity of participatory MCA methodologies in the planning and transport literature can be seen as a response to the perceived shortcomings of traditional appraisal practice and some emerging global challenges (above all, the growing complexity in society and the sustainable development paradigm). However, many of these studies and research tend to adopt too rigid and restrictive assumptions (i.e. the predominant role of CBA in the appraisal process, the manifest superiority of MCA over CBA) and excessively narrow boundaries (i.e. the
disregard of the wider political decision-making context). These studies are also rather vague on some fundamental aspects (i.e. the key features of MCA and participatory MCA methods as well as the main attributes of mega transport projects). Major knowledge gaps thus still exist on several areas related to this topic.

Therefore, during the conception of the research design, it was envisaged that the achievement of the above aim and the formulation of an appropriate response to the main question would require also the identification of suitable answers to a series of (interrelated) research sub-questions as indicated below:

i. **What are the main attributes of mega transport projects and what are the most important aspects which need to be considered when appraising such projects?**

ii. **What are the basic characteristics, and strengths and weaknesses of the appraisal methodologies most commonly adopted to appraise the economic, environmental and social effects of mega transport projects?**

iii. **What are the key features of participatory MCA methodologies and how do they differ from traditional appraisal methodologies?**

iv. **How are mega transport infrastructure planning and related decision-making currently undertaken and what is the role of appraisal within the process?**

v. **What are the possible issues surrounding the application of participatory MCA methodologies to the appraisal of mega transport projects and how can these issues be addressed?**

Figure 2.1 illustrates the relationship between research gaps, aim, main overarching question and sub-questions.

### 2.3 Research design

#### 2.3.1 Overall approach

A research methodology outlines the general strategy and principles, adopted to undertake research (Buckley and Chiang, 1976), and, among other things, identifies the specific techniques to be used in it (Crotty, 1998; Howell, 2013). The choice of the research strategies and techniques is based on the type and features of the research problem. Mouton and Marais (1988), in this regard, distinguish between three types of studies and research: descriptive research, which are aimed at describing a given phenomenon; explanatory research, whose main objective is to indicate causality between variable and events; and exploratory studies, which are carried out in an effort to develop new insight into relatively unknown topics (see also Marczyk et al., 2005). Given the fact that the practical use of participatory MCA methodologies to the appraisal of large-scale transport projects still seems to represent an under researched area (i.e. no previous studies investigating the applicability of such methods were found), this research mainly pertains to the third category of studies.

Exploratory research is mainly qualitative (Creswell, 2007; Corbin and Strauss, 2008) and thus seeks to build an understanding of phenomena without arriving at their quantification (Creswell, 2014). Such studies generally present also a rather flexible
nature. In exploratory research, hypotheses tend to be developed as a result of such research, rather than the research being guided by hypotheses, and the research strategy can also continually evolve as response to new stimuli (Mouton and Marais, 1988; Abdulai and Owusu-Ansah, 2014).

Figure 2.1 - Relationship between research gaps, aim, main overarching question and sub-questions.

<table>
<thead>
<tr>
<th>Research Gaps and Issues</th>
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<tbody>
<tr>
<td>MAIN KNOWLEDGE GAPS</td>
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<td>- Limited empirical testing of participatory MCA methodologies</td>
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<td>FURTHER UNDER RESEARCHED AREAS</td>
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<tr>
<td>- Lack of comparative analyses between different appraisal approaches and methods</td>
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<td>- Lack of studies concerning the relationships between the appraisal process and the wider decision-making context;</td>
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<td>- Lack of comprehensive analysis over the key features of participatory MCA methods.</td>
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<td>- Lack of agreement over the main attributes of mega projects</td>
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<table>
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<tr>
<th>Research Aim</th>
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<tr>
<td>To investigate the applicability and effectiveness of participatory MCA methodologies to the appraisal of mega transport infrastructure</td>
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<tr>
<th>Main Overarching Research Question</th>
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<td>To what extent can the use of participatory MCA methodologies enhance the current appraisal practice of mega transport infrastructure?</td>
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<tr>
<th>Research Sub-Questions</th>
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<tbody>
<tr>
<td>i. What are the main attributes of mega transport projects and what are the most important aspects which need to be considered when appraising such projects?</td>
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<tr>
<td>ii. What are the basic characteristics, and the strengths and weaknesses of the appraisal methodologies most commonly adopted to appraise the economic, environmental and social effects of mega transport projects?</td>
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<tr>
<td>iii. What are the key features of participatory MCA methodologies and how do they differ from traditional appraisal methodologies?</td>
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<tr>
<td>iv. How are mega transport infrastructure planning and related decision-making currently undertaken and what is the role of appraisal within the process?</td>
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<tr>
<td>v. What are the possible issues surrounding the application of participatory MCA methodologies to the appraisal of mega transport projects and how can these issues be addressed?</td>
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According to Selltiz and colleagues (1965), exploratory research can be conducted by using three main research techniques:

- a review of the pertinent literature;
- in-depth interviews and survey of people who have a good knowledge of the problem under investigation; and
- an analysis of one or more case studies.

In this research all the above techniques were employed. Moreover, in the attempt to ensure a comprehensive investigation of the research problem, these methods were applied, to the greatest extent possible, according to three interrelated principles:

- **Triangulation**: this term indicates that two or more different research techniques are used to investigate the same aspect (Yeasmin and Rahman, 2012). It is generally believed that the examination of a given phenomenon from different perspectives allows the researcher to acquire a better understanding of it (Cohen and Manion, 2000; Shih, 1998). Moreover, it is also frequently contended that, by employing different means of data collection it is possible to compensate for the limitations of each method, while increasing the reliability of the results (Denzin, 1978; Shih, 1998).

- **Iteration**: studies and research adopting an iterative approach are characterized by multiple rounds of revisiting the data, or sometimes even the methodology itself, as a deeper understanding of the problem is achieved and additional issues and questions emerge (Berkowitz 1997).

- **Saturation**: in qualitative research, saturation represents the point in the process of data collection that indicates little need for continuing the process because additional new information cannot be obtained (Guest *et al.*, 2006). The possibility of reaching data saturation improves the quality and reliability of the research undertaken (Fusch and Ness, 2015).

As illustrated in Table 2.1, different methods of investigation were combined together and multiple sources of data and information, both primary and secondary, were used to address each research sub-question. Typically, a literature review was combined with primary data obtained from interviews. The initial examination of the literature allowed the identification of many themes and issues, which were investigated during the interviews. Interviews, in many instances, led to the recognition of further aspects, which were successively explored through the analysis of secondary sources and sometimes by means of other rounds of interviews. This iterative process continued until when no new information or new themes were emerging from the analysis.

Table 2.1 also indicates where the different research sub-questions are addressed. While each chapter deals specifically with one (or two) research sub-questions, all of the chapters collectively contribute to address the main overarching research question.

Figure 2.2 illustrates the overall research methodology. The different stages of the research are described in detail in the following section. Although presented in a sequential manner many of these steps were carried out simultaneously between July 2013 and July 2017.

It obvious that every research, irrespectively of how well it is constructed and conducted, has some limitations. In this case, the research design was surely penalized by
the lack of similar research on this topic. Indeed, prior research and studies always represent the foundation and an important benchmark for the researcher to develop the overall research strategy and identify the most appropriate research techniques. In addition, the methods adopted to address the different research sub-questions also presented some weaknesses. For instance, the review of the literature used at different stages of the research covered almost exclusively the English language; the case studies analysis was limited to three port projects; there were also some problems with accessing data, findings people willing to take part in this research, issues with question formulation and so forth. All these limitations are discussed in detail in the concluding chapter (see Section 10.4).

2.3.2 Research steps and methods

Identification of the main attributes of mega transport projects

<table>
<thead>
<tr>
<th>Research sub-question</th>
<th>Research methods</th>
<th>Chapter</th>
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<tbody>
<tr>
<td>i. What are the main attributes of mega transport projects and what are the most</td>
<td>Literature review • focus group interview</td>
<td>Chapter 3</td>
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<td>important aspects which need to be considered when appraising such projects?</td>
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<td>ii. What are the basic characteristics, and strengths and weaknesses of the</td>
<td>Literature review • Informal and unstructured interviews</td>
<td>Chapter 4</td>
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<td>appraisal methodologies most commonly adopted to appraise the economic, environmental</td>
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<td>and social effects of mega transport projects?</td>
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<td>iii. What are the key features of participatory MCA methodologies and how do they</td>
<td>Literature review • Informal interviews • Direct experimentation (i.e. part. MCA</td>
<td>Chapters 3, 4, 5, 6, 7, 8, 9</td>
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<td>differ from traditional appraisal methodologies?</td>
<td>exercise) • Survey</td>
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<tr>
<td>iv. How are mega transport infrastructure planning and related decision-making</td>
<td>Literature review • semi-structured interviews • Case studies analysis</td>
<td>Chapters 6, 7</td>
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<td>currently undertaken and what is the role of appraisal within the process?</td>
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<tr>
<td>v. What are the possible issues surrounding the application of participatory MCA</td>
<td>Findings from previous steps complemented with Direct experimentation (i.e. part.</td>
<td>Chapters 3, 4, 5, 6, 7,</td>
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<tr>
<td>methodologies to the appraisal of mega transport projects and how can these issues</td>
<td>MCA exercise) • Survey</td>
<td>8, 9</td>
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<td>be addressed?</td>
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The first step of the research entailed an investigation into the key features of mega transport projects with the view to identifying possible aspects, besides costs and size, which differentiate large-scale projects from conventional ones and which thus require a particular consideration when appraising such projects. This objective was pursued by conducting a comprehensive review of the relevant literature on large-scale infrastructure
Figure 2.2 - Research steps.

- Literature review of mega transport projects
- Focus group interview with managers of PANYNJ
- What are the main attributes of mega transport projects?
- Literature review of transport appraisal practice
- Unstructured interviews with experts
- What are the strengths and weaknesses of the most common appraisal methodologies?
- Literature review of participatory MCA method
- What are the key features of participatory MCA methodologies?
- Identification of methodological and non-methodological issues of participatory MCA methodologies
- Identification of possible survey participants (i.e. MCA and participatory MCA experts)
- Expert survey
- What are the possible issues surrounding the application of participatory MCA methodologies to the appraisal of mega transport projects and how can these issues be addressed?
- To what extent and how can the use of participatory MCA methodologies enhance the current appraisal practice of mega transport infrastructure?
- Semi-structured interviews with experts
- Literature review of infrastructure planning and decision-making practice
- How is mega transport infrastructure planning and related decision-making currently undertaken?
- Case study analysis (Alameda Corridor, expansion of the Port of Rotterdam, London Gateway port complex)
- Application of participatory MCA methods to the London Gateway port complex
and mega transport projects. A more specific literature survey and desk research was also carried out to explore the main attributes of major container ports and large-scale port-related infrastructure as a sub-set of mega transport projects.

In order to increase the reliability of the analysis, the findings of the literature review were subsequently discussed and tested during a focus group interview, involving four managers of the Port Authority of New York and New Jersey (PANYNJ) (see Appendix A). Focus group interviews represent a qualitative research technique for eliciting information about a particular topic from a group of selected individuals (Wilkinson, 2004). With focus group interviews a group of 4 to 12 people, who have a similar backgrounds or share similar experiences or concerns, are gathered together to discuss a specific issue with the help of a moderator (Liamputtong, 2011). The interview took place in October 2014 at the PANYNJ Corporate Offices (New York) and lasted approximately 2 hours. The reasons for adopting this method of investigation and involving those people were the following:

- **Scope**: the method used was considered particularly appropriate for the purpose of this step. Indeed, as Stycos (1981) and Bender and Ewbank (1994) point out, this technique is often used to explore themes that are not well-known to the researcher, to elicit people’s opinions on known topics, to enable researcher to generate new hypotheses, and also to validate findings gathered through other methods, according to the triangulation approach.

- **Efficiency**: compared to individual interviews, focus group interviews allow researcher to collect an appropriate amount of data in a short period of time, although their preparation is more demanding (Nagle and Williams, 2013).

- **Opportunity**: the focus group interview was organized concomitantly with a short-term study visit to US undertaken by the author of the present work to collect data and information on one of the case studies (*i.e.* the Alameda Corridor). Several managers of the Port Authority of New York and New Jersey were particularly willing to be involved in this research. However, time constraints made individual interviews an unfeasible option.

- **Independence**: the Port of New York/New Jersey constitutes one of the biggest container ports in the world. Therefore, it represented an interesting case for testing the general lessons and findings of the literature review. At the same time, this port was not included in the case study analysis, which would be undertaken at a later stage. During the focus group discussion, it was thus possible to avoid (or limit) any form of (conscious or unconscious) bias from both interviewers and interviewees.

According to Morgan (2002), there are two broad types of focus group interviews: a structured approach, where the emphasis is placed on the discussions between the moderator and the participants, and a less rigid and structured approach, in which participants are encouraged to talk to each other, rather than answering the moderators’ questions. Morgan (2002) claims that, depending on the research problem; both approaches can be adopted within social sciences. Given the scope of the exercise (*i.e.* validation and integration of findings gathered through the literature review and possible identification of new themes not yet covered), a more structured approach (allowing, however, for some discussions between participants) was selected.
Analysis of strengths and weaknesses of traditional appraisal methodologies

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<th>Research sub-question</th>
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<tr>
<td>ii</td>
<td>• Literature review</td>
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<td></td>
<td>• Informal and unstructured interviews</td>
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Similarly to the previous step, the analysis of the appraisal methodologies most commonly adopted to appraise the economic, environmental and social effects of mega transport projects was based on a comprehensive analysis of the existing literature, complemented with unstructured interviews and informal discussions with some international experts (see Appendix A). This part of the research benefited in particular from several seminars, conferences, studies and consultancy projects on appraisal methodologies, which the author of the present work had been involved in between 2013 and 2017. All these activities provided the author with the opportunity to engage in rather informal conversations with several academics and practitioners, interestingly all presenting a different view over the strengths and weaknesses of the various appraisal tools and techniques. The decision to rely on unstructured interviews and informal conversation for this step of the research was motivated by the fact that this approach allows respondents to direct the interview into areas, which they see as interesting and significant. This can provide the researcher with new and important insights (see Trueman, 2015). Hence, whereas an initial review of the literature shaped an emerging understanding of the key features of the various appraisal methodologies, such discussions led then to the identification of several additional themes and issues to be explored with further literature review.

Two projects in particular need to be mentioned here as they resulted to be particular beneficial for this stage of the research: a study carried out by the author for the European Investment Bank (EIB) under the STAREBEI (STAges de REcherche BEI - EIB research internships) Programme¹ and a consultancy assignment undertaken by the OMEGA Centre for the Projects Directorate’s Regional and Urban Division of the EIB². Not only did these projects offer important findings and lessons, which informed this research, but they also gave the author of the present work the opportunity to spend some time at the EIB Headquarters (Luxembourg) so as to gain a practical perspective on appraisal practice.

¹ Dean, M. (2015). Study of the Possible Application of a Policy-Led Multi-Criteria Analysis (PLMCA) to the Appraisal of Major Gateway Port Projects. Final Report, STAREBEI Programme. This theoretical study, in which the author of the present work was involved as main researcher under the supervision of Professor Harry T. Dimitriou (UCL, OMEGA Centre) and Dr. José Doramas Jorge Calderon (EIB), was aimed at investigating how the use of MCA to the appraisal of major port projects can integrate and complement the results obtained with CBA and other traditional appraisal methodologies.

² OMEGA Centre (2015). Multi Criteria Analysis Methodology for Project Appraisal in the Regional and Urban Development Division. Consultancy Project undertaken for the Projects Directorate’s Regional and Urban Division of the European Investment Bank. This consultancy project, in which the author of the present work was involved as research assistant, was aimed at developing a new multi-criteria appraisal framework for the appraisal of urban projects.
Determination of the key features of participatory MCA methods

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<th>Research sub-question</th>
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<tbody>
<tr>
<td>iii</td>
<td>Literature review</td>
<td>Chapter 5</td>
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<td></td>
<td>Informal interviews</td>
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As already pointed out, notwithstanding the popularity of methodologies combining deliberative procedures with multi-criteria techniques has increased considerably over the past three decades, in the literature there is a noticeable lack of comprehensive and comparative analysis of such methods. Because of this, the identification of commonalities and differences between the different participatory MCA methodologies as well as those between participatory MCA methodologies and traditional analyst-led appraisal techniques turns out to be rather problematic. Therefore, a broad review of the literature concerning multi-actor multi-criteria methodologies was undertaken with the view to developing some conceptual frameworks and classification systems, which would allow a better comprehension of the key features of such methods.

As part of this analysis, over 60 (mainly academic but also grey) literature publications were reviewed. Data collection strategy was mainly based on a computerized search. Articles were searched through library e-catalog from the University College London Library, scientific databases (e.g. ScienceDirect) and ordinary web-search robots (e.g. Google). The search was undertaken by using the Boolean operator ‘AND’ with the search terms ‘multi-criteria’ (or ‘multiple criteria’ or ‘multi-criteria analysis’ or other similar terms) and ‘participation’ (or ‘deliberation’ or ‘participatory processes’ or other analogues terms). Given the specific focus on transport project appraisal, another search was carried out by employing the Boolean operator ‘AND’ with the search terms ‘multi-criteria’, ‘participation’ and ‘transport’. The articles thus obtained were analyzed and further articles were identified by tracking cited references.

Overall, over 35 different multi-actor multi-criteria approaches were examined and compared. A better deeper understanding of participatory MCA methodologies was also achieved through the author's attendance to several seminars and lectures on participatory techniques and his numerous discussions with proponents of such methods.

Investigation into current trends in mega transport infrastructure planning and decision-making practice

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<th>Research sub-question</th>
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<td>iv</td>
<td>Literature review</td>
<td>Chapters 6,7</td>
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<td></td>
<td>semi-structured interviews</td>
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<td>case studies analysis</td>
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In contrast to the majority of studies on appraisal practice and the possible development of new appraisal methodologies, the present research was grounded in the assumption that appraisal cannot be considered in isolation from the wider decision-making context. Accordingly, an investigation into the current trends in mega transport infrastructure planning, appraisal and decision-making practice was deemed both opportune and necessary. To delve deeply into the topic two converging lines of inquiry were undertaken.
The first line of inquiry involved an examination of both academic and empirical literature on infrastructure planning and decision-making, while the second method of investigation consisted in expert interviews. A total of 18 interviews (a number with were considered sufficient to reach concept saturation) were also conducted with infrastructure practitioners and experts between 2015 and 2016 (see Appendix A). Interviewees were mainly selected on the basis of their outstanding reputation in the field and their practical experience with the topic under investigation. In some cases, the selection of some interviewees was based on the suggestions of people previously interviewed (i.e. snowball sampling). In the large majority of cases, interviews were carried out in person. However, in some instances, on account of the number of commitments of some interviewees, the use of phone interviews was necessary. Each interview lasted between 40 minutes and one hour and was conducted in a semi-structured manner. According to Harrell and Bradley (2009), compared to other types of interviews (e.g. structured or totally unstructured interviews), semi-structured, in-depth interviews represent the best approach when the objective is to gain a thorough understanding of a topic of interest. An evolving questionnaire template (see Appendix B) ensured the coverage of some key areas and, at the same time, offered flexibility in terms of the flow of the interview, so that interviewees had also the possibility to discuss additional themes and issues. In the formulation of the questionnaire, care was taken to avoid the use of simple close-ended questions (which imply a very concise answer, typically yes or no), leading questions (which prompts a particular answer or strongly affect the direction of the interview) or excessively long questions. The notes taken during the interviews and the recording and transcription of interview material (obtained for those interviews where it was possible to use a digital voice recorder) where then analyzed through qualitative content analysis. In accordance with what suggested by Kohlbacher (2006) and Moore and McCabe (2005), this analysis firstly implied an attempt to synthesize all the data collected in such a way as to obtain a more manageable corpus but, at the same time, preserve the essential content of the interviews. The material thus obtained was then analyzed in detail with the view to identifying organized underlying themes and main categories. On this basis, it was eventually possible to produce a coherent narrative, which included also some key quotes from the interviewees.

Successively, a more focused investigation into the current port planning, appraisal and decision-making practice was performed through a case study analysis. Qualitative case study is an approach to research that, through the examination of a single or small number of case study units, facilitate an in depth analysis of a given phenomenon (particularly its description and the explanation or cause of it) within its real-world context (Bromley, 1986; Yin, 2003). Stake (1995) differentiates between intrinsic or instrumental case studies. The former approach is used when the intent is to better understand the case study unit(s), without any attempt to build theory. With the latter approach the aim is instead to refine a theory, while the case study unit(s) is of secondary interest and plays only a supportive role (Stake, 1995). Stake (1995) also distinguishes between individual or collective case studies. In this research an instrumental case study approach was adopted. Moreover, as already indicated, three case studies were investigated, namely the Alameda Corridor, the expansion of the Port of Rotterdam and the London Gateway port complex. The reasons for this rest on the fact that, compared to the analysis of a single case study, the evidence created from the examination of multiple case studies is
considered more robust and reliable (Baxter and Jack, 2008). However, a collective case studies approach is more demanding and requires also particularly attention in the selection of the case study units, which need to be comparable (Baxter and Jack, 2008). In particular, the three case studies examined in this research were selected on the basis of the following criteria (see also Section 2.3.3).

- **Sector**: the three case studies represent port and port-related infrastructure projects.

- **Size**: all the projects are mega transport projects, which entailed a construction cost of over US$ 1 billion (i.e. the price tag that is commonly suggested in the literature to differentiate mega projects from other smaller scale infrastructure investments). Specifically, the costs for the Alameda Corridor and the expansion of the Port of Rotterdam amounted respectively to $2.4 billion (at 2002 price) and almost €3 billion (over to $3.5 billion). By comparison, the costs for the London Gateway port complex have been estimated to £1.5 billion (approximately $2.1 billion).

- **Role**: the Ports of Los Angeles and Long Beach act as the US and North American leading gateways to the markets of Pacific Asia and Mexico. The Port of Rotterdam, by comparison, is by far the largest European port and the main gateway to Continental Europe. Lastly, the London Gateway port complex is expected to become one the major UK container ports for international trade. These three projects are part of ambitious import-led port development strategies, which are aimed at providing these ports with the capacity of capturing a larger share of imported commodity flow, coming especially from export-oriented Asian ports.

- **Context**: all these projects are in Western countries. Therefore, while, unavoidably, the case studies entailed differences in the geographical, political, institutional, social, economic, transport and logistic contexts, infrastructure planning and decision-making practices were expected to be rather similar.

- **Time**: the three case studies represent ‘recent’ projects. Indeed, the first phase of the expansion of the Port of Rotterdam has been recently completed. The London Gateway port complex is currently under construction. Finally, the Alameda Corridor project was completed in 2002 but it was anticipated to reach full capacity only by the year 2020.

A hallmark of case study research is the use of multiple data sources so as to ensure an examination of the phenomenon under investigation through multiple lenses and enhance data credibility (Yin, 2003; Baxter and Jack, 2008). Hence, in the attempt to reach a holistic and reliable understanding of the planning and decision-making process of the three projects various sources of information were used. These comprised: books, journal articles, papers and reports focusing on both the projects and the wider context in which these projects are placed; documents published by the agencies managing the ports and the projects; online newspapers and other online resources; and interviews with port and project stakeholders, elected officials and experts. As illustrated in Appendix A, for the analysis of the Alameda Corridor five interviews were conducted. The analysis of the decision-making process concerning the expansion of the Port of Rotterdam also relied on interviews with five people. By comparison, as the main case study of this research, the London Gateway port complex was investigated by interviewing 10 people. Also in this case the interviews were conducted in a semi-structured manner, with only
some questions prepared in advance (see Appendix B), so as for the researcher to guide the interviews, but with additional questions conceived during the interviews. Content analysis (see Kohlbacher, 2006; and Moore and McCabe, 2005) was also employed to analyze and categorize the data and information gathered from these in-depth interviews.

**Identification and exploration of the issues surrounding the use of participatory MCA methodologies to the appraisal mega transport projects**

<table>
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<tr>
<th>Research sub-question</th>
<th>Research methods</th>
<th>Chapters</th>
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<tr>
<td>V</td>
<td>Findings from previous steps plus</td>
<td>Chapters 3, 4, 5, 6, 7, 8, 9</td>
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<td></td>
<td>- Direct experimentation (i.e. part. MCA exercise) - Survey</td>
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In this research, all the issues potentially affecting participatory MCA methodologies were distinguished into two main categories:

- **methodological issues**: technical problems associated with the implementation of participatory MCA methodologies;
- **non-methodological issues**: problems related to the position of participatory MCA methodologies (and, more in general, of the appraisal process) within the wider decision-making context.

As illustrated in Figure 2.2, these two categories of issues were identified in different ways. In particular, the analysis of the case studies and the interviews with infrastructure practitioners and experts, while providing important insights into current mega transport infrastructure planning and decision-making practice, led to the recognition of possible non-methodological issues.

By comparison, methodological issues were determined as a result of the analysis of the key features of participatory MCA methodologies and their comparison with the main properties of traditional analyst-led appraisal methodologies.

In an effort to further identify and examine possible (methodological and non-methodological) issues of participatory MCA methodologies, a practical multi-actor multi-criteria appraisal exercise was also carried out. Specifically, this test was performed for the London Gateway Port complex. The examination of this project, previously undertaken as part of the case study analysis, helped frame the exercise. As part of this process, several project stakeholders and experts were asked to develop their own multi-criteria framework to compare this development, which is currently under construction at the edge of the Thames Estuary, with a hypothetical do-minimum alternative option, consisting in a better use of the existing port terminals and infrastructure along the Thames. A thorough description of the key features of the participatory exercise and its underlying assumptions is presented in Chapter 8 and particularly in Section 8.2.

Eventually, in the attempt to explore and possibly address the methodological and non-methodological issues thus identified, a questionnaire was prepared and sent to a number of participatory MCA experts (see Section 9.1 for a detailed explanation of how the questionnaire was designed). Overall, 24 people were contacted by email and invited
to take part in this survey. Recipients comprised academics, who enjoy a high reputation in the field, and also specialists, who had applied such methods quite extensively. The large majority of these experts were identified on the basis of the analysis of literature undertaken during the previous stages of the research.

The choice of employing a survey questionnaire for this part of the research was based on three essential factors:

- **Efficiency**: questionnaires allow for the collection of data and information from a large number of people in a relatively short period of time (Lee, 2006).
- **Practicality**: the participatory MCA experts, who were contacted, work and live in different countries. Therefore, it would have been extremely impractical to use other more resource intensive methods (e.g. interviews) to collect the opinion of these people.
- **Anonymity**: the people who took part in the survey are proponents and authors of specific participatory MCA methodologies. Accordingly, it was envisaged that many respondents would not be willing to publicly criticize their own method. Hence, the survey questionnaire ensured anonymity to respondents in the attempt to encourage openness and honesty.

In the preparation of the questionnaire, noticeable effort was made to ensure that respondents would be able to clearly understand the questions. The questionnaire, in particular, included an introduction, where the general purpose of the exercise was stated, and the key assumptions and basic terminology adopted in the questions were explained so as to guarantee, to the largest extent possible, that all respondents would interpret the questions in the same way (see Appendix C).

As Lee (2006) explains, questionnaires typically fall into two general categories: structured (or fixed-response questions), where respondents are asked to select their answers from a fixed set of response alternatives; and unstructured (or free-response questions), in which respondents are required to provide answers to questions using their own words. Each form of question has advantages and limitations. For instance, while fixed-response questions are easier to code and statistically analyze, they tend to simplify responses and blur possible distinctions between the different respondents' opinions. In contrast, free-response questions are particularly adequate for complex topics, as with this type of questions creativity, self-expression and richness of detail are permitted. An unstructured questionnaire, however, make the identification of pattern and trends in answers more difficult (Lee, 2006). Hence, in the attempt to minimize possible flaws, the questionnaire was prepared by combining fixed-response and free-response questions (see Appendix C).

The survey ran for two months, from June to July 2017. Eventually, 14 people (of which 9 with a deep knowledge of transport and infrastructure planning) participated in the survey (overall response rate of 58%). The results of the survey questionnaire were analyzed by employing simple frequency counts for fixed-response questions and by paraphrasing, summarizing and categorizing all the free-response answers received.

The questionnaire provided a measure of experts' opinions, attitudes and perceptions about the issues affecting participatory MCA methodologies and the possibility of
effectively addressing them. These data and information resulted particularly useful in also arriving at the formulation of an appropriate response to the main overarching research question (see Figure 2.2).

2.3.3 Justification for the selection of the case studies

As earlier indicated, this research sought to test the applicability and effectiveness of participatory MCA methodologies to the appraisal of large-scale port infrastructure, with the view to also exploring the potential value of such methods for the appraisal of other large-scale transport projects. The selection of major container ports and port-related infrastructure projects as the main focus of the research was motivated by four main reasons:

- the pivotal role currently exerted by gateway ports in international trade and the world economy;
- the increasing conflicts and the problematic reconciliation between global and local needs, which are typically entailed by such projects and which, consequently, may make the employment of multi-actor multi-criteria techniques particularly useful;
- the author’s particular interest in freight transportation and logistics; and
- the little attention reserved by the literature to ports (and more in general freight projects), if compared to large-scale passenger transport infrastructure.

In particular, the choice of the London Gateway port complex as the main case study of this research was justified by the possibility of acquiring more information, if compared to other projects located outside the UK. It was also derived from the desire to shed light on a project that, in comparison to other large-scale transport infrastructure projects, which are currently under construction in the London Region (e.g. London Underground’s Northern Line Extension project and Crossrail) or whose construction has yet to start (e.g. the expansion of Heathrow Airport, High Speed Two), has remained largely unexplored by academics and has not been covered extensively by the media. Indeed, as written by Wainwright (2015) in an article on the Guardian website, “unlike the daily controversy of runways and commuter trains, the cumbersome business of how 90% of our goods reach us from all over the world doesn’t tend to impinge on the public psyche”.

2.3.4 Reflections on ethical issues and risks

The research did not imply either any relevant ethical issues or any significant risks. Besides some preliminary interviews and informal discussions undertaken during the early conception of the research (not mentioned in the research design section), over 60 people were interviewed during the different phases of the research (see Appendix A). In accordance with the basic ethical principles and standards, all the people contacted were fully informed regarding the objectives of the research. Only the people who gave their consent were involved in the research process. There was no attempt to collect particular sensitive data. However, participants were also reassured that their identity would not be disclosed and all the information provided through interviews or surveys would be collected and held confidentially.
Wherever we go in the world, we are confronted with a new political and physical animal: the multibillion-dollar mega infrastructure project.

(Flyvbjerg et al., 2003:1)

3.1 Chapter overview

Infrastructure networks are at the heart of every economy, increasingly providing the foundations for virtually all the aspects of individual and collective life. Recent decades have seen a remarkable growth in the number, size and scope of infrastructure projects. As a result, the world has entered what can be termed ‘the era of mega infrastructure projects’. However, while large-scale development projects are generally seen as a ‘different breed’ of projects (see Capka, 2004), a closer examination of the literature reveals a more complicated picture with both practitioners and researchers offering different definitions of ‘mega projects’ and their associated attributes.

This chapter entails an investigation into the key features of mega transport projects with regard to their conception and appraisal. This part builds on the findings of a literature review, complemented and integrated with primary data obtained from a focus group interview with managers of the Port Authority of New York and New Jersey (PANYNJ). The focus group interview allowed the examination of the above aspects particularly with reference to major container ports and large-scale port-related infrastructure as a sub-set of mega transport projects.

The chapter includes four further sections. Section 3.2 discusses the various definitions of the term ‘mega project’, which have been proposed by different authors in the course of time. Section 3.3 analyzes the main drivers for mega infrastructure development. Section 3.4 focuses on large-scale transport projects (and major container ports and port-related infrastructure) and seeks to identify and explore their most critical attributes, especially with reference to the economic, environmental and social appraisal of such projects. Lastly, Section 3.5 summarizes the main findings of the chapter.
3.2 What is a mega project? A review of the literature

Frequently associated with icons of development and symbols of progress, mega infrastructure projects have in recent decades grown rapidly in number (Miller and Lessard, 2000; Flyvbjerg et al., 2003; Allport, 2011; Greiman, 2013). A specific term, that is ‘mega project’ (also spelt ‘megaproject’), has thus been coined to conceptualize these massive undertakings and distinguish them from conventional (i.e. less expensive and smaller) projects. The word ‘mega’ originates from the Greek word ‘megas’, which means ‘large’, ‘great’, ‘vast’ or ‘important’. Connecting the prefix ‘mega’ to ‘project’ thus emphasizes the uniqueness and the greatness of a given initiative (van Marrewijk, 2013). According to Altshuler and Luberoff (2003), the term ‘mega project’ was introduced, almost simultaneously, by the Canadian Government and the Bechtel Corporation (one of the largest engineering firms in the US) in the late 1970s. Specifically, the Canadian Government used it to identify large-scale energy projects to which it had recently committed (see Bott, 2015; Marsh, 2015), whereas the Bechtel Corporation employed this term to indicate its general portfolio of major projects which had been developed in those years (Sallot, 1980).

Since its introduction, the term ‘mega project’ has become progressively more popular in the international academic literature, although mega infrastructure projects are also commonly referred to as ‘great projects’ (see Tobin, 2001), ‘major projects’ (see Morris and Hough, 1987; Allport, 2011; and Marshall, 2013), ‘large-scale projects’ (see Miller and Lessard, 2000; and Hertogh et al., 2008), ‘super projects’ (see Taylor III, 1982; and Brown-West, 2008), ‘giants projects’ (see Grün, 2004) or even ‘mammoth projects’ (see Greiman, 2013). As illustrated in Table 3.1, in the course of time, different authors have proposed many interpretations for such undertakings, although, at present, no agreed or standard definitions exist. Many authors seem to be most concerned with the fact that mega infrastructure projects require vast amount of financial, technical, human, temporal and material (e.g. concrete and steel) resources during their preparation and construction. Financially, a price tag is often adopted to distinguish the construction costs of large-scale development projects from those of ordinary projects. Merrow (2011), for instance, refers to mega projects as capital projects entailing a construction cost of over US$ 1 billion as measured on 1st January 2003, although, as he specifies (and also as it clearly transpires from Table 3.1), both the price and the date are completely arbitrary.

Merrow (2011) also recognizes that, while extremely practical, a definition based exclusively on the resources and capital costs required to build a project may turn out to be excessively simplistic, as it completely disregard the context in which the project is placed. This appears particularly evident with reference to at least two aspects. Firstly, as some authors argue (see Warrack, 1985; Brown-West, 2008; Greiman, 2013), the cost of a project is relevant only if it is compared with the size of the location in which it is built.

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1 Notwithstanding the focus of this work is represented by physical infrastructure and large-scale transport infrastructure in particular, it should be noted that in literature the terminology ‘mega project’ and its synonyms are used to indicate a wider range of projects, encompassing also aerospace and defense programmes, important sectoral initiatives, large software and major cultural events such as the Olympics Games.

2 This cost includes material, engineering and construction labour associated with completing a project. Operating, maintenance and decommissioning costs, which represent an important share of the total cost of major infrastructure projects (Greiman, 2013), are instead excluded.

3 At the 2016 price level, that would amount to about $2 billion.
Table 3.1 – Definitions of mega project (or similar terms) according to different authors.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Definitions of mega project</th>
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<tr>
<td>Hall (1980)</td>
<td>Great planning decision: “a major planning decision, involving an investment (or a set of related investments) costing a great deal of money by almost anyone’s standard: at least millions of pounds or dollars, more commonly tens or hundreds of even thousands of millions” (p. 1)</td>
</tr>
<tr>
<td>Morris and Hough (1987)</td>
<td>Major projects: “those which are particular demanding either because of their size, complexity, schedule urgency or demand on existing resources or know-how” (p. 14)</td>
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<tr>
<td>Miller and Lessard (2000)</td>
<td>Large engineering projects: “high-stakes games characterized by substantial irreversible commitments, skewed reward structures when they are successful, and high probabilities of failure” (p. 146)</td>
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<tr>
<td>Altshuler and Luberoff (2003)</td>
<td>Mega projects: “initiatives that are physical, very expensive and public. More specifically, mega-projects involve the creation of structures, equipment, prepared development sites, or some combination thereof. They cost at least $250 million in inflation-adjusted year 2002 dollars” (p. 2)</td>
</tr>
<tr>
<td>Gellert and Lynch (2003)</td>
<td>Mega projects “projects which transform landscapes rapidly, intentionally, and profoundly in very visible ways, and require coordinated applications of capital and state power” (pp. 15-16)</td>
</tr>
<tr>
<td>UMUC and FHWA (2004)</td>
<td>Major (or mega) projects: “projects with an estimated total cost of at least $1 billion or projects approaching $1 billion with a high level of interest by the public, Congress, or the Administration” (p. 6)</td>
</tr>
<tr>
<td>Fiori and Kovaka (2005)</td>
<td>Mega project: “a construction project, or aggregate of such projects, characterized by: magnified cost, extreme complexity, increased risk, lofty ideals, and high visibility, in a combination that represents a significant challenge to the stakeholders, a significant impact to the community, and pushes the limits of construction experience” (p. 3)</td>
</tr>
<tr>
<td>Allport (2011)</td>
<td>Major projects: “projects that are particularly demanding because of their size, complexity, schedule urgency or demand on existing resources and know-how, and whose cost is large – usually &gt; £0.25 billion and often many billions of pound sterling” (p. 3)</td>
</tr>
<tr>
<td>Merrow (2011)</td>
<td>Mega projects: “any project with a total capital cost of more than $1 billion (U.S. dollars) as measured on January 1, 2003” (p. 15)</td>
</tr>
<tr>
<td>OMEGA Centre (2012)</td>
<td>Mega transport projects: “They are projects that entail a construction cost of over US$1 billion (at 1990 prices), completed since 1990 and are frequently perceived as critical to the ‘success’ of major urban, metropolitan, regional and/or national development” (p. 2)</td>
</tr>
<tr>
<td>Flyvbjerg (2014)</td>
<td>Mega projects: “large-scale, complex ventures that typically cost US$1 billion or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people” (p. 6)</td>
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</table>

Source: Author’s own elaboration based on the cited literature.
Hence, for example, a US$ 500 million project in a medium-sized town may be considered a mega project, whereas this would not necessarily be the case if the same project is undertaken in a major world city. Secondly, this definition, completely disregards the potential implications of such projects for their surroundings (Merrow, 2011). From this point of view, the definition of mega projects proposed by Gellert and Lynch (2003), Fiori and Kovaka (2005) and Flyvbjerg (2014) appear to be more comprehensive as they focus also on the effects that such projects can have on the traversed territories and the served communities (see Table 3.1).

3.3 Main drivers for mega infrastructure projects

Large-scale projects and increased infrastructure spending do not represent a totally new phenomenon. Without going back into the history too deeply, it is possible to observe that, during the 19th century, all the industrialized countries promoted heavy investments in infrastructure, especially in the urbanized areas (Prud’homme, 2004). More recently, after the Second World War, some contexts, especially the US, have also experienced an unprecedented wave of public spending on major infrastructure projects (see Altshuller and Luberoff, 2003).

Nowadays, however, investments in infrastructure and mega projects appear to have become even more critical (Greiman, 2013; Flyvbjerg, 2014). In particular, this ‘new era’ of mega infrastructure projects, which can be thought to have begun during the last two to three decades of the past century (see Altshuller and Luberoff, 2003; and Lehrer and Laidley, 2008), can be seen to be fueled by globalization processes and neoliberal ideas and aspirations, constituting, in many cases the very raison d’être for such undertakings (Dimitriou, 2009). As described below, these new economic, social and political forces, creating new urgencies in many infrastructure fields, have also been reinforced by other factors not directly linked to globalization.

- **Hypermobility**: the latest wave of globalization has been accompanied by a significant increase in the volume of international freight trade (Rodrique et al., 2013), the rise of a ‘hypermobile society’ (see Adams, 1999), where people tend to travel more and further as well as by the historically unprecedented growth in the amount of the information exchanged across the world (Castells, 1996). On the one hand, it is clear that globalization processes would have not taken place without physical infrastructure capable of supporting the increasing levels of exchange, movement and transaction across distance (Dicken, 2011). On the other hand, this hypermobility trend has called for even more extended and efficient infrastructure systems to move goods, people and information quickly, safely and reliably, across ever greater distances and at much greater speeds. Therefore, over the past few decades, a large proportion of investments has been oriented toward the provision of new ports, airports, highways and key rail links as well as telecommunication infrastructure. Looking ahead this tendency seems likely to continue (OECD, 2006 and 2011).

- **New financing instruments**: Historically, especially in the period following the Second World War, infrastructure systems had been generally funded and managed by the public sector (Marshall, 2013). However, since the 1980s, in the attempt to release the financial burden of such assets from public accounts, many governments of both
industrialized and industrializing countries have encouraged other groups and actors to assume a much more direct role in infrastructure and service provision (Merna and Njiru, 2002; Marshall, 2013). Hence, reduction in the level of public funds allocated to infrastructure and the consequent need for alternative sources of funding have led to the development of a wide range of innovative financial instruments (comprising both equity and debt financing) with the aim of attracting increased private financing (see OECD, 2015). These new financial instruments, facilitated also by advances in information and communication technologies (which have had a dramatic impact on the volume and pace of international financial transactions), have progressively made the infrastructure sector one the most lucrative areas of private sector investments worldwide (Graham and Marvin, 2001; Dimitriou, 2009; Olds, 2011). As pointed out by the PANYNJ (pers. comm. 2015), the port sector and in particular container terminals have also come to be regarded as an asset class and for revenue generation potential (see also Pawlik et al., 2011; Farrell, 2012). Notwithstanding the economic and financial crisis of 2008 partially reduced this appetite (Dimitriou, 2009), data seems to indicate that the interest of investment banks, hedge funds, private equity groups and investors in infrastructure has begun to grow again (OECD, 2014).

- **Transnational corporations**: Facilitated by market deregulation and liberalization, privatization trends, the creation of public-private partnerships and other special legal and regulatory frameworks, and by the restructuring of the international financial system, several parties, such as private sector entrepreneurs, international engineering firms, and global financial institutions, have become increasingly involved in the development and operation of large-scale infrastructure projects across different parts of the world (Graham and Marvin, 2001; Olds, 2011; Marshall, 2013). As confirmed by the PANYNJ (pers. comm. 2015), these changes have also affected the container ports industry, leading to the emergence of few major shipping lines and transnational terminal operating companies, which at present control a significant share of global container throughput (see also Heaver et al., 2000; Slack and Frémont, 2005; Notteboom and Rodrigue, 2012). It is also contended (see, for instance, Peck, 1996) that major transnational corporations have become increasingly capable of influencing the attitudes of governments through various lobbying initiatives as regards to the development of major infrastructure projects, which are specifically tailored to their requirements.

- **‘Pro-growth’ coalitions**: on the one hand, it is clear that modern economies cannot function without adequate infrastructure systems and that especially transport infrastructure may have a catalytic role in promoting the economic and social development of a territory (World Bank, 1994; OECD, 2006 and 2011). On the other hand, several studies suggest that infrastructure investments alone do not represent a sufficient condition for such a development and that, in highly urbanized territories, new infrastructure assets may result in very marginal benefits (Banister and Berechman, 2000; Prud’homme, 2004; Eddington, 2006). Notwithstanding the uncertainty surrounding the relationship between infrastructure and growth, massive infrastructure investments currently appear to represent the cornerstone of development agendas worldwide. Indeed, large-scale infrastructure projects are increasingly regarded by global cities, metropolitan regions and nations, pursuing ambitious development strategies, as a means to increase their competitiveness over
other places (Olds, 1995 and 2001; Lehrer and Laidley, 2008; Dimitriou, 2009). ‘Infrastructuralism’, as Marshall (2013) names this trend, is supported not only by business lobbies worldwide, but rather also by local, national and international governments and agencies (Mollenkopf, 1983; Altshuller and Luberoff, 2003; Te Brommelstroet and Nowak, 2008).

- **Sustainable development**: for a long time large-scale infrastructure projects had been undertaken almost exclusively on the basis of economic concerns (Goodman and Hastak, 2006) thus, in many cases, becoming emblematic of a destructive approach to development (Lehrer and Laidley, 2008). However, since the second half of the 20th century, with the spread of the concept of ‘sustainable development’, new infrastructure investments have started to be promoted and justified on the basis of wider policy goals (Marshall, 2013). Hence, in the case of transport sector, at present, besides economic growth, the declared objectives of many high-speed rail corridors, freight railroads, ports and other strategic projects, encompass also the promotion of territorial cohesion, the reduction of social inequalities, the regeneration of deprived areas, and the promotion of a modal shift to more efficient and less polluting forms of transport (see, for instance, the objectives of Trans-European Transport Network strategy as identified in EC, 2005). However, owing to the high level of uncertainty and ambiguity surrounding the effective operationalization of sustainable development, there is a risk that this ‘sustainability consciousness’, pressing for ‘more responsible’ mega infrastructure investments, is used only as a mere marketing platform by project promoters in their lobbying activities (Cedolin, 2010; Ramella, 2011; Marshall, 2013).

- **Infrastructure interdependencies**: recent studies and research highlight that, frequently, the construction of a mega project is likely to generate opportunities for embarking upon other large-scale developments (see OMEGA Centre, 2011 and 2012; Bertolini and Salet, 2009; Salet et al., 2013). The development of airports or ports, for example, is usually accompanied by the construction of roads and railroads to connect efficiently them with their hinterlands (PANYNJ, pers. comm. 2015). In some cases, interdependent projects, which are planned and constructed under a unique policy umbrella, can also belong to completely different sectors (Bertolini and Salet, 2009). For instance, major transport projects are associated with urban renewal programmes and with commercial development initiatives (OMEGA Centre, 2011 and 2012). Accordingly, although they are generally referred to as ‘projects’ (i.e. single schemes which can be reasonably analyzed and evaluated as an independent unit) mega infrastructure ‘projects’ often are, in fact, programmes of a combination of various large-scale projects, having similar or even different characters (Lehrer and Laidley, 2008; OMEGA Centre, 2011 and 2012). This aspect further underlines the inadequacy of using a price tag to define and compare mega projects as the cost of a new large-scale project/programme turns out unavoidably to depend on how wide the boundaries of the systems are set (i.e. what elements of the project/programme are included in the analysis).

- **Mega events**: events of international audience such as the Olympic Games, the Football World Cup and other important world expositions and fairs, can also have a significant role in promoting mega project development (OMEGA Centre, 2011;
Indeed, the global attention that a mega event promises to attract is widely perceived as an opportunity to market the city (and sometimes the whole country) at the international scale to both potential investors and tourists (Greene, 2003). Despite many studies have shown that, often, the benefits of mega events tend to be overestimated (see Müller, 2015), many cities across the globe appear still keen to exploit such events as catalyst for the upgrading of their transport infrastructure networks, the construction of event facilities (e.g. stadia and arenas) and other specialized infrastructure, and the promotion of urban regeneration initiatives (Varrel and Kennedy, 2011).

The spread of ideas: according to Olds (1995 and 2011), travelling and networking and the consequent stretching of social relations have contributed to the formation of a critical mass of expertise on mega infrastructure projects. This, in turn has facilitated the dissemination of ideas and visions concerning such projects to the level of reaching a sort of ‘tipping point’ (see Gladwell, 2000) within society. Mega infrastructure projects have thus become the new, almost unchallenged, development models across the globe (Dimitriou, 2006 and 2009; Ponti, 2007; Urry, 2011). However, it also evident that such a ‘big fix’ mentality, increasingly pervading political leaders, planners and other experts, can also entail negative repercussions, since it tends to promote general ‘solutions’ to universalized infrastructure problems, irrespectively of the context (Pressman and Wildavsky, 1973; OMEGA Centre, 2011 and 2012). In the transport sector, for instance, a number of high-speed rail lines (Vickerman, 1997), container freight terminals (Bologna, 2010; PANYNJ, pers. comm. 2015) and airports (Bowen and Cidell, 2011) have been promoted exclusively in the attempt to replicate previous successful experiences in other areas of the world.

New technologies: finally, it is also evident that engineering advancements and major technological breakthroughs have facilitated the implementation of projects that previous technology could not before deliver (Brunn, 2011). In recent years, for instance, the construction of new large-scale port terminal facilities have required extensive land reclamation, massive dredging operation and other impressive engineering projects in the attempt to accommodate the ever-bigger containerships, (Rodrigue, 2011; PANYNJ, pers. comm. 2015). Sometimes, the desire of prominent architects, engineers and politicians to push the boundaries of engineering to the limit and provide a new local iconic landmarks (i.e. building the tallest building, the longest bridge or tunnel, the largest port or airport) becomes one of the primary reasons for embarking upon the construction of mega infrastructure projects (Frick, 2005 and 2008; Flyvbjerg, 2014).

3.4 Main attributes of mega transport projects

3.4.1 A survey of the literature

In the literature mega projects are frequently described by means of different superlatives and outstanding attributes (the prefixes ‘mega’, ‘major’, ‘great’ and so forth are already some of them). Table 3.2 includes a summary of the key attributes of mega transport projects as identified by Bruzelius and colleagues (2002), Flyvbjerg and COWI (2004), Capka (2004), Frick (2005), the OMEGA Centre (2008, and 2012) and Greiman (2013). Key attributes of other types of mega infrastructure projects have been also discussed by

Table 3.2 – Key attributes of mega transport projects according to several authors.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Mega transport project characteristics</th>
</tr>
</thead>
</table>
| Bruzelius, Flyvbjerg and Rothengatter (2002) | - High investment expenditures of US$1 billion or more  
- Long lifetime of 50 years and more  
- Considerable uncertainty with respect to the demand forecasts and cost estimates  
- Considerable share of indirect benefits which cannot be captured by the operator (benefits not occurring to the users of the project rather than to third parties) |
| Flyvbjerg and COWI (2004) | - High risk due to long planning horizons and complex interfaces.  
- Use of non-standard technology  
- Multiple actors with conflicting interests.  
- Project scope and ambition level tend to change significantly over time.  
- Unplanned events are often unaccounted for leaving budget contingencies inadequate.  
- Misinformation about costs, benefits, and risks is the norm.  
- Cost overruns and/or benefit shortfalls are frequent |
| Capka (2004)             | - Huge sizes  
- Costly  
- Complex  
- Controversial  
- Long development cycle  
- Multiple contracts and agreements  
- Substantial impacts  
- Uncertain outcomes |
| Frick (2005 and 2008)    | - Colossal  
- Captivating  
- Costly  
- Laden with control issues  
- Complex  
- Controversial |
| OMEGA Centre (2008, 2011 and 2012) | - High investment expenditures of US$1 billion or more  
- Long development cycle  
- Frequently part of programmes of different mega projects  
- Substantial and multiple impacts  
- Comparable to organic phenomena  
- Complex  
- Multiple stakeholders  
- High uncertainties and risk |
| Greiman (2013)           | - Huge sizes  
- Costly  
- Complex  
- Controversial  
- Long development cycle  
- Multiple contracts and agreements  
- Substantial and multiple impacts  
- Multiple stakeholders  
- Containing several elements of innovation  
- Subject to strict regulations  
- Consistent cost underestimation and poor performance  
- Dynamic governance structure |

Source: Author’s own elaboration based on the cited literature.
Table 3.2 illustrates that, notwithstanding it is generally acknowledged that each construction project is unique in terms of character, scope, location and effects, mega transport projects seem to share some important attributes. After careful analyses and discussions with practitioners and experts, and in particular the focus group discussion with four managers of the PANYNJ, three characteristics of mega transport projects (including major container ports and large-scale port-related infrastructure) were identified as particularly critical for the appraisal of such projects:

- structural and organizational complexity;
- multiple and uneven impacts; and
- long pre-construction preparatory and construction works.

These three broad attributes (encompassing also other characteristics included in Table 2.2) will be discussed in detail in the following sections.

3.4.2 Mega transport projects as complex systems

The study of complex systems investigates how relationships between parts give rise to the collective behaviors of a system and how the system interacts and forms relationships with its environment (Bar-Yam, 1997 and 2004). Complexity theory challenges the traditional Newtonian-positivist science on aspects such as determinisms, inherent knowability of natural phenomena and the predictability of future events (Bertuglia and Vaio, 2005). Over the last decades, elements of this theory has been applied to a variety of disciplines and fields (Bertuglia and Vaio, 2005), including planning and project management. As a result, infrastructure projects, especially the major ones, have also come to be regarded as complex systems. Presently there is almost no working paper, journal article or book on mega infrastructure projects, which does not mention the word ‘complex’. Nevertheless, it seems that notion of ‘project complexity’ is used without consistency in the literature. For instance, in the works of many authors (see, amongst others, Williams, 1999; Frick, 2005 and 2008; and Koppenjan et al., 2011), the adjective ‘complex’ appears to be used as a sort of synonym for ‘complicated’, ‘demanding’ or ‘technically difficult’. Hence, according to these authors complex projects are characterized by huge costs, intricate financial scheme, new and untried technologies, engineering challenges, hundreds of different works and activities whose coordination is extremely problematic, multiple contractual agreements, long processes to obtain approvals and permits and so forth. By comparison, in many other studies (see, for instance, van Marrewijk et al., 2008; and Giezen, 2012), the concept of ‘complexity’ is used in a very general and vague way, without recourse to any specific explanation. Surveys amongst practitioners, carried out by Remington and colleagues (2009) and Hertog and Westerveld (2010), further demonstrate how the meaning of ‘project complexity’ is currently open to many interpretations, the large majority of which highlight a disconnection between theoretical and practice-based terminology and understanding.

By drawing on the works of Waldrop (1993) and Bar-Yam (1997 and 2004), two pre-eminent complexity scientists, complex systems can be defined as systems consisting of a number of different and strongly interrelated elements, which are organized in a multitude of different subsystems or hierarchical levels and which interact with one another and with the external environment in a great many ways. Complex systems are
not totally knowable and cannot be fully described by using one single level of description (Bertuglia and Vaio, 2005). Indeed, due to their multiple elements, the different levels and scales around which these elements are structured, and their ‘porous’ boundaries separating the ‘inside’ from the ‘outside’, complex systems elude any attempt to provide a unique and inclusive representation, which describes and captures all their properties and aspects (Mikulecky, 2007). Any description of a complex system (which is the result of an arbitrary choice of using a particular observation scale and mapping some elements, while omitting others) thus reflects only a sub-set of all its possible, non-equivalent representations (Rosen, 1977).

After a careful examination, it seems possible in principle to identify the above characteristics, typical of a complex systems, in at least two aspects of mega transport projects. The first dimension of complexity is represented by the physical object of planning, that is the piece of infrastructure itself. Indeed, as pointed out in the previous section, large-scale transport projects frequently are not single schemes but rather constitute programmes of different major transport projects, framed as a single unitary package. For instance, as illustrated in Figure 3.1, the realization of a high-speed rail line or a metro project normally entail a series of sub-projects such as bridges or tunnels and is also associated with the construction of new major stations or the redevelopment of the old ones. Furthermore, new projects are not dropped in an empty world but, in many cases, only aim at complementing and integrating one or more existing transport networks, at different scales (Bertolini and Salet, 2009). Hence, a new high-speed rail line, connecting two cities, while performing a role in the inter-regional transport network, may also represent an important link in the national or even international transport system. The high-speed rail line, in addition, may also enable the existing regional and local rail networks to better connect the two cities with adjacent towns (see Fourniau, 1995).

Figure 3.1 – Components and sub-components of a large-scale railway project/programme.
As also previously highlighted, mega transport projects can also be planned as part of more integral strategies of development, aimed at integrating transport with other functions and different infrastructure projects. For example, major rail stations and terminus do not comprise only railway platforms, but also a number of other facilities and an array of retail, entertainment and office spaces. A new stations may also spawn important urban regeneration programmes, including the upgrading, retrofitting or demolition of existing structures and the construction of new one, relocation of businesses and people, and other activities. Ultimately, the whole transport axis can also be conceived as the backbone of a territory, around which wider economic and urban development strategies can be organized (Belli et al., 2008; OMEGA Centre, 2011 and 2012). It is also obvious, however, that even a transport project promoted to accomplish a purely transportation function will eventually give rise to a number of interdependency relations with a wide array of infrastructure systems already in operation and will turn up to serve wider economic and social goals (Bertolini and Salet, 2009).

This structural complexity can also be found reflected in all the major ports in Western countries (see Figure 3.2). Ports such as Rotterdam and Antwerp in Europe, and Los Angeles, Long Beach and New York-New Jersey in the US are heavy consumers of space and are constituted by multiple port terminals, each offering a multitude of specialized services to a particular category of freight (Notteboom, 2009a and 2009b; PANYNJ, pers. comm. 2015). The introduction of container and the consequent development of intermodal transport have vastly extended the tributary area of these ports, allowing them to serve not only their host cities but also urban centres located far away from the coast (Van Klink, 1998; Robinson, 2002). Hence, through efficient rail, road, and inland waterway corridors these ports have become gateways for much wider territories (Notteboom and Rodrigue, 2005). However, major gateway ports do not only perform cargo-handling function. Indeed, they also accommodate warehousing facilities for cargo storage and logistics parks, where several logistics activities (e.g. labeling, assembly, quality control and customizing) are performed on the imported products before the final delivery (Rodrigue and Notteboom, 2010). Such activities can represent an important source of employment and can contribute substantially to value added creation (PANYNJ, pers. comm. 2015). Logistics parks can also be located away from the coastline due to local constraints (e.g. congestion and lack of space in the port), or in the attempt to exploit and strengthen the competitive position of a port, expanding its hinterland (Notteboom and Rodrigue, 2005; Roso, 2009). As highlighted by the managers of the PANYNJ (pers. comm. 2015), it is thus apparent that major gateway ports can no longer be regarded purely as separate node of the freight transport network, but rather as part of a wider infrastructure, economic, transport and logistic system.

Overall, what emerges from this analysis is that, in many cases, large-scale transport infrastructure projects/programmes lack a unique description. What seems ostensibly to be a unique object may turn instead out to have multiple, intertwined dimensions, which may need to be investigated at different scales and levels. Therefore, any analysis of a major transport project/programme is unavoidably affected by the way in which its boundaries are drawn as well as by the number and types of elements and components considered in the analysis.
The second dimension of complexity relates to the societal and organizational context in which decisions on mega transport projects (as well as other large-scale infrastructure and major policy problems) have to be made. According to a broad view, project stakeholders are represented not only by all the individuals, groups and organizations who are actively involved in the project, but also by all the parties whose interests may be (positively or negatively) affected by the construction and operation of a project (see Winch, 2004; Samset, 2010; Greiman, 2013). Due to their size, cost and their critical role major projects have always had stakeholders. However, over the past decades, there has been an increase in the number of actors that claim a stake in decision-making on large-scale projects (Martens and van Weelden, 2014). This growing number of stakeholders is the product of several trends, including:

- globalization and the creation of various frameworks for governance and cooperation among nations (Dicken, 2011);
- deregulation, privatization, institutional fragmentation and devolution of power and responsibility from higher to lower levels of governments and other similar mechanisms through which agencies have experienced a reduction in their decision capacity (see Giuliano, 2007);
- growing specialization and fragmentation of knowledge and procedures in both infrastructure construction (Clegg et al., 2002) and service provision (O’Sullivan and Patel, 2004);
- increased government regulations and norms to comply with (Miller and Lessard, 2000; Winch, 2004);
- growing costs and size of projects and the continuous use of new technology, requiring specific expertise (Greiman, 2013; Flyvbjerg, 2014); and
- fast development of new information and communication technologies, which have made more people active stakeholders in societal problems (Roberts, 2000).
For instance, as displayed in Figure 3.3, currently, port stakeholders may be seen as including local government, but also national and supranational authorities (e.g. the European Commission in the case of European ports), several transport and logistics companies (responsible for the sea leg of the transport service, the land transport leg or operating at the port terminals), communities groups, labour unions, regional firm associations, environmental groups and so forth (PANYNJ, pers. comm. 2015).

Figure 3.3 - Main stakeholders for a major gateway port.

<table>
<thead>
<tr>
<th>INTERNAL STAKEHOLDERS</th>
<th>EXTERNAL STAKEHOLDERS</th>
<th>SEA (IN/OUT)</th>
<th>PORT</th>
<th>HINTERLAND (OUT/IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups inside port authority organization</td>
<td>Groups not part of port authority organization</td>
<td>Maritime transport</td>
<td>Transhipment &amp; storage</td>
<td>Rail</td>
</tr>
<tr>
<td>Managers</td>
<td>Transhipment &amp; storage</td>
<td>Stevedoring companies</td>
<td>Railway companies</td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>Value-added activities</td>
<td>Logistic service providers</td>
<td>Inland shipping</td>
<td></td>
</tr>
<tr>
<td>Board members</td>
<td></td>
<td></td>
<td>Inland barge operators</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Road haulage</td>
<td></td>
</tr>
<tr>
<td>SHAREHOLDERS</td>
<td></td>
<td></td>
<td>Trucking companies</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSPORT OPERATOR GROUPS** (including branch organizations)
- Maritime transport
- Shipping line
- Shipping agent
- Logistic service providers (3PL and 4PL)
- Transhipment & storage
- Stevedoring companies
- Value-added activities
- Logistic service providers

**TRANSPORT ORGANISATION GROUPS** (including branch organizations)
- Shipping agent
- Logistic service providers (3PL and 4PL)
- Freighter
- Freight forwarder
- Port authorities of other seaports
- Rail terminal authorities
- Rail infrastructure management companies
- Central, regional and local public authorities (cf. roads, (inland) waterways, ..)
- Supranational public organisations (cf. EU, World Bank)
- Inland terminal authorities

**SUPPORTING SERVICES** (including branch organizations)
- Towage companies
- Port authorities of other seaports
- Pilotage services
- Inland terminal authorities
- Repair services (cf. shiprepair, container repair)
- Waste reception facilities
- Inspection services
- Inland terminal authorities
- Banks, insurance companies, ...
- Legal firms (lawyers, ..)

**INDUSTRY GROUPS** (including branch organizations)
- Industries in foreland
- Maritime transport
- Value-added activities

**PUBLIC) INFRASTRUCTURE COORDINATION, FACILITATION & MANAGEMENT GROUPS**
- Transportation and logistics
- Central, regional and local public authorities (cf. roads, (inland) waterways, ..)
- Intermodal service providers
- Inland terminal authorities
- Inland shipping
- Repair services (cf. shiprepair, container repair)
- Waste reception facilities
- Inspection services
- Inland terminal authorities
- Banks, insurance companies, ...
- Legal firms (lawyers, ..)

**LEGISLATION & PUBLIC POLICY GROUPS**
- Central and regional governments (including port commissions)
- European Union
- Trade negotiations groups (cf. WTO)
- Rail terminal authorities
- Rail infrastructure management companies
- Central, regional and local public authorities (cf. roads, (inland) waterways, ..)
- Inland shipping
- Maritime transport
- Inland shipping

**COMMUNITY GROUPS**
- Local inhabitants groups
- Consumers/ tax payers
- Environmentalist groups of a local, regional or global scale
- The press

(Source: Notteboom and Winkelmans, 2002)
This figure, provided for illustration purposes only, clearly highlights that decisions on major infrastructure projects take place in a networks of actors and groups, at different spatial scales (i.e. international, national, regional and local) and linked to one another by either contractual agreements or non-contractual relationships (Notteboom and Winkelmans, 2002; PANYNJ, pers. comm. 2015). Quite obviously, then, the interests and priorities of the different stakeholders are in most cases very different from each other. Consequently, they tend to frame the same problem or issue in a different way, thus producing multiple (and often conflicting) interpretations of what the problem is and what might be the right course of action to address it.

3.4.3 Mega transport projects as uneven and controversial developments

It is widely recognized that, different from conventional and smaller scale infrastructure investments, mega projects frequently entail consequences that go far beyond the physical assets that are being delivered. Hirschman (1995), for instance, defines major infrastructure projects as ‘trait making’, as opposed to ordinary, ‘trait taking’ projects. While the latter merely fits into pre-existing physical structures and urban fabrics, without any attempt to significantly modify them, the former is designed to ambitiously change these structures. Echoing Hirschman’s opinion, the OMEGA Centre (2011 and 2012) argues that large-scale infrastructure and mega transport projects in particular, frequently become critical ‘agents of change’ for the traversed territories and the served communities owing to the multiple spatial, institutional, political, financial, economic, environmental and social impacts that such projects produce on the regions in which they are placed. Discussions about the transformational impacts of mega projects and their change agent role can also be found in the work of many other authors, including Olds (1995 and 2001), Belli and colleagues (2008) and Greiman (2013).

Every development, however, produces numerous and diverse effects. Some of these consequences are planned, desirable and beneficial, whereas others are not. Hence, while promising great benefits, mega projects may also entail substantial adverse impacts (see Hall, 1980; Morris and Hough, 1987; Miller and Lessard, 2000; Altshuller and Luberoft, 2003; Flyvbjerg et al., 2003; Cedolin, 2010; OMEGA Centre, 2011; Samset, 2012). Furthermore, by crossing different territories and operating at different scales, mega transport projects tends to generate a mismatch between costs and benefits. Indeed, empirical evidence reveals that such projects often results in uneven distributions of the gains and losses over space and consequently amongst stakeholder groups, thus raising issues of social and territorial justice. Typically, the primary benefits of large-scale infrastructure projects tend to be longer-ranging and regional, national or even international in scope, whereas their potential negative effects, are likely to be immediate and local (Warrack, 1985; Gellert and Lynch, 2003). For instance, a high-speed rail line offers a fast and direct train connection between two or more major cities and can also provide them with regeneration and economic development opportunities. However, it generally bypasses smaller cities and urban settlements located along the line (Givoni, 2006). Therefore, these smaller cities, while experiencing environmental problems as a result of the line (see Ziparo et al., 2011), see also a reduction in their level of transport accessibility (Shanchez-Mateoz and Givoni 2009). As already pointed out, major ports play a key role in international trade, expanding the market opportunity of a region or a
country. By supporting a series of port-related transport and logistics activities, ports also contribute to generate employment opportunities in their logistic hinterlands (PANYNJ, pers. comm. 2015). On the other hand, port activities entail a variety of negative impacts for their host cities and local communities, including air pollution emissions from ships and trucks, water and soil pollutions, noise, and road congestions (Musso, 1996; Merk, 2013). The mismatch between benefits and costs and the unavoidable presence of winners and losers, however, applies for the opposite case as well. Indeed, the creation of more stops along a high-speed rail line would come at the expenses of the need for maintaining the shortest possible travel time between major cities (Givoni, 2006). Similarly, in a port region, the imposition of very strict regulations as well as other local constraints may render the port infrastructure system a bottleneck in the international trading system, thus determining a loss of its competitiveness (Hall and Hesse, 2013).

Large-scale projects thus always generate controversy and opposition. Whereas the possibility of achieving win-win solutions represents a captivating idea, which is frequently mentioned in the literature (see de Bruijn and Leijten, 2008; Priemus, 2008; Salet et al., 2013), consensus over large-scale projects seems hardly possible to obtain as what may appear as an ideal solution by some parties may instead be seen as a threat by others.

3.4.4 Mega transport projects as uncertain undertakings

Improvements in forecasts and data collections are often advocated as a mean to improve decisions on mega projects (see for instance, Hall, 1980; Flyvbjerg et al., 2003; Allport, 2011). However, this is not easy to realize in practice. The preceding sections have underlined that mega projects entails multiple ambiguity, uncertainty, issues and risks that do not normally exist in conventional projects. Large-scale projects are also unique and this characteristic makes them hard to estimate through comparative analysis.

In addition, major projects also involve a long-term perspective. Indeed, as indicated by many research, the period comprised between the initial conception of a large-scale project and the point when the project is approved for funding, which in the literature is commonly referred to as the front-end stage, develops slowly over many years. For example, a study undertaken by the OMEGA Centre (2011) on 30 mega transport projects has shown that half of these projects spent almost a decade in their front-end stage. The construction phase of large-scale transport projects is also particularly long, on average almost 6 years based on the OMEGA Centre’s research findings (OMEGA Centre, 2011). However, mega projects, whose preparation and construction require 20, 30 or even 50-year commitments, are not totally uncommon. This long-term planning horizon thus introduces a further source of uncertainty (see Figure 3.4) as for a project to be realized one or more decade in the future the possibility of foreseeing with any degree of precision its future consequences is severely limited (Samset, 2010; Næss and Strand, 2012). Indeed, many of the economic and social effects produced by a transport project depend ultimately on intertwined and inherently unpredictable technological, social, economic, and political trends, taking place between the early conception and the opening of the project. For instance, as explained by the managers of the PANYNJ (pers. comm. 2015), the traffic generated as a result of construction of a new container port (or the expansion of an existing one) and the possible benefits for the port region are linked to a number of factors, amongst which: economic fluctuations; the possible emergence of new market
outside of the current main container routes; the launch of new shipping routes potentially diverting freights from the port; development strategies of competing ports; advancements in maritime technology; political discontinuity; changing standards and legislation; energy and oil prices, population growth or decline and possible major alternations in the lifestyle of populations. Hence, even if a project is somehow similar to previous ones, new events and circumstances will always occur. Given then the complexity of the natural environment, the types and intensity of the effects produced by an infrastructure project on the natural habitat are also extremely likely to differ from the estimated ones (Geneletti, 2006).

![Figure 3.4 – Relationship between time horizon and uncertainty.](image)

Source: Author's own elaboration.

### 3.5 Summary of findings

Introduced in the late 1970s, the term ‘mega (infrastructure) project’, at present, is often used loosely to indicate programmes of various large-scale infrastructure projects, which may even belong to different sectors. At present, factors such as global competitiveness, the increasing involvement of private sector in infrastructure provision, an enhanced global financial system, and the ‘big fix’ mentality, increasingly pervading political leaders, seem to represent the major factors boosting mega project developments. This analysis has illustrated that there are three aspects, which deserve particular attention when dealing with the planning and appraisal of large-scale transport projects:

- their inherent complexity both structural (i.e. multiple interdependent elements which elude a univocal representation) and social (i.e. broad network of interdependent project stakeholders having different objectives and priorities);
- their potential, uneven and controversial change agent role for their surroundings; and
- their unicity and long-term perspective, which unavoidably generates many uncertainties regarding the outcomes and impacts of such projects.

Therefore, in light of this and with reference to the conceptual model in Figure 1.1 (Chapter 1), decisions on such projects can be seen as an example of ‘wicked’ problems.
Chapter 4
Mega Transport Infrastructure Appraisal: 
An Overview of the Most Common Appraisal Methods

*Forecasting is the art of saying what will happen, and then 
explaining why it didn't.*

(Anonymous, in Chatfield 2001: 109)

4.1 Chapter overview
Appraisal is an essential activity of the planning process, which is aimed at determining, in advance, whether a development proposal is worthwhile, before any decision concerning the opportunity to proceed with it is finally made. Since the beginning of the 20th century, several appraisal methods have been developed and proposed in the attempt to ensure more robust and informed decisions. At present, the methodologies most commonly adopted to assess the economic, social and environmental effects of major transport infrastructure investments, encompass cost-benefit analysis (CBA), economic impact assessment (EcIA) techniques, environmental and social impact assessment (EIA and SIA) procedures and (analyst-led) multi-criteria analysis (MCA) methods. Notwithstanding the progress made, many questions remain open and significant debates have emerged over the merits and shortcomings of each method. In particular, one of the most important disputes pervading appraisal practice is represented by the choice between CBA and MCA, which are generally seen as two opposite appraisal approaches. The former assesses a given proposal on the basis of only one indicator, reflecting the economic efficiency of the given course of action, whereas MCA methods attempt to account for a wide range of different objectives and decision criteria.

Based on a comprehensive analysis of the existing literature on transport and infrastructure appraisal, complemented with unstructured interviews and informal discussions with some international experts, this chapter attempts to explore the key features and the strength and weaknesses of the above appraisal methodologies as well as to shed light on these ongoing debates.

This chapter comprises six further sections. Section 4.2 describes the role of appraisal within the ideal planning process and presents an historical perspective of appraisal practice. The key features and underlying principles, and the strength and
weaknesses of CBA, EcIA, EIA (and SIA) and (analyst-led) MCA are discussed in Sections 4.3, 4.4, 4.5 and 4.6 respectively. The main findings of the chapter are discussed in Section 4.7.

4.2 The ideal planning process and brief history of appraisal practice

Planning can be defined as a systematic process aimed at improving the quality of decision-making. This process, in particular, consists of a number of activities, which are orientated towards the identification of effective strategies and actions to respond to a perceived problem or need and attain the desired results (Dror, 1963; de Smit and Rade, 1980). In the course of time, various paradigms have dominated the discussion of planning theory. The rationalist school of thought that emerged in the 1940s is probably the most well-known. Advanced primarily by economists and closely related to neoclassical Welfare Theory (Rycroft and Szylowicz, 1980; Kickert et al., 1999), the rational problem-solving approach assumes that an optimal judgment is arrived at, by following a detailed and exhaustive examination of all available scientifically valid information (Schön, 1983). The approach implies a sequence of logical steps, starting with the identification of a problem, and ending with the selection of the ‘best’ course of action to ‘solve’ it (Zey, 1992). These principles have been translated into the planning vocabulary by a number of authors so that, presently, the rational planning model, also termed the ‘rational-comprehensive’ (see Lindblom, 1959) or the ‘synoptic’ (see Hudson, 1979), appears in countless variations. According to Rogers and Duffy (2012), for instance, a rational planning process can be envisaged to encompass the following eight steps:

- recognition of the problem or the unmet need;
- specification of the goals and objectives to be pursued in relation to this problem;
- identification of possible courses of action to achieve these goals and objectives, while addressing the problem;
- information search so as to determine the characteristics of each alternative option;
- ex-ante appraisal of the different options on the basis of all the data and information collected;
- selection of the preferred solution;
- implementation of the chosen course of action;
- ex-post evaluation\(^1\) (i.e. after implementation) of the selected option so as to evaluate its effective outcomes and thus obtain relevant data and useful feedback on the whole process.

Owing to its critical role, appraisal has always been an intrinsic part of the planning process (McAllister, 1982; Khakee 1998). However, formal appraisal methods and

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\(^1\) In the literature, the terms ‘appraisal’ and ‘evaluation’ are often used as synonyms. However, for precision, it should be noted that ex-ante appraisal activities have a ‘forward looking’ and thus rely extensively on forecasts and predictions, while ex-post evaluation exercises present a ‘backward looking’ and are concerned with assessing, in a retrospective sense and on the basis of direct observations, the performance of a proposal, after it has been implemented (see Voogd, 1983; and Boardman et al. 2006).
procedures have started to emerge and be progressively integrated within the plan making process only after the beginning of the 20th century (Alexander, 2006a). Since then, the growing need for making more informed and rigorous decisions, while embracing new planning theories and addressing more and more appropriately emerging global issues and challenges, has led to the development of several appraisal methodologies (McAllister, 1982; Rogers, and Duffy, 2012). At risk of oversimplifying this historical trend, by drawing on Goodman and Hastak (2006) and Dalal-Clayton and Sadler (2014), the following approximate development of the field is suggested (see Figure 4.1).

Figure 4.1 – Historical development of transport and infrastructure appraisal practice.

- **Phase I** (until the early 20th century): the economic, social and environmental effects of a given development proposal were not captured systematically. Decisions concerning whether to proceed with a proposal were based exclusively on considerations about the costs of the proposal, technical aspects and purely intuitive assessments of its merits and flaws.

- **Phase II** (mid-1930s to late 1960s): the growing need for pursuing more rational investments, in consideration of the decreasing of the investment resources and the many potential and conflicting opportunities for the use of them, led to the introduction of CBA.

- **Phase III** (late 1960s to late 1990s): pressing environmental problems and the consequent growing debate on sustainability contributed to development of EIA and SIA methodologies to address more systematically environmental and social considerations and guarantee that such aspects would receive the same level of attention of other issues. Moreover, in those years, empirical research on the wider economic impacts of transport investments and the pressing need for investigating
the consequences of large-scale development proposals culminated in the introduction and diffusion of EcIA methods (Leistritz et al. 1986; Weisbrod, 2000).

- **Phase IV** (since the late 1990s): the increasing acceptance of sustainable development as the overarching policy goal of achieving a better integration between social equity, economic development and environmental protection, and the proliferation of different appraisal methodologies, each having a specific focus, has produced the need for considering all the different forms of appraisal in a more integrated way. This has resulted in the increasing use of multi-criteria appraisal frameworks, capable of ensuring a holistic examination of the multifold effects of a proposal, while highlighting synergies and conflicts between them².

### 4.3 Cost-benefit analysis

#### 4.3.1 Theoretical foundations of cost-benefit analysis

CBA can be defined as an appraisal methodology which seeks to establish the social desirability of embarking upon a given proposal, mainly from the economic point of view (Sinden and Thampapillai, 1995), by quantifying in monetary terms the value of all the positive (benefits) and negative (costs) consequences of the proposal for all members of society (Boardman et al., 2006). This method has a long history. The French engineer and economist Dupuit, in one of his papers, written in the 19th century with the objective of establishing a criterion for determining the social desirability of public investments (see Dupuit, 1844), was one of the first to articulate the principles of this technique (Alexander, 2006a). However, the earliest systematic use of formal CBA is associated with the work that took place in the field of water resource development in the United States in the 1930s, as part of the comprehensive series of social and economic programmes enacted in the country during the Great Depression (Marglin, 1967; Irvin, 1978). The *Green Book* of 1950, produced by the US Federal Inter-Agency River Basis Committee (FIARBC, 1950), is generally recognized to be one of the first attempts to instill an agreed set of rules for comparing costs and benefits, which was followed by further studies and manuals (Pearce, 1983). Since the 1960s, on account of the growing need for pursuing more rational investments, the use of CBA has been extended to other sectors, besides water, and has also spread outside the US. Presently, CBA represents the most common appraisal methodology adopted in many countries as input for decision-making on infrastructure development, particularly in the transport sector (Hayashi and Morisugi, 2000; Grant-Muller et al., 2001).

The theoretical foundations of CBA are rooted in Welfare Economics and classical Utilitarianism (van Wee, 2012; Baujard, 2013). Utilitarianism is a moral and political philosophy whose origins are commonly traced back to the works of Jeremy Bentham (Bentham, 1789). In general terms, the concept of ‘utility’ conveys the satisfaction, pleasure or happiness that an individual derives from being in a particular situation or from using a particular combination of goods and services (Parkin and Sharma, 1999). While there is wide variation of utilitarian theories, they all share the general fundamental ethical

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² While this review covers economic, environmental and social appraisal methodologies, it should be noted that, over the past century, advancements in these methods have been also paralleled by continuous improvements in technical, financial, institutional and legal appraisal procedures.
Welfare Theory, in turn, is a branch of economics, which focuses on the objective of economic efficiency and aims at identifying the optimal allocation of resource in a society so as to achieve the highest degree of welfare or well-being (or utility) of the society (Just et al., 2004). Adam Smith's book, *Wealth of Nations* (Smith, 1776), is usually considered to mark the beginning of this discipline of study, which has been strongly affected by Utilitarianism (Baujard, 2013). Although, similarly to Utilitarianism, in the development of Welfare Theory different lines of arguments and positions have progressively emerged, Welfare Economics fundamentally suggests that the welfare (or utility) of a society is made up of the welfare (or utility) of individuals that make up society. Mathematically this is expressed as:

\[
SW = U_1 + U_2 + \ldots + U_n
\]

where:

- \( SW \) represents the social welfare; and
- \( U_i \) indicates the utility of individual \( i \).

The above preposition, which is generally known as 'the principle of individualism', implies that in determining the social preference over two different states of economy the only things that count are the individual utilities and thus, ultimately, the preference of the members of society (Quirk and Saposnik, 1968). It follows that in order to determine whether an economic intervention improves or makes worse the welfare of a society, it would be necessary to estimate the change in utility of each person who is affected by this initiative (Dobb 1969; McAllister, 1982; Just et al., 2004).

Originally, the benchmark for measuring potential improvements in social welfare had been provided by the concept of 'Pareto optimality'. According to Pareto (1906), the only objective test of whether social improvement had been brought about by a change in the existing state was if some people were made better off and no one was made worse off. Therefore, any intervention, which is able to increase the utility level of at least one individual, without decreasing the utility level of any other individual, represents a Pareto improvement.

The Pareto criterion, while being powerful in theoretical terms, in practice, turns out to be excessively strict as, as already highlighted, almost every development, and in particular the major ones, is likely to produce some negative consequences, thus reducing the welfare of some people. Consequently, projects qualifying as a pure Pareto improvement (and thus potentially representing win-win solutions) are virtually non-existent. This limitation has been surmounted by Kaldor (1939) and Hicks (1940), who introduced the concept of 'compensation'. Under this less-restrictive principle, a given project can still constitute a welfare improvement if those who gain from the project are in a position to compensate those who experience losses as a result of it. It should be noted, however, that the actual process of compensation does not need to take place (Dobb 1969). Indeed, the rationale behind the Kaldor–Hicks criterion is that if there was a mechanism for such compensation to occur, the project would result in an actual Pareto improvement. Therefore, a change in the economy depicts a Kaldor–Hicks improvement.
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(Also termed potential Pareto improvement) if it would be potentially possible for the winners to compensate the losers so that, after the compensation, both the losers and gainers could turn out to be better off.

Overall, the introduction of the Kaldor–Hicks criterion, which forms the basis of modern CBA, implies that a choice about the desirability of a project can be made by considering only the overall welfare of society, disregarding the examination of the change in utility of each person as a result of this initiative. Hence, under the potential Pareto condition any intervention can be justified as long as it raises the net social welfare\(^3\) (Parkin and Sharma, 1999).

Hicks, in one of his successive works (see Hicks, 1943), has also sought to address the controversial issue of the effective measurability of utility, suggesting the use of indirect money measures. Welfare Economics thus, ultimately, relies on the ability of individuals to express their values in money terms and adopts the ‘willingness-to-pay’ criterion, namely a money metric for a person’s utility change derived from a certain action, which can be aggregated across people to obtain the overall net goodness of its outcomes. Willingness-to-pay is the maximum amount that a person would be willing to pay, sacrifice or exchange in order to receive a welfare gain or to avoid a welfare loss. As a result, within this overall framework, the approach adopted to measure the effect of a given course of action entails the calculation of the sum of the individuals’ willingness-to-pay with reference to that action. If the sum of the willingness-to-pay from those willing to pay for implementing that course of action exceeds the sum of the willingness-to-pay from those who would pay to avoid it, plus any other costs of implementation, then, under the potential Pareto improvement criterion, it is possible to argue that the proposal under examination should be implemented as it represents a potential Pareto improvement and produces an increase in the collective utility (Sugden and Williams, 1978; McAllister, 1982; Just et al., 2004).

The aggregate willingness-to-pay for a particular proposal (for instance a transport investment project) is often approximated by variations in consumer and producers surplus (Hicks, 1943 and 1956)\(^4\). Consumer surplus, first introduced by Dupuit, is the difference between what an individual has to pay for a good (i.e. the market price) and what an individual would be willing to pay for each unit of the good rather than to go without it. Analytically, consumer surplus is the triangle-like area under the aggregate private demand curve bounded by the prices of services (e.g. transport service) before and after the improvement is introduced (see Figure 4.2). Producer surplus, by comparison, is depicted by the triangle-like area below the price line and above to the supply curve function. It represents the difference between the opportunity costs of adding another unit of service (e.g. transportation) to the market, captured by the supply curve, and the revenues earned by selling that additional unit (see Figure 4.2). Changes in these areas can thus be used to measure welfare changes in society (Just et al., 2004).

\(^3\) The Kaldor-Hicks criterion has not been immune to criticism. Scitovsky (1941), for instance, has demonstrated that there are circumstances in which the potential Pareto improvement criterion could be used to argue both for a change and also for a return to the initial situation. This undermines the value of potential Pareto improvement as a clear-cut rule for resource allocation.

\(^4\) Hicks (1943) has suggested four measures of consumer surplus, amongst which the compensating variation and the equivalent variation, defined as income adjustments that maintain the consumer at particular level of welfare. According to Hicks (1956), if the income effect is small, consumer surplus will provide a good approximation of either compensating or equivalent variation.
4.3.2 Types of cost-benefit analysis appraisal exercises

CBA has been originally conceived as a rather ‘narrow’ tool, capable of quantifying only the most tangible and thus most easily measurable economic effects produced by a development proposal. However, in the course of time, owing to the rising of environmental and social awareness and continue improvements and refinements of the general theory, this method has been extended in scope (Pearce, 1998). Indeed, as illustrated in figure 5.2, CBA has progressively assumed the features of a much ‘broader’ method, encompassing a wide range of costs and benefits, including ostensibly environmental and social effects on people not directly involved in the production and/or consumption of a good or service (Schutte and Brits, 2012). These effects, which can be both positive (i.e. benefits) and negative (i.e. costs), are usually referred to as externalities as they fall outside the sector under consideration. In a broad CBA, therefore, the net change in total welfare produced by economic investments ($\Delta SW$) is conceived as the algebraic sum of the net change in total consumer surplus ($\Delta CS$) and the net change in total producer surplus ($\Delta PS$), plus the change in total external costs ($\Delta E$) (Berechman, 2014):

$$\Delta SW = \Delta CS + \Delta PS + \Delta E$$

Moreover, there have been attempts to incorporate also equity objectives besides the one of measuring the economic worth of a development proposal for society as a whole. From this point of view, it is possible to draw a distinction between ‘economic’ CBA and ‘social’ CBA (Schutte and Brits, 2012). While the former deals only with the problem of whether a given course of action constitutes an economically efficient allocation of resources, the latter seeks also to take into account intra-generational equity issues, by
considering the distribution of the costs and benefits generated by the given proposal\(^5\) (see Figure 4.3).

![Figure 4.3 – Types of CBA.](image_url)

The practice of social CBA entails the inclusion of weighting factors applied to costs and benefits in the attempt to give particular advantage to certain population groups (e.g. low-income people) or certain areas (e.g. most deprived zones) of the region under consideration, as a matter of specific policy concerns (Brent, 2006). Hence, under this approach, the net change in social welfare, \(\Delta SW\) turns out to be the weighted sum of these individual gains and losses (Sugden and Williams, 1978):

\[
\Delta SW = \alpha \Delta U_1 + \beta \Delta U_2 + \ldots + \gamma \Delta U_n
\]

where:

- \(\Delta U_i\) indicates the change in utility of individual \(i\) resulting from the project; and
- \(\alpha, \beta\) and \(\gamma\) represent distributional weights, which, in the case of economic CBA, are equal and unitary (i.e. \(\alpha = \beta = \gamma = 1\)).

However, as Snell (1997) points out, in practice, the identification of ‘appropriate’ weights is difficult (i.e. determining the distribution of net benefits by income class is seldom feasible with the available data) and controversial. Consequently, social CBA is hardly undertaken. Therefore, hereafter the generic term ‘cost-benefit analysis (CBA)’ will be employed to identify an economic CBA, unless diversely specified.

\(^5\) In literature, frequently, the term ‘social’ referred to CBA is erroneously adopted to indicate a ‘broad’ CBA, while ‘economic’ CBA is used to refer to a ‘narrow’ CBA.
4.3.3 Basic steps in cost-benefit analysis

By drawing on Snell (1997), Boardman and colleagues (2006) and Rogers and Duffy (2012), it is possible to list the main steps of a typical CBA exercise as follows:

- recognition of the problem and analysis of the decision context;
- determination of the various alternative project options to be appraised;
- specification of all the different parameters and assumptions which will be adopted in the analysis (e.g. boundaries of the area for which the analysis has to be carried out, categories of costs and benefits relevant to the analysis, planning horizon in years for the appraisal, adjustment parameters);
- prediction of all the positive (i.e. benefits) and negative (i.e. costs) effects produced by the alternative courses of action under examination, over their life span;
- monetization of these effects;
- assessment and comparison of the cost-benefit performances of the different options;
- implementation of a sensitivity analysis;
- presentation of the result of the analysis as support for the final decision.

The primary purpose of CBA is to estimating possible net social gains from proceeding with an investment compared with a reference case, which is typically represented by a ‘without project’ situation. CBA thus measures both the incremental costs and benefits, which accrue to everyone in society as a result of the implementation of a proposed project, against the costs and benefits, which would be likely to take place if the project does not go ahead. In general terms, on the costs side, the most relevant items are represented by the economic resources used by the project during its implementation and operational phases (e.g. labour, equipment, materials, land). Ideally, any other adverse effects such as negative environmental consequences and increases in risk should also be treated as a cost and added to actual budgetary outlays. In contrast, the major sources of benefits are represented by reductions in costs, to both consumers and producers, which would occur in the presence of the project. Possible environmental improvements and reductions in risk should also be included where relevant. In the case of rail or road projects, for instance, the main direct benefits as a result of the improved corridor comprise travel time saving, reduced vehicle operating costs and reduced accident costs. In the case of the construction of a new container port, the major benefit is represented by reduced transport costs, including environmental external costs, since, in the absence of the project, container ships would be forced to call at other, less convenient ports to load/unload cargo. On the other hand, the main costs of such projects encompass capital costs, costs of work zone disruption, maintenance and operating costs (EIB, 2013).

Having identified the costs and benefits that should be included within a CBA exercise, the next task is to assign monetary valuation to each of these items. The process of assigning monetary valuation to costs and benefits is relatively straightforward for the most tangible items for which a market price exists. For those items the market price can be directly used to measure the economic value of several benefits and costs
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(e.g. labour, materials). This price may be adjusted through an appropriate coefficient, termed shadow price factor, to take into account of possible market distortions.

On the other hand, market values are not available for items such as environmental aspects, the value of human life and also the travel time unit cost values, which often is assumed to be the principal benefit of transportation investments. For such items willingness-to-pay may be estimated indirectly by means of a variety of economic valuation techniques. These techniques fall into two main categories (Snell, 1997):

- revealed preference techniques, where some market prices are used as an indirect reflection of individuals' preferences for certain effects;
- stated preference techniques, which create hypothetical markets by means of structured surveys, providing respondents with the opportunity to state their preferences.

Finally, in order to make comparable the costs and benefits occurring at different points during the economic life of the project under examination, a discounting procedure is adopted to convert all future costs and benefits into their present value. Specifically from today's perspective \( t = 0 \) the economic value \( x \) of a given benefit (or cost) accruing in the period \( t = n \) is:

\[
x = \frac{1}{(1 + s)^n}
\]

In this expression \( s \) is the social discount rate which accounts for the fact that society attaches greater weight to near benefit than to distant ones (Boardman et al., 2006).

The present value of the total flows of benefits and costs happening in different years \((t=1,2,3\ldots)\) after the commencement of the project \((t = 0)\) is thus given as:

\[
present \ value \ of \ Benefits \ PV(B) = \sum_{t=0}^{T_B} \frac{B_{(year \ t)}}{(1 + s)^t}
\]

---

6 A perfectly competitive market is characterized by the presence of many buyers and sellers who have complete information about prices, product quality, and production but who are incapable of influencing the market price. Furthermore, in a perfect market all the factors of production are privately owned and there are no barriers or structural impediments to prevent firms from entering into or exiting from the market. Each firm in the market, in turn, produces and sells a homogeneous product to many buyers at the market price. Market imperfections or market distortions, generally, are any deviations from these assumptions of perfect competition. These include monopoly and oligopoly markets, negative and positive externalities in production and consumption, the presence of public goods and imperfect and asymmetric information (Nas, 1996).

7 Revealed preference techniques include: the hedonic price method, which uses commonly property prices to obtain the value of things pertaining to a location; the aversion behavior method, which is based on analyses of the changes in people's spending patterns; and the travel cost method, assessing people willingness-to-pay for visiting a site. By comparison, contingent valuation method, consisting in surveys of opinions amongst people, is one of the most used stated preference techniques (Hanley and Spash, 1993).

8 In economic (and social) CBA, the social discount rate \( s \) is represented by the sum of two elements: \( a \) and the product of \( b \) and \( g \) (Boardman et al., 2006):

\[
s = a + bg
\]

\( a \) is the pure time preference rate and reflects the hypothesis that society prefers well-being in the present over the future regardless of economic growth;

\( b \) measures the pace at which the additional (marginal) welfare arising from an increase in consumption declines; and

\( g \) is the rate of growth of per capita consumption.
present value of Costs \( PV(C) = \sum_{t=0}^{T_c} \frac{C(\text{year } t)}{(1 + s)^t} \)

The final results of CBA are often presented in summarizing indicators. The main ones are the Net Present Value (NPV), which is obtained by subtracting the sum of the discounted costs from the sum of the discounted benefits, and the Benefit-Cost Ratio (BCR), which is obtained by dividing the sum of the discounted costs into the sum of the discounted benefits:

\[
Net \text{ Present Value (NPV)} = PV(B) - PV(C) \\
Benefit-Cost Ratio (BCR) = \frac{PV(B)}{PV(C)}
\]

The basic idea behind CBA is that scarce resources should be allocated to their most valued uses, namely projects whose benefits outweigh their costs (i.e. NPV > 0 and BCR > 1)\(^9\).

The example in Figure 4.4 concerns a hypothetical rail project for which a discount rate equal to 7 percent has been assumed. The NPV suggests that society is $1.5 million better off after implementation of the project. The BCR indicates that for every US dollar of capital expended on the project, society gains $1.4.

![Figure 4.4 – Example of CBA for a transport project.](#)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Years (0 to n)</th>
<th>0 ($m)</th>
<th>1 ($m)</th>
<th>2 ($m)</th>
<th>(n) ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Travel time savings</td>
<td>0.000</td>
<td>2.000</td>
<td>2.600</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>- Vehicle operating cost savings</td>
<td>0.000</td>
<td>0.500</td>
<td>1.000</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>- Reduced greenhouse gas emissions</td>
<td>0.000</td>
<td>0.250</td>
<td>0.500</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>- Reduced pollution to nearby waterway</td>
<td>0.000</td>
<td>0.100</td>
<td>0.150</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td><strong>Total benefits</strong></td>
<td>0.000</td>
<td>2.850</td>
<td>4.250</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capital investment</td>
<td>4.000</td>
<td>0.000</td>
<td>0.000</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>- Recurrent/operating</td>
<td>0.000</td>
<td>0.500</td>
<td>0.500</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>- Externalities (noise intrusion)</td>
<td>0.000</td>
<td>0.010</td>
<td>0.010</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td>4.000</td>
<td>0.510</td>
<td>0.510</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Present value of total benefits</td>
<td>0.000</td>
<td>2.664</td>
<td>3.712</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Present value of capital costs</td>
<td>4.000</td>
<td>0.000</td>
<td>0.000</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Present value of non-capital costs</td>
<td>0.000</td>
<td>0.477</td>
<td>0.445</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td><strong>Benefit-cost ratio (BCR)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Net present value (NPV)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.5 $m</td>
</tr>
<tr>
<td><strong>Discount rate used (r)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.00 %</td>
</tr>
</tbody>
</table>

Source: DOT (2010)

\(^9\) Other criteria used to rank project proposals are the Internal Rate of Return (IRR) and the First Year Rate of Return (FYRR). IRR represents the value of the interest rate (\(r\)) at which the sum of the discounted benefits becomes equal to the sum of the discounted costs (i.e. NPV = 0 and BCR = 1). When a project presents an IRR bigger than the adopted social discount rate, the project is desirable. When comparing alternative projects, the project with the highest IRR is the preferred one. By comparison, FYRR is computed by dividing the first year’s net benefits by the present value of the investment. A low FYRR may indicate a poor investment (Berechman, 2014).
Overall the calculation of costs and benefits can be extremely challenging and it is based on different types of forecasts (e.g., estimates about project costs; length of the construction period; future transport demand, which, in turn depends on economic fluctuations, demographic conditions, development of competing modes and many other factors). The results of CBA also strongly depend on assumptions concerning the unit values of different categories of costs and benefits (e.g., travel time unit costs, measured in dollars per hour, which then need to be multiplied by the effective time savings provided by the project) and other critical parameters (e.g., social discount rate). To address uncertainties in the determination of the various parameters of the analysis and to verify its ‘robustness’ different types of sensitivity tests are undertaken at the end of the CBA exercise. Generally, during these tests the analyst determines how changes in these parameters (the different variables are varied in an arbitrary manner, generally one-by-one) affect the outcomes of the CBA.

Ideally, CBA can also be carried out for two (or more) different scenarios. This approach provides the analyst with the opportunity to identify possible changes in the NPV and BCR of the project, depending on different assumptions concerning the possible future exogenous (economic, environmental, social, political and technological) conditions.

4.3.4 Strengths and weaknesses of cost-benefit analysis

According to Snell (1997), Van Wee and Tavasszy (2008), Ergas (2009), van Wee and Rietveld (2013), and many other economists, CBA has several important assets supporting it as a useful evaluation method. In particular:

- it is a relatively rigorous and straightforward way to assess whether a proposed project constitutes an economically efficient allocation of resources;
- it uses impact categories and measurement units (i.e., money) that are understandable to decision-makers\(^\text{10}\) and the average adult;
- most of the costs and benefits for different categories of projects are relatively well-known and there is an extensive body of literature on the application of CBA to various appraisal problems, which can be used as a basis for deriving the effects of a project to be evaluated;
- it attempts to include in the final judgment the values of all people in a society rather than a selected few.

On the other hand, notwithstanding its popularity and its widespread application, CBA is also strongly criticized. Hence, beside manuals with positive recommendations, a considerable number of polemical essays have also been published. The critical comments span from technical problems to the fundamental principle and the theoretical foundations of the methodology. In some cases, these critiques are devastating and present CBA as ‘senseless’ (Self, 1970), ‘inapplicable’ (Junger, 1979) ‘stupid’ (Richardson, 2000), ‘unrealistic’ (Næss, 2006) and even ‘bastard science and insidious

\(^{10}\) As it will be emphasized in the following chapters (see in particular Chapters 6 and 7), the term ‘decision-maker(s)’ is a highly idealized notion as many people, agencies and institutions play a role in the decision-making process of major infrastructure projects.
poison in the body politick’ (Williams, 1973). Some of the most common points of criticism are presented below.

- **Difficult monetization of some effects**: in CBA, the monetization of costs and benefits is highly problematic and controversial. Whereas many (see, in this regard, Snell, 1997; Small, 1999; Beuthe, 2002; and Dobes and Bennett, 2009) consider the creation of artificial prices for environmental and social items an opportune way to include into the analysis other aspects beside the economic ones, others (see, for instance, Heinzingerl and Ackerman, 2002; Næss, 2006; Ackerman, 2008) judge the process of reducing life, health, and the natural world to monetary values as inherently unethical and flawed. Additionally, despite the progress made in economic valuation techniques, the monetization of many environmental and social items remain highly problematic (Hanley and Spash, 1993; Graham, 2006). As a result, factors whose conversion into monetary terms is relatively easier (e.g. purely economic items) may be implicitly treated as being the most important ones for the overall viability of the project (Atkins, 1990; Van Wee and Rietveld, 2013).

- **The adoption of a ‘weak sustainability’ position**: closely related to the issue of monetization of social and environmental effects is the underlying assumption that everything can be traded off against everything else. On the one hand, CBA, by expressing all the different positive and negative effects produced by a proposal in a common unit of measurement (i.e. money), helps to compare these factors with each other in the attempt to simplify decision (Snell, 1997; Small, 1999; Dobes and Bennett, 2009). On the other, this expedient entails that in an effort to pursue utility, complete substitution between environmental quality and economic growth is always allowed (Kornai, 1979). It follows that, theoretically, the possible depletion of natural, non-renewable resources does not pose a fundamental problem as far as a sufficient amount of economic capital is generated (Munda, 1995, 2008). This, however, constitute a rather questionable assumption.

- **Weak acknowledgment of policy objectives and strategies**: whereas CBA provides information about the economic viability of project proposals, it actually prevents decision-makers from properly understanding the contribution of the projects to the achievement of other objectives, which cannot be properly measured by consumer preference (Brown *et al.* 2001; van Wee and Tavasszy, 2008; Van Wee and Rietveld, 2013). Hence, hypothetically, an appraisal based exclusively on CBA may lead to the implementation of projects presenting a favorable NPV or BCR but, at the same time, colliding significantly with wider policy goals such as social equity, territorial cohesion and environmental protection.

- **Intra-generational equity issues**: CBA is explicitly designed to comply with consumer sovereignty, namely the assertion that consumer preferences determine the production of goods and services. Indeed, as explained above, CBA aims at answering one question: by how much does the total sum of money that the gainers from a project would be prepared to pay to ensure that the project is undertaken exceed the total sum of money that the losers from the project would accept as compensation for putting up with it? For this reason, CBA can be regarded, at least to a degree, as a democratic procedure for reaching collective decisions in a society (see Hanley and Spash, 1993; and Dobes and Bennet, 2009). However, it should be
noted that the willingness-to-pay of people turns out unavoidably to depend on their ability to pay, which, for rich people is greater than lower class (Nyborg, 2012). Aggregating the single preference of the individuals, in the attempt to obtain a global perspective on something, may run the risk of disregarding the views and wishes of certain parties (Dobb 1969). On account of the absence of real compensation measures in the model (i.e. the potential Pareto improvement criterion only involves a hypothetical possibility to compensate), and the lack of public participation mechanisms within the framework, preventing the identification of possible conflicts of interests (Nardini, 1997), the use of CBA can thus favor projects which, while promoting economic efficiency, produce a very uneven distribution of costs and benefits within society and even reinforce existing pattern of social inequalities (Dobb 1969; van Wee, 2012 and 2013). A possible way to address intra-generational equity issue is to perform a social CBA, by including distributional weights in the analysis. However, as already pointed out, there is no clear guidance about how such weights should be assigned. As Farrow (1998) claims, distributional weights can be considered arbitrary and can be contested, while at the same time further complicating the CBA exercise. Consequently, this approach is rarely used in practice (Snell, 1997). A rather simpler approach to deal with (or at least account for) these issues consists in merely listing distributional effects of a development proposal alongside the results of CBA. This approach is currently adopted in several countries, including UK (see DfT, 2014).

- **Inter-generational equity issue**: as explained above, discounting procedures and the choice of the social discount rate influence the speed at which costs and benefits decline into the future. As shown in Figure 4.5, where the effects of a discount rate of 1% and 4% are compared, these parameters can dominate the result of CBA and can determine whether a development proposal is judged to be socially beneficial or not. In particular, while there seems to be a general consensus within academics and practitioners about the need for differentiating the effects occurring in the short-terms

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11 According to Leonard and Zeckhauser (1983), the systematically inclusion of distribution concern in CBA is not only difficult but also inopportune. Indeed, they claim that comprehensive taxes and expenditure package constitute a far more efficient means of affecting redistribution than attempts to redistribute within every project. In contrast, other economists argue that there is a limit to the amount of distribution that can take place through the tax system (see, for instance, Brown and Jackson, 1987).

12 Amongst the approaches proposed to overcome this critical weakness of CBA, the Planning Balance Sheet surely deserves a particular mention. This appraisal method was devised by Nathaniel Lichfield in the 1950s (see Lichfield, 1956) and applied by him on several occasions to town and regional plans in the UK (see for instance Lichfield, 1966). Lichfield’s Planning Balance Sheet largely adopts the framework of CBA, sharing with the latter its basic theory and methods. It however goes beyond traditional CBA as it records detailed information on the distribution of costs and benefits amongst different groups of people affected by a proposed plan. In particular, with this method, two main groups of actors within the community, producers and consumers, are considered (Lichfield, 1970; Lichfield et al. 1975). The Planning Balance Sheet also formally accommodates in appraisal tables non-monetary effects alongside monetized impacts (Lichfield, 1970; Lichfield et al. 1975). While providing valuable ideas for surmounting some of the intrinsic limitations of CBA, Lichfield’s methodology has been heavily criticized for its excessive complexity (Peters, 1973; Voogd, 1983) and costs (McAllister, 1982), which have both limited its applications. McAllister (1982) also points out that the organization of information around two main categories of people often may fail to reveal the most important equity effect, namely the adverse impact on disadvantaged groups in society, who seldom constitute a unified producer or consumer group. Other different critiques to this approach were made by Morris Hill, who explicitly developed its Goal-Achievement Matrix as a response of the perceived shortcomings of both CBA and Lichfield’s Planning Balance Sheet (see Hill, 1966, 1968).
from those produced in the long-term, the way such effects should be treated is a very controversial topic, subject to multiple and conflicting interpretations. Indeed, in the course of time, alternative discounting formulas and procedures (see, amongst others, Samuelson, 1937; Weitzman, 2001; Ponti, 2003; and El-Haram and Horner, 2008) as well as different values of the social discount rate have been suggested. Some people, for example, contend that the most common values of the discount rate (i.e., 4%-6%) are excessively high and, by reducing dramatically the potential long-term negative environmental consequences of a project proposal, may systematically and improperly downgrade the importance of the environment, thus forcing future generations to bear a disproportionate cost (Heinzerling and Ackerman 2002; Næss, 2006). The use of very low discount rates is thus expected to overcome this situation. On the other hand, it is also obvious that even the use of a lower discount rate may not be necessarily beneficial for environmental quality and future generations. Indeed, compared with a high discount rate, a very low value of \( s \) may imply an increase in the volume of investment projects. By preserving the value not only of the future costs but also of the long-term benefits, a low discount rate may indeed allow a very large number of projects to pass the cost-benefit test. This, in turn, would increase the demand of environmental resources, thus accelerating their depletion (Markandya and Pearce, 1988; Koopmans and Rietveld 2013).

**Figure 4.5 – Influence of the discount rate of the benefits occurring in different years.**

![Figure 4.5 – Influence of the discount rate of the benefits occurring in different years.](source: Koopmans and Rietveld (2013)).

- **Arbitrariness:** while CBA may be seen as a relatively ‘neutral’ approach to assess the economic viability of a project (see Van Wee and Tavasszy, 2008; Ergas, 2009; and Van Wee and Rietveld, 2013), some scholars, such as Davies (1997), Omura (2004), Næss (2006) and Damart and Roy (2009) question the presumed objectivity of the

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13 Some economists contend that issues associated with inter-generational equity, similarly to those of intra-generational equity (see footnote 10), cannot and should not be addressed by CBA alone (Goulder and Stavins, 2002). According to these economists, the successful treatment of these issues should require the establishment of opportune institutional frameworks aimed at safeguarding the rights of future generations (see Padilla, 2002).
method. Indeed, these authors claim that several aspects of this method, including the use of the utilitarian concept, the assumptions of perfect markets and that humans act as fully informed utility-maximizing consumers, the use of monetary equivalents for the different categories of costs and benefits, the procedure for obtaining these price tags, discounting and so forth, are all part of a set of purely arbitrary hypotheses (which often do not reflect the reality). Furthermore, different countries present dissimilar traditions and guidelines for CBA (e.g. different monetary values for various categories of costs and benefits, different ways to values costs and benefits, different views on the social discount rate). Even within the same country, sector or organization, some of the key parameters of CBA are also likely to change over time, thus leading to projects been accepted or rejected exclusively on the basis of these shifting parameters. The European Investment Bank, for instance, highlights that, at present, in Europe, $s$ ranges from 1% (Czech Republic) to up to 6% (Denmark) (EIB, 2013). Currently, the European Commission recommends a social discount rate of 5% for the most disadvantaged European economies, with high growth outlook, and 3% for relatively rich countries (EC, 2014), while, in 2008, it recommended a social discount rate of 3.5% and 5.5% respectively (EC, 2008). In UK, since 2003, a discount rate of 3.5% has been suggested (HM Treasury, 2003), while previously it had been set at 6%.

- **Uncertainty**: as previously explained, the calculation of costs and benefits of a project proposal is based on forecasts and assumptions about the future development of the multiple (economic, social, political and technological) variables influencing the project under examination. However, as already pointed out in Chapter 3, despite the progress made in forecasting techniques, computer modeling and sensitivity analysis, all these factors remain extremely difficult to predict with any reasonable degree of accuracy (Samset, 2010; Næss and Strand, 2012).

- **Complicatedness**: lastly, due to its intrinsic complicatedness, CBA often turns out to be impossible to understand completely for other people than a narrow group of experts (Næss, 2006).

### 4.4 Economic impact assessments

CBA is the basic tool to estimate the direct economic costs and benefits of infrastructure projects and transport investments in particular. On the other hand, there is an increasing awareness that especially large-scale transport projects may have economic impacts that go far beyond travel cost savings. These impacts may include, for instance, employment generation, increased productivity and availability of labour, changes in land and property values (Weisbrod, 2000), and represent second and later round flow-on effects of a transport investment (Mohring, 1976). EcIA techniques attempt to measure such impacts with the view to complementing the results of CBA, thus providing decision-makers with a broader perspective concerning the economic implications of infrastructure projects (Sinha and Labi, 2007).

Economists techniques range from qualitative to highly quantitative methods as shown in Figure 4.6.
Less data intensive tools comprise business surveys and expert interviews, market studies and other small-scale investigations, and comparative analyses of similar case studies. More elaborated methodologies include: input–output modeling, which are aimed at mapping the inter-industry relationships within an economy and showing how output from one industrial sector (e.g. transport) may become an input to another industrial sector; statistical models, which predict the relationships between transport investments and regional development patterns on the basis of historical data; and economic simulation models, which essentially represent more sophisticated versions of input–output models (Sinha and Labi, 2007).

The selection of tools for assessing economic development impacts depends on the nature and scope of the project and the amount of resources available. Large-scale infrastructure investments would typically demand more detailed and quantitative studies than conventional projects. However, although often capable of producing more rigorous results, quantitative analyses can be very expensive and time consuming, since they require large amount of data, which are not readily available (Sinha and Labi, 2007).

It should be noted, in any case, that, to date, the estimation of the economic impacts of infrastructure investment has remained a rather inexact field. Indeed, as already highlighted, the relationships between infrastructure investments and growth are not totally clear. There is also no agreement over the mechanisms by which transportation projects can impact on the economy (see Banister and Berechman, 2000) and whether wider economic impacts are somehow additional to those ones captured by CBA or represent merely different ways to view the same economic growth (see Mohring, 1976; SACTRA, 1999; and Vickerman, 2013). Moreover, economic impacts studies frequently entail inconsistencies and discrepancies even concerning the basic terminology (see Weisbrod and Alstadt, 2007).

In general, economic impact studies tend to be marred by several sources of error, as several factors are hard to directly measure. Clearly discerning the long-term impacts of a new infrastructure from all the other factor potentially affecting the development of a region (e.g. demographic, economic and political trends, and the construction other infrastructure systems) is also extremely problematic if not impossible (ECMT, 2001). Moreover, the outcome of the analyses turns also out to be highly affected by the assumptions, which have been employed. For instance, the total economic impacts

![Figure 4.6 – Tools and techniques for economic development impact assessment.](image-url)
produced by a project may differ substantially, according to the geographic scale being examined (Weisbrod, 2000). Hence, the investigation of the possible economic impacts of a new transport infrastructure based on relatively small study areas may lead to description of the location movements of businesses as ‘creation of new activities’. Vice versa, with the definition of wider boundaries the location movements of these businesses may be considered simply as ‘internal redistributions of existing business activity’.

4.5 Environmental and social impact assessments and consultation procedures

4.5.1 Key features of environmental impact assessment

EIA represents a systematic procedure for identifying, predicting and examining in advance the possible consequences of a development action on the environment, with the view to mitigating potential negative effects before taking decisions on whether the development should go ahead (Glasson et al., 2005; Senécal et al., 1999). The origin of EIA can be traced back to the late 1960s when, as the result of the growing demand for environmental accountability in infrastructure provision, the US National Environmental Policy Act (NEPA) of 1969 established a specific procedure in order to account for non-monetary effects, not included in CBA (Parkin and Sharma, 1999; Goodman and Hastak, 2006). In the European Union, EIA was firstly introduced in 1985 with the Directive 85/337/EEC, which has been successively amended by the Directives 97/11/EC and 2014/52/EU. Progressively, EIA has been given legal and institutional force in many other parts of the world, so that it is now practiced in more than 100 countries (Petts, 1999c; Wood, 2003), including many developing economies (Lee and George, 2000).

EIA provides for a formal, multi-dimensional framework capable of integrating different types of assessment such as air quality assessment, water quality assessment, ecological impact assessment, visual impact assessment and health impact assessment, so as to arrive at a comprehensive, holistic view of the manifold environmental consequences (i.e. adverse and beneficial, short and long-run, reversible and irreversible, spatially concentrated or diffuse) of a development proposal, prior to a decision being taken on whether the proposal should be given approval to proceed (Petts, 1999a). Compared with other mechanisms for environmental protection, EIA places a greater emphasis on prevention (Glasson et al., 2005). Ideally, it should lead to the abandonment of environmentally unacceptable actions and to the mitigation to the point of acceptability of the environmental effects of proposals, which are ultimately approved (Wood, 2003).

According to Noble (2011), a typical EIA process comprises the following five steps (see Figure 4.7), although the process can differ substantially from project to project or/and from country to country (Glasson et al., 2005):

- **screening**: determination of whether a development action requires EIA and if so what type of level of assessment is required;
- **scoping**: detailed description of the development action, definition of possible alternative courses of actions, identification of all the issues and parameters that should be addressed during the process and the likely potential effects produced by the development proposal;
• **assessment**: identification all the relevant effects of the development action under consideration and appraisal of their significance with respect to the pre-project conditions.

• **mitigation**: determination of opportune measures to avoid, reduce, remedy or compensate for any significant adverse effects;

• **monitoring** (for those projects that have been eventually implemented): observation of the impacts effectively produced by the projects, with the view to determining whether they conform to the predicted ones and taking appropriate action in response to unanticipated consequences.

With respect to the concept of ‘environment’ and the consequent scope of EIA there are different interpretations. While some countries limit the scope of EIA to only ecological and physical issues, others consider the environment inclusive of social and cultural aspects. Yet, other countries interpret the meaning of ‘environment’ in an even larger way to include also economic consideration (Partidario, 2005). In the latter case, EIA may thus encompass also the results of EcIA, although these are generally limited to a brief summary (Weisbrod, 2000).

**Figure 4.7 – Key steps EIA process**

![Diagram of the EIA process](image)


A range of both quantitative and qualitative tools and techniques are employed throughout the EIA process. Baseline studies and impact prediction and assessment are undertaken by means of forecasts, input-output techniques, scenario and simulation
analysis, computer modeling, geographical information systems, field surveys, literature search and so forth (Dom, 1999; Parkin and Sharma, 1999; Goodman and Hastak, 2006). Uncertainty in EIA predictive exercises can be handled through sensitivity analyses, by examining the effect of varying the inputs of the mathematical model on the output of the model itself (Glasson et al., 2005). As illustrated in Figure 5.6, consultation and participation are considered a fundamental part of the process (Glucker et al., 2013). Ideally, different forms of participatory methods can be employed with the view to disseminating information, receiving feedback, examining some issues in detail, solving conflict and/or promoting social learning, in accordance with the needs of the different stages of the EIA process (Petts, 1999b).

Often simple MCA techniques (see Section 4.6) are used to support EIA procedures (Jones, 1999; Neste and Karjalainen, 2013). Indeed, the results of the assessment are usually presented through tables, graphs, or charts illustrating the effects produced by the given project against to the different environmental (and, in some cases, also social and economic) aspects that have been investigated (Glasson et al., 2005). In many cases, in an effort to arrive at an overall judgment concerning the impact of the project under investigation, the performances of the project against the various indicators are aggregated together to obtain a global index (Steele et al., 2009; Huang et al., 2011). Figure 4.8 illustrate a typical EIA appraisal summary table for a port expansion project.

**Figure 4.8 – Example of a typical EIA appraisal summary table for a port expansion project.**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
</tr>
<tr>
<td></td>
<td>Range Value (-5 to +5)</td>
</tr>
<tr>
<td></td>
<td>During Construction</td>
</tr>
<tr>
<td></td>
<td>Range Value (-5 to +5)</td>
</tr>
<tr>
<td></td>
<td>Post Construction</td>
</tr>
<tr>
<td></td>
<td>Range Value (-5 to +5)</td>
</tr>
<tr>
<td>Hydrology (Ground and Surface water)</td>
<td></td>
</tr>
<tr>
<td>Coastal Dynamics</td>
<td></td>
</tr>
<tr>
<td>Marine Water Quality impacts</td>
<td></td>
</tr>
<tr>
<td>Gaseous emissions</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td></td>
</tr>
<tr>
<td>Impacts on Terrestrial Ecosystem</td>
<td></td>
</tr>
<tr>
<td>Impacts on Terrestrial Marine Ecosystem</td>
<td></td>
</tr>
<tr>
<td>Sociological and Cultural Components</td>
<td></td>
</tr>
<tr>
<td>Economic and Operational Components</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Adapted from) Technological and Environmental Management Network Ltd (2013).
4.5.2 Social impact assessment

Whereas environmental and economic issues dominated the sustainable development debate at its beginning, in recent years the social dimension has gained increased recognition as a fundamental component of sustainable development (Colantonio, 2007 and 2008). Consequently, besides EIA, also SIA has been developed. Differently from EIA, which attempts to assess mainly measurable phenomena such as noise or pollution, SIA presents a sociological focus. Indeed, it can be defined as a process, which is aimed at identifying, predicting and evaluating the future effects of a proposed intervention on peoples’ cultural traditions and lifestyles, their physical and psychological health, their families, their businesses, their institutions and their community, with the objective of ensuring that possible adverse consequences are minimized (D’Amore, 1978; Vanclay, 1999).

SIA can be traced back to the same NEPA of 1969 that spawned EIA (Parkin and Sharma, 1999; Goodman and Hastak, 2006). Hence, in general, the key principles (i.e. prevention, multidisciplinarity, participation) and steps of the EIA process can also be found in the SIA, although the latter is undertaken in order to develop and implement appropriate recommendations and impact management measures to protect mainly the quality of life of people (Vanclay, 1999). Institutional analysis, value mapping, social profiling, focus group discussions, surveys and questionnaires are some of the social science tools usually employed for SIA (Goodman and Hastak, 2006).

In many case, SIA constitutes a subset of EIA, with social and cultural issues forming a specific section of the EIA report. Other times, SIA is conducted as a separate exercise, either in parallel with EIA or on its own (Vanclay, 1999). In the latter case SIA may also include some environmental impact indicators as the environment can be seen as a life support system (Vanclay, 1999).

4.5.3 Strategic environmental assessment

In many cases, projects are not ‘stand-alone’ entities, but rather they are the ultimate product of broader decision-making hierarchy. Ideally, this hierarchy may be envisaged ranging from (international, national and/or regional) policies down to (national or regional) plans, programmes and ultimately projects. A policy can be thought as a set of instructions elaborated by governments that identifies the long-term goals and the intended path towards a desired state of affairs (see Nakamura and Smallwood, 1980; and Howlett and Ramesh 2003). A plan, by comparison, represents a long-term agenda of coordinated activities, for the implementation of a policy in a particular sector or area (ECMT, 2000; Eales et al., 2003). A programme, as already explained in the previous chapter, consists of a coherent set of project proposals, with reference to a relatively near planning horizon, which elaborates and implements the correspondent plan and policy (ECMT, 2000; Eales et al., 2003). A project, finally, is a well-defined and non-divisible course of action, which is undertaken as part of a wider programme to deliver a specific output (Little and Mirrlees (1974; Eales et al, 2003). Ideally, policies, plans, programmes and projects are thus progressively more specific in time and place, and concerning the level of detail, although, in practice, this distinction turns out to be less clear and elegant than in theory (e.g. mega projects are in reality programmes of different large-scale projects).
Since the 1990s, due to dissatisfaction with the limitations of EIA to site-specific projects, the use of a modified form of this technique at policy, plans and programme decision-making levels has become increasingly common in several countries (Parkin and Sharma, 1999). Originally known as EIA of policies, plans and programmes, it has been subsequently named strategic environmental assessment (SEA) to distinguish it as a new methodological tool. The term ‘strategic’ in SEA has thus been conventionally adopted to identify policies, plans and programmes all together, as opposed to projects (Partidario, 2005). SEA can thus be defined as a formalized, systematic and comprehensive process for evaluating the environmental (and social) consequences of a strategic action (i.e. policy, plan or programme) in order to ensure they are fully included and opportunely addressed at the earliest appropriate stage of decision-making, before the development and authorization of individual projects (Sadler and Verheem, 1996). International literature, but also legislation (see, for instance, the EU SEA Directive 2001/42/EC), distinguish the various planning and decision-making levels and map the mutual relationships between the various SEA and EIA assessments (see figure 4.9).

Figure 4.9 – Ideal sequence of environmental assessments procedures within a tiered planning and decision-making system

Source: (Adapted from) ECMT (2000).

Similarly to SIA, SEA inherited EIA assumptions, concepts, terminologies as well as key process stages, tools and techniques (Parkin and Sharma, 1999; Therivel and Brown, 1999). However, the geographical scale and the planning horizon considered by a typical SEA process are generally greater than those of an EIA process (ECMT, 2000). As a result, unavoidably, the degree of detail and accuracy of information in a SEA process is generally lower than that of EIA (see Figure 4.10).

14 However, according to Partidario (2005), while the term ‘strategic’ is acceptable for policies, it is debatable whether programmes (and in some cases also plans) could be described as strategic, since many of them lack a long-term perspective.
4.5.4 Participatory consultation procedures

As explained above, consultation and participation are essential elements of environmental and social impact assessment practice. Virtually all the Western countries have enacted some forms of participatory consultation procedures in infrastructure planning, which are organized as part of both ordinary planning processes and EIA exercises (Petts, 1999b; Behre et al., 2015). The general principles of public participation in formalized planning and decision-making procedures concerning infrastructure projects are laid down in the NEPA of 1969, the EU environmental impact assessment legislation and in the already mentioned Aarhus Convention (UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, adopted in 1998 and enacted in 2001). All these documents and guidelines provide for the rights of everyone to receive information and express their opinion on matters concerning the environment (Petts, 1999b; Behre et al., 2015). Nevertheless, the picture of public participation procedures in the various countries is very heterogeneous and often contrasting (see Table 4.1). Major difference can be found with reference to the several aspects.

- **Types of participatory procedures**: in the literature a number of different participatory techniques can be found (see Petts, 1999b; van Asselt et al., 2001; and Slocum, 2003). However, according to Behre and colleagues (2015), the most common forms of participatory process adopted in Western countries are represented by public hearing, written submissions and public inquiries. The main purpose of a public hearing is to allow citizens and all the other interested parties to give oral comments over a proposal. However, comments are limited in time (i.e. typically each person is given only a few minutes to express his/her viewpoint) and there is no obligation to take them into account when formulating the final decision concerning the proposal.
(Williamson and Archon, 2004). Written comments, by comparison, enable the different stakeholder groups to express their views on a proposal in a more formal way, even though, also in this case, opinions are not necessarily considered in the decision-making (Behre et al., 2015). In contrast, public inquiries indicate a broader process, where the benefits and costs of a given proposal and the associated issues are discussed in depth and where citizens and all the other interested parties can play a more active role in the identification of the best course of action (Behre et al., 2015).

Table 4.1 – Participatory mechanisms in infrastructure planning in selected countries.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Overview of participatory practices in infrastructure planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>In the UK, public participation in infrastructure planning takes place in two different moments. The first one concerns the development of the National Policy Statements (i.e. policy guidelines including the UK Government’s objectives for the development of nationally significant infrastructure in a particular sector or area) and their assessment through strategic environmental assessment procedures, where the public and the environmental authorities are also involved. Furthermore, as part of the planning and decision-making process of a project, the developer has the duty to consult local authorities, landowners and all the other significantly affected actors and groups. During a pre-examination phase, people are invited to register in order to become interested parties and provide their comments in written form. In a preliminary meeting an inspector identifies the most significant issues to be discussed and examined in a successive phase. During this examination phase, interested parties can submit more detailed representations to the Planning Inspectorate and public hearing can also be held. (See Marshall, 2013; Behre et al., 2015; and King, 2015).</td>
</tr>
<tr>
<td>France</td>
<td>In France, public inquiries are held for the most important infrastructure projects. The inquiry generally takes place at the early planning stages so as to provide a public space to discuss the need, form and desirability of the projects. The process is led by an independent commission, which eventually publishes a report summing up the findings of the public inquiry, but with no recommendations. The developers must then declare what actions they will take in response to these findings (i.e. go ahead as planned, alter, or withdraw the project). The commission has also some follow-up role, as a guarantor of the developers’ commitments. Projects then have also to go through various other stages of gaining public approval. (See Marshall, 2013; Behre et al., 2015; and Eveillard, 2015).</td>
</tr>
<tr>
<td>Holland</td>
<td>In the Netherlands, decision-making procedures on large-scale projects typically imply broad participatory processes. Participation takes place at an early stage of the planning process and is open to anyone. A draft decision, together with all the associated documents (including EIA reports), is available for inspection during a period of six weeks. During this period, interested parties can express their views, either in writing or orally (e.g. public hearing). The applicant shall be given the opportunity to respond to the views stated. The administrative authority shall take the decision no later than six months after the receipt of the application. (See Marshall, 2013; Beijen and Schueler, 2015; and Behre et al., 2015).</td>
</tr>
<tr>
<td>Italy</td>
<td>In Italy, public participation generally takes place during the final planning stage, when a definitive project has already been drawn. In the ordinary planning process only landowners have the right to participate to defend their property rights against expropriation. By comparison, during environmental impact assessment procedures public inquiries, involving all the interested parties, can be held. It is a faculty of the competent authority to call for such a consultation process. (See Behre et al., 2015; and Civitarese Matteucci, 2015).</td>
</tr>
<tr>
<td>USA</td>
<td>In the US, every metropolitan planning organization (MPO) and state department of transportation (DOT) have a public participation plan, which describes the agency’s overall strategy to provide public participation opportunities in the planning process. For proposed projects implying potential environmental impacts, public participation is regulated under NEPA and other federal and state laws. The most common form of participatory process adopted in the US is represented by public hearings. Oral comments from the public are recorded at the hearing, while written comments are collected during the pre- or post-hearing comment periods, which must last for a standard, predetermined number of days. Formal public hearings have legal implications on how the agency responds to public comments (See Williamson and Arhon, 2004; Goodman and Hastak, 2006; Meyer, 2016).</td>
</tr>
</tbody>
</table>

Source: Author’s own elaboration based on the cited literature.
• **Management of the procedures:** Participatory processes can be organized and managed by an independent commission, although in many cases they are arranged by project promoters, who invite the public and the interested parties and pay the costs of the processes (Petts, 1999b).

• **Participants in the procedures:** the participatory process may be open to anyone, to the interested parties or only to some specific groups (Behre et al., 2015). When the process is open to anyone, the level of attendance (which can range from a small room with only a few people and some elected officials to an big auditorium full of concerned citizens) depends on the amount of controversy surrounding the issue and the level of publicity of the event (i.e. sometimes the process is well publicized in the media, while other times it is barely mentioned) (Williamson and Archon, 2004). Participants take part in the process as either individuals or representatives of organized groups. Sometimes also experts from fields relevant to the issue can be involved in the process (Petts, 1999b).

• **Time when the process is undertaken:** participatory procedures can virtually take place during all the planning stages comprised between the early conception of the proposal and the moment in which the decision on the binding permit is taken (Petts, 1999b; Behre et al., 2015).

4.5.5 **Strengths and weaknesses of environmental and social impact assessments**

Several authors, amongst whom Senécal and colleagues (1999), Petts (1999a), Glasson and colleagues (2005), point out that EIA and SIA constitute a valid appraisal framework for ensuring that the environmental and social consequences of a project proposal are properly addressed in project appraisal, at the same level of economic and technical considerations. In addition, the employment of EIA at policy, plan and programme decision-making levels (i.e. SEA), can function as an early warning system, identifying potential issues at the beginning of the decision-making hierarchy (Bina and Vingoe, 2000). Overall, the employment of EIA, SIA and SEA procedures thus ensure that actions are authorized in the full knowledge of their environmental consequences (Sadler and Verheem, 1996; Parkin and Sharma, 1999), avoiding potential high costs for mitigating unforeseen negative and damaging impacts.

These impact assessment procedures represent, however, only partial appraisal methodologies as, in many cases disregard (completely or partially) the economic implications of policies, plans, programmes and/or projects (Ortolano and Shepherds, 1995; Eales et al., 2003). Moreover, often, such analyses are generally incapable of arriving at accurate predictions of environmental impacts (Byron et al., 2000; Gontier et al., 2006). Indeed, the environmental impacts produced by a transport project are related to, among other things, the technical and engineering design characteristics of the infrastructure, the traffic generated (which, as already pointed out, are determined by the future economic, social and political conditions) and the features of the receiving environment (e.g. fauna, flora, population density, topography, soil types). All these factors introduce inevitable uncertainty and complexity in impact predictions (Dom, 1999; Geneletti, 2006). Many social costs and benefits, then, not only are very difficult to measure (either in a quantitative or qualitative manner), but rather are even difficult to define objectively (Vanclay, 1999). For instance, the definition of aspects such as equity,
cohesion, happiness, quality of life, sense of place, is a matter of judgment on which there is no real consensus (Miller, 1985). This general lack of precision is exacerbated even more in the case of SEA owing to the more generic and vague nature of programmes, plans and policies if compared to projects (Eales et al., 2003).

It should also be noted that data collection activities, impact prediction tools and indicators used as part of EIA, SEA and SEA, are very elaborated and costly, so that, often, time and budget constraints to undertake these analyses further limit the accuracy of the results (see Thompson et al., 1997; Gustavson et al., 1999; Dom, 1999).

Furthermore, analogously to EcIA, the outcome of environmental and social impact assessment procedures turns out to be affected by the key assumptions and choices made in carrying out the analysis (see Wood et al., 2006). In this respect, notwithstanding the existence of specific directives regulating EIA, international literature highlights a lack of uniformity in these procedures in terms of steps of the process, definition of the boundaries of the study area, categories of effects taken into account, tools and techniques employed throughout the process, level of stakeholder involvement and so forth (Bina and Vingoe, 2000; Geneletti, 2006). On the one side, it is evident that any development is unique in terms of character, scope, location and effects, so that appraisal procedures need somehow to adapt to the features of the proposal under examination. On the other hand, it is equally clear that too much room for interpretation may risk undermining the power of these methods.

Finally, while the concept of participation has underpinned EIA procedures since its inception, the organization and management of participatory consultation processes still entail significant practical issues. Even a quick glance at the literature on environmental and social impact assessment practice shows that this represents one of the more debated topic amongst scholars and practitioners (see, amongst other, Petts, 1999b; Del Furia and Wallace-Jones, 2000; Saarikoski, 2000; Hartley and Wood, 2005; Doelle and Sinclair, 2006; Stewart and Sinclair, 2007; Glucker et al., 2013; Soria-Lara et al., 2015). In particular, the most critical question seems to be: ‘who should participate in the process?’ From a democratic point of view, an inclusive approach to participation in EIA seems reasonable. On the other hand, in the case of large-scale infrastructure projects or other major policy decisions having far-reaching consequences with regard to both time and space, it is by no means trivial to identify all the interests involved in or potentially affected by the specific conflict. Indeed, in such circumstances there are far too many parties who may be considered potential stakeholders for the problem at hand (i.e. virtually, major infrastructure projects affect the whole society). The situation is further complicated by the fact that many groups fail to make their views known due to lack of resources or experience (Sewell and Coppock, 1977). Moreover, whereas normative stakeholder theory assumes that it is possible to subdivide stakeholders into rigorously defined specific classes, very few stakeholder groups are in reality internally homogeneous in terms of values, interests or priorities (Wolfe and Putler, 2002). For instance, what is commonly referred to as ‘local community’ is in reality the aggregation of several groups who might have some interests in common but who might also disagree on many other matters (see Petts, 1999b; and Vaclancy, 1999). A number of partially overlapping groups can thus be identified according to the specific issue considered and the criteria used to map those groups (e.g. geography, gender, income, age, ethnicity) (see Bootha and Richardson, 2001; Wolfe and Putler, 2002).
While, undoubtedly, there can be considerable benefits in including in the process a wide array of different values and goals, the involvement of a large number of participants is also extremely likely to make the consultation exercise very challenging. Indeed, the more people and groups are allowed to participate; the more difficult meeting all the various expectations becomes (Sewell and Coppock, 1977). Fishkin (1995:80), in this respect, argues that “a room of one million creates the conditions for rational ignorance”. In other words, too many voices amount to noise, not to a shared public opinion. Accordingly, it is evident that some trade-offs need to be made between the objectives of democracy, inclusiveness and comprehensiveness and the more practical need for creating a workable and efficient process, thus involving a limited number of people. Therefore, this ideal model, where every person affected by a given issue can have an input into the decision concerning that issue, in many cases, turns out to be approximated by discussions between a few tens of people, which consequently do not satisfy the requirements of statistical representativeness (see Kenyon et al., 2001; and Gavelin et al., 2007). The selection of participants, regardless of how it is undertaken, poses also issues of justice, equity and fairness and almost always result in some people feeling deprived of a fundamental democratic right to participate (Petts, 1999b).

Some parties also may not be informed enough to correctly assess the consequences of the proposal under examination (McAllister, 1982) or many may not be able to abstract or conceptualize issues and impacts in the way required by EIA and SIA procedures (Vaclancy, 1999). In all these cases, all these parties may be required to take some crash courses before they can even begin to approach their task.

4.6 Multi-Criteria Analysis

4.6.1 Origins and diffusion of Multi-Criteria Analysis

Appraisal methodologies can be classified in several ways (see, for instance, Faludi and Voogd, 1985; Guba and Lincoln, 1989; Söderbaum, 1998; and Rogers and Duffy, 2012). One of the simplest classification schemes is based on the number of objectives (and decision criteria) considered in the analysis. From this point of view, it is possible to distinguish between two families of appraisal methodologies, although it is important to stress that the boundaries between these two classes of methods are not always clearly defined:

- *mono-criterion methods*, including CBA, which assess a given course of action with respect to a single and specific objective; and

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15 Allain (2015), for instance, reports that, in a large public meeting concerning the extension of an highway in the western part of Paris (France), owing to the presence of more than 2,000 people, having contrasting views on the project, the noise produced during the discussion reached the level of 104 decibels, that is the noise made by a plane at takeoff. This obviously hampered effective communication.

16 This section focuses on analyst-led multi-criteria appraisal frameworks, which are adopted, according to a technocratic approach, to examine comprehensively and in a more integrated manner the economic, environmental and social effects of a development proposal. Participatory multi-criteria appraisal frameworks, combining multi-criteria appraisal frameworks and participatory processes, will be described instead in the following chapter.
• **multi-criteria methods**, which encompass a wide array of techniques and tools through which multiple objectives and criteria can be formally incorporated into the analysis.

Differently from CBA, which has an old history, MCA is a relatively new discipline. The work of Charnes and Cooper on goal programming problems in the field of operational research, during the second half of the previous century (see, for instance, Charnes and Cooper, 1961), is commonly regarded as one of the major stimuli for the development of MCA methodologies. However, as pointed out by Köksalan and colleagues (2011), the real roots of this discipline are much more ancient and are deeply entwined with studies of classical economists and mathematicians, which are also at the origin of CBA. The evolution of MCA has also been directly or indirectly influenced by a number of research in a variety of different areas including, amongst others, game theory, utility and value theory, voting oriented social choice theory, revealed preference theory and fuzzy sets theory (Roy, 1996; Köksalan et al., 2011). All these works have been extended in various directions so that, presently, MCA comprises many subfields and different schools of thought. As already specified in Section 1.3.2, over the years, various forms of MCA have been employed in a number of different fields, including transport and infrastructure appraisal (see Macharis and Bernardini, 2015).

In the scientific literature, many arguments can be found in support and against both CBA and MCA methods as possible appraisal approaches. Originally the focus of these discussions had been represented mainly by ‘which one between CBA and MCA constitutes the best appraisal framework’ (see, for instance, Hill, 1966, 1968 and 1973). However, progressively the debate seems to have shifted, at least partially, towards reflections aimed at identifying complementarities between the two approaches. Hence, in many studies, a combination of CBA and MCA has been proposed to account respectively for effects of development proposals which can be easily monetized, and those, which, in contrast, cannot be subject directly to a monetary assessment (see, amongst other, Salling et al., 2005; Sijtsma, 2006; and Schutte, 2010). Alternatively, as Parkin and Sharma (1999) and Goodman and Hastak (2006) illustrate, CBA and MCA can also be used in two successive stages, one as primary screening tools (to identify and reject poor project options, immediately at the early stages of the appraisal process) and the other for further, more detailed assessments of the most suitable project proposals.

Furthermore, especially in the last two decades, on account of the growth and the spread of the concept of ‘sustainable development’ as a multidimensional variable and the consequent need for undertaking more holistic assessments (Eales et al., 2003), MCA has started to be proposed as an overarching appraisal framework, in the attempt to reconcile the results provided by the different forms of (economic, environmental and social) appraisal exercises (Lichfield, 1996; Colantonio, 2007 and 2008; OECD, 2010; Dalal-Clayton and Sadler, 2014). On the one hand, ideally, infrastructure appraisal can already be interpreted as a multi-criteria and interdisciplinary process, during which the viability of development proposals is investigated from different perspectives, by employing several assessment methodologies, each examining the proposal under a different lens (see Figure 1.3 of Chapter 1). On the other hand, it is increasingly contended that, only a general framework capable of properly integrating these various approaches may allow decision-makers to properly understand synergies and conflicts
between the various project objectives\(^\text{17}\) (Lee and Kirkpatrick, 1997 and 2000). Figure 4.11 illustrates the (theoretical) relationship between the various appraisal methodologies. As it is noticeable from this figure, by incorporating, in many cases, social and cultural aspects and economic analyses, besides ecological and physical concerns, EIA summary sheets result to be very similar in scope to MCA.

**Figure 4.11 – (Ideal) mutual relationships between the various forms of economic, environmental and social appraisal.**

4.6.2 **Key elements of multi-criteria analysis**

While, MCA is often erroneously regarded as a single, specific appraisal methodology, the literature is rich with several dozens of different MCA approaches so that, almost paradoxically, selecting an appropriate method can (paradoxically) turn out to be a multi-

\(^{17}\) In some cases, multi-criteria frameworks are also employed to integrate, together with the economic, environmental and social effects of development proposals, also financial, technical, institutional, legal concerns in an effort to promote a ‘fully integrated’ appraisal. However, this approach seems to be questionable. Indeed, on the one hand, economic, social and environmental appraisals deal mainly with the future effects of a project proposal on the traversed territories. In contrast, financial, technical, institutional and legal forms of assessments are primarily oriented towards the assessment of some essential conditions linked to the practical feasibility of the proposal (e.g. what are the possible funding sources to build, maintain and operate the project? Is the project proposal technologically and physically feasible? Does the project organization present the necessary capability to carry out the project? does the proposal conflict with legal requirements and regulatory constraint?). It is thus evident that these two categories of concerns require separate treatment and should not be aggregated and/or traded off with each other.
criteria problem itself (see Triantphyllou and Mann, 1989). In general, however, the large part of multi-criteria methods incorporates the following elements\(^\text{18}\):

- **option**: a proposed course of action (as possible solution to a perceived problem), which is being assessed;
- **objective**: a specific result, which is proposed as achievable within a specific time frame and with clearly defined resources;
- **criterion**: a measurable indicator of performances in relation to an objective, reflecting the extent to which a given option meets the affiliated objective. For instance, the objective of ‘promoting employment’ can be measured through a criterion such as ‘number of new jobs created’. It is then possible to distinguish between quantitative indicators, assessing the performances of an option in a numerical fashion (e.g. monetary units or bio-physical units), and qualitative indicators, containing qualitative description of the performances;
- **dimension**: the overarching areas which the different objectives and appraisal criteria pertain to. Objectives and appraisal criteria can be aggregated in various ways. Quite often, objectives and criteria are clustered around the economic, environmental and social dimensions, namely the three pillars of sustainable development;
- **score**: a constructed measure, pertaining to a given interval scale, which identifies the performance of an option against a specific objective/criterion. High-performing options score higher on the scale, while low-performing options score lower. Interval scales may be either numeric (e.g. 1-10 scale) or semantic (e.g. very good, good, moderate, bad, very bad);
- **weight**: a coefficient, which is commonly intended to represent the level of importance of objectives and correspondent appraisal criteria (i.e. high-importance objectives and criteria are identified with high weights), although as Zardari and colleagues (2015) and Munda (1995 and 2008) stress, in practice, weights can assume very different meanings according to the different MCA method adopted.

Typically, in a multi-criteria assessment exercise one or more project options are assessed against a number of different objectives, for which a set of appraisal criteria have been identified. The performances of an option against the various appraisal criteria, which may be assigned different weights, are then evaluated by means of scores. Overall, what formally defines a multi-criteria method is the set of rules establishing the nature of options, objectives, criteria, scores and weights and the way in which these elements are ultimately aggregated together (Munda, 1995 and 2008).

### 4.6.3 Classification of multi-criteria analysis methods

A number of, partially overlapping, classification systems for MCA techniques have been proposed in the course of time (see, for instance, Hwang and Yoon, 1981; Voogd, 1983; Roy, 1996; Janssen and Munda, 1999; Hajkowicz et al., 2000; Belton and Stewart, 2002). Figure 4.12 illustrates just one of the possible taxonomies. According to this scheme, a first important distinction is between *sophisticated* and *elementary* methods (see Zardari

\(^{18}\) In the MCA literature there is not unanimity on the descriptions of these basic concepts. The definitions used in this research are largely based on the works of Dodgson and colleagues (2009) and Munda (1995 and 2008).
et al., 2015). The former generally consists in (fairly or even highly) elaborate methods based on a set of rigorous rules and, sometimes, also on rather advanced mathematical principles, whereas the latter entails simple and frequently rough MCA applications.

Sophisticated MCA methodologies can be further categorized in continuous and discrete methods (see Nijkamp et al., 1990). Continuous MCA methods deal with problems where ideally the solution space is continuous, so that an infinite number of feasible solutions exist. This is the realm of multi-objective programming methods such as linear programming and goal programming, where alternatives are generated during the solution process on the basis of some mathematical calculation. On the other hand, in discrete methods the number of alternatives to assess is limited. This situation reflects real planning and policy problems (it should be noted that CBA and other appraisal methods commonly employed in transport appraisal deal only with a finite number of project options).

It is then possible to separate discrete MCA methodologies in two broad categories, namely full aggregation methods and partial aggregation methods (D’Este, 2009), representing two different and opposite schools of thought. The former category, corresponding to the American MCA school, aims at synthetizing the performances of an option against all the different appraisal criteria into a single, global score. The most common approach, in this respect, is to calculate the overall performance of the option as the weighted sum of the single performances of that option against each criterion (see, for instance, Keeney and Raiffa, 1976, in the case of the Multi-Attribute Utility Theory methods; and Saaty, 1980, in the case of the Analytic Hierarchical Process). In other words, given an option $a$ and $N$ appraisal criteria the overall performance $U$ of $a$, measured against the $N$ criteria, is determined in accordance with the following mathematical rule:

$$U(a) = \sum_{j=1}^{N} w_j \times u_j(a)$$

where:

- $u_j(a)$ represents the single performance of the option $a$ against the $j$-th criterion; and
- $w_j$ is the weight of the $j$-th criterion, through which $u_j(a)$ is standardized to a 0–1 scale, where 0 and 1 represent the worst and best performances, respectively.

The preference relation of full-aggregation methods is said to be compensatory since, for an option, a poor performance against one criterion can be compensated by a good scores against another criterion, so that the overall performance of that option can remain high. Weights, in these methods, assume the meaning of trade-off coefficients, that is, the amount of achievement of one criterion that must be sacrificed in order to gain a unitary increase on another criterion (Munda, 1995 and 2008).

Partial aggregation methods, by comparison, representing the European (French) MCA School, rejects the full aggregation of the single performance scores into a unique common scale on account of the strong heterogeneity which often characterizes objectives and appraisal criteria. Such methods, based on the notion of outranking, lead to a series of pairwise comparisons between the performances of the alternatives over the different appraisal criteria. An option is said to outrank another one if there is strong
enough argument to support a conclusion that the former outperforms the latter on enough criteria (of sufficient importance), while there is no essential evidence to show that this statement is false with respect to the remaining criteria (Roy, 1996). With outranking methods such as ELECTRE (see Roy, 1968) the output of an analysis is not thus an overall value for each alternative, but an outranking relation on the set of alternatives. However, the ranking of the options, in many cases, can be only partial because the notion of ‘incomparability’ is allowed (i.e. when there is no essential evidence to demonstrate that one option is superior or inferior to another one). Partial aggregation (or outranking) methods are partially compensatory or totally non-compensatory since bad score against one criterion cannot (or can only partially) be compensated for by a better score against another criterion. In ELECTRE and other outranking methods, weights assume the meaning of importance coefficients (Munda, 1995 and 2008).

Figure 4.12 - Classification of MCA methodologies.

Source: (Adapted from) Zardari et al. (2015).
Notwithstanding the large number of sophisticated MCA methodologies available, many practitioners and academics still rely on simplified MCA techniques (Beinat, 2001; Janssen, 2001; Dodgson et al., 2009). Elementary methods include amongst others:

- **simple appraisal summary tables**, where the performances of an option against different appraisal criteria are simply displayed in tabular form. In some cases, score and weights are not ascribed and there is no attempt either to determine a global score or to rank the project options under examination. In other cases, the table may include qualitative scores and symbols (e.g. plus and minus scale, traffic light labels, etc.); and

- **simple weighted additive models**, which, in the attempt to arrive at an overall performance of the alternative options under investigation, adopt a liner additive function (typical of full aggregation MCA methodologies), although, almost always, completely disregarding any basic theory behind it.

The following section discusses the step of a typical multi-criteria assessment problem, which relies on a simple weighted additive model. The latter represents the most widely used approach to MCA.

### 4.6.4 Basic steps in MCA (simple weighted additive model)

A classic multi-criteria decision problem comprises generally the following steps (see Belton and Stewart, 2002; Diakoulaki and Grafakos, 2004; Dodgson et al., 2009; Zardari et al., 2015):

- problem recognition and structuring;
- Identification of the options to be appraised;
- definition of the objectives and the relative appraisal criteria;
- ascription of weights to the appraisal criteria;
- prediction of all the effects produced by the project options under examination against the various objectives and correspondent appraisal criteria;
- assignment of scores to evaluate the performances of each alternative options against each criterion;
- application of the aggregation convention entailed by the given MCA method which is being applied;
- possible fulfilment of sensitivity analyses;
- presentation of the result of the MCA exercise as support for the final decision.

The order of the above steps, nonetheless, may also vary considerably according to the different MCA method, which is being employed, as well as the nature of the problem under examination. Sometimes, for instance, the options to be assessed are strictly defined in advanced. Conversely, in other circumstances, the specification of a list of objectives and their corresponding appraisal criteria may also take place before the identification of the possible courses of action. According to the latter approach, options are thus develop as systematic explorations of the objectives that need to be pursued in the decision situation under consideration. In the same manner, weighting procedures can
be undertaken either at the beginning of the process, immediately after the identification of objectives and appraisal criteria, or even at the end of it, after the construction of the performance profile of the options and the ascription of scores.

In an analyst-led MCA exercise, usually, the identification of a list of generic objectives is obtained by the analysts on the basis of a comprehensive analysis of historical, legislative and administrative documents (see Hill, 1973; De Marchi et al., 2000; Dodgson et al., 2009; OMEGA Centre, 2010). Starting from these generic goals, more specific objectives and appropriate appraisal criteria are brainstormed by the analysts. Generally, objectives and appraisal criteria are constructed hierarchically as a value tree, where general and broad aims are presented at the top of the tree, while more explicit objectives and specific measurable indicators of performance stand at the bottom (see Keeney, 1992 and 1996). As illustrated in figure 4.13, different objectives may present a diverse level of scalability.

Figure 4.13 - Example of value tree for the articulation of goals and objectives.

In any MCA exercise, the set of criteria employed has to comply with a number of minimum requirements, the satisfying of which ensures the logical correctness of the process. Different authors provide a slightly different list of requisites, in accordance also with the different MCA methodology adopted (see, amongst others, Belton and Stewart, 2002; Diakoulaki and Grafakos, 2004; Keeney and Gregory, 2005; Dodgson et al., 2009). However, in general, a coherent set of criteria should comply at least with the following properties:

- **completeness**: the set of criteria must cover all important aspects of the problem under consideration;
• **manageability**: in order to avoid unnecessary analytical effort, the value tree must not be more detailed than necessary and the total number of criteria must be as limited as possible.

• **non-redundancy**: criteria that have been judged to be excessively similar to others must be excluded from the list;

• **understandability**: analysts, decision-makers and all the other parties involved in the process must have a shared understanding of the assumptions and concepts behind each criterion; and

• **operability**: criteria must measure the performances of an option as precisely and clearly as possible, in a quantitative or qualitative way, compatibly with the characteristics of the nature of the measure under consideration.

The ascription of weights to appraisal criteria constitutes a quite controversial stage of the MCA process. The adoption of diverse weighting systems is likely to produce, in fact, totally different outcomes. Therefore, there are huge debates over the better way to derive weights. Munda (2004 and 2008), for example, suggests that the weighting scheme should reflect some ethical principles (e.g. ‘ecological stability’ position, leading to higher weights for criteria related to environmental dimension; ‘economic prosperity’ position, implying a strong consideration for economic criteria; ‘social equity’ position, leading to the assignment of higher priorities to social objectives). According instead to the OMEGA Centre (2010), Brown and colleagues (2001), and Ward and colleagues (2016a) weights should be derived directly from policy documents and government guidelines. Dodgson and colleagues (2009), by comparison, claim that, when setting weights, analysts should role-play the position of various interest groups in an effort to ensure that all the different interests are adequately represented. Moreover, as it will be explained in the following chapter, several authors argue that weights should be obtained as inputs coming from participatory techniques (see, amongst other, Hill, 1966, 1968 and 1973; Macharis et al., 2009; Hickman, 2016). To facilitate weighting processes, a wide array of different practical weighting techniques, based on different assumptions, have also been developed (for an overview of these techniques see Nijkamp et al., 1990; and Diakoulaki and Grafakos, 2004).

The following task concerns the construction of the performance profile of each project option against the various appraisal criteria previously identified. Analogously to other appraisal methodologies, impact predictions in (analyst-led) MCA are based on forecasts, mathematical models, surveys and so forth, combined with assumptions and expert judgements. Ideally, when a MCA exercise is undertaken with the objective of reconciling the results of the other (economic, environmental and social) appraisal exercises, information concerning the likely effects of a project proposal may also be directly inferred from the impacts predictions undertaken as part of other appraisal methods.

On the basis of all the (quantitative and qualitative) information and data collected, scores can thus be assigned to assess the performances of each option against each criterion. Generally, the assignment of scores is considered to be more neutral and less contentious than weighting procedures, although, almost always also this step includes some value judgments.
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

Once the weights and scores have been assigned, it is then possible to arrive at the overall performances of the option under investigation. According to the simple weighted additive model, this is obtained by simply summing together all the products of criteria and their respective weight. The results of the appraisal are generally presented by means of graphs, charts or performance tables, similar to the one depicted in Figure 4.14. In the table generally, each row identifies a specific appraisal criterion and each column contains information relatively to the appraisal criteria (i.e. weights and performances).

**Figure 4.14 – Example of performance table constructed for a single option.**

<table>
<thead>
<tr>
<th>Option a</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appraisal dimensions</td>
<td>objectives</td>
<td>criteria</td>
<td>Weights w</td>
<td>Scores s</td>
</tr>
<tr>
<td>Economic</td>
<td>Objective 1</td>
<td>Criterion 1,1</td>
<td>W 1,1</td>
<td>S 1,1</td>
</tr>
<tr>
<td></td>
<td>Criterion 1,2</td>
<td>W 1,2</td>
<td>S 1,2</td>
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<td></td>
<td>Criterion 1,3</td>
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<td></td>
<td>Objective 2</td>
<td>Criterion 2,1</td>
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<td></td>
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<td></td>
<td>Criterion 2,2</td>
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<td></td>
<td>Objective 3</td>
<td>Criterion 3,1</td>
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<td>Environmental</td>
<td>Objective 4</td>
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<td>Objective 5</td>
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<td>Objective 6</td>
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<td>Social</td>
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<tr>
<td>OVERALL PERFORMANCE</td>
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<td></td>
</tr>
</tbody>
</table>

Source: Author's own elaboration.

At the conclusion of the analysis, in the attempt to capture uncertainties surrounding the decision situation, sensitivity tests are usually undertaken. These tests usually entail the variation of some key parameters and, in particular, weights and scores assigned in the first place, so as to observe possible changes in the overall performance scores of the options under investigation (Dodgson et al., 2009).

Different MCA exercises may also be carried out for different (economic, environmental, social, political and technological) scenarios. Under different scenarios, parameters such as weights, scores and also objectives and criteria may be changed in the attempt to examine the robustness of the project ranking under different future possible conditions (see Goodwin and Wright, 2001; Belton and Stewart, 2002; Lambert et al., 2012).
4.6.5 Strengths and weaknesses of multi-criteria analysis methods

According to MCA proponents, this appraisal approach has several important properties that make it appealing and practically useful. In particular, they emphasize that:

- the inherently flexible nature of MCA methods makes it possible to deal with a wide array of data and information, whether quantitative or qualitative (see Van Pelt, 1993; Belton and Steward, 2002);
- by taking explicit account of multiple objective and criteria, MCA methodologies, compared to mono-criterion methods (e.g., CBA), provide better insights into the nature of the problem at hand. Indeed, analyzing a problem in a multi-dimensional fashion may lead to more justifiable decisions (see, amongst others, Voogd, 1983; Hill, 1985; Munda, 1995 and 2008);
- the displaying, through tables or charts, of all the objectives, appraisal criteria, weights and scores as well as all the data and information obtained during the analysis provides a clearer and more transparent approach to appraisal (see OMEGA Centre, 2010 and Dodgson et al., 2009).

On the other hand, MCA, similar to other appraisal methods, is not immune from criticism.

- **Possible inconsistencies and lack of clarity:** while relatively straightforward and transparent, simplistic MCA methods frequently entail several problems and inconsistencies. These include: the use of excessively numerous or ambiguous criteria; missing objectives and criteria; double counting (i.e., appraisal criteria which account for effect already taken into account elsewhere); the employment of rough scoring and weighting procedures; and the adoption of questionable aggregation rules\(^\text{19}\) (see Voogd, 1983; BTE, 1999, Beinat, 2001, Janssen, 2001). In contrast, while more consistent, sophisticated MCA methods generally are technically too complicated to be completely understood by non-experts (Voogd, 1983; Van Pelt, 1993). In some cases, the mathematical algorithms at the heart of such methods may even be locked within proprietary software (D’Este, 2009). This may thus reduce drastically the transparency of the process.

- **The disregard of economic efficiency consideration:** Differently from CBA, MCA allows the assessment of a proposal against a large variety of planning and policy objectives, thus potentially providing a decision-maker with information concerning the extent to which the proposal contributes to the achievement of strategic objectives and development visions (at local, regional, national and/or international scale). However, the outcome of the analysis, irrespectively of the MCA method employed, does not offer any indications about the possible net social benefits generated by the intervention (Lichfield, 1993). It thus not possible to understand whether the proposal

\(^{19}\) In particular, the possibility of effectively employing a linear aggregation rule requires an accurate selection of criteria, which, in addition to the basic requirements presented above (i.e., completeness, manageability, non-redundancy, understandability and operability), would need to be checked also against the condition of mutually preferentially independence (see Keeney and Raiffa, 1976). Loosely speaking, this implies that between the different criteria there should not be phenomena of synergy or conflict. However, as explained by Beroggi (1999) and Munda (1995 and 2008), this condition is extremely time-consuming (i.e., there are a huge number of conditional clauses to examine), difficult to test empirically and virtually impossible to achieve in planning and policy making (i.e., economic, environmental and social dimensions are highly intertwined).
represents the best use of society’s limited resources\textsuperscript{20} (Dobes and Bennett, 2009 and 2010). Theoretically, in the worst-case scenario, all the project options, which are being assessed through MCA, might constitute an economically inefficient allocation of resources, so that even the ‘best’ option (i.e. the one with the highest overall performance score, according to the multi-criteria ranking) might lead to a reduction in overall welfare within society.

- **Lack of consideration of the temporal dimension:** notwithstanding, in principle, MCA could also incorporate the time dimension into the analysis, in practice, this aspect has received scant attention in the MCA literature (Van Pelt, 1993; BTE, 1999). Hence, in the large majority of MCA methods, the performances of options against the different appraisal criteria turn out to be simply a collection of snapshots, often with no common or clearly defined base period (D’Este, 2009). Only a few attempts to incorporate systematically the treatment of time into the analysis have been made (see, in particular, Hill, 1973; and Nijkamp et al., 1989). However, these approaches are largely based on the discounting procedures used in CBA and consequently are exposed to the same inter-generational equity issues affecting CBA.

- **Arbitrariness:** it is frequently contended that MCA is even more arbitrary than CBA (Dobes and Bennett, 2009 and 2010). Indeed, on the one hand, CBA, despite its unavoidable subjectivity, entails well-established principles and general procedures for the selection of the benefits and costs to consider and for their measurement. This makes the results of CBA capable of rigorous review by peer analysts (Ergas, 2009). In MCA, by comparison, there are no accepted and specific guidelines concerning the selection of objectives and criteria, scoring and weighting procedures, aggregation methods, through which all the elements of the MCA framework (i.e. criteria, scores and weights) are ultimately brought together, as well as all the other parameters which can strongly affected the results of the analysis\textsuperscript{21} (see Cook et al., 1988; Ozernoy, 1997; BTE, 1999; Jeffreys, 2004). For instance, while, as explained above, an examination of the socio-cultural, political, and institutional contexts and the policy

\textsuperscript{20} It should be noted that the possible inclusion of BCR and NPV as possible appraisal criteria within a wider multi-criteria framework (an approach that seem to be frequently adopted to address this issue) is methodological wrong as it likely leads to double-counting issues.

\textsuperscript{21} The Manual for Multi-Criteria Analysis commissioned by the UK Department of the Environment, Transport and the Regions and prepared by Dodgson and colleagues (2009) may be considered a clear case in point. The Manual represents the principal current central government guidance on the application of MCA methods. It, however, provides only a very basic overview of these methodologies and appears somehow vague on several critical steps of the process. The Manual, for instance, strongly recommends the use of a simple weighted additive model. However, it does not provide any real justification for this choice. Concerning, then, the selection of objective and appraisal criteria, Dodgson and colleagues (2009) argue that the time spent determining these parameters in any MCA “is the most important time of all” (p.144) and that it is fundamental to ensure that “the objectives included in any MCA analysis are sufficiently wide to encompass the main concerns of people as a whole” (p.12). On the other hand, they do not offer any concrete advices about the identification of stakeholders and the construction of the value tree. According to the Manual, the number of criteria should “range from 6 to 20” (p.33). However, this obviously is a too broad range to be of any help to government officials. The Manual does not provide also any indication regarding the most appropriate scale of measurement for scores and weight, but only states that, in the case of scoring procedures, “scales extending from 0 to 100 are often used” (p. 22). Finally, the Manual acknowledges that the identification of appropriate weighting scheme is “fundamental to the effectiveness of a MCA” (p. 64), although weighting procedures unavoidably entail “the question of whose preferences count most” (p. 64). However, quite surprisingly, instead of attempting to address this issue, the Manual points out that it “can go no further than identify this as an issue which should be recognized explicitly rather than implicitly” (p.64).
and legislative framework may be helpful in formulating a list of general objectives, there are no rules of thumb either on the maximum and/or minimum number of objectives, which should be considered, or on their types. It is also evident that starting from a generic lists of goals two analysts are extremely likely to derive totally different appraisal criteria. The objective of supporting economic development may thus be measured through the number of job created or by means of variation in GDP growth rates. The objective of protecting the natural environment may also be measured through a wide array of indicators including reduction in greenhouse gas emissions, creation of green spaces or pollutant concentration in soil or water. In MCA there are also no accepted rules specifying the way in which scores and weights should be ascribed and even their respective interval scale. Hence, almost paradoxically, the ranking of the options obtained by adopting a 10-point scale (e.g. 0-10) may turn out to be different from the one produced with a 5-point scale (e.g. 0-5). Lastly, also the MCA method employed and its respective aggregation rule (i.e. partial aggregation or full aggregation) unavoidably leads to completely different outcomes (Kangas and Kangas, 2002; Zardari et al. 2015). Given this intrinsic subjectivity, the outcome of a MCA appraisal exercise is hardly capable of third-party audit (Ergas, 2009). This thus unavoidably exposes MCA to the risks of bias and strategic misrepresentations (Dobes and Bennett, 2009 and 2010).

- **The problematic determination of weights**: analogously to social CBA, weights seem also to constitute the most subjective and controversial aspect of any MCA appraisal exercise, so that they are often referred to as the ‘Achilles’ heel’ of these methodologies (see BTE, 1999). In the course of time, difficulties in determining suitable weights have hampered the use of MCA in several countries. In France, for instance, after an extensive use in transport appraisal between the late 1980s and the early 1990s, MCA methods have been progressively put aside on the basis of the claim that totally arbitrary weighting procedures had led to clearly illogical and incongruous decisions and the consequent waste of public funds (Quinet, 2000). In the Netherlands, differently from CBA, MCA has not been proposed as a mandatory appraisal methodology, to support decisions on major transport projects as the basis for the assigned weights is considered to be rather unclear (Annema et al., 2015). Hill, one of those authors whose works have pioneered the development of MCA methods (and participatory MCA) in planning has always acknowledged that MCA “is not very useful if weights cannot be objectively determined or assumed” (Hill, 1968:27). However, none of the approaches to weighting procedure suggested so far seems to be capable of solving this issue. For instance, if weights are chosen by the analysts or the decision-makers, they unavoidably turn out to be largely arbitrary. They will thus tend to vary according to the will of the person (people) in charge of the process. This may produce very inconsistent decisions, with some projects, which will be accepted on the basis of one particular set of weights, and other rather similar projects, which instead will be rejected due to the use of a complete different weighting scheme. On the other hand, if the weights are elicited from policy documents and guidelines, it is evident that they will also vary from year to year, and from one country to another, according to the composition of legislatures, political fashions, and the exigencies of bureaucrats. Hence, in all the cases, one may anticipate continued struggles over the weights to be adopted and the danger that
special-interest groups will be offered the opportunity to have an undue degree of influence in the decision-making process. Hence, in an effort to avoid this issue, some MCA methodologies do not incorporate weights (see Munda, 1995). This is also the approach that has been taken in the UK, where the multi-criteria framework, employed to appraise transport infrastructure proposals, is represented by a simple appraisal summary table, so that there is no attempt neither to impose any pre-determined weighting on the various elements nor to generate a global project score (see DfT, 2014). However, this has not prevented this approach to MCA from coming under heavy criticism. Sayers and colleagues (2003), for instance, claim that the absence of any guidance relatively on which dimension and objective matter most may result in a reduction of the transparency of the process and lack of coherence in decision-making. A similar point is made by the OMEGA Centre (2010), which claims that on account of the omission of weights, the decision-making process is more likely to be exposed to narrow and hidden interests. As a result, this approach risks addressing social and environmental concerns as secondary to economic ones (see also Hickman, 2016).

- **Uncertainties**: to determine the performance profile of each alternative option, MCA, similarly to other appraisal methodologies, relies on different types of forecasts. Hence, on the one hand, theoretically, in a MCA appraisal exercise a large number of objectives and appraisal criteria can be specified, so as to ensure a holistic assessment of a project. On the other hand, in practice, given the high level of uncertainty surrounding any future development, for several of these objectives and criteria often it is possible to gather only rough and vague data and information concerning the performance of the options. For some objectives and criteria, data and information may be even not available. As a result, criteria against which impacts can readily be measured in an easy and meaningful way may gain (explicitly or implicitly) a disproportionate importance within the analysis, irrespectively of their effective weight (BTE, 1999).

- **The poor acknowledgment of the assumptions behind the simple weighted additive multi-criteria model**: as pointed out, owing to its simplicity, which allows virtually anyone to run it, the simple weighted additive multi-criteria models represent the most widely used MCA method. However, the assumptions at the heart of this approach and its implications seem to be poorly acknowledged. As Munda (1995) points out, the employment of a linear additive function subverts completely the nature of the decision situation. Indeed, on the one hand, a typical multi-criteria problem is represented by a situation where there is no optimal solution: an option a may be better than an option b according to one criterion but, at the same time, it may be worse than b according to another criterion, so that it is eventually impossible to identify the ‘best’ course of action. This situation, which is illustrated in Figure 4.15, is sometimes indicated as the ‘multi-criteria imbroglio’ (see Schärlig 1985). On the other hand, through the full aggregation assumption, such a multi-dimensional problem is (roughly) translated into a mono-criterion one, where different options are simply assessed and ranked on the basis of their overall performance index. Whereas this assumption responds to the needs of arriving at a final judgment over the desirability of the various alternative options, it results in excessive oversimplifications of the decision situation and loss of important information (Munda, 1995, 2008; Roy, 1996),
especially concerning equity issues and distribution of effects. According to Voogd (1983:21) the use of a single synthesis criterion approach represents “the reductio ad absurdum of the quality of a given alternative into one single number” as this tends to deny multi-dimensional nature of project options. While initially clearly supportive for the adoption of a single overall score, as preferred approach when assessing multiple options, Hill, in the course of time, had also become quite skeptical on this approach. Indeed, as he pointed out in one of his last papers: “If the emphasis of the evaluation is on achieving a weighted overall-performance score, the range of choice may actually be obscured” (Hill, 1985:174).

![Figure 4.15 – Multi-criteria and mono-criterion problems.](image)

Source: Author’s own elaboration.

It has also to be noted that, with linear aggregation rules, complete comparability and compensability among the different appraisal criteria is always assumed (otherwise the performance scores of an option against the different criteria could not be added together). The employment of a simple weighted additive MCA technique, analogously to CBA, thus implies a ‘weak sustainability’ approach, according to which, theoretically, a possible depletion of natural resources due to the project option under consideration does not represent a fundamental problem as far as the overall performance score of the option is high22 (Munda, 1995, 2008). Furthermore, while it is debatable whether assessing factors such as life, health, and natural resources through weights and scores, expressed in a numeric or semantic scale, is more accurate and ethical than monetizing them23, ironically, the use of a simple weighted additive models can itself end up attaching implicit monetary values to the various appraisal criteria employed. Indeed, on account of the hypothesis of complete comparability, which characterizes full aggregation MCA methods, when the

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22 Theoretically, this issue may be partially addressed by assigning to the most critical appraisal criteria (e.g. environmental and social criteria) specific thresholds, which place some restrictions concerning the worst acceptable performance of an option against those specific criteria.

23 Dobes and Bennett (2009:21), in this regard, contend that “Money is just a common expression of value, a numeraire, [...]. It would be just as valid to express the value of bundles of goods or services in terms of hamburgers, conch shells or Mars bars that would need to be given in exchange to obtain them”.

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performance table contains one (or more) value expressed in monetary terms, then the non-money variables turn out to be implicitly monetized (Dobes and Bennett, 2009 and 2010). In the performance table shown in Figure 4.16, for instance, equal weights have been attached to the attributes of ‘growth in local business’ (measured in dollars) and ‘car crashes’. Through a simple mathematical proportion it is thus possible to obtain the monetary value of human life. Implicit monetary values can also be inferred, in the same manner, for the ‘loss of green areas’ and all the other (non-monetary) criteria included in the table below.

**Figure 4.16 – Illustrative example of a MCA method based on the simple weighted additive model.**

<table>
<thead>
<tr>
<th>Appraisal criteria</th>
<th>Weights (0 ÷ 100)</th>
<th>Project option performances</th>
<th>Scores (-5 ÷ +5)</th>
<th>Weighted scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time travel saving per trip (minutes)</td>
<td>10</td>
<td>15 minutes</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Growth in local business ($ thousand)</td>
<td>15</td>
<td>50,000 $</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>Car crash reduction per year (No. of car crashes)</td>
<td>15</td>
<td>5</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Growth in CO2 emission (percentage)</td>
<td>20</td>
<td>5%</td>
<td>-2</td>
<td>-40</td>
</tr>
<tr>
<td>Loss of green areas (hectare)</td>
<td>25</td>
<td>1 hectare</td>
<td>-3</td>
<td>-75</td>
</tr>
<tr>
<td><strong>OVERALL PERFORMANCE</strong></td>
<td><strong>100</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$1,000$ = 15 = 1 car crash $\Rightarrow 1$ car crash = $1,000$ $\Rightarrow 25 / 15 = 1$ ha green areas / $1,000$ $\Rightarrow 1$ ha green areas = $1,6 \times 1,000$ $\Rightarrow 1,700$ $\Rightarrow$

Source: (Adapted from) Dobes and Bennett (2009 and 2010).

**4.7 Summary of findings**

Over the past century, substantial progress has been made in transport infrastructure appraisal practices. However, notwithstanding the introduction of several appraisal methods and techniques, and their continuous refinements, appraisal still continues to be a hotly contested field. This review has clearly illustrated that CBA, EcIA, EIA and MCA, namely the appraisal methodologies most commonly adopted to assess the economic, social and environmental effects of transport infrastructure projects, present both advantages and disadvantages. Therefore, it is evident that only by employing all these
different appraisal methodologies it would be possible to obtain the full breadth of information necessary to decide on the opportunity to proceed with a given project proposal.

Most interestingly, however, the above analysis has also demonstrated that all the methods share many similarities.

- All the appraisal methodologies are (directly or indirectly) based on the technical-rational approach to planning and decision-making. Indeed, the steps of these methods, especially those of EIA, SIA and MCA techniques, clearly mirror those of the classic rational-comprehensive planning process. The idea of multiple tiers of decision and the objective of achieving an integrated (or holistic) appraisal implicitly entail a linear and orderly planning process, where each stage is a detailed elaboration of the previous one.

- EIA procedures in many cases result to be very similar to MCA. Indeed, they often account for environmental, social and also economic aspects, which are brought together through MCA techniques. Figure 4.8 and Figure 4.14 clearly illustrate the similarity of these two appraisal frameworks. Furthermore, both CBA and simple weighted additive MCA methodologies also present a very similar structure. Indeed, in CBA, unitary monetary value of different categories of costs and benefits are multiplied respectively by the effective amount or resource used by the projects and the effective savings provided by it, so as to obtain the total costs and benefits of projects. In MCA, similarly, weights, reflecting the importance of various criteria, are multiplied by scores, indicating the performances of the projects against the respective appraisal criteria. Weights can thus be assimilated to surrogate prices applied to each criteria. Clearly, this MCA approach differs little from traditional CBA, except that pure numbers other than money are employed\(^24\). Therefore, being very similar to CBA, simple weighted additive MCA methodologies are also affected by many issues and flaws, typical of CBA.

- Any appraisal exercise, regardless of the specific method employed, faces a critical dilemma (see McAllister, 1982). On the one hand, in an effort to understand entirely the manifold implications of a proposal it would be convenient to divide its effects into many component parts. However, weighting carefully all these multiple and diverse factors in reaching a conclusion can be very problematic. Therefore, to arrive at a final decision on the project proposal under examination it would be thus opportune to reconcile and synthetize these different arrays of data and information into a more manageable and understandable whole. In this respect, many appraisal methods (\textit{e.g.} CBA, full aggregation MCA methods) incorporate a mathematical formula or equation, which summarizes all the various effects into a grand index (\textit{e.g.} NPV, BCR, overall performance score). This, in principle, provides the decision-makers with a relatively simple criterion for establishing the desirability of the proposal. On the other hand, especially in the case of large-scale projects, reducing the multiple dimensions and consequences of a proposal to a single index seems to represent an unrealistic assumption and is likely to results in the loss of important information,

\(^{24}\) From this point of view, it is not surprising that some commentators (see Van Pelt, 1993; Howarth \textit{et al.}, 2001; Eales \textit{et al.}, 2003; and Page \textit{et al.}, 2007) argue that CBA is essentially a form of MCA (or, vice versa that MCA is a particular form of CBA).
which may be relevant for arriving at a final choice. Often, a single indicator may thus create more confusion rather than simplifying decisions (on this dilemma see also Hill, 1985; Lichfield, 1990; Sager, 2003; and Stirling, 2006).

- All the appraisal methodologies aim at assessing the predicted performances of a proposal against one (e.g. CBA) or more (e.g. MCA) objectives and their associated indicators. This assessment is ultimately dependent on several mathematical and statistical models, forecasts, surveys and other studies regarding the future impacts of the proposal. It is thus evident that the quality of any appraisal exercise, irrespective of whether this is in the form of CBA, EcIA, EIA or MCA, depends primarily on the accuracy and validity of these models and forecasts. However, as already pointed out, the possibility of foreseeing with any degree of precision the future effects of large-scale transport projects is severely limited by their long-term planning horizon and their complex interactions with their context in which they are placed, (Samset, 2010; Næss and Strand, 2012). Despite that, in many cases the results of the appraisal exercises are often presented in the form of numbers and equations, without any indication of the underlying uncertainties, thus creating a false impression of accuracy.

- All the appraisal methodologies are also based on extensive value judgments. Indeed, the methods themselves and also the forecasts, which the appraisal methods ultimately rely on, implicitly incorporate a number of assumptions, made by analysts, decision-makers and all the other consulted parties. These assumption concerns: the definition of the system boundaries; the key aspects and parameters to be incorporated in the model; the future development of the (economic, social, political and technological) conditions of a given territory; the specific steps and procedures entailed by each appraisal methodology (e.g. specific unitary monetary value for various categories of costs and benefits, discounting and social discount rate, in the case of CBA; number of criteria, weighting and scoring procedures, in the case of MCA) and so forth. Moreover, as already highlighted, the assessment of many environmental, social, cultural, health and other ‘intangible’ effects, whether in quantitative or qualitative form and in monetary or non-monetary terms, is also itself a matter of judgment on which there is no real consensus. Accordingly, as Renn and colleagues (1995:4) put it, “value free evaluation is an oxymoron. By definition, ‘objective’ evaluation does not exist”.

At the conclusion of this chapter, it is clearly possible to argue that the debate about which methodology constitutes the best approach to appraisal is absolutely inappropriate and misplaced, and generally reflects a poor understanding of the topic.
Chapter 5
Participatory Multi-Criteria Analysis Methodologies: A Framework for Investigation

The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you.

(Arnstein, 1969: 216)

5.1 Chapter overview

As the above quotation suggests, stakeholder involvement and citizen participation have progressively achieved a sort of unassailable status, which is vigorously applauded by virtually everyone. In particular, this hegemonic discourse coalition around the need for engaging more directly the public in planning and policy making has been complemented by increased experimentation with a wide array of decision-support tools, originally developed to be used with a relatively small team of analysts and decision-makers. Over the past decades, especially participatory MCA methodologies, combining various forms of MCA techniques with deliberative processes, have shown a dynamic evolution, so much so that many authors have started to regard them as a plausible and valuable approach to the appraisal of major transport infrastructure projects and other critical societal problems. However, as already stressed, so far, especially in the transport field, a comprehensive and objective assessment of such methods has not been undertaken.

This chapter explores the key features of participatory MCA methodologies based on an analysis of the relevant literature and a review of a number of techniques belonging to this family.

This chapter includes four further sections. Section 5.2 distinguishes between non-participatory and participatory appraisal tools and techniques and summarizes the characteristics of the participatory MCA methods that have been reviewed as part of this analysis. Section 5.3 presents in detail the key attributes, which differentiate the various participatory MCA methods from each other and from traditional, non-participatory MCA techniques. Section 5.4 includes a critical discussion of these aspects. Finally, Section 5.5 contains a synthesis of the key findings of the chapter.
5.2 Analyst-led and participatory multi-criteria analysis

In Section 4.6.3 of the previous chapter, a taxonomy of MCA methodologies has been proposed. However, as highlighted in that chapter, many other classifications, based on a number of different parameters, are possible. For instance, analogously to other appraisal methods, MCA methodologies can also be distinguished in non-participatory (or analyst-led) and participatory techniques, depending on the number of actors involved in the process. Analyst-led techniques have been described in Chapter 4. Such methods adopt a classic technocratic approach to the analysis and correspond to a situation where the appraisal exercise is carried out autonomously by a single analyst or a small team of analysts and experts. A key argument in favor of this approach is that a group of scientists and trained specialists is best suited to make complex technical decisions (see McAllister, 1982; Stirling, 1998; and Funtowicz, and Ravetz, 1991).

In contrast, participatory techniques adopt a collaborative and democratic approach to the decision problem. By involving different interested parties in the analysis, such methods attempt to look at a problem from multiple perspectives to get a better understanding (see Stirling, 1998; Funtowicz, and Ravetz, 1991). As illustrated in Figure 5.1, ideally, participatory processes cover a wide range of decision situations, spanning from totally cooperative group decision-making procedures, where the different parties involved share similar interests and priorities, to negotiation decision-making procedures, where participants present very different, or even diametrically opposed, agendas (see Lu et al., 2007; Kilgour et al., 2010). The former case ideally corresponds to a situation where participants are members of the same organization. The latter, by comparison, reflects a typical decision-making process regarding a mega transport projects or another complex and uncertain policy problem, involving a number of actors and agencies, whose relationships often turn out to be partially or even entirely adversarial.

Figure 5.1 – Types of participatory exercises.

![Cooperative decision-making processes](image1)

- Involvement of only a few people
- The parties involved present similar interests and priorities
- The problem at hand is characterized by low uncertainty and ambiguity

![Negotiation decision-making processes](image2)

- Involvement of many people
- The parties involved present conflicting interests and priorities
- The problem at hand is characterized by high uncertainty and ambiguity

Source: Author’s own elaboration.
As illustrated in Section 4.6, the potential advantages of MCA methodologies are related to the possibility of framing a problem in a rather comprehensive and clear way. In this regard, many authors (see, amongst other, Munda, 1995 and 2008; Banville et al., 1998; Stirling and Mayer, 1999; Macharis et al., 2009; OMEGA Centre, 2010; Ward et al., 2016a) contend that participation can strengthen these key attributes. Specifically, these authors claim that:

- participatory processes can enrich the multi-criteria framework by leading to the identification of the full spectrum of interests and values in dispute, thus improving the quality of the appraisal exercise;
- deliberative procedures can further improve the transparency of the multi-criteria exercise; and that
- the involvement of different stakeholders in the appraisal exercise is expected to increase the legitimacy of the final decision, even in negotiation decision-making procedures, characterized by value conflicts.

Due to the ever-growing demand for increased public involvement, especially in recent years, a number of participatory MCA methodologies have been proposed. Examples of such methods include: the Goal-Achievement Matrix (Hill, 1966, 1968 and 1973); the Three-Stage Multi-Criteria Analysis (see Renn et al., 1993); the Multi-Criteria Mapping (Stirling and Mayer, 1999 and 2001); the Deliberative Multicriteria Evaluation (Proctor and Drechslerm 2006); the Participative Multi-Criteria Analysis (Stagl, 2006), the Eclectic Multi-Criteria Analysis (De Brucker and Verbeke, 2006 and 2007); the Social Multi-Criteria Evaluation (Munda, 2008); the Multi-Actors Multi-Criteria Analysis (Macharis et al., 2009) and the Policy-Led Multi-Criteria Analysis (OMEGA Centre, 2010; Ward et al., 2016a). While proposed for different fields, all these participatory MCA methods seem to be based on the same general principles and underlying assumptions. They may thus be theoretically employed in various sectors and applied to a wide range of problems.

In the attempt to identify and examine the key features of such methodologies and develop some conceptual frameworks and classification systems, over 60 publications, corresponding to 35 types of participatory MCA methods (plus some variants) have been reviewed and compared. With the exception of the Morris Hill’s Goal-Achievement Matrix, which dates back to the 1960s, all the methods examined have been developed in the last two to three decades. Nine of these methods have been expressly conceived for transport and infrastructure planning and appraisal, whereas the remaining ones have been envisaged for different types of problems (including also very complex and controversial issues, characterized by high level of uncertainty and ambiguity) in the fields of energy, natural resource management and sustainable science, health and technology risk assessment. Table 5.1 presents an overview of the main attributes of these methods, which will be presented and discussed in depth in the following sections.

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1 It is important to point out that the analysis of participatory MCA methodologies proposed for other fields, besides transport and infrastructure planning was undertaken exclusively to develop some comprehensive frameworks for exploring the technical characteristics of such methodologies. This approach was justified by the fact that all the various multi-actor multi-criteria techniques seem to be based on the same general principles and underlying assumptions. However, it has to be noted that the transport planning, appraisal and decision-making practices are different from those of other sectors. Therefore, the findings of this research, especially those related to non-methodological issues (i.e. problems related to the position of participatory MCA methodologies within the wider decision-making context), are only referred to major transport projects.
| Methods                        | References                                                                 | Field                                      | Application to real planning and decision-making processes | MCA Techniques Employed                                                                                      | Actors Involved                                                                 | Stakeholder Analysis Techniques Employed | Level of Participant Involvement | Engagement Techniques | Treatment of Individual Preferences | Duration of The Process | Costs | Envisaged Benefits | Envisaged Issues                      |
|-------------------------------|-----------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------|--------------------------|----------------------------------|----------------------------------|-------------------|----------------------|-------------------------------------|
| Goal-Achievement Matrix       | Hill (1966, 1968, 1973, 1985)                                               | Land use and transport planning           | Limited (several application in the UK but generally applied in a non-participatory manner) | Simple weighted additive model combined with some elements of the CBA framework                              | A few stakeholder groups. Types of stakeholder groups not always clear. Number of stakeholders per group not specified | Not specified                      | Stakeholders can partially affect weights | Not specified                      | Aggregation                       | Not specified | Not specified | More comprehensive analysis          | Problematic determination of some parameters (e.g. weights) |
| Multi-Actors Multi-Criteria Analysis | Macharis (2005, 2007); Macharis et al. (2009); Macharis & Nijkamp (2011, 2013); Macharis & Bernardini (2015) | Transport planning                        | Limited/unclear (several applications especially in Belgium but real implications not clear) | Typically, AHP and PROMETHEE but it is envisaged that any method can be used                                 | Typically, the few most important stakeholder groups. Number of stakeholders per group not specified | Not specified                      | Stakeholders can affect objectives/criteria and weights | Interviews, surveys                | Disaggregation, Aggregation          | Not specified | Not specified | More comprehensive analysis          | More transparent process |
| Policy-Led Multi-Criteria Analysis | OMEGA Centre (2010); Dimitriou et al. (2016); Ward et al. (2016a, 2016b) | Transport planning                        | None (only used as part of role-play exercises) | Simple weighted additive model                                                                            | Different stakeholder groups. A single representative for each group            | Analysis of key documents, brainstorming                                      | Stakeholders can partially affect options, objectives/criteria and weights. They can also directly determine scores | Workshops, focus groups            | Filtration, Sharing, disaggregation | Not specified | Not specified | More comprehensive analysis          | Dropouts of stakeholders |
| COSIMA, SUSTAIN, EcoMobility, Customised decision support systems and other similar appraisal framework | Salling (2008); Letour (2012); Barfod (2012); Jensen (2012); Jensen et al. (2013) Barfod & Salling (2015) | Transport planning                        | Unclear (apparently only theoretical application to real case studies) | Combination of MCA based on a simple weighted additive model, CBA and different types of sensitivity analyses | Not always clear who the parties involved are, whether they are individual participants or representatives of organized groups, and how many people are involved | Not specified                      | Stakeholders can affect objectives/criteria and weights | Consensus conferences, workshops | Sharing                          | Not specified | Not specified | More comprehensive analysis          | No issues explicitly highlighted |
### Table 5.1b - Key features of the participatory MCA methodologies examined.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Field</th>
<th>Application to real planning and decision-making processes</th>
<th>MCA Techniques Employed</th>
<th>Number and Types of Stakeholder Involved</th>
<th>Stakeholder Analysis Techniques Employed</th>
<th>Level of Participant Involvement</th>
<th>Engagement Techniques</th>
<th>Treatment of Individual Preferences</th>
<th>Duration of The Process</th>
<th>Costs</th>
<th>Envisaged Benefits</th>
<th>Envisaged Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participatory MCA for the appraisal of transport projects</td>
<td>D’Este (2009)</td>
<td>Transport planning</td>
<td>None (only theoretical description of the method)</td>
<td>Typically full aggregation MCA methods</td>
<td>Different stakeholder groups. Number of stakeholders and groups not clear</td>
<td>Not specified</td>
<td>Stakeholders can affect only weights</td>
<td>Electronic surveys, workshops</td>
<td>Disaggregation, Aggregation</td>
<td>Seemingly short. Not specified (ideally, some preparatory work followed by a workshop or a survey)</td>
<td>Not specified</td>
<td>▪ More comprehensive analysis ▪ More transparent approach to appraisal ▪ Democratic decisions more acceptable to stakeholders ▪ The management of group dynamics can be difficult ▪ Difficult interpretation of the overall-performance score</td>
<td></td>
</tr>
<tr>
<td>Participatory MCA for the appraisal of transport projects</td>
<td>Hickman (2016)</td>
<td>Transport planning</td>
<td>None</td>
<td>Simple weighted additive model</td>
<td>Not specified</td>
<td>Not specified (ideally, analysis of key documents, brainstorming)</td>
<td>Stakeholders can affect objectives/criteria, weights and scores</td>
<td>Consensus conferences</td>
<td>Sharing and filtration</td>
<td>Seemingly short (some preparatory work followed by a 1-day workshop)</td>
<td>Not specified</td>
<td>▪ More comprehensive analysis ▪ More transparent approach to appraisal ▪ Democratic decisions more acceptable to stakeholders No issues explicitly highlighted</td>
<td></td>
</tr>
<tr>
<td>Participatory MCA for the appraisal of infrastructure investments</td>
<td>Lami et al. (2011); Persa et al. (2013)</td>
<td>Transport planning</td>
<td>Unclear (method developed as part of the Interreg IVB NWE project Code24)</td>
<td>Analytic Network Process (variation of AHP)</td>
<td>Different stakeholder groups. Number of stakeholders and groups not clear</td>
<td>Not specified</td>
<td>Stakeholders can partially affect options. They can also affect weights</td>
<td>Workshops. Use of visualization tools</td>
<td>Presumably filtration and sharing</td>
<td>Not specified (apparently some preparatory work followed by a few workshops or focus groups)</td>
<td>Not specified</td>
<td>▪ More comprehensive analysis ▪ Visualization tools can be a good way to communicate information No issues explicitly highlighted</td>
<td></td>
</tr>
<tr>
<td>Participatory MCA for prioritizing infrastructure investments</td>
<td>Lambert et al. (2012)</td>
<td>Inf. planning and investment</td>
<td>Unclear (method developed to prioritize infrastructure investments in Afghanistan)</td>
<td>Simple weighted additive model combined with Scenario planning</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Stakeholders can partially affect objectives/criteria as well as scenarios. They presumably can also affect weights</td>
<td>Focus groups</td>
<td>filtration, and presumably disaggregation, aggregation</td>
<td>Not specified (one meeting, interactive interviews and analyst-led research)</td>
<td>Not specified</td>
<td>▪ More comprehensive analysis No issues explicitly highlighted</td>
<td></td>
</tr>
<tr>
<td>Two-Stage MCA</td>
<td>De Brucker et al. (2015)</td>
<td>Road safety and Intelligent Transport System</td>
<td>Limited/unclear</td>
<td>AHP</td>
<td>The few most important stakeholder groups. Number of stakeholders per group not specified</td>
<td>Not specified</td>
<td>Stakeholders can affect objectives/criteria and weights</td>
<td>Workshops</td>
<td>Disaggregation, sharing</td>
<td>Not specified (typically some preparatory work followed by a few workshops)</td>
<td>Not specified</td>
<td>▪ More comprehensive analysis ▪ More transparent approach to appraisal No issues explicitly highlighted</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.1c - Key features of the participatory MCA methodologies examined.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Field</th>
<th>Application to real planning and decision-making processes</th>
<th>MCA Techniques Employed</th>
<th>Number and Types of Stakeholder Groups and Experts Involved</th>
<th>Level of Participant Involvement</th>
<th>Engagement Techniques</th>
<th>Treatment of Individual Preferences</th>
<th>Duration of The Process</th>
<th>Costs</th>
<th>Envisaged Benefits</th>
<th>Envisaged Issues</th>
</tr>
</thead>
</table>
| Multi-Criteria Mapping   | Stirling and Mayer (1999, 2001, 2005); McDowell & Eames (2007) | Various planning and policies fields and sub-fields                  | Limited                                                    | Simple weighted additive model                                   | Several representatives of different stakeholder groups and experts who have a good knowledge of the problem at hand      | Not always specified. Ideally, analysis of key documents, and interviews with stakeholders (snowball sampling) | Stakeholders can affect options, objectives/criteria, weights and scores | Disaggregation, sharing, aggregation | Several weeks (individual interview lasting 2-3 hours and analyst-led research) | Not specified | • More comprehensive analysis | • More transparent approach to appraisal
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | stakeholders sometimes have difficulties in assessing an issue in terms of weights and scores
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | democratic decisions more acceptable to stakeholders
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | demanding method
| Deliberative Mapping     | Davies et al. (2003); Burgess et al. (2007) | Various planning and policies fields and sub-fields, mainly healthcare sector | Limited/unclear                                                   | Simple weighted additive model                                   | 2 parallel processes; one involving experts, and one involving citizens (who participate in the process as individual participants) divided in several citizens' panels. Overall several tens of people | Not specified.                                                                                         | Both the group of experts and the group of citizens follow the same procedure and can affect options, objectives/criteria, weights and scores. | Telephone interviews, face-to-face interviews, joint workshops, focus groups | Disaggregation, sharing, aggregation | About 2 years over £200,000 | • More comprehensive analysis | • More transparent approach to appraisal
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | social learning processes
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      |
| Three-Stage MCA          | Renn (1986); Renn et al. (1984); Renn et al. (1993) | Various planning and policies fields and sub-fields, several applications in Germany and US but real impact not clear | Limited/unclear                                                   | Simple weighted additive model                                   | Representatives of different stakeholder groups, a groups of experts and a number of randomly selected citizens (who participate in the process as individual participants) divided in several citizens' panels | Not specified for stakeholder groups and experts. Random selections for citizens | Stakeholders can affect options and objectives/criteria. Experts can affect scores. Citizens can partially affect weights. | Workshops, panel discussions, groups Delphi, focus groups, interviews | Aggregation, filtration, sharing | Not specified | • More comprehensive analysis | • Inability of dealing with all the problems (e.g. decisions involving inequalities between regions or groups)
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | Difficult interpretation of the overall performance score
|                          |                                   |                                                                                       |                              |                                      |                                                                                                             |                                                                                                           |                      |                                   |                       |       |                      | Conflict resolution remains difficult

Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI
### Table 5.1d - Key features of the participatory MCA methodologies examined.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Field</th>
<th>Application to real planning and decision-making processes</th>
<th>MCA Techniques Employed</th>
<th>Number and Types of Stakeholder Involved</th>
<th>Stakeholder Analysis Techniques Employed</th>
<th>Level of Participant Involvement</th>
<th>Engagement Techniques</th>
<th>Treatment of Individual Preferences</th>
<th>Duration of The Process</th>
<th>Costs</th>
<th>Envisaged Benefits</th>
<th>Envisaged Issues</th>
</tr>
</thead>
</table>
| Participatory MCA for various planning and policy decisions | Gregory & Keeney (1994); Keeney (1998)          | Various planning and polices fields and sub-fields                   | None (only theoretical application to real case studies)    | Not specified           | A few stakeholder groups. Overall 30-40 people. | Analysis of key documents, brainstorming, interview with experts | Stakeholders can affect options, objectives/criteria and weights. | Joint and separate meetings | Aggregation                       | Not specified (presumably some preparatory work followed by few meetings) | Not specified          | • More comprehensive analysis  
• More transparent approach to appraisal  
• Democratic decisions more acceptable to stakeholders | • Risks of bias and strategic misrepresentations |
| Participatory MCA for various planning and policy decisions | Barville et al. (1998)                         | Various planning and polices fields and sub-fields                   | None (only theoretical description of the method)           | Not specified           | Only the most critical stakeholder groups. Number of stakeholders and groups not specified | Various stakeholder identification and classification techniques are suggested | Stakeholders can affect primarily options and objectives/criteria. In some cases they can also affect weights and scores | Workshops and general meetings | Sharing, filtration                | Seemingly short. Not specified. | Not specified          | • More comprehensive analysis  
• More transparent approach to appraisal  
• Democratic decisions more acceptable to stakeholders | No issues explicitly highlighted |
| Participative MCA for integrated development planning | Scott (2005)                                    | Various planning and polices fields and sub-fields                   | None (method developed as part of a research project in South Africa) | Simple weighted additive model | Different stakeholder groups. Number of stakeholders and groups not clear | Stakeholders can affect options, objectives/criteria and weights. | Stakeholders can affect options, objectives/criteria and weights. | Surveys, interviews, workshops | Sharing, Disaggregation, Aggregation | Seemingly short. Not specified. | Not specified          | • More comprehensive analysis  
• More transparent approach to appraisal  
• Democratic decisions more acceptable to stakeholders  
• Social learning processes | No issues explicitly highlighted |
| Social Multi-Criteria Evaluation & NAIADE Method | Munda (1995, 2003); De Marchi et al. (2000); Gamboa & Munda (2007) | Various planning and polices fields and sub-fields, and natural resources mgmt. | Limited/unclear (several applications especially in Italy and Spain but real implications not clear) | SMCE/NAIADE             | Typically, the 10-15 most influential stakeholder groups. Number of stakeholders per group not specified | Analysis of key documents, brainstorming, interview with experts | 2 parallel processes.  
1) Stakeholders can partially affect options and objectives/criteria  
2) Stakeholders are asked to give their overall preferences for the various options | Surveys, interviews, focus groups | Filtration, disaggregation | Not specified | Not specified          | • More comprehensive analysis  
• More transparent approach to appraisal  
• Democratic decisions more acceptable to stakeholders  
• Social learning processes | No issues explicitly highlighted |
| Stakeholder Multi-Criteria Decision Analysis | Clark et al. (1998)                             | Natural resources mgmt                                            | Limited/unclear (method developed as part of project commissioned by the UK Environment Agency) | Simple weighted additive model | 15 people representing 3 different stakeholders groups | Analysis of key documents, brainstorming, interview with experts | Stakeholders, typically divided in small groups, can affect options/issue to be appraised, objectives/criteria, scores and weights. | Workshops | Sharing, aggregation                 | Not specified | Not specified          | • More comprehensive analysis  
• More transparent approach to appraisal  
• Democratic decisions more acceptable to stakeholders  
• Social learning processes | Dropouts of stakeholders  
Stakeholders may not have enough time for undertaking the analysis properly  
Resource demanding (time, level of expertise) |
### Table 5.1e - Key features of the participatory MCA methodologies examined.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Field</th>
<th>Application to real planning and decision-making processes</th>
<th>MCA Techniques Employed</th>
<th>Number and Types of Stakeholder Involved</th>
<th>Stakeholder Analysis Techniques Employed</th>
<th>Level of Participant Involvement</th>
<th>Engagement Techniques</th>
<th>Treatment of Individual Preferences</th>
<th>Duration of The Process</th>
<th>Costs</th>
<th>Envisaged Benefits</th>
<th>Envisaged Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliberative Multi-Criteria Evaluation</td>
<td>Proctor &amp; Drechsler (2006)</td>
<td>Natural resources mgmt. / Tourism mgmt.</td>
<td>Unclear (method developed as part of the Ecosystem Service project in Australia)</td>
<td>PROMETHEE</td>
<td>6 people who participate in the process as individual participants</td>
<td>Random selection of people</td>
<td>Stakeholders can affect options, objectives/criteria, scores and weights</td>
<td>Workshops</td>
<td>Preferably sharing</td>
<td>A few workshops</td>
<td>Not specified</td>
<td>More comprehensive analysis, social learning processes</td>
<td>Bias and subjectivity of the method</td>
</tr>
<tr>
<td>Participative MCA for enhancing sustainable use of natural resources</td>
<td>Mendoza &amp; Prabhu (2009)</td>
<td>Natural resources mgmt.</td>
<td>Method developed as part of the Adaptive Co-Management project in Zimbabwe. Real implications not clear.</td>
<td>AHP</td>
<td>20 people representing 3 different stakeholder groups</td>
<td>Not specified</td>
<td>Stakeholders can affect options, objectives/criteria, weights and scores</td>
<td>Workshops</td>
<td>Sharing, disaggregation, aggregation</td>
<td>Some preparatory work followed by a 1-day workshop</td>
<td>Not specified</td>
<td>Social learning processes</td>
<td>Change in the perception of people involved compared to those who are not non-expert people may not be able to assess technical issues</td>
</tr>
<tr>
<td>Participative MCA for assessing renewable energy sources</td>
<td>Polatidis &amp; Haralambopoulou (2004)</td>
<td>Natural resources mgmt.</td>
<td>None (method developed as part of a research project in Greece)</td>
<td>Not specified</td>
<td>Various representatives of different stakeholder groups. Total number of stakeholders not clear</td>
<td>Analysis of key documents, interview with experts</td>
<td>Stakeholders can affect options, objectives/criteria, weights and scores</td>
<td>Interviews, joint meetings</td>
<td>Sharing, Aggregation, filtration</td>
<td>Seemingly short. Not specified.</td>
<td>Not specified</td>
<td>More comprehensive analysis</td>
<td>Consensus/Conflict resolution remains difficult</td>
</tr>
<tr>
<td>Participative MCA for sustainable forest mgmt.</td>
<td>Sheppard &amp; Metlner (2005)</td>
<td>Natural resources mgmt.</td>
<td>None (method developed as part of a research project in Canada)</td>
<td>Simple weighted additive model</td>
<td>47 participants representing 9 different stakeholder groups</td>
<td>Analysis of key documents</td>
<td>2 parallel processes. 1) Stakeholders can affect weights and partially affect objectives/criteria. 2) Stakeholders are asked to give their overall preferences for the various options</td>
<td>Workshops, Use of visualization tools</td>
<td>Disaggregation, aggregation</td>
<td>A series of workshops spread over 14 months</td>
<td>Not specified</td>
<td>More comprehensive analysis, social learning processes, Visualization tools can be a good way to communicate information</td>
<td>Risk of producing an unrepresentative sample due to small number of stakeholders, Resource demanding (costs, time, data), Difficult interpretation of the overall-performance score</td>
</tr>
<tr>
<td>Participative MCA for sustainable forest mgmt. planning</td>
<td>Proctor (2005)</td>
<td>Natural resources mgmt.</td>
<td>None (method developed as part of a research project in Australia)</td>
<td>AHP</td>
<td>22 participants representing various stakeholder groups</td>
<td>Not specified</td>
<td>Stakeholders can partially affect objectives/criteria. They can also affect weights.</td>
<td>Surveys, general meetings</td>
<td>Filtration, disaggregation, aggregation</td>
<td>Seemingly short (one meeting followed by interactive interviews)</td>
<td>Not specified</td>
<td>More comprehensive analysis, More transparent approach to appraisal</td>
<td>Subjectivity of the method, Stakeholder engagement can be difficult</td>
</tr>
<tr>
<td>Participative MCA for sustainable forest mgmt.</td>
<td>Saarikoski et al. (2013)</td>
<td>Natural resources mgmt.</td>
<td>None (method developed as part of a research project in Finland)</td>
<td>Simple weighted additive model</td>
<td>Several stakeholder groups. Number of stakeholders per group not specified</td>
<td>Not specified</td>
<td>Stakeholders can partially affect options and objectives/criteria. They can also affect weights.</td>
<td>Interviews, general meetings</td>
<td>Filtration, disaggregation</td>
<td>A few workshops interspersed with interactive interviews and analyst-led research</td>
<td>Not specified</td>
<td>More comprehensive analysis</td>
<td>Conflict resolution remains difficult</td>
</tr>
</tbody>
</table>
### Methodologic forest mgmt.

- **Participants**: Balana et al. (2016)
- **Field**: Natural resources mgmt.
- **Method developed**: Part of a research project in Ethiopia. Real implications not clear.
- **MCA Techniques Employed**: AHP
- **Number and Types of Stakeholder Techniques Employed**: Around 15 participants, including experts, practitioners and representatives of various stakeholder groups.
- **Engagement Techniques**: Not specified
- **Level of Stakeholder Involvement**: Stakeholders can partially affect objectives/criteria. They can also affect weights.
- **Focus groups, workshops**: Not specified
- **Treatment of Individual Preferences**: Focus groups, workshops.
- **Duration of The Process**: Several focus group discussions, a 3-day workshop, and an expert workshop.
- **Costs**: Not specified
- **Benefits**: • More comprehensive analysis
- **Issues**: No issues explicitly highlighted

### Participative MCA for forest and ecosystems mgmt.

- **Participants**: Grošelj et al. (2016)
- **Field**: Natural resources mgmt.
- **Method developed**: Part of the NATREG project in Slovenia. Real implications not clear.
- **MCA Techniques Employed**: AHP combined with SWOT analysis
- **Number and Types of Stakeholder Techniques Employed**: Around 40 participants representing various stakeholder groups.
- **Engagement Techniques**: Not specified
- **Level of Stakeholder Involvement**: Stakeholders can partially affect objectives/criteria options. They can also affect objectives/criteria and weights.
- **Workshops, general meetings**: Workshop, aggregation, A few workshops
- **Treatment of Individual Preferences**: Not specified
- **Duration of The Process**: Not specified
- **Costs**: • More comprehensive analysis
- **Benefits**: No issues explicitly highlighted

### Participative MCA for sustainable forest mgmt.

- **Participants**: Mustajoki et al. (2011)
- **Field**: Natural resources mgmt.
- **Method developed**: None (method developed as part of a research project in Finland).
- **MCA Techniques Employed**: Simple weighted additive model combined with decision analysis interviews
- **Number and Types of Stakeholder Techniques Employed**: Representative of different stakeholder groups. Number of stakeholders and groups not specified.
- **Engagement Techniques**: Not specified
- **Level of Stakeholder Involvement**: Stakeholders can partially affect objectives/criteria options. They can also affect objectives/criteria and scores. They can also affect weights.
- **Workshops, general meetings**: Personal and interactive interviews, group meetings
- **Treatment of Individual Preferences**: Sharing, disaggregation
- **Duration of The Process**: Six months
- **Costs**: Not specified
- **Benefits**: • More comprehensive analysis
- **Issues**: • The need for maintaining a tight schedule risks to limit the analysis
• Conflict resolution remains difficult
• Risks of bias and strategic misrepresentations
• The results obtained are only a snapshot at a given point in time.

### Participative MCA for assessing irrigation mgmt. alternatives

- **Participants**: Antunes et al. (2011)
- **Field**: Natural resources mgmt.
- **Method developed**: None (method of the PLEIADeS project in Portugal).
- **MCA Techniques Employed**: Combination of AHP and Social Multi-Criteria Evaluation
- **Number and Types of Stakeholder Techniques Employed**: Representative of different stakeholder groups. Overall 20 people. Number of stakeholders per group not specified.
- **Engagement Techniques**: Analysis of key documents, interviews with stakeholders (snowball sampling)
- **Level of Stakeholder Involvement**: 2 parallel processes. 1) Stakeholders can partially affect options, objective/criteria and score. 2) stakeholders are asked to give their overall preferences for the various options.
- **Interviews, in-depth discussions, workshops**: Aggregation, filtration
- **Treatment of Individual Preferences**: Not specified (some preparatory work, followed by two workshops)
- **Duration of The Process**: Not specified
- **Costs**: • More comprehensive analysis
- **Benefits**: • More comprehensive analysis
- **Issues**: • Subjectivity of the method
• Stakeholder engagement can be difficult

### Integrated Methodologic Approach for water allocation problems

- **Participants**: Messner et al. (2006)
- **Field**: Natural resources mgmt.
- **Method developed**: Part of the GLOWA Elbe project in Germany. Real implications not clear.
- **MCA Techniques Employed**: PROMETHEE combined with CBA
- **Number and Types of Stakeholder Techniques Employed**: Around 25 participants representing various stakeholder groups.
- **Engagement Techniques**: Analysis of key documents, interviews with stakeholders (snowball sampling)
- **Level of Stakeholder Involvement**: Stakeholders can partially affect options. They can affect objectives/criteria and weights.
- **Interviews, workshops**: Aggregation, filtration, sharing
- **Treatment of Individual Preferences**: Not specified 1 million Euro
- **Duration of The Process**: Not specified
- **Costs**: • More comprehensive analysis
- **Benefits**: • More comprehensive analysis
- **Issues**: • It is impossible to include all the stakeholders
### Table 5.1g - Key features of the participatory MCA methodologies examined.

<table>
<thead>
<tr>
<th>Methods</th>
<th>References</th>
<th>Field</th>
<th>Application to real planning and decision-making processes</th>
<th>MCA Techniques Employed</th>
<th>Number and Types of Stakeholder Groups Involved</th>
<th>Stakeholder Analysis Techniques Employed</th>
<th>Level of Participant Involvement</th>
<th>Engagement Techniques</th>
<th>Treatment of Individual Preferences</th>
<th>Duration of the Process</th>
<th>Costs</th>
<th>Envisaged Benefits</th>
<th>Envisaged Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participatory Multicriteria Evaluation</td>
<td>Stagi (2006)</td>
<td>Energy/ Natural resources mgmt.</td>
<td>Method developed as part of a research project in the UK. Real implications not clear.</td>
<td>Simple additive model</td>
<td>A few people who participate in the process as individual participants</td>
<td>Not specified</td>
<td>Stakeholders can partially affect options. They can also affect criteria, scores and weights.</td>
<td>Workshops</td>
<td>Sharing, aggregation, disaggregation</td>
<td>Not specified (some preparatory work, followed by a few workshops)</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>Resource demanding (time)</td>
</tr>
<tr>
<td>Participative MCA for assessing alternative energy scenarios</td>
<td>Omann et al. (2006); Kowalski et al. (2009).</td>
<td>Energy / Natural resources mgmt.</td>
<td>Method developed as part of the ARTEMIS project in Austria. Real implications not clear.</td>
<td>PROMETHEE</td>
<td>2 parallel processes carried out at national and local levels. Each process involves representatives from different interest groups and institutions and experts (around 20 people)</td>
<td>Not specified</td>
<td>2 parallel processes carried out at national and local levels. In both of them participants can affect over alternatives, objective/criteria and weights. The results of the two processes are then compared together</td>
<td>Personal and telephone interviews, joint and separate meetings, workshops</td>
<td>Filtration, sharing, aggregation, disaggregation</td>
<td>Some preparatory work, followed by a few workshops. Analysis carried out as part of a 3-year project.</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>• Social learning processes</td>
</tr>
<tr>
<td>Participative MCA for assessing forest plantations</td>
<td>Denk &amp; Cortina (2014)</td>
<td>Natural resources mgmt.</td>
<td>Method developed as part of a research project in Spain. Real implications not clear.</td>
<td>Not specified</td>
<td>Around 40 participants representing various stakeholder groups</td>
<td>Not specified</td>
<td>Stakeholders can affect weights.</td>
<td>Interviews, general meetings</td>
<td>Aggregation</td>
<td>Not specified (one meeting, interactive interviews and analyst-led research)</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>Subjectivity of the method</td>
</tr>
<tr>
<td>Participative MCA for the sustainable use of natural resources</td>
<td>Garmendia &amp; Gamboa (2012)</td>
<td>Natural resources mgmt.</td>
<td>Method developed as part of a research project in Spain. Real implications not clear.</td>
<td>Partial aggregation MCA methods</td>
<td>Around 30-40 participants representing various stakeholder groups</td>
<td>Identification: analysis of key documents and stakeholders snowball sampling. Classification: according to power, legitimacy and urgency</td>
<td>Stakeholders can partially affect options and objectives. They can also affect weights.</td>
<td>Interviews, general meetings, workshops</td>
<td>Filtration, aggregation, disaggregation</td>
<td>Not specified (some preparatory work, followed by interviews and a few meetings)</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>• Social learning processes</td>
</tr>
<tr>
<td>Participative MCA for assessing the sustainability of fisheries systems</td>
<td>Adrianto et al. (2005)</td>
<td>Limited/unclear</td>
<td>Simple weighted additive model</td>
<td>15 representatives of 3 different stakeholder groups</td>
<td>Not specified</td>
<td>Stakeholders can partially affect objectives/criteria. They can also affect weights and scores.</td>
<td>Not specified</td>
<td>Disaggregation, aggregation</td>
<td>Not specified</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>No issues explicitly highlighted</td>
<td></td>
</tr>
<tr>
<td>Participative MCA for localization of waste-treatment plants</td>
<td>Norese (2006)</td>
<td>Waste mgmt.</td>
<td>Method used to select a proper location for a waste-treatment plants in Italy. Real implications not clear.</td>
<td>ELECTRE</td>
<td>Around 50 participants representing various stakeholder groups</td>
<td>Not specified</td>
<td>Stakeholders can affect objectives/criteria, weights and scores (not totally clear)</td>
<td>Workshops</td>
<td>Presumably sharing, aggregation, disaggregation</td>
<td>35 meetings over a period of 16 months</td>
<td>Not specified</td>
<td>• More comprehensive analysis</td>
<td>• Social learning processes</td>
</tr>
</tbody>
</table>
5.3 Key features of participatory multi-criteria analysis methods

5.3.1 Steps of the process

The examination of the methods listed in Table 5.1 highlighted that, in operational terms, the steps of participatory MCA methodologies resemble those of analyst-led MCA methodologies (and thus those of the classic rational-comprehensive planning process). Indeed, typically, a multi-actor multi-criteria exercise encompasses the following stages:

- primary problem analysis (e.g. identification of the problems and the relevant issues, preliminary determination of the boundaries of the system under investigation, definition of the objectives of the process, etc.);
- identification, mapping and engagement of group decision-making participants;
- definition of the options to be appraised (with possible input from group decision-making participants);
- formulation of the objectives and the correspondent appraisal criteria (with possible input from group decision-making participants);
- ascription of weights to the objectives/criteria (with possible input from group decision-making participants);
- construction of the performance profile of each project options (i.e. prediction of all the effects produced by the project options under examination against the various objectives/appraisal criteria);
- assignment of scores to reflect the performances of each alternative against the different objectives and appraisal criteria (with possible input from group decision-making participants);
- application of the aggregation convention entailed by the specific MCA technique employed (see Chapter 4) and presentation and examination of the outcomes of the process as support for the final decision.

Analogously to analyst-led MCA methods, in participatory MCA methodologies the order of the above steps may vary considerably. For instance, the specification of a list of objectives and their corresponding appraisal criteria can also take place before the identification of the alternative options. In the same manner, the identification of stakeholders and their successive involvement can occur at the beginning of the process, contextually to the primary problem analysis, or can be undertaken at a later stage, once that some parameters of the analysis (e.g. options or objectives) have already been established.

The key difference between an analyst-led and a participatory approach to MCA is represented by the fact that, with the latter the key elements of the multi-criteria framework (i.e. options, objectives and criteria, weights and scores) are not necessarily determined by the analysts, but rather they can benefit from inputs from the group decision-making participants. Methodological adaptations of MCA to group decision-making seem thus to have taken place primarily in three main domains:

- the identification and classification of group decision-making participants;
- the management of group processes; and
• the treatment and inclusion of the individual preferences in the multi-criteria framework;

5.3.2 Actors involved in the process

Based on the review of the different participatory MCA methods it is possible to conclude that, in a multi-actor multi-criteria exercise there are three main groups of actors, who have different roles.

• Research team: a team who oversees the whole participatory exercise. The team may comprise:
  - analysts and specialist advisors, who carry out a primary problem analysis, identify the group decision-making participants, construct the performance profile of the various project options under investigation and develop the multi-criteria framework, by including data and information obtained as a result of the participatory exercise;
  - trained facilitators and mediators, who facilitate the engagement of decision-making participants in the process by helping them to familiarize with the principles of MCA, articulate their concerns and managing their discussions; and
  - observers who monitor carefully all the steps of the exercise and record participants' responses and discussions so as to enable a thorough analysis of the process.

It should be noted that not all the articles examined are particularly clear on the role of the research team. In the majority of the methods reviewed, the research team is (explicitly or implicitly) meant to act as an independent consultancy group, taking (to the greatest extent possible) a general and independent view of the problem at hand and ultimately presenting the results of the analysis to governments and policy-makers. The exception in this respect is represented Ward and colleagues (2016a and 2016b), who contend that the research team should represent the interests of a specific client, whose agenda is supposed to provide a significant input for steering the process. This approach, obviously, appears quite reasonable in the case of a problem affecting exclusively a particular organization (i.e. cooperative group decision-making procedures). It is also valid when the purpose of the exercise is solely to identify the potential implications of a decision for a specific party. On the other hand, this approach results to be largely questionable when the participatory process is aimed at informing government decisions over large-scale transport infrastructure or other major policy problems having multiple and uneven implications for society at large (i.e. negotiation decision-making procedures). Indeed, as Stirling (2006) claims, the management of a participatory exercise (e.g. the framing of the problem and issues, the identification and recruitment of participants, the provision of information, the phrasing of questions, the facilitation of group discourses, the management of potential conflicts, the displaying of findings) provides ample scope for inadvertent bias or the exercise of deliberate conditioning influence. Therefore, these situations ideally demand a neutral and impartial third-party examination.
- **Stakeholders**: individuals or groups of individuals who have a vested interest in the problem under examination and who can influence or are influenced by the outcomes of the decision-making process. As above explained, during the participatory exercise, the research team can rely (more or less extensively) on these individuals and groups to determine the basic elements of the multi-criteria framework, namely:
  - the list of options to be appraised;
  - the value tree of objectives and related appraisal criteria;
  - the set of weights; and
  - the set of scores.

Furthermore, data and information obtained from these parties can help the research team better frame the problem at hand and highlight neglected issues and ignored aspects. Similar to traditional participatory consultation procedures carried out as part of ordinary planning processes or EIA exercises (see Section 4.5.4 of the previous chapter), in participatory MCA methodologies, stakeholders are allowed to take part in the process either as individual participants or as representatives of organized groups. In many of the articles reviewed it is hard to find precise figures concerning the total number of people engaged in the process, the number of stakeholder groups involved and/or the size of the various groups (see Table 5.1). From the information gathered it seems that, typically, multi-actor multi-criteria exercises involve approximately 10 to 25 people, who may represent a few (i.e. 3-6) stakeholder groups.

- **Experts**: individuals who have a prolonged or intense experience, through practice and education, in the area to be investigated. Differently from the other two groups of actors, not all the methods imply the involvement of experts in the process. In some methods, experts only assist the research team in building the multi-criteria framework (see Macharis, and Nijkamp, 2011; and Ward et al., 2016a), analogously to what happens in analyst-led MCA methods. In contrast, another approach to participatory MCA exercises sees experts playing the role of actual group decision-making participants. With this approach, experts thus contribute, similarly to ordinary stakeholder groups, to the identification of the key parameter of the multi-criteria framework (see Renn et al., 1993; Stirling and Mayer, 1999; Burgess et al., 2007; and Mcdowall & Eames, 2007). However, whereas it is reasonable to assume that different decision-making situations may require different types of group decision-making participants (i.e. only stakeholders or stakeholders plus experts), only a few authors (see in particular Renn et al., 1993) clearly explain the rationale behind the approach adopted in their methods.

### 5.3.3 Identification and involvement of group decision-making participants

As above explained, in a multi-actor multi-criteria exercise, the identification and involvement of group decision-making participants (i.e. stakeholders and, in some circumstances, also experts) is generally performed by the research team. Whereas the identification of experts is relatively simple and can be limited to an online search, stakeholder analysis, especially in the case of major planning and policy problems, can be quite challenging. Following some manuals on guidelines for stakeholder analysis (see for
instance, Bryson, 2004), it is possible to argue that, ideally, stakeholder identification should be undertaken on the basis of the review of key documents concerning the decision-making situation, surveys, brainstorming sessions between the researchers and snowball sampling techniques, where the stakeholders identified and contacted at the beginning of the process may assist the researchers with locating others relevant parties. Stakeholders should then be grouped on the basis of their interests and role in the decision-making situation. Grids and diagrams may also be conveniently used to determine how the different groups and individuals might be related to one another through their relationship with the issue and who might be the most influential or central stakeholders. The majority of the articles examined, however, are rather vague and generic on how group decision-making participants are determined (more accurate discussions in this regard are presented in Banville et al., 1998; and Ward et al., 2016a).

In participatory MCA methodologies, the involvement of stakeholders (and experts) can also be realized with different degrees of intensity and in a wide variety of forms. Indeed, the methods reviewed cover a continuous spectrum, ranging from limited-participatory techniques, where participants are involved only at a few stages of the process and thus have the possibility of affecting only partially the multi-criteria framework, to fully-participatory techniques, in which the various parties are given the opportunity to provide an input for all the elements of the framework (i.e. options, objectives/criteria, weights, scores). As shown in Figure 5.2, at one extreme of the spectrum it is possible to find methods such as the Goal-Achievement Matrix (Hill, 1966, 1968 and 1973), where stakeholders’ opinions are considered by the research team only during the determination of the weighting scheme. At the other extreme of the spectrum, there is, for instance, the Multi-Criteria Mapping (Stirling and Mayer, 1999), which, in contrast, provides participants with the opportunity to determine options, objectives/criteria, weights and scores.

**Figure 5.2 – Types of participatory MCA methods.**

![Figure 5.2](source)

Source: Author’s own elaboration.
Furthermore, in more elaborated participatory MCA techniques, stakeholders and experts can also be asked to separately provide data and information for different elements of the multi-criteria framework. For instance, in the methodology proposed by Renn and colleagues (1993), experts are asked to identify scores, while stakeholders groups are involved in the determination of the other parameters of the analysis. Other methods entail also the contemporary fulfilment of two (or more) distinct participatory exercises, which are carried out in parallel, even with totally different modalities, and whose results are ultimately subject to a comparative analysis. The participatory MCA methods proposed by Burgess and colleagues (2007), for instance, entail two separate participatory exercises, one for ordinary stakeholders and one for expert groups. By comparison, the method devised by Kowalski and colleagues (2009) implies different multi-actor multi-criteria exercises for stakeholders operating at different scales (e.g. local versus national stakeholders).

In order to engage with stakeholders and experts, a large variety of participatory techniques, ranging from simple interviews and structured questionnaires to in-depth group discussions, can be employed. Various techniques can also be used during the same process with the view to eliciting different types of valuation information from participants. Table 5.2 presents a brief overview of the most common participatory techniques employed as part of participatory MCA methodologies. In the attempt to facilitate group processes, some methodologies also make large use of specialized software and visualization tools (see, amongst other, Lami et al., 2011; and Pensa et. al., 2013).

Table 5.2 – Overview of participatory techniques.

<table>
<thead>
<tr>
<th>Participatory techniques</th>
<th>Description</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>Formal meetings between the interviewer(s) and the interviewee(s), in which a series of questions are asked by the interviewer(s) to obtain information.</td>
<td>To identify specific and detailed information about the value and concerns of a specific person or a few people (belonging to the same stakeholder group).</td>
</tr>
<tr>
<td>Surveys</td>
<td>Investigations involving a large number of people aimed at obtaining information through the use of questionnaires and similar data collection techniques, and statistical methodologies.</td>
<td>To collect data from a large number of people in a systematic manner.</td>
</tr>
<tr>
<td>Focus Groups</td>
<td>Planned discussions amongst a relatively small group of people facilitated by a skilled moderator.</td>
<td>To obtain information about values and preferences regarding a given issue; and to promote knowledge exchange and mutual learning among the parties involved.</td>
</tr>
<tr>
<td>Consensus Conferences</td>
<td>Planned discussions, involving a relatively large numbers of people, who negotiate over an issue.</td>
<td>To broaden the debate on a given issue and to arrive at a consensus of opinion upon which decisions can be based.</td>
</tr>
<tr>
<td>General Meetings</td>
<td>Gatherings where people come together to share information and exchange ideas about a specific problem at hand.</td>
<td>To allow people share their concerns and hear other points of view; and to identify possible similarities and areas of conflict.</td>
</tr>
<tr>
<td>Workshops</td>
<td>Meetings that encourage active participation and present a strong focus on problem-solving.</td>
<td>To create a common baseline for knowledge; to generate ideas for solving problems through collaborative working; and to increase the sense of ownership and empowerment over a problem.</td>
</tr>
</tbody>
</table>

Source: (Adapted from) Petts (1999b), van Asselt et al. (2001) and Slocum (2003).
On the one hand, it is sensible to assume that different problems would require a
different level of involvement of stakeholders (and expert groups), different engagement
techniques and the fulfilment of one or multiple participatory processes. On the other
hand, quite disappointingly, also concerning these important aspects, only in a few cases
(see, in particular, Renn et al., 1993; Stirling and Mayer, 1999; Munda 1995 and 2008)
clear explanations and justifications for the approach adopted are offered.

5.3.4 Inclusion of different perspectives in the analysis

One of, if not the most, critical aspects of participatory MCA methodologies is represented
by the ways in which the multiple participants’ perspectives are processed to determine
the key elements of the multi-criteria framework (i.e. the list of options, the value tree of
objectives and appraisal criteria, the sets of scores and weights). Especially in multi-actor
multi-criteria exercise characterized by value conflicts, the inclusion of multiple
perspectives in the framework is generally a quite challenging and controversial task.
However, quite surprisingly, this issue does not seem to have received much attention in
the MCA literature. Indeed, only Stirling and Mayer (1999), Stirling (2006), Munda (1995
and 2008) and Macharis and Nijkamp (2011) discuss, although quite briefly, the rationale
behind the strategy adopted to handle data and information provided by the different
group decision-making participants. Other authors (see Belton and Stewart, 2002; and
Leyva-Lopez and Fernandez-Gonzalez, 2003) consider this issue very marginally.

Conceptual schemes, identifying possible approaches for incorporating different
viewpoints in the analysis, have been proposed by Belton and Pictet (1997) and D’Este
(2009). However, although useful, these models appear to be narrow and incomplete.
Based on the examination of all the participatory MCA methods presented in Table 5.1, a
more comprehensive framework was developed. The framework, as presented below,
envisages five different basic strategies for identifying options, objectives and criteria,
weights and scores, while dealing with multiple viewpoints.

- **Exclusion**: a common value for a given element of the multi-criteria framework (i.e.
  the list of options, the value tree of objectives and criteria, the set of weights or the set
  of scores) is established directly by the research team, irrespective
  of the opinion of
  the group decision-making participants (i.e. stakeholders and, in some cases, also
  experts).

- **Filtration**: all the various participants’ preferences regarding a given element of the
  multi-criteria framework are carefully scrutinized by the research team. The analysts
can then rely (more or less extensively) on these data and information for identifying a
  plausible common value for that element, which all the participants will be then
  required to adopt.

- **Sharing**: the various participants engage in a process of negotiation, opportunely
  mediated by the research team, with the view to reaching a consensus
  of opinion
  over a given element of the framework.

- **Aggregation**: the analysts identify a common value for a given element of the multi-
  criteria framework, through the calculation of the mathematical average between the

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2 The term ‘aggregation’, in this context, should not be confused with the different aggregation rules employed
to bring together weights and scores with the view to producing the final ranking.
various participants' preferences or the construction of a representative value, which minimizes the differences between participants' opinions;

- **Disaggregation**: the points of view of the different participants regarding a given element of the multi-criteria framework are kept apart from each other and included separately in the analysis.

These five strategies are illustrated in Figure 5.3.

**Figure 5.3 – Possible strategies for building a multi-actor multi-criteria appraisal framework.**

Source: Author’s own elaboration.
As it is noticeable from this figure, exclusion, filtration, sharing and aggregation strategies are explicitly aimed at generating a common value for the element of the multi-criteria framework under examination (i.e. a common list of option, a common value-tree of objectives and appraisal criteria, a common set of weights or a common set of scores). However, a group consensus is needed only with the sharing approach and the results obtained with each of these strategies are extremely likely to differ from one another.

With the disaggregation strategy, by comparison, multiple values for the element of the multi-criteria framework under examination (i.e. multiple value-tree of objectives and appraisal criteria, multiple set of weights or multiple set of scores) are obtained. Differently from the other strategies, the point of view of the different group decision-making participants is thus made explicit in the analysis.

In all the approaches, with the exception of exclusion, the point of view of the group-decision making participants is taken (directly or indirectly) into account by the research team. In particular, with the filtration approach the information provided by stakeholders (and experts) is initially analyzed by the analysts, who then establish whether and how to include these data in the multi-criteria framework. In contrast, with sharing, aggregation and disaggregation strategies, the information provided by participants is directly processed and incorporated in the analysis, although some assistance from the research team may be needed to avoid inconsistencies (e.g. exclusion of unfeasible options from the list; rephrasing of some objectives and criteria; reconciliation of similar objectives and criteria to avoid double counting).

As displayed in Table 5.3 and described further below, the above strategies can be applied to (almost) all the elements of the multi-criteria framework (i.e. options, objectives/criteria, weights, scores). They can also be applied to the final rankings produced as a result of the process.

**Determination of options**

In participatory MCA exercises, options to be appraised can be identified in different ways. The simplest and most straightforward approach sees options being defined in advanced, before the formal commencement of the MCA process, or being determined by the research team, irrespectively of participants' preferences (i.e. exclusion).

In other cases, in establishing the options, the research team can also rely (considerably or only partially) on the information gathered through a series of interviews and workshops with the different group decision-making participants (i.e. filtration).

Alternatively, options can come directly from participants through a negotiation process mediated by the research team, where different interests and priorities are explored with the view to arriving at a shared list of alternative solutions (i.e. sharing).

Finally, the research team can also arrive at a final set of options by simply including in this list all the different (feasible and realistic) alternative proposals suggested, by the different individuals and/or groups taking part in the process, without the need of achieving a high degree of group consensus over this list (i.e. aggregation).

Generally, the practical need for ensuring basic comparability requires the use of a common set of alternative options. Indeed, it is evident that a situation where the different
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parties consider different set of alternatives would prevent the research team from formulating any meaningful recommendations concerning the preferred course of action. Therefore, the *disaggregation* approach is not applicable to options.

**Determination of objectives and criteria**

Conversely from options, comparability concerning objectives and respective appraisal criteria does not represent an essential requirement. Therefore, the value tree, linking hierarchically higher order objectives with more specific sub-objectives and eventually with measurable indicators of performances, can be either common to all the participants or not. A common set of objectives and appraisal criteria can be identified by the research team, either totally independently from the stakeholders’ agendas (*i.e.* exclusion) or by using data and information provided by participants as a source of inspiration (*i.e.* filtration).

As an alternative to the above approaches, a shared list of objectives and correspondent appraisal criteria can be ideally obtained through a mediation and consensus-building process between the various group decision-making participants (*i.e.* sharing).

Finally, a common value tree can be built by the research team in a more mechanical way, by mixing and combining the individual value-trees developed by the different parties involved in the exercise (*i.e.* aggregation).

In contrast, the various individuals and/or groups taking part in the exercise can also be allowed to assess the project options by employing exclusively their own objectives and appraisal criteria. Therefore, in this circumstance, assuming that participants present different interests, various discordant value-trees are eventually incorporated separately in the multi-criteria framework (*i.e.* disaggregation).

**Determination of weights and scores**

Similarly to objectives and associated appraisal criteria, weights and scores are not necessarily required to be identical for all the various parties involved in the participatory MCA exercise. Hence, in principle, all the five strategies can be used to define weights and scores. The analysts can directly identify a set of weights and/or scores common to all the various participants, regardless of their viewpoint (*i.e.* exclusion).

Alternatively, a set of scores and/or weights common to all the various parties can also be identified by the research team, after an analysis of participants’ opinions and/or priorities (*i.e.* filtration).

It is also possible to assume that shared scores and/or weights can be derived from a negotiation exercise amongst the various group decision-making participants (*i.e.* sharing)

More simply, common scores and/or weights can be determined as the arithmetic or geometric mean (or other similar median figures) of the individual scores and/or weights provided by the different individuals and/or groups taking part in the process (*i.e.* aggregation).
Finally, the parties involved can also be given the possibility of using their own scores and/or weights. Hence, if participants have different opinions and priorities, this approach leads to different sets of weights and/or scores being included in the multi-criteria framework (i.e. disaggregation).

**Determination of the final rankings**

Once options, objectives/criteria, weights and scores have been established, the next step in a typical MCA process concerns the aggregation of these elements to arrive at the final rankings of options. As highlighted in Chapter 4, the various MCA techniques present different aggregation rules, ranging from very rigorous and advanced mathematical formulae to basic calculations.

Normally, in participatory MCA exercise, the MCA technique employed and the underlying aggregation rules are common to all the participants. In particular, the large majority of the participatory MCA methodologies which have been reviewed tend to employ simplistic MCA techniques, where generally the overall performance of an option is computed as the weighted sum of the single performances of an option against each objective/criterion (i.e. simple weighted additive models).

Independently from the MCA technique adopted, the output of a participatory MCA process can be represented by either an overall ranking common to all the participants (i.e. multi-actor view) or a series of individual rankings (i.e. single-actor views). The type of output produced as a result of the process depends on the specific strategies used to handle the different stakeholders’ point of views during the identification of objectives/criteria, weights and scores. Specifically, when in determining these parameters only approaches aimed at obtaining a common multi-criteria framework are employed (i.e. exclusion, filtration, sharing and aggregation) the output of the analysis is represented exclusively by a single multi-actor view. This global ranking is then analyzed by the research team and used as support for the final decision.

Vice versa, if during the process, the research team employs the disaggregation approach, at least in one occasion, for determining objectives/criteria, weights and/or scores, different single-actor views (one for each individual or group involved in the process) are produced. The various single-actor views can differ in terms of value trees (i.e. number and types of objectives and criteria), level of importance ascribed to the various objectives/criteria (i.e. weights) and/or performance scores, according to which stage of the process the disaggregation strategy has been applied to (see Figure 5.4).

---

3 A department form this assumption is represented by de Keyser and Springael (2002), whose method allows group-decision making participants also to choose their own MCA techniques. However, differently from what these authors claim, it appears hardly possible for this method to open new perspectives and opportunities to group decision-making. Indeed, as already pointed out in Chapter 4, the various MCA methodologies are based on contrasting assumptions and rules (Munda, 1995 and 2008; Zardari et al., 2015) so that the results produced by two different MCA methods can hardly be comparable in a meaningful way (Belton and Pictet 1997). Furthermore, since the majority of MCA methods are not easily comprehensible for non-technical stakeholders, ideally, only real MCA experts would be able to take part in Keyser and Springael’s participatory MCA process.
Figure 5.4 – Possible outputs obtained with a multi-actor multi-criteria appraisal exercise.

Source: Author’s own elaboration.
The single-actor views can be treated in different ways. They can be kept separate and examined individually by the research team as support for the final decision (i.e. disaggregation). Alternatively, from the single-actor views it is possible to obtain a global multi-actor view. The most common approach to derive a multi-actor view is to calculate the average of the individual rankings or undertaking similar calculations in the attempt to produce a purely mathematical synthesis of the single-actor views4 (i.e. aggregation).

The research team by exploring the single rankings can, otherwise, obtains useful indications concerning an overall common ranking (which in this case does not necessarily correspond to the arithmetic mean of the single-actor views) and the potential preferred solution (i.e. filtration).

Lastly, a multi-actor view can also be obtained through a process of negotiation, where the various parties, opportunely assisted by a facilitator, explore communalities and differences between the individual rankings, in an effort to reach a consensus on the preferred course of action (i.e. sharing).

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4 When full aggregation MCA methods are employed, typically, the aggregation approach at the output level entails the calculation of the average of the individual rankings. A more sophisticated aggregation approach, used particularly when a synthesis-outranking MCA approach is employed, implies the fulfilment of a new overarching MCA, in which each stakeholder group is assimilated to an appraisal criterion and the preferential information contained in each single-actor view is used to generate a final collective ordering analyses (see, for instance, Leyva-Lopez and Fernandez-Gonzalez, 2003). The aggregation of the single-actor views can be performed considering either the various groups to be equally important or assuming unequal weights for stakeholders (see Herath, 2004).
Table 5.3 – Possible strategies for building a multi-actor multi-criteria appraisal framework.

<table>
<thead>
<tr>
<th>Elements of the MCA framework</th>
<th>Common Framework</th>
<th>Stakeholder Engagement</th>
<th>Discordant Frameworks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td>Options are identified directly by the analyst</td>
<td>Stakeholders agree on a common list of options</td>
<td>A common list of options is obtained by including all the options suggested by the stakeholders</td>
</tr>
<tr>
<td>Objectives/Criteria</td>
<td>Objectives and criteria are identified directly by the analyst</td>
<td>Stakeholders agree on a common set of objectives and criteria</td>
<td>A common set of objectives and criteria is created by combining together all the different objectives and criteria proposed by the various stakeholders</td>
</tr>
<tr>
<td>Weights</td>
<td>Weights are established directly by the analyst</td>
<td>Stakeholders agree on a common set of weights</td>
<td>A common set of weights is obtained by calculating the mean of the single weights ascribed by the various stakeholders</td>
</tr>
<tr>
<td>Scores</td>
<td>Scores are ascribed directly by the analyst</td>
<td>Stakeholders agree on a common set of scores</td>
<td>A common set of scores is obtained by calculating the mean of the single scores ascribed by the various stakeholders</td>
</tr>
<tr>
<td><strong>Possible Outputs (final ranking)</strong></td>
<td>CASE I (Common Framework): single multi-actor view</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>CASE II (Discordant Frameworks): multiple single-actor views</td>
<td>–</td>
<td>The analyst identifies an overall common ranking on the basis of the examination of the single-actor views</td>
</tr>
</tbody>
</table>

− = not applicable

Source: Author’s own elaboration.
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**Examples**

Some participatory MCA methods rely exclusively on one strategy to include the various participants’ perspectives in the multi-criteria model. For example, with the *Deliberative Multicriteria Evaluation* (see Figure 5.5) the various parties involved are required to reach an agreement (i.e. sharing) over the list of options to be appraised, the value tree of objectives and appraisal criteria, the importance of these criteria and the performance scores. As a result of the process a global multi-actor view is produced.

**Figure 5.5 – Approach adopted by the Deliberative Multicriteria Evaluation.**

However, in general, the majority of participatory MCA methods adopt two or more strategies to deal with data and information provided by the different group decision-making participants. For instance, with the *Multi-Actors Multi-Criteria Analysis* (see Figure 5.6), usually, stakeholders are asked to assess a common set of pre-defined options (i.e. exclusion), by using their own objectives and weights (i.e. disaggregation). Scores are instead established directly by the specialist advisor of the research team (i.e. exclusion). The outcome of the process is expressed in the form of charts illustrating the performances of the different options according to the viewpoint of the different stakeholders. Additionally, a mathematical synthesis of the single-actors views (i.e. aggregation) is also generated by the research team so as to obtain a multi-actor view.

**Figure 5.6 – Approach adopted by the Multi-Actors Multi-Criteria Analysis.**
With the Multi-Criteria Mapping (see Figure 5.7), instead, the various participants can contribute to generate a common set of alternatives by suggesting some additional options, besides those originally identified by the analysts (i.e. aggregation). To judge these options, they are then given the possibility to identify their own list of objectives and criteria, which are ultimately aggregate into a few meta-objectives (i.e. aggregation). Participants are then asked to appraise the various options against this common set of general objectives by using their own sets of weights and scores (i.e. disaggregation). The outcome of the process is thus represented by different single-actor views, which can also be aggregated into a unique, global multi-actor view.

Figure 5.7 – Approach adopted by the Multi-Criteria Mapping.

<table>
<thead>
<tr>
<th>Possible Outputs (final ranking)</th>
<th>CASE I (Common Framework) single multi-actor view</th>
<th>CASE II (Disagreement Frameworks) multiple single-actor views</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>Options</td>
<td>Stakeholders can describe their own weights</td>
</tr>
<tr>
<td></td>
<td>Objectives/ Criteria</td>
<td>Stakeholders are free to select their own objectives and criteria which are ultimately aggregated into meta-objectives</td>
</tr>
<tr>
<td></td>
<td>Weights</td>
<td>Stakeholders are allowed to score the options differently</td>
</tr>
<tr>
<td></td>
<td>Scores</td>
<td></td>
</tr>
<tr>
<td>Common Framework</td>
<td>Stakeholder Engagement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exclusion</td>
<td>Stakeholder Engagement</td>
</tr>
<tr>
<td></td>
<td>Filtration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sharing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aggregation</td>
<td></td>
</tr>
<tr>
<td>Disagreement Frameworks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Finally, with Policy-Led Multi-Criteria Analysis (see Figure 5.8) a common value tree of objectives and appraisal criteria is constructed by the research team on the basis of the analysis of key planning documents and policy guidelines concerning the problem at hand, complemented, where necessary, with stakeholder interviews (i.e. filtration). Policy documents are also supposed to provide a critical input for ultimately determining which appraisal criteria matter more (i.e. exclusion). On the basis of this value tree and this set of weights, stakeholders are asked to discuss and ultimately agree on a list of options to be assessed (i.e. sharing). Successively, stakeholders are also required to score, according to their point of view, the performance of each option against the various appraisal criteria (i.e. disaggregation). Hence, different individual rankings are thus obtained. With this method, the tables and charts illustrating the positions of the various actors represent the starting point of a negotiation exercise (i.e. sharing), undertaken in an effort to explore possibilities of convergence of interests and to arrive at an agreement over a global ranking.

The structure of above methods is not totally fixed but rather it may vary to suit the requirements of the specific problem at hand. For instance, in the case of the application of Multi-Actors Multi-Criteria Analysis to support a decision-making process on mobility and logistics in the Flanders region (see Macharis et al. 2010), conversely from the ordinary procedure, the appraisal criteria were selected by the research team (i.e. exclusion) and turned thus out to be the same for all stakeholders. In the case of the application of the Policy-Led Multi-Criteria Analysis to the London Underground’s Northern Line Extension project (see Ward et al., 2016b), the option to assess was given a priori (i.e. exclusion) and, due to the presence of some policy gaps, a sharing approach was used to establish a common set of appraisal criteria and weights.
Finally, in more sophisticated participatory MCA techniques, entailing two or more parallel participatory processes, each process can obviously be carried out by employing different combination of strategies for handling data and information provided by the various group decision-making participants.

5.4 Possible issues with participatory multi-criteria analysis methods

5.4.1 Participatory processes

As it is noticeable in Table 5.1, the large majority of the methods reviewed seem to have remained simple academic proposals. Furthermore, when the methods have been really applied to ‘live’ practice, both the manner and the extent to which the results of the multi-criteria participatory exercises have been incorporated in the final decision are not always clearly explained by the authors. It is also evident that, so far, in the literature there has been a lack of any comprehensive and systematic identification and examination of the potential issues surrounding the practical application of such methods. Indeed, while, as shown in Table 5.1, the potential benefits of participatory MCA methodologies, in terms of expanding the depth and breadth of analysis, establishing a transparent and democratic process and favoring mutual understanding and acceptance, have been widely espoused by their proponents, issues and potential drawbacks are not always explicitly acknowledged or are only briefly mentioned.

In particular, one of the most apparent issues highlighted by this analysis is represented by the participatory process itself. It is apparent that, analogously to traditional participatory consultation procedures, with participatory MCA methodologies the identification and involvement of group decision-making participants is extremely likely to be fraught with difficulties and challenges. Echoing the literature on discursive democracy, many proponents of participatory MCA methods (see, for instance, Macharis, and Nijkamp, 2011) emphasize that, ideally, a multi-actor multi-criteria exercise should try to involve or represent all interested parties that are affected by the issue under discussion, with no viewpoint excluded a priori. However, as already highlighted, in most
cases, due to practicality reasons, participatory MCA processes involve only a small number of people. While useful to a research team to improve the knowledge of a problem at hand, it is evident that such exercises can hardly be considered a way for deriving consistent conclusions on social preferences, especially in the case of large-scale infrastructure projects or other major policy decisions potentially affecting a large number of people. Moreover, as already pointed out in Section 4.5.5, the choice of which stakeholder groups need to be involved in the process is also difficult and largely arbitrary, and entails implicit considerations on a number of interdependent factors, including the nature of the problem at hand and its physical boundaries, and the questions to prioritize (see Stirling, 2006; Kahane et al., 2013). There is a persistent risk of missing stakeholder groups that instead should have been included and also reinforcing existing patterns of social and political disparities. In many case, in fact, choices about which stakeholders to involve may lean (intentionally or unintentionally) towards the most organized, and often most powerful, groups, that have consolidated themselves as a public presence (Kahane et al., 2013). Therefore, compared to CBA, which somehow attempts to include in the final judgment the values of all people rather than a selected few, participatory MCA methodologies, owing to these issues, risk even representing a step backwards with regard to equity considerations.

Quite surprisingly, then, the large majority of the article reviewed tend to ignore traditional consultation procedures. In particular, while all motivated by the need for overcoming the limitation of traditional analyst-led economic-centric appraisal tools such as CBA, the articles describing the possible application of participatory MCA methods to in the field of transport and infrastructure planning do not make almost any reference to EIA procedures and related participatory practices. Therefore, it is not clear what would be the hypothetical relationships between EIA procedures and the proposed participatory MCA methodologies (i.e. should participatory MCA methodologies replace EIA procedures or should the former be undertaken in addition to the latter?) and what a multi-actor multi-criteria exercise can add compared to existing consultation process.

Concerning the last aspect, McAllister (1988) claims that, asking people to express their reaction to a proposed plan in terms of numbers (i.e. a set of weights and scores) represents a meaningless and empty approach to participation as it tends to exclude critical information that is essential for arriving at a rich representation of the problem at hand. In the words of McAllister (1988:265), running a multi-actor multi-criteria process in the effort to acquire information for planning “would be like communicating in monosyllable words” (p.265). Most interestingly, then, whereas MCA advocates argue that MCA is closely related to the way humans have always been making decisions and thus participatory MCA can be seen as an effective means for eliciting people’s opinion, other works seems to disprove this argument. According to Miller (1956) and Arrow and Raynaud (1986) the inherent limitations of short-term memory make an individual unable to consider simultaneously too many factors (i.e. criteria) when taking a decision. Miller, in particular, sets the maximum number of factors to approximately seven, while Arrow and Raynaud appear to be even more pessimistic in this respect. Shepard (1964) assembles a persuasive variety of results from psychological experiments, which demonstrate that the ability of individuals to arrive at an overall evaluation by weighting, and combing or trading off different separate criteria is severely limited. Along the same line, Manheim and colleagues (1974) and Steele and colleagues (2009) claim that many have difficulties in
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

5.4.2 Treatment and inclusion of the individual preferences in the multi-criteria framework

As stated in the previous sections, the inclusion of multiple perspectives in the multi-criteria framework is probably the most critical task of participatory MCA methodologies. The methods reviewed as part of this analysis employ a variety of different approaches (i.e. exclusion, filtration, aggregation, sharing and/or disaggregation strategies) to derive options, objectives and criteria, weights and scores, from a wide variety of different, and often conflicting, viewpoints. However, as already pointed out, explanations and justifications for the approaches chosen are largely missing from almost all the articles examined.

Exclusion, filtration, aggregation, sharing and disaggregation strategies rest on very different assumptions. In particular, exclusion and filtration largely reflect a typical analyst-led appraisal exercise. Indeed, with these strategies the research team is mostly (i.e. filtration) or entirely (i.e. exclusion) responsible for the identification of the key elements of the multi-criteria framework, which all the participants are required to adopt, irrespectively of their interests and priorities.

Aggregation, which is extensively used in mainstream economics (e.g. CBA) and mathematical decision theory, instead assumes that social preferences can be obtained by simply aggregating individual preferences, without the need for explicitly discussing possible differences in values.

By comparison, participatory MCA methods relying on sharing strategies are those ones that, more than others, appear to be particularly prone to the ideas of communicative and collaborative planning theories and deliberative and discursive democracy (see Forester, 1989 and 1999; Healey, 1998 and 2003; Innes, 1995 and 1996; Innes and Booher, 2003). With these methods appraisal becomes in fact a form of interactive discourse, where all the actors involved in the process can explain their values and concerns and, at the same time, have the opportunity to learn about the social identities of the other parties in the attempt to identify win-win solutions. Sharing strategies promise to identify common interests and shared values through the exchange of information and reflections, avoid conflicts or their escalation by reframing contentious issues, replace animosity with trust, and ultimately arrive at the determination of win-win solutions.

Finally, disaggregation, while acknowledging that information can be uncertain and subject to different interpretations (i.e. ambiguity), also recognizes that any attempt to obtain a global perspective on a problem under examination may entail the risk that the views and wishes of certain parties are discriminated. Therefore, this approach attempts

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to map the point of view of each individual or group taking part in the process, while keeping these different perspectives strictly separated. The focus, with this strategy, is exclusively on 'opening up' the analysis and accounting, to the largest extent possible, for neglected perspectives, excluded possibilities and ignored issues (see Stirling, 1998 and 2006).

Begin based on different principles and assumptions, these different strategies obviously entail some implications and issues for the multi-actor multi-criteria process in which they are applied. These issues appear to be mainly related to three spheres:

- the practical feasibility of the process;
- the reliability and usefulness of the outcome of the participatory exercise; and
- the resources (i.e. time, money and level of expertise) required to run the process.

All these aspects will be discussed in detail in the following sections.

**Practical feasibility of the process**

Exclusion, filtration, aggregation and disaggregation strategies constitute straightforward and feasible approaches for incorporating multiple perspectives in the multi-criteria framework. Indeed, with exclusion and filtration strategies, an analyst or a team of analysts is ultimately responsible for the identification of the key elements of the framework. With the aggregation strategy, by comparison, the analysts are only required to identify (mathematically) the average value of the set of preferences expressed by the various group decision-making participants. Under the disaggregation approach, finally, the point of view of the different participants is simply included separately in the framework. It is thus evident that all the above strategies entail very limited possibilities of deadlocks during the process.

On the other hand, with the employment of a sharing approach, the captivating objective of developing a common agreed analysis and ultimately arriving at a mutually convenient solution, may require long and complicated negotiations. In particular, according to many academics and practitioners (see, amongst others, Susskind *et al.*, 1999; More, 2003; Ansell and Gash, 2008; Schenk *et al.*, 2016) a number of conditions need to hold for creating a consensus building process:

- there should be strong incentives for all the parties to take part in the process;
- all the parties should be able to participate and have equal access to information and other resources;
- there should not be significant imbalance in power between the parties;
- it should be possible to create a process where all are heard and respected; and
- the different parties should be willing to cooperate and learn about each other's social identities.

These requirements, however, seem to be quite difficult (if not impossible) to achieve in real decision-making situations, particularly when stakes are high, facts are uncertain and ambiguous and stakeholders present totally opposite interests, with little room for
compromise. In these circumstances, the hypothesis that clear consensus positions, on which to base decisions, will eventually emerge may prove excessively optimistic.

Practical experiences with negotiation process with multiple stakeholders have shown that the chances for a group of actors having different agendas to ultimately arrive at the formulation of a shared frame are extremely limited (see Pasquero, 1991; Driscoll, 1996; and Turcotte and Pasquero, 2001). These experiences have demonstrated that consensus can be achieved only over general and rather vague principles (e.g. the importance of pursuing a sustainable development path; the necessity to ensure an equitable distribution of resources), while there is little or no agreement over more specific parameters (e.g. how and at which scale to measure sustainable development? what constitutes a fair distribution of these resources?).

Hence, in a participatory MCA process where the interests and priorities of group decision-making participants fundamentally clash, a sharing strategy leads to high possibilities of deadlock as each participant tries to impose his or her own logic over the others and each has a veto power. Different parties would tend to adopt different objective and criteria to assess the same issue. Even when a mutual alignment between the various participants’ general objectives seem to exist, the characterization of the correspondent appraisal criteria, and the definition of the temporal and spatial scale at which these objectives should be measured are likely to differ substantially across participants. The identification of a common weighting scheme may also easily result in several conflicts between participants. Chadwick (1971:269) summarizes the situation as follows: “weighting is a process which is not only unlikely but theoretically impossible [...] how might interest groups agree to a weighting which placed their own weight lower than other in rankings?” Echoing Chadwick’s opinions, Manheim and colleagues (1974:161) argue that “only a very naive group” would be willing to agree on a set of weights, which ultimately undermines their interests. Clearly, then, there is also no reason to believe that the various participants, whoever they are, would come up with the same set of scores for each option.

Reliability and usefulness of the results

The strategies adopted to handle data and information, provided by the different group decision-making participants, unavoidably affect the reliability, validity and utility of the results of the multi-actor multi-criteria exercise. With exclusion and filtration strategies, the responsibility of identify the key elements of the multi-criteria framework is given to the analysts. On the one hand, the employment of these two strategies never brings the process to a standstill. On the other hand, the values produced (more or less) arbitrarily by the research team are likely to dismiss or misrepresent, totally (i.e. exclusion approach) or partially (i.e. filtration approach), the viewpoints of group decision-making participants. Therefore, notwithstanding for very technical and complex issues, it is possible to contend that, some participants may not be informed enough to offer judgments on aspects which may be best approached from a solid background of scientific knowledge (see McAllister, 1982; and Yearley, 2001), there is the serious risk that this overall picture constructed by analysts and specialist advisors may please nobody.
Similar problems are also entailed by aggregation strategies, where, in practice, the concepts of ‘consensus’ and/or ‘compromising solutions’ is confused with the crude calculation of the average of a wide spectrum of values. Furthermore, similar to what explained in Chapter 4 for all the analyst-led appraisal methodologies, the aggregation of the individual viewpoints with the intention of deriving a group preference on something is highly problematic form the point of view of equity. In this regard, Arrow (1951), in his ‘Impossibility Theorem’, has demonstrated in formal mathematical terms that, in a plural society, there exists no analytical procedure through which individual preferences can be aggregated together in a democratic and consist manner, irrespectively of how much information is available and how much consultation and consideration are involved. To put it another way, a purely analytical tool is unable to either address the conflicts of interests of different stakeholders or reconcile the divergent frames of references, which these actors employ. It follows that the median values obtained through aggregation procedures are theoretically weak and extremely likely to lead to a compromise that is uncomfortable and unstable. Indeed, since neither party is completely satisfied with the results of the process, conflicts between them are quite likely to re-emerge at a later stage.

Aggregation strategies are also severely exposed to the jeopardy of bias and dishonesty. The former may occur when, at the beginning of the process, a party presents already a clear idea on the problem under examination, so that, throughout the multi-actor multi-criteria exercise, unconsciously, tends to select only objectives and criteria supporting that particular position and assign to them very high weights, while discarding all the data and information potentially disproving that position (see Macharis and Nijkamp, 2011). Dishonesty and strategic misrepresentations, on the other hand, imply people intentionally and strategically setting scores and weights to increase the probability that a particular goal will occur or to put deliberately other parties at a disadvantage (Sager, 2003; Yearley, 2001). For example, some respondents may strategically attach very low weights to criteria, which they believe their opponents might give high priority, and/or ascribe very low scores to others’ likely favored options, in the hope of dragging down the aggregate statistical importance of those criteria and the overall performances of those options. Bias and dishonesty, whose boundaries often appear to be quite fuzzy (De Bruijn, and Leijten, 2008), may be also favored by the largely arbitrary and subjective nature of MCA, for which, as pointed out, there are no overriding principles, theoretical underpinnings or universal guidelines guiding the selection of criteria, weights and scores (i.e. a party cannot be explicitly accused of having selected too many, or too few, objectives, or having ascribed too high, or too low, weights to these objectives).

Regarding to the reliability and usefulness of the results produced, the employment of a sharing approach potentially represents a good choice (assuming, of course, that consensus can be really achieved over the element of the multi-criteria framework). However, also with this strategy some problems can emerge. The management of group dynamics remains a very strenuous task also for experienced staff. Sometimes the process can become unfair with more skilled parties, dominating the discussion and imposing their logic over others parties, who are not willing or not really able to speak in public (Petts, 1999b; Saarikoski, 2000). In other cases, consensus may be implicitly or explicitly forced by facilitators and mediators in the attempt to arrive at a final answer within a reasonable time frame, so as to respect a given schedule (D’Este, 2009). Hence, these and other similar circumstances may contribute to create doubts over the validity.
and utility of the outcome of the analysis, while leading to dissatisfaction amongst stakeholders, who may feel that their point of view has not been adequately captured by the analysts.

The disaggregation strategy can be seen as an attempt to avoid all these issues. According to many authors (see, amongst other, Clark et al., 1998; Stirling, 2006; Macharis and Nijkamp, 2011), this approach seems to be more open and democratic than an exercise in which participants are required to adopt somehow a common model, irrespective of the potential numerous dissimilarities between their belief and value systems. This approach potentially also provides a hypothetical decision-maker with a wide array of information concerning the way the different parties frame the problem, highlighting both differences and commonalities in the positions of the different actors (e.g. most relevant objectives/criteria for each stakeholder group; objectives/criteria which seem to be important for all the parties; objectives/criteria which cause the most disagreement amongst stakeholders; preferred option for each group) (see Stirling and Mayer, 2001; Stirling, 2006).

There is, however, the risk that disaggregation strategies may do little more than uncover this fundamental clash of frames (see Owens et al., 2004). Indeed, while the need for deciding and acting, once the relevant information has been collected, remains firm, with this approach, there is nothing self-evident about how to process systematically and comprehensively these constellations of opinions, and how to derive clear outcomes from this analysis (see Van Eeten, 1999 and 2001; and Yearley, 2001). As already explained in Chapter 4, appraisal faces a critical dilemma. On the one hand, to understand divergent values, conflicting interests, and possible disparate interpretation of the available evidence several tables or charts displaying the different stakeholders’ views are helpful. However, in the attempt to make a choice on the problem under examination, a decision-maker would find himself/herself almost ‘bombarded’ by such a large amount of data and information and thus in need of reconciling and synthetizing these different arrays of objectives and criteria, weighting schemes and/or scores into a more manageable and understandable whole (see McAllister, 1982; and Stirling, 2006). As previously illustrated, in many participatory MCA methodologies relaying more or less extensively on disaggregation strategies, beside the various single-actor views, there is also an attempt to obtain a global multi-actor view, most usefully oriented toward the aim of providing decision justification. To achieve this scope aggregation, filtration or sharing strategies can be adopted. On the other hand, the construction of a global multi-actor view exposes the process inconsistencies, possible bias and strategic behaviors, potential loss or misrepresentation of the viewpoint of the various actors and all the other issues discussed above, which the disaggregation approach was instead supposed to avoid.

Last but not least, it should be noted that, by employing MCA techniques to structure stakeholder dialogues, any multi-actor multi-criteria exercise, irrespectively of the approach adopted, turn also out to be exposed to all the methodological issues of MCA, which have been discussed in the previous chapter (see Section 4.5.5).
Chapter 5 - Participatory Multi-Criteria Analysis Methodologies: A Framework for Investigation

Resources required to run the process

As it is noticeable in Table 5.1, it is hard to find precise estimates of the costs and length of participatory MCA procedures. However, it is evident that the strategies employed to build the multi-criteria framework are extremely likely to imply also major differences in terms of resources required for the management of the participatory processes. Amongst the various strategies, sharing is obviously the most demanding approach. Indeed, building a common, agreed model represents an ambitious aim, which necessitates generally a longer time and highly skilled and experienced facilitators. Sharing strategies expressly requires the various parties to be in the same room. This requirement for a lot of face-to-face time can be expensive and can pose serious logistics problems with scheduling meetings (McAllister, 1982). Hence, beside the identification of common ground between parties, sharing approaches have also to face the (almost equally problematic) challenge of finding a mutually convenient time for the actors to meet. Particularly when the work is conducted over a prolonged period, a sharing strategy may thus led to non-participation and dropouts of stakeholders owing to the lack of free time (these issues have been documented in Renn et al., 1993; Kowalski et al. 2009; Ward et al., 2016b).

By comparison, exclusion, filtration, aggregation and disaggregation strategies represent very clear-cut straightforward approaches and generally necessitate fewer resources than sharing, in term of time, money and demand for facilitator expertise. Indeed, exclusion, as already pointed out, does not require the involvement of group decision-making participants. Aggregation, disaggregation or filtration approaches, while requiring an input from stakeholders, do not entail discussions between participants to be facilitated so that they do not necessarily need to be in the same room. Consequently, under these three strategies, individuals and/or groups involved in the exercise have the possibility of working simply with the research team, totally independently from each other. In some cases, the process can be iterative, with actors free to examine the implications of their choices and possibly modify them several time, before ultimately communicating to the research team their final decision (see, for instance, Stirling and Mayer, 2001). However, in other circumstances, the process result to be much quicker, with the research team eliciting stakeholder groups’ preferences even through simple email and phone interviews and surveys (see Macharis et al., 2010). Some authors (see, for instance, Musso et al. 2007) have claimed that, in the attempt to further increase the speed of the process, reduce its costs and encourage more participation, filtration, aggregation and disaggregation strategies could be conveniently combined with web applications for criteria, weights and score elicitation. The risk here, however, is to provide participants with not enough time and support to properly assimilate the principle of the exercise and the nature of the problem under investigation.

Overall, what emerges from this analysis is that there is not any ‘best’ way to carry out the process. Each approach implies both advantages and drawbacks. Table 5.4 below include a brief overview of the strengths and weaknesses of these different approaches for identifying options, objectives and criteria, weights and scores, while dealing with multiple viewpoints.
Table 5.4 – Overview of pros and cons of the different approaches for building a multi-actor multi-criteria appraisal framework.

<table>
<thead>
<tr>
<th>Pros and Cons</th>
<th>Exclusion</th>
<th>Filtration</th>
<th>Sharing</th>
<th>Aggregation</th>
<th>Disaggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pros</td>
<td>• Relatively quick and inexpensive</td>
<td>• Relatively quick and inexpensive</td>
<td>• possible (theoretical) advantages include: mutual learning, conflict resolution, identification of win-win solution</td>
<td>• Relatively quick and inexpensive</td>
<td>• Relatively quick and inexpensive</td>
</tr>
<tr>
<td></td>
<td>• scientists and trained specialists may be best suited to make complex technical decisions</td>
<td>• Analyses of analysts can be complemented with input from stakeholders</td>
<td></td>
<td>• Democratic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Provision of a wide array of information concerning the positions of the different actors</td>
</tr>
<tr>
<td>Cons</td>
<td>• No consideration of stakeholders' viewpoints</td>
<td>• Limited consideration of stakeholders' viewpoints</td>
<td>• time-consuming and costly</td>
<td>• theoretically weak (i.e. Arrow's impossibility theorem)</td>
<td>• No decisions can be taken (i.e. need for reconciling and synthesizing these different arrays of information)</td>
</tr>
<tr>
<td></td>
<td>• Subject to arbitrary judgments of the analyst</td>
<td>• Subject to arbitrary judgments of the analyst</td>
<td>• difficult to realize in practice</td>
<td>• Risks of bias and strategic misrepresentations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Possible loss of critical information</td>
<td></td>
</tr>
</tbody>
</table>

5.5 Summary of findings

In the last decades, several attempts have been undertaken to enhance the participative character of conventional appraisal methodologies, especially MCA. Participatory MCA techniques have progressively come to be seen by many as a plausible and valuable approach to deal with major transport projects and other critical societal problems. However, notwithstanding the growing number of publications on this subject, several critical aspects, such as the selection of group decision-making participants, the level of involvement of participants in the process, the treatment and inclusion of the individual preferences in the multi-criteria framework, the possible relationship between current traditional participatory procedures and new multi-actor multi-criteria processes, and the time and costs of these processes, appear to have been largely neglected in the literature.

This chapter has attempted to fill this knowledge gap, by proposing some conceptual frameworks and classification systems, which can allow a better comprehension of the key features of such methods, possibly guiding also the design of the structure of the multi-actor multi-criteria exercise that best suit the requirements of the problem at hand. It has also been highlighted that any approach to participatory MCA methodologies presents some advantages, disadvantages and issues, which require to be fully understood.

In terms of issues, by combining conventional participatory techniques with analyst-led MCA techniques, any multi-actor multi-criteria exercise, irrespective of the approach adopted, is also subject to the methodological issues typical of both participatory procedures and MCA methodologies.
Chapter 6
Mega Transport Infrastructure Planning and Decision-Making:
Two Contrasting Perspectives

Megaprojects don’t come ready-to-go right out of the box from any perspective.
(Merrow, 2011:54)

6.1 Chapter overview
The previous two chapters have analyzed, respectively, the strengths and weaknesses of traditional appraisal methods, and the key features of participatory MCA methodologies. However, as pointed out at the beginning of this thesis, this research was grounded on the assumption that appraisal of transport projects cannot be considered in isolation from the wider planning and decision-making context. Therefore, an examination of how mega transport projects are conceived and key decisions are taken was deemed both appropriate and necessary.

This chapter begins by presenting the project planning and decision-making process as commonly represented in many educational and training courses and books. It then describes the process by drawing on the empirical literature on mega infrastructure planning and decision-making, complemented with the findings from interviews with several infrastructure practitioners and experts. The key differences between these two perspectives and the implication for transport appraisal are highlighted in a concluding section.

6.2 The ideal of the project life cycle
In Chapter 4 the rational planning and decision-making model has been described. On account of its clarity and simplicity, this model has always had a great appeal to many academics (Schön, 1983). Indeed, throughout the 1950s and the 1960s, western planning practices became almost conterminous with the technical-rational paradigm (Weaver et al., 1985), whereas, during the successive decades, rational planning has always, directly
or indirectly, constitutes an important benchmark for other emerging planning theories (Brooks, 2002; Schönwandt, 2008).

The rationalist school of thought still pervades a large part of the recent literature on infrastructure planning. Indeed, in many papers, books and manuals (see, amongst others, Gittinger, 1982; Shunk, 1992; MacArthur, 1994; Yoe and Orth, 1996; Parkin and Sharma, 1999; Priemus, 2008; Goodman and Hastak, 2006; Martland, 2012; Rogers and Duffy, 2012; and Meyer, 2016) the project life cycle is portrayed (sometimes only to facilitate its description and comprehension, other times with the specific intent to communicate how projects are actually developed) as a well-defined sequence of stages, through which a project evolves from an initial idea to a completely structured scheme. The classic rational model can also be found reflected in many legislative texts and government guidelines on infrastructure of several countries (Szyliowicz and Goetz, 1995; Goetz and Szyliowicz, 1997; Lobos and Partidario, 2014).

In all these books and documents, the number of the stages forming the project life cycle as well as the terminology used to refer to them is slightly different. However, the basic principles remain the same. For instance, by drawing on the work of MacArthur (1994), it is possible to split the project life cycle in three broad phases, namely the front-end phase, the implementation phase and the operational phase (see Figure 6.1). The front-end phase, which represents the focal point of this work, includes all activities ranging from the moment where the need for a project is firstly recognized to the point when the final decision to finance the project is taken. The implementation phase encompasses a series of activities, such as detailed design, tendering, preparation of the project financial plans, resolution of all the legal issues, land acquisitions, construction of the infrastructure, quality control inspection and provision of mitigation measures, which are all oriented toward the delivery of the agreed project. Finally, during the operational phase the project is brought into full use by means of the appointment of agencies responsible for its operation, management, maintenance and control and the provision of adequate funding. The operation phase lasts until the dismantling of the project. Alternatively, rehabilitation, modification or improvement interventions may also take place so as to prolong the project life span.

As illustrated in Figure 6.1, each phase encompasses several, mutually interlinked steps and sub-steps. In particular, in the front-end phase, three main steps can be distinguished, namely project identification (marked with the number 1 in Figure 6.1), project definition (comprising the sub-steps 2, 3 and 4) and project appraisal (5). Project identification has to be thought as a sort of exploratory phase, where the societal needs forming the main motivation for an intervention in a given region or country is firstly identified (Martland, 2012; Meyer, 2016). Needs can be seen as expression of both problems and opportunities affecting a territory. Problems represent existing or upcoming undesirable situations to be overcome, while opportunities constitute desired future conditions, and chances for progress or advancement to be exploited (see Yoe and Orth, 1996). Hence, at this stage some preliminary analyses are undertaken in the attempt to describe the current state of affair and predict possible future conditions (e.g. baseline studies and forecasts concerning population types and distribution, land use and land status, hydrology and geomorphology profiles, natural resources, economic and financial conditions, infrastructure networks, statues and regulations structure and so forth) (Shunk, 1992; Parkin and Sharma, 1999; Goodman and Hastak, 2006).
During the various sub-steps forming the project definition stage, additional, more detailed studies are carried out to further specify the needs of the territory and what should be achieved (Goodman and Hastak, 2006; Meyer, 2016). Hence, generic goals are translated into more operational objectives, additional (complemental or conflicting) priorities are carefully examined with the view to balancing to the largest extent possible various societal concerns, the various constraints (e.g. geotechnical condition, costs, zoning regulations, safety requirements) are properly defined, and the different possible alternative project options to achieve the established objectives are thoroughly identified (Shunk, 1992; Parkin and Sharma, 1999).

Successively, the process enters the appraisal stage, where the economic, environmental and social impacts of the various options are accurately assessed (by using different appraisal methodologies) and also strategic, institutional, financial, technical aspects are also carefully scrutinized (Yoe and Orth, 1996; Parkin and Sharma,
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

1999; Goodman and Hastak, 2006). Appraisal can lead to different possible outcomes. If one alternative is clearly the best, then, it is possible to move to the implementation phase. On the contrary, if no alternative appears to be satisfactory, new options need to be devised. In some cases, the project may even be abandoned (Martland, 2012; Meyer, 2016).

Figure 6.2 shows the evolution of a project according to this purely technical-rational perspective on planning.

**Figure 6.2 – Project evolution according to a technical-rational perspective.**

![Diagram of project evolution](image)

Source: Author's own elaboration.

Furthermore, as already explained in Chapter 4, the literature often envisages a planning process divided into several progressive levels, consisting of policy statements, government plans and programmes, and ultimately projects (see Figure 6.3). According to this view, the front-end planning stage thus does not represent the real starting point for an infrastructure project, which is instead the final product of broader development visions and aspirations for an area (see Morphet, 2016; Dimitriou, 1992). These visions and aspirations, agreed by democratically accountable leaders, are defined and made progressively more specific as they move down to the planning hierarchy. Each planning levels is thus intended to be a refinement of the previous one, with information cascaded endlessly from the former level to the latter level, and each tier of decision being the result of a separate and linear planning process (see Goodman and Hastak, 2006; and Brown et al. 2001).
6.3 Criticism of the rational-comprehensive position

In essence, the main assumptions characterizing the rational-comprehensive position include the following (see Rueffli and Serrazin, 1981; Forester, 1989; Heracleous, 1994; Heyes, 2007):

- **centralized planning**: the process is led by a powerful, impartial decision-maker or a single agency;
- **shared values**: all the actors involved or affected by the decision hold analogous or similar objectives and priorities and factors such as social, ethnic, or gender differences are seen as relatively unimportant;
- **complete knowledge**: the decision-maker has adequate skills and resources for identifying, analyzing and properly understanding, without hesitation or equivocation, the problem at hand, values and preferences of society, all the possible alternative solutions and their future consequences;
- **static process**: the key parameters of the decision remain fixed during the decision period.

Especially since the last decades of the 20th century, the rational model has progressively come under severe attack. Firstly, there has been an increasing awareness that many planning and policy problems facing society are characterized by complexity, dynamicity, unpredictability and uniqueness, (see Emery and Trist, 1965; Rittel and Webber, 1973; and Ackoff, 1979). These problems thus result to be uncertain, ill-structured, and potentially exposed to different plausible interpretations (Douglas and
Wildavsky, 1983; Schön and Rein, 1994). Empirical studies have also shown that the manner in which individuals and organizations carry out the analysis tends to deviate from comprehensive rationality. There are in fact limits to human information processing capabilities, so that a hypothetical decision-maker, unconsciously, may tend to simplify the problem at hand, ignoring data and/or misinterpreting information (Miller, 1956; Shepard, 1964; Schwenk, 1984). Constraints on time and cost of acquiring data and information further limit the breadth and depth of the analyses (Etzioni, 1967). Moreover, people are also likely to bring their values and beliefs and their previously formed hypotheses into the decision-making situations, thus implicitly disregarding facts contradicting those ideals and assumptions (Das and Teng, 1999; Jones and Sugden, 2001). Therefore, during the analysis, a total separation between objective, science-based knowledge, on the one hand, and subjective, decision-maker specific norms and values, on the other, is virtually impossible. This represents a particularly critical aspect as, unavoidably, the way in which a problem is framed determines the way in which it will be successively addressed (Rittel and Webber, 1973; Douglas and Wildavsky, 1983; Schön, 1983). Accordingly, on account of all these limitations, ‘optimal decisions’ can hardly be taken. Simon (1955 and 1982) has thus coined the term ‘bounded rationality’ to describe typical decision-making situations, where, usually, only ‘satisfactory’ (i.e. sub-optimal) solutions for the problems under examination can be arrived at.

Finally, as highlighted in multiple research studies, major societal problems are not addressed by a single decision-maker. Rather, they take place in a network of mutually dependent actors and organizations, who operate at different territorial levels and typically have different and often conflicting goals (see, amongst others, Lindblom, 1959 and 1979; Cohen et al., 1972; Sabatier, 1988; and Koppenjan and Klijn, 2004). According to these studies, it is the chaotic and unpredictable interactions between these individuals and groups, negotiating and compromising with each other in an effort to gain what they perceive as their objectives, which contributes to the structuring of the problem and subsequently to the identification of possible solutions.

### 6.4 The ‘shaping’ of major projects

The above observations and criticisms on the rational-comprehensive model appear to be in line with the findings of some empirical studies on Western countries’ practice of mega infrastructure planning and decision-making. Indeed, according to these studies, large-scale projects are not developed and selected through a clear sequence of steps and sub-steps. Rather, they are progressively ‘shaped’ (see Miller and Lessard, 2000) through a rather long, messy and at least partially indeterminate process, which consists of a number of critical events and involves multiple stakeholders, with different ownership, responsibilities and stakes. This, prevalently political, perspective on planning was also largely confirmed by several infrastructure practitioners and experts, who were interviewed as part of this research.

Both the examination of the empirical literature and the expert interviews highlighted that, major transport projects, in many cases, originate as a specific solution to the concerns and desires of specific stakeholder groups and individuals (see Grant, 1977; Altshuller and Luberoff, 2003), who have been striving for many years to place their own
visions at the center of the political agenda, while eliminating and marginalizing competing stories (Bank, 1998; Olesen, 2014). As one interviewee put it:

“Pressures to embark upon major transport projects generally come from some powerful groups or people, who claim that a (transport) problem exists and it is in the interest of a region or a country to solve it.” (Transport Economist, 2016).

Project promoters are represented by local public or semi-public agencies, business groups and real estate developers, global infrastructure investors, multi-national engineering companies, financial institutions, trucking and automobile industries as well as other lobby groups and entrepreneurial minded individuals (Dwarka and Feitelson, 2013; Nobbe, 2014). All these parties, as previously illustrated, owing to privatization and deregulations trends, have progressively assumed a stronger role in infrastructure projects and services provision (Merna and Njiru, 2002; Marshall, 2013).

Under these circumstances, it seems evident that major transport projects can hardly constitute the result of relatively impartial visions of what is wrong and what is needed and systematic analyses aimed at identifying the objectives to be pursued within a territory (see Berechman and Paaswell, 2005). As argued by one respondent:

“[…] major transport projects, included in the wish list of some special interest groups, may not necessarily represent the best solution. Sometimes they may even be completely unnecessary.” (Professor of City Planning and former City Planning Officer, 2016).

Several infrastructure practitioners and experts also emphasized that, during the front-end planning, accurate comparisons of different possible alternative project options are often lacking (see also Flyvbjerg et al., 2003; and Samset, 2010):

“It’s too costly to undertake comprehensive analyses of several alternative proposals. Typically, only a few options are examined […]. In some cases, options are developed only to justify the already preferred solution.” (Expert in Infrastructure Procurement and Management, 2017).

Moreover, the interviews findings highlighted that, in sharp contrast to the ideal model of planning, where policy and wider development strategies come in at the top and are then transmitted down to the decision-making hierarchy, mega projects sometimes do not even present any clear acknowledged links to existing policy and government plans (see also Marshall, 2013). According to Greiman (2013), frequently it is governments that, in response to the perceived willingness of one important player to embark upon a project, indicate their interest in the initiative by creating windows of opportunities, through new policy statements and changes to the legal and institutional frameworks. This perspective was shared by the large majority of the people interviewed. One interviewee in particular affirmed that:

“Projects come first […] policies and plans are only added (or modified) at a later stage, once the project has gained enough political momentum.” (Private Transport Consultant, 2016).
As discussed above, the rational-comprehensive approach to planning assumes that mega projects are undertakings that can be planned and specified in advance, based on complete information. In this regard, improvements in forecasts and data collections, and the search for the 'right' information are constantly mentioned in the literature as possible solution to improve decision-making for such projects (see for instance, Hall, 1980; and Priemus, 2008). Nevertheless, according to almost the totality of the interviewees, the above represents a rather naïve and unrealistic assumption. The following three quotes summarize this well:

“Decisions on major projects entail a sort of paradox: on the one hand, information is critical to proper decision-making; on the other, information is lacking as predicting what will happen in 10, 20 or even 30 years is impossible.”
(Private Planning Consultant, 2016).

“In the case of mega transport projects [...] only very few aspects can be defined at the outset." (Academic Researcher and Former Transport Consultant, 2015).

“There are not many hard facts. It is very difficult to try to forecast the future impacts of project during its planning stage. Measuring the actual impacts once the project has been realized is also very challenging.” (Private Planning Specialist, 2016).

The planning process thus start with the leading promoters sketching some rough and vague hypotheses concerning the key attributes of the project proposal, the possible issues entailed by the proposal and the resource required to develop it (Miller and Lessard, 2000; Miller and Hobbs, 2009; Lessard and Miller, 2013). However, given the complexity of mega transport projects (i.e. multiple components, multiple dimensions and multiple spatial scales) as well as the costly nature of in-depth studies and wide-ranging data search (see Samset, 2009; and Sunnevåg, 2009), information is always incomplete (Samset, 2010; Næss and Strand, 2012). Hence, as the planning process proceeds, project promoters constantly become aware of new aspects, which they had not considered before, and problems, which had not been anticipated (Miller and Lessard, 2000; Greiman, 2013).

Furthermore, from the interviews emerged also that the (real) front-end planning phase does not include only the exploration and development of the project concept, but even the creation of a project coalition, consisting in different players who, together, are capable of guaranteeing the necessary support for the project. As mentioned in Chapter 3, the ever-increasing amount of resources required for mega project developments, the growing number of permits required to conform to different types of regulations, and trends towards specialization and fragmentation, all make it impossible for one single party to plan and deliver a large-scale infrastructure (Clegg et al., 2002; Winch, 2002; Giuliano, 2007). Bringing mega projects to fruition thus requires the creation of a variety of inter-organizational relationships such as alliances, partnerships, and joint ventures (Miller and Hobbs, 2009; Merrow, 2011; Lessard and Miller, 2013). Possible members of the project coalition include, amongst others, expert technocrats and advisors, investment banks, debt holders, contractors and equipment suppliers. These partners allow the project promoter to further elaborate the initial idea into a clearly defined project, by
generating technical solutions, carrying out feasibility studies, dealing with rules and laws, granting permits, securing project funding, acquiring implementation and operations power and allocating risks (Miller and Lessard, 2000; Allport, 2011). Support from regulatory agencies and governments and other parties having a strong infrastructure investment interest is also critical to guarantee the necessary stability and legitimacy to the project (Allport, 2011; Greiman, 2013).

On account of their high costs and their significant (and controversial) impacts, mega infrastructure projects present a high public profile and are thus subject to intensive scrutiny also by a wide variety of other stakeholder groups (Winch, 2002; Greiman, 2013). These parties, not directly involved in the project, may include, for instance, potential users, neighborhood associations, environmental groups and other non-governmental organization, and competitors. Some of them may be in favor of the project, while others may oppose to it, combining their effort in one or more ‘anti-project’ coalitions (Della Porta and Piazza, 2008; Roccato and Mannarini, 2012; Dwarka and Feitelson, 2013).

On the one hand, members of a stakeholder coalition, especially those ones forming the alliances supporting the project, need each other’s resources in order to promote their interests. They are, in other word, mutually interdependent and are thus obliged to interact and collaborate with one another (Dwarka and Feitelson, 2013). On the other hand, even the parties combining their effort into the same coalition, although sharing some overarching goals, are likely to present different interests and priorities (Winch, 2004; Samset, 2010). In this respect, from the focus group interview with managers of the PANYNJ (see Chapter 3) it emerged also that a port expansion project is generally seen by the respective port authority as a way to increase the competitive position of the port. By comparison, potential external investors may place a greater emphasis on the profitability of the project in the short to medium-term. National governments may be particularly interested in the contribution provided by the project to the longer-term development strategies of the country. The project may instead be perceived by local governments as a means to boost the regional economy (PANYNJ, pers. comm. 2015).

Within the ‘anti-project’ coalition, environmental groups may be particularly concerned with the possible adverse impacts (e.g. noise, pollution, displacements) produced by the development. Local communities and residents, while also interested in minimizing possible disruptions and other negative consequences (but mainly in their own neighborhoods), may be also keen to explore possible economic opportunities created by the project (e.g. jobs). In all probability, then, the major interest of competitors is represented by the promotion of an alternative project proposal (e.g. an expansion project in a rival port), while some objectors known as NIMBYs (‘Not In My Back Yard’) generally oppose to any form of development (PANYNJ, pers. comm. 2015). This situation is generally referred to as ‘co-opetition’ (see Brandenburger and Nalebuff, 1997) as stakeholders, although incapable of making unilateral decisions and thus required to cooperate with each other, remain always alert to their own interests (Dwarka and Feitelson, 2013).

As far as the project concept evolves, members of the project coalitions engage in a process of mutual influence and negotiation, while searching for solutions, over arrays of rising, intertwined issues related to costs, funding sources, potential revenues, engineering design, impacts, mitigation measures and other factors (Miller and Lessard,
2000; Greiman, 2013). At the same time, members of the opposing coalition also attempt to influence the outcome of the process to the greatest extent possible (Roccato and Mannarini, 2012; Dwarka and Feitelson, 2013; Nobbe, 2014).

“Decision-making procedures on major projects often turn into power games.”
(Land Planning and Law Expert, 2017).

As above highlighted, the various actors and groups tend to frame the same situation in their own ways by using different languages and rationalities. They are thus likely to adopt different observation scales, employ different logics of time, focus on different aspects and make different trade-off between the various objectives and concerns (de Bruijn and Leijten, 2008; Leijten, 2013; Martens and van Weelden, 2014). However, due to the high degree of complexity and uncertainty surrounding the problem at hand, the available information can be interpreted in different ways, with no clear criteria to distinguish valid interpretations from less valid ones (de Bruijn and Leijten, 2008; Leijten, 2013; Martens and van Weelden, 2014). For instance, the same policy problem, constituted by a container port currently operating near or at full capacity, can be presented either in terms of ‘insufficient port capacity’ or as ‘excessive traffic volumes’. Furthermore, the use of rather narrow boundaries to assess the economic effects of a new port project may lead to the conclusion that proposal could contribute to generate new jobs, while the inclusion also of peripheral areas in the analysis may show that some of these jobs are only the product of relocation of existing economic activities. Moreover, this potential shift of jobs from one region to another due to the construction of the new infrastructure may be portrayed either as a ‘drain of employment’ or as an ‘attempt to balance the labour market’. As Flyvbjerg and colleagues (2003) argue, during the front-end stage of a major project what is presented as reality by one party is, often a social construct that can be easily deconstructed and reconstructed by other stakeholder groups. Since no one is really willing to dismiss and revise their key values and fundamental assumptions, thus taking up a position that goes against his or her own interests, the planning and decision-making process of such projects is likely to degenerate into a ‘report war’ between proponents and opponents of a project (de Bruijn and Leijten, 2008).

“Producing data and analysis supporting (or challenging) a project is a bit an art.”
(City and Regional Planning Officer, 2016).

In some cases, there are strong incentives for actors and organizations to manipulate the documentation and to produce false analyses in an effort to strengthen one particular position and to weaken that of opponents (Persson, 1979; Wachs, 1989; Pickrell, 1992; Bruzelius, et al., 2002; Flyvbjerg et al., 2003; Flyvbjerg, 2009; Flyvbjerg and Sunstein, 2015). In other cases, some stakeholders may simply try to use opportunistically their power to turn possible conflicts to their own advantages, irrespectively of the outcomes of technical analyses (Nobbe, 2014; Altshuller and Luberoff, 2003; Berechman and Paaswell, 2005). Confrontation may thus bring potential deadlocks and crises, with some actors and groups withdrawing their support for a coalition, initiating skirmishes or even legal challenges with other actors, organizing conferences and sit-in protests and thrusting projects into the media (Miller and Lessard, 2000; Roccato and Mannarini, 2012). Some of
these crises can also be fatal for the project, leading to a decision to abandon the whole venture, at least temporarily (Greiman, 2013; Merrow, 2011).

Interdependent issues can rarely be resolved all at once. Generally, the resolutions of some issues and problem represent pre-conditions for proceeding to the resolution of other logically interlinked issues and problems (Miller and Lessard, 2000). Accordingly, the process turns out to consist of several decision episodes, each of which attempts to bring resolution to the most critical issues, facing the project at that particular point in time (Koppenjan and Klijn, 2004; Miller and Hobbs, 2009; Lessard and Miller, 2013).

In each decision round, efforts to identify mutual-gain trajectories or attempts to impose one particular perspective over the others may produce a substantial redefinition of the project, in terms of overall scope, objectives and key attributes. Additionally, also the composition of stakeholder coalitions, the role exerted by the various parties within these coalitions and their mutual relationships may alter significantly (Miller and Lessard, 2000; Miller and Hobbs, 2009; Lessard and Miller, 2013). Each successive decision round may thus be organized around a (slightly or totally) ‘new’ project and may involve new problem perceptions, new stakes and new strategies (Koppenjan and Klijn, 2004). Accordingly, in contrast with the regular character of an ideal planning process, where each phase constitutes an elaboration of the previous one (see Figure 6.2), the course of the project assume a quite erratic and zigzag appearance (see Figure 6.4).

**Figure 6.4 – Project evolution according to a political perspective.**

The turns the process takes as a result of these successions of decision rounds are also reinforced by changes in the environment. Indeed, as many interviewees underlined, while the rational-comprehensive approach assumes that conditions do not change appreciably over time, fluidity and unpredictability is a central feature of the real world. During the years, which intervene between the initial conceptualization and the effective realization of the infrastructure, political, financial, economic, social and technological changes are likely to manifest, leading to new regulations and new resources constraints for the delivery of the project, new stakeholders’ agendas and priorities and so forth (Priemus, 2010; Hertog and Westerveld, 2010). Some of these changes may represent potential showstoppers for the project, while others may depict windows of opportunity for it (Allport, 2011; OMEGA Centre, 2011 and 2012).

The situation is further complicated by the fact that, as explained by a large part of the interviewed people, decisions on large-scale infrastructure projects as well as on other major planning and policy problems, normally present a highly fragmented character so that all these interactions between stakeholders do not actually take place in a unique arena (see Figure 6.4). By crossing several territories and transcending the boundaries of established policy fields (i.e. transport, economy, environment, equity, safety, employment and so forth) large-scale projects involve multiple level of governments and tiers of decisions (Koppenjan and Klijn, 2004), whose separation and sequence are generally not as clear as they are in theory (Bina and Vingoe, 2000; Arts et al., 2005). Most actors have the possibility to participate in only some of these arenas, whereas some interests (e.g. the less powerful groups) may not even be represented in any arena. The different parties thus can be confronted with unexpected decisions made by other actors, in other arenas, in which they are not present, but which, however, have major consequences for them. Moreover, within each arena, actors negotiate at the same time over different interrelated themes. For instance, discussions over the construction of a new container port may be coupled with discourses over alternative port management structures and ownership models, initiatives to promote freight modal shift from road to rail transportation, the provision and management of rail freight transport services, and the introduction of new financing schemes for major infrastructure projects (PANYNJ, pers. comm. 2015). The outcomes of one policy game can strongly influence the course of the others (Koppenjan and Klijn, 2004).

This process consisting of interconnected episodes of progressive problem-solving and issue resolution progresses until the initial idea is transformed into a fully tangible project, the project coalition is able to achieve a final commitment and the other stakeholders are either rather content with the project or have been silenced (Miller and Lessard, 2000; Miller and Hobbs, 2009; Merrow, 2011 Lessard and Miller, 2013). However, in light of this fragmentation, it is often difficult to locate the critical final decision on the project approval and identify who the key decision-maker(s) are. Indeed, there are many actors taking many decisions, each of which, although fundamental for removing some obstacles to the realization of the infrastructure, does not constitute the all-inclusive and definitive resolution (de Bruijn et al., 2010).

Furthermore, stabilizing completely the project environment almost always results a prohibitive task. Indeed, as highlighted by Pressman and Wildavsky (1973), contrarily to what is commonly assumed by the rational planning framework, during the implementation
stage, after the final decision to finance the project has been taken, hardly any aspect of
the project remain unchanged. Contextual changes leading to unexpected problems (e.g.
economic and financial crisis, bankruptcy), re-emerging issues not adequately considered
and disagreements rapidly coming to the surface all imply the need for reexamining and
revising, even drastically, previous decisions (see Figure 6.4).

6.5 Actual impacts of ex-ante appraisal analyses on decision-making

The interviews also allowed exploring the role of appraisal in the planning and decision-
making process of mega transport projects. The findings from the interviews were
somewhat surprising. Indeed, as explained in the introductory chapter of this thesis,
the academic literature generally emphasizes the critical role played by appraisal (see,
amongst other, Naess, 2006; Haezendonck, 2007; Metz, 2008; Macharis et al., 2009;
OMEGA Centre, 2010; Barfod, 2012; Leleur, 2012; Dimitriou et al, 2016; Hickman, 2016;
Leleur, 2012; Ward et al., 2016a), many infrastructure practitioners and experts claimed
that, notwithstanding some forms of appraisal are explicitly required by law and
regulations, mega projects decision-making is seldom a matter of comparing carefully all
the potential costs and benefits of project proposals. In other words, as one interviewee
affirmed:

“Mega projects are rarely based on extensive ex-ante appraisal analyses.” (Private
Planning and Transport Consultant, 2016).

In light of this, a further literature review was conducted with the view to determining
the real impacts of appraisal on decision-making of transport projects. The review led to
the conclusion that connection between appraisal results and transport investment
decisions is limited at best. Concerning, for instance, the impact of CBA on decision-
making, several studies and research can be mentioned. One of the earliest studies was
carried out in Sweden by Nilsson (1991), who examined the 10-year investment plan
developed in the late 1980s by the Swedish Road Administration, without finding any
significant correlation between NPV and BCR calculations, and the ranking of projects. A
more recent study, examining the Swedish National Transport Investment Plan 2010-2021
(Eliasson and Lundberg, 2012), also came to the same conclusion. In Norway, a study
undertaken by Odeck (1996) on 385 road projects spread over 15 Norwegian regions,
demonstrated that in 11 regions the outcome of CBA were not decisive for project
selection. Odeck’s study was also reinforced by other pieces of research carried out in the
Norwegian context (see Fridstrom and Elvik, 1997; Nyborg, 1998; and Sager and Ravlum,
2005). Similar findings were also obtained by Nellthorp and Mackie (2000) with reference
to 68 road schemes developed in the UK. The two researchers were incapable of
identifying any statistical evidence that the pattern of decisions on these projects was
systematically related to NPVs or BCRs. In Holland, a study carried out by Annema (2013)
and focusing on 16 mega transport projects approved during the period 2000 to 2011
showed that the impact of CBA on decision-making concerning these projects were
limited. After the investigation into the planning and decision-making process of several
large-scale projects in the US, including highways, airports and major rail projects,
Altsuler and Luberoff (2003:236) concluded that “benefit-cost analyses are at best of
minor importance, at worst irrelevant”. Proost and colleagues (2010) found that the large
majority of transport projects belonging to the Trans-European Transport Network (see EC, 2005) do not actually pass the CBA test and that for most of these projects it is impossible to obtain any documents concerning economic efficiency assessment. An internal study by the World Bank (2010) highlighted that the percentage of Bank projects that are justified by CBA had been declining dramatically, dropping from 70% to 25% between 1970 and 2008. According to this study, one of the reasons for this rests in the fact that, often, the analysis is prepared after the decision to proceed with the project has already been taken. Finally, Nobbe (2014) examined the planning and decision-making process of 60 major transport projects in 22 countries and showed that CBA had been conducted for only half of the projects in the database.

Analogously to CBA, environmental and social impact assessment procedures appear to be systematically disregarded during decision-making. Wood and Jones (1997), for instance, examined the effectiveness of EIA in the UK, by studying 40 planning applications presented during the mid-1990s. They found that, in almost all occasions, the EIA results were unable to affect the type and scale of these proposals to any important extents. Similar findings have been produced by Christensen and colleagues (2005), in the case of Denmark, and by ten Heuvelhof and Nauta (1997), in the case of the Netherlands. Wider comparative reviews of the EIA experiences across different Western countries (see Baker and Wood, 1999; and Wood, 1999 and 2003) also illustrated that, in the large majority of cases, the outcome of environmental and social impact assessment procedures only led to some marginal mitigation measures. Differently from what envisaged by EIA legislation, often, such assessment procedures are carried out in a very rough manner and in a very short period of time (see Ortolano and Shephers, 1995). In particular, one of the greatest reservations about EIA performance is represented by participatory processes, which are generally poorly performed (see Sadler, 1996).

In general, according to many authors, participatory consultation procedures almost never are really conceived as open and transparent processes, in which differences in power between stakeholder groups can be excluded from the deliberative dialogue, and citizens and other interest parties are given the possibility to exert control over decision-making. Participatory procedures are typically carried out at the final planning stage, when project cancellation is virtually impossible, and people are given not too much time to express their view (Petts, 1999b; Williamson and Archen, 2004; Behre et al., 2015; Gross, 2015). Even in (apparently) broader deliberative procedures, often, power remains with project promoters and the individuals or organizations setting up the process, so that participation become only a means to obtain consent for projects and programmes, which have already been determined in advance (Cedolin, 2010; Roccato and Mannarini, 2012; Durrant, 2016).

6.6 Summary of findings
There seem to be two different viewpoints about how major infrastructure projects emerge and critical decisions on such projects are made. On the one hand, in many academic papers and textbooks large-scale infrastructure projects are often portrayed as the product of detailed and systematic analyses, which follow a unitary, logical and chronological sequence of steps. According to this purely technical-rational perspective on
planning, data search, forecasting and value free *ex-ante* appraisal plays a critical role within the planning process by providing the factual basis of the issues for decision.

However, on the other hand, an examination of empirical literature and a series of interviews with practitioners and experts led to the conclusion that these assumptions about comprehensiveness and regularity result to be totally out of line with the realities of such projects. As one interviewee put it:

“Decision-making is more political than technical. Major transport projects evolve differently from what books say.” (Professor of City Planning and former City Planning Officer, 2016).

According to this political perspective on planning, major projects emerge progressively through a rather chaotic, unstructured and at least partially undetermined process, where hardly any aspect can be entirely and precisely defined at the outset. The process typically entails contemporarily various arenas at various government levels and multiple interrelated policy games. Within these arenas, a number of mutually interdependent actors and groups, presenting conflicting agendas and thus framing the same situation in a different (often incompatible) way, negotiate and compromise with each other, over arrays of rising, intertwined issues, in an effort to gain what they perceive as their objectives. Sometimes, rather than being characterized by openness and social responsibility, the process results to be rather narrow, and even deceptive and irresponsible, with stakeholders refusing to collaborate, using their power opportunistically to turn possible conflicts to their own advantages, initiating legal challenges with other actors and even producing distorted data in the attempt to rationalize and legitimate their position. Negotiations between stakeholders, contextual changes and other unexpected events are likely to produce substantial alternation in the scope, objectives and attributes of project and also in the composition and strategies of stakeholders groups themselves.

The inherent uncertainty and complexity of the problem at hand implicitly undermine the presumed disciplining role of *ex-ante* appraisal analyses. Indeed, data and information are always incomplete and any study is potentially contestable, either justly or unjustly, by someone who looks at the same problems through the perceptual lens of a different frame and comes to divergent conclusions. CBA, EcIA, EIA, MCA and other technical analyses can thus easily become mere political weapons, which can, in principle, be prepared and modified to serve any party’s interest. In general, however, as highlighted by many

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1 For the purpose of this work, the term ‘rational’ planning has been used to indicate a planning approach whose hallmarks include centralization of decision-making authority, complete knowledge, agreement on problems and objectives, clear separation between fact and value, explicitness of evaluation and a high degree of comprehensiveness of overview. It should be noted, however, that the term ‘rational’ is used with very different meaning in the planning literature (see Alexander, 2000). For instance, many authors (see, amongst others, Lichfield et al., 1975; Hill, 1985; and Alexander, 2006b) describe as rational any planning process whose proponents attempt to justify it by using reasoned arguments. In effect, as Allmendinger (2002) underlines, this term derives from the Latin word ‘ration’, which means ‘reason’. Rationalism thus implies an emphasis on systematic analyses and logical capacities as opposed to faith, superstition and more emotive or intuitive forms of reasoning (Teitz, 1985). From this point of view, a planning process where strategic and political judgments prevail over technical analyses should not been seen necessarily as ‘irrational’. Indeed, reasoned analysis and politics do not constitute necessarily a dichotomy. Behind choices to give priority only to some particular issues, exclude some elements from the debate, and represent a situation in particular way when many other visions are possible, there are always reasoned and careful analyses (Stone, 2011).
interviewees and confirmed also by several studies and research, the outcome of appraisal methodologies tend to carry little weight in the final decision.
Chapter 7
Port Planning and Appraisal Practice: A Review of Selected International Experiences

It is a bad plan that admits of no modification.
(Publius Syrus, Roman slave & poet, ca. 100 BC)

7.1 Chapter overview
The previous chapter included a general analysis of mega transport infrastructure planning and decision-making practice. It has highlighted the rather unstructured, fragmented and uncertain nature of decision-making procedures as well as their often deceptive and irresponsible character. Chapter 6 has also underlined the limited connections between appraisal outcomes and transport investment decisions. This chapter, by comparison, presents an analysis of three case studies with the view to undertaking a more detailed and empirical investigation into current trends in mega transport planning, appraisal and decision-making. The case study investigated concerns three large-scale port projects:

- the Alameda Corridor, a freight rail line designed to facilitate the movement of containers from the US Ports of Los Angeles and Long Beach to their hinterlands;
- the expansion of the Port of Rotterdam, in Holland, which has been undertaken with the view to increasing by 20% the port’s footprint and doubling its container capacity; and
- the London Gateway port complex, which is constituted by a new deep-sea, highly automated container port, a logistics park and a port rail terminal.

This chapter draws on several sources, including books, journal articles, papers and reports focusing on both the projects and the wider context in which these projects are placed; documents published by the agencies managing the ports and the projects; online newspapers and other online resources; and interviews with port and project stakeholders, elected officials and experts.

The chapter encompasses four further sections. The planning and related decision-making process of the Alameda Corridor is described in Section 7.2. Section 7.3 focuses on the expansion of the Port of Rotterdam, while the Section 7.4 concerns the London Gateway port complex. All these sections start by outlining the characteristics of the respective ports and the geographic, logistics and institutional contexts in which these
ports operate. Compared with the other two case studies, the London Gateway port complex is investigated in more detail, since, as already explained, it was also adopted as case study for a practical application of participatory MCA methodologies (presented in following chapter). Section 7.5 offers a critical discussion of these international experiences with particular reference to some critical themes: 1) main drivers for the projects; 2) key features of the projects; 3) transparency and openness of the planning and decision-making processes; 4) structure of these processes; and 4) impacts of ex-ante appraisal analyses on decision-making.

7.2 The Alameda Corridor project in Southern California

7.2.1 Overview of the Ports of Los Angeles and Long Beach

Geographical context

The US is served by approximately 360 commercial ports, located along the Atlantic, Pacific, Gulf and Great Lakes coasts, as well as in Alaska, Hawaii, Puerto Rico, Guam, and the American Virgin Islands (USMA, 2009; AAPA, 2016). A study reported by the American Association of Port Authorities has found that, currently, port activities generate approximately 23 million jobs and add nearly $4.6 trillion to the economy (AAPA, 2016). However, as shown in Figure 7.1, the US, and, in general, North America, appears to rely on a relatively small number of large gateways ports (Rodrigue and Notteboom, 2010).

Figure 7.1 - Main container ports, trade corridors and distribution hubs in North America.

Source: Rodrigue and Notteboom (2012).
In US, over 85% of the total container traffic, estimated approximately at 46.5 million TEUs\(^1\) in 2014, flows through ten ports (CBRE, 2015). The major container port along the East Coast is represented by the Port of New York/New Jersey, with a total throughput of 5.7 million TEUs in 2014, while the main gateways ports along the Pacific Coast are the Ports of Los Angeles and Long Beach, which, in the same year, handled approximately 8.3 and 6.8 million TEUs respectively (see Table 7.1).

The Ports of Los Angeles and Long Beach, in particular, act as the US leading gateways to the markets of Pacific Asia and Mexico (Interview 1.1). If taken together, the container volume of these two ports represents over 30% of the US total container throughput and about 60% of the overall containerized cargo along the US-Canadian West Coast (CBRE, 2015). The two ports, however, compete with each other (Interview 1.1; Fawcett, 2007) as well as with the other container ports along the Pacific Coast (Jacobs, 2007).

Table 7.1 – Top 10 North America container ports in 2014.

<table>
<thead>
<tr>
<th>Ports</th>
<th>Nations</th>
<th>Container Throughput (Millions of TEUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>USA</td>
<td>8.34</td>
</tr>
<tr>
<td>Lon Beach</td>
<td>USA</td>
<td>6.82</td>
</tr>
<tr>
<td>New York/New Jersey</td>
<td>USA</td>
<td>5.77</td>
</tr>
<tr>
<td>Seattle &amp; Tacoma</td>
<td>USA</td>
<td>3.43</td>
</tr>
<tr>
<td>Savannah</td>
<td>China</td>
<td>3.35</td>
</tr>
<tr>
<td>Vancouver</td>
<td>Canada</td>
<td>2.91</td>
</tr>
<tr>
<td>Oakland</td>
<td>Oakland</td>
<td>2.40</td>
</tr>
<tr>
<td>Norfolk (Port of Virginia)</td>
<td>USA</td>
<td>2.39</td>
</tr>
<tr>
<td>Manzanillo</td>
<td>Mexico</td>
<td>2.35</td>
</tr>
<tr>
<td>Houston</td>
<td>USA</td>
<td>1.95</td>
</tr>
<tr>
<td><strong>Total Top 10 Ports</strong></td>
<td></td>
<td><strong>39.71</strong></td>
</tr>
<tr>
<td><strong>Total North America Ports</strong></td>
<td></td>
<td><strong>62.82</strong></td>
</tr>
</tbody>
</table>

Source: CBRE (2015)

Los Angeles (almost 3.8 million inhabitants) and Long Beach (about 462,000 inhabitants) are two cities within the County of Los Angeles. The County is located in Southern California, which, with approximately 24 million people, is the second most populous region in the US behind the American Northeast. Southern California, with a GDP of $2.3 trillion in 2014, represents also one of the largest economies in the world.

\(^1\) The shipping container has a reference size of 20 feet long, 8 feet high and 8 feet wide. These dimensions were established and standardized by the International Organization for Standardization (ISO) in 1964 (Slack, 2008). The acronym TEU stands for ‘Twenty-foot Equivalent Unit’ and denotes the basic container of 20 foot in length. Most containers are now 40 foot in length and thus account for 2 TEU.
(Masunaga, 2015), which is strongly driven by international trade (Erie, 2004). As illustrated in Figures 7.2 and 7.3, the Ports of Los Angeles and Long Beach lie on the Bay of San Pedro, next to each other, approximately 40 kilometers south of Los Angeles, within the most densely developed part of the region (Interview 1.1).

**Figure 7.2 – Map of San Pedro Bay ports area.**

Source: Jacobs (2007).

**Historical development and infrastructure assets**

Both the Port of Los Angeles and the Port of Long Beach have a long history. The former was established in 1907 and annexed, two years later, to the City of Los Angeles. In the course of time, the progressive economic and demographic growth of this city and its large metropolitan area has strongly fueled several port expansion and dredging programmes (Interview 1.4). The Port of Long Beach, chartered in 1911, has also been able to embark upon major development schemes due to the nearby presence of abundant oil resources, which have provided the port with the financial wherewithal to pursue its own interests, independently from its neighbor across the San Pedro Bay (Interview 1.4). The opening of the Panama Canal in 1914 was integral to the growth of the two ports, giving them a clear advantage over northern West Coast competitors as a destination point for east-to-west seaborne trade, because of their proximity to this artificial waterway (Queenan, 1986).
As a result of their massive development, both the ports currently occupy about 3,000 hectares of land and water and, in an aerial view, they appear as a sort of continuous harbour around the crest of the San Pedro Bay (see Figure 7.3). There are a total of 15 container terminals in the San Pedro Bay area, nine of which are in Los Angeles (CBRE, 2015). These terminals are available for long-term lease by private operators (Interview 1.1). Notwithstanding the strong focus on containerized cargo (Interviews 1.1 & 1.3), both Los Angeles and Long Beach are multi-purpose ports, which encompass terminals and facilities to handle other types of cargo, including iron and steel, agricultural products, vehicles, crude oil and chemical products (USMA, 2009; CBRE, 2015). In addition, both of them present also lucrative cruise terminals (Jacobs, 2007).

According to the most recent estimates (PoLA, 2016), the San Pedro Bay port complex accounts for almost 180,000 direct jobs. In addition, it also indirectly supports almost 1 million jobs in Southern California and around 2.8 million jobs throughout the US (PoLA, 2016).

Notwithstanding the big rivalry, the two ports are heavily dependent on the same hinterlands, regional transportation systems and labour pool (Interviews 1 & 2). Hence, in the course of time, this factor has led to the development of cooperation in various areas, including security, environmental programmes and infrastructure projects (see Giuliano and O’Brien, 2009; and O’Brien and Giuliano, 2013).
Institutional context

In US, differently from many countries, there is no national port authority. Rather responsibility for ports is diffused throughout all three levels of government, namely federal, state and local (Interview 1.3). This stems from the federal character of the US Constitution, which reserves certain powers for the national government and others strictly for the states (USMA, 2009).

The US also presents a large variety of port organization types, ranging from fully public facilities to small privately owned terminals (Interview 1.3). Often, the distinction between the various forms of port management is not well defined (Stevens, 1999; Fawcett, 2007). The management style of many US ports, including the Ports of New York/New Jersey, Los Angeles and Long Beach can be assimilated to a landlord port model (Interviews 1.1 & 1.3). According to this model, which currently represents the worldwide most commonly used form of port management, a public agency acts as a regulatory body and retains ownership of the land, whereas port infrastructure, particularly terminals, are leased to private companies for operation (World Bank, 2002). However, in US the nature of these agencies managing the ports can differ substantially (Fawcett, 2007). In the case of Los Angeles and Long Beach this agency is a municipal department (Interviews 1.1 & 1.3). As Jacobs (2007) illustrates, the two ports are administered separately by the Harbour Departments of each city. Each Harbour Department is managed by a five-member Board of Harbour Commissioners. All members are appointed by the Mayor of each city and appointments must be approved by the City Council. In Los Angeles, each Commissioner can remain in charge for a maximum of eight years, which correspond to the maximum period a person can serve as a Mayor of Los Angeles (i.e. two four-year terms). In Long Beach, by comparison, each Commissioner is appointed for a period of six years with a maximum of two terms.

While the Harbour Departments are responsible for a wide array of strategic decisions, including the approval of the land-use or master-plan, the formulation of port policies, the management of port budget and the leasing out of available land to terminal operators, their actions are subject to considerable control by the Mayor, the City Council and the elected officials. In general, the Port of Los Angeles experiences more political control than the Port of Long Beach (Interviews 1.1 & 1.3). This can be explained, in part, by the fact that the economy of Los Angeles is more diversified than that of Long Beach and also because the Port of Los Angeles must deal with the concerns of a much wider population (Erie, 2004; Jacobs, 2007).

The two ports are not supported by local taxes. The development and maintenance of port infrastructure is instead financed by port revenues from the tariffs and lease contracts. By comparison, major capital intensive projects, such as terminal developments, can be supported by different funding sources including loans and revenue bonds (Interviews 1.1; Jacobs, 2007).

7.2.2 The Alameda Corridor and the other Southern California's key transport infrastructure

Southern California offers a good example of how freight transportation and logistics activities can affect urban development. While this region has long been a trade gateway,
its role has been redefined and enhanced over the past three decades. Indeed, since the 1990s, a series of important infrastructure interventions have been promoted to handle huge volumes of global trade with Asia and Mexico (Interviews 1.2). The resulting world-class transport infrastructure system includes (Erie, 2004):

- the $2.3 billion ‘NAFTA-network’ border infrastructure scheme to enhance rail and road connections with Mexico;
- the $8-12 billion Los Angeles International Airport Master Plan for the period 1999-2015 as well as other airport expansion proposals, having a specific focus on international air cargo;
- the $4.8 billion Los Angeles and Long Beach long-range Port Master Plan to the year 2020, consisting in a series of separate projects to be built in incrementally. These projects comprise new maritime terminals, dredging to deepen navigation channels, new pipelines, roads and rail lines as well as rail and intermodal terminals, amongst which a $55 million intermodal container transfer facility (ICFT) opened in 1987 and located approximately eight kilometers from the ports;
- the $2.4 billion Alameda Corridor project, a freight rail line completed in 2002 and designed to facilitate the movement of goods from the San Pedro Bay port complex to downtown Los Angeles (see Figure 7.2 and 7.4); and
- the $1.6 billion Alameda Corridor East project, consisting of a series of safety improvements, mobility upgrades and grade separation interventions at different roadway-railroad crossings in the San Gabriel Valley (East Los Angeles), and the Orange County Gateway railroad grade separation project within the cities of Fullerton, Placentia, and Anaheim. Both these two projects are currently under construction.

Figure 7.4 shows the key features of the Alameda Corridor and also illustrates the position of the ICFT and other rail terminals. The Alameda Corridor, in particular, is a 32-kilometer, grade-separated, high-capacity (3 double-stack tracks) freight rail line, linking the port cluster of Los Angeles and Long Beach to the transcontinental rail network near downtown Los Angeles. The corridor, which along most of its route runs parallel to Alameda Street, from which it takes its name, runs through or adjacent to eight cities: Los Angeles, Long Beach, Carson, Compton, Lynwood, South Gate, Huntington Park, and Vernon (Interviews 1 & 4). It consists of three major sections: the South End segment, including a fork to serve each of the two ports; a North End segment, encompassing connections to existing rail lines near the Los Angeles central rail yards; and the Mid-Corridor segment, namely the most critical section of the project, which carries freight trains in an open trench that is 33 feet deep, 50 feet wide and 10 miles long. Each of the three parts contains smaller sub-projects such as bridges, underpasses, overpasses and street improvements, built with the view to separating rail freight circulation from street

2 In the early 1990s, the Port of Long Beach withdrew from the 2020 Plan, after concluding that the costs were too high. It then prepared its own, less ambitious and relatively cheaper 2020 Master Plan (Erie, 2004). However, in recent years, on account of the growth of port throughput, resulting in a significant increase in truck traffic and emissions, public perceptions of the ports have shifted from generally positive to quite negative. As a result, the Ports of Los Angeles and Long Beach have found increasingly difficult to successfully promote new expansion projects (Giuliano and O’Brien, 2009; O’Brien, and Giuliano, 2013).
traffic and passenger trains, thus realizing a more efficient transport network\(^3\) (ACTA, 2016a). The total costs of the project amounted to $2.4 billion (Callahan, 2002; Nobbe, 2014).

**Figure 7.4 – Map of the Alameda Corridor.**

The Alameda Corridor is owned by the Alameda Corridor Transportation Authority (ACTA). ACTA is a joint powers authority whose seven-member Governing Board consists of representatives of the cities of Los Angeles and Long Beach (one each), two representatives from each port and one representative of the Los Angeles County Metropolitan Transportation Authority (LACMTA), which is the public transportation operating agency for the County of Los Angeles (ACTA, 2016b). The Union Pacific (UP) and the Burlington Northern Santa Fe (BNSF), the two major rail operators in the Western

\(^3\) The Alameda Corridor Engineering Team (ACET), a joint venture including the firms of Daniel Mann Johnson Mendenhall, Moffatt & Nichol Engineers, Jenkins-Gales & Martinez, Inc., and TELACU, was responsible for the preliminary design, engineering and construction oversight of the corridor (Rudin Centre, 2011; Nobbe, 2014).
US, formed from mergers and acquisitions of previous rail companies\(^4\), share traffic operations along the Alameda Corridor (Jacobs, 2007).

Similarly to the other infrastructure investments presented above, the planning of the Alameda Corridor involved many conflicts of interests and contentious issues (Interview 1.1 & 1.2). Hence, while the construction of the Alameda Corridor required five years (i.e. from April 1997 to April 2002), pre-construction preparatory works took almost 15 years (ACTA, 2016a).

### 7.2.3 The planning and decision-making process of Alameda Corridor project

**Origin of the project**

Nobbe (2014) claims that the original concept of the Alameda Corridor was firstly sketched on a cocktail napkin during a typical informal meeting, involving politicians, high-ranking civil servants and interest groups representatives. However, according to official documents (see, for instance, MFA, 1993; FHWA, FRA and Caltrans, 1996; Shafran and Strauss-Weider, 2003; and ACTA, 2016a), the origin of the project can be traced to some transport studies conducted in the early 1980s (Interview 1.3). At that time, the San Pedro Bay ports were facing severe development constraints, including poor hinterland connectivity and chronic logistics bottlenecks along the rail and road arteries linking the ports with their hinterlands (Interview 1.1; Erie, 2004). Hence, with port activities projected to grow exponentially in the following decades, owing to booming container trade with Asia, the Southern Californian Association of Governments (SCAG), namely the local metropolitan planning organization, took the initiative to propose a ‘solution’ (Interview 1.4; Agarwal et al., 2004). In 1981, the SCAG established the Ports Advisory Committee (PAC), whose members include representatives of the two ports, rail and trucking industry, the US Navy, the US Army Corps of Engineers, local elected officials as well as the Los Angeles County Transportation Commission (LACTC), which successively had been replaced by the LACMTA\(^5\) (MFA, 1993; FHWA, FRA and Caltrans, 1996; Shafran and Strauss-Weider, 2003).

The PAC, in turn commissioned two sets of transport studies for a few hundreds of thousands of dollars (MFA, 1993). The first, dealing with highway issues, was completed in 1982 and identified a comprehensive list of essential street improvements. The second set of studies, concluded in 1984, concerned instead with the rail network in the port area. The network, until that moment, consisted of four rail routes, running from the San Pedro Bay port complex to downtown Los Angeles, operated by three rail operators, specifically Southern Pacific, Union Pacific Corporation and Santa Fe Railway (see figure 6.4). These rail lines, which overall amounted approximately to 150 kilometers, were intersected by about 200 at-grade road crossings, with consequent traffic conflicts, delays, safety hazards as well as air and noise pollution (Erie, 2004; Agarwal et al., 2004). In the attempt to improve rail access to the ports, the study recommended consolidating all freight-train

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\(^4\) The BSNF resulted from the purchased of the Atchison, Topeka and Santa Fe Railway by the Burlington Northern Railroad in 1996. In the same year, Union Pacific Corporation and Southern Pacific merged, thus creating the UP (see Shafran and Strauss-Weider, 2003).

\(^5\) The LACMTA was formed in 1993 as a result of a merger of the Southern California Rapid Transit District and the LACTC.
traffic flows into a single uninterrupted corridor along Alameda Street (MFA, 1993; FHWA, FRA and Caltrans, 1996; Shafran and Strauss-Weider, 2003), a line known by its owner, the Southern Pacific rail company, as the San Pedro Branch (see Figure 7.5).

**Figure 7.5 – Original freight rail network in the San Pedro Bay ports area.**

The rail study also suggested creating a task force to analyze the myriad of legal, financial, technical and environmental issues associated with the planning of the project. Indeed, because of the strong political fragmentation of the Southern California (see Giuliano, 2007 and 2010), no individual agency or authority was originally responsible for a project like Alameda Corridor (Interview 1.2), crossing and touching upon multiple jurisdictions (Nobbe 2014). Therefore, in 1985, the SCAG created the Alameda Corridor Task Force (ACTF), whose memberships was similar to that of the PAC, with the addition of the eight cities along the corridor route and the California Public Utilities Commission, which has regulatory powers over rail projects (MFA, 1993; FHWA, FRA and Caltrans, 1996). After having further development the project concept, between 1985 and 1989, the ACTF expressly required the creation of a joint powers authority with design and
construction responsibility for the Alameda Corridor. In 1989, the Alameda Corridor Transportation Authority (ACTA) was thus established\(^6\). The ACTA, initially, had a Governing Board of 16 members, representing the eight cities along the Corridor, the two ports (with two representatives each), the SCAG, the LACTC, the California Department of Transportation (Caltrans) and the Los Angeles County Board of Supervisors (LAC BOS), namely a governing body of the County of Los Angeles (MFA, 1993; FHWA, FRA and Caltrans, 1996; Shafran and Strauss-Weider, 2003).

In the meantime, the need for the project was further confirmed by a long-term freight and traffic study, commissioned by the two ports in 1988, which projected massive freight growth by the year 2020 (see TMS, 1988).

**Negotiations with the rail companies**

Since its creation, the ACTA needed to work on several critical issues, amongst which the most pressing one was the lack of control over the land located along the suggested corridor route. Indeed, when the ACTA was formed, neither the two ports, nor the corridor cities, nor any other organization involved in this joint powers authority, owned any piece of land (Interview 1.4). The right of way\(^7\) needed to build the proposed Alameda Corridor was instead owned by the Southern Pacific, the Union Pacific Corporation and the Santa Fe Railway Railway (Callahan, 2002).

Therefore, these three privately owned rail companies had to be convinced to renounce their tracks in favor of one consolidated freight corridor (Interview 1.1). The Port of Los Angeles and Long Beach started to negotiate with them in 1992, with the mayors of Los Angeles and Long Beach and several advisors acting as facilitators (Nobbe, 2014). Negotiations were fierce. The rail companies originally opposed to the project, as they were particularly concerned about their loss of value on the properties, exclusivity and associated competitive edge as well as about the idea of paying fees for using the new future infrastructure (Nobbe, 2014). However, they eventually accepted the proposal, although demanding high prices for their right-of-way, based on three main factors. Firstly, the rail companies warmed to the idea of having a more efficient transport system. Furthermore, besides these potential long-term benefits, they also would receive immediate cash from the right-of-way purchases. Finally, as the user charges would be implemented uniformly, no competitive disadvantage was likely to occur on the Alameda Corridor for any company (Interview 1.4; Agarwal *et al*., 2004).

As a result of these successful negotiations, in 1994, the Port of Los Angeles and Long Beach purchased the necessary rights-of-way from the rail companies for $394 million and signed a memorandum of understanding with them. In this multilateral agreement, which provided the basic structure for the successive operating agreement approved in 1998, Southern Pacific, Union Pacific Corporation and Santa Fe Railway Railway

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\(^6\) The original name chosen for the ACTA in 1989 was 'Consolidated Transportation Corridor Joint Powers Authority (CTCJPA)'. Successively, in 1990, the CTCJPA changed its name into the less confusing acronym ACTA (Nobbe, 2014).

\(^7\) A 'right-of-way' is a type of easement granted or reserved over the land for transportation purposes. This includes highways, public footpaths, rail routes, canals, as well as electrical transmission lines, oil and gas pipelines (Campbell Black, 1968). In the US, railroad rights-of-way are generally considered private property by the respective railroad owners and by applicable state laws.
(which two years were replaced by BNSF and UP) agreed to pay a container-based user fee to access to the Alameda Corridor\(^8\) (Agarwal et al., 2004).

However, the purchase of the rights of way in 1994 only started the process of building the project (Interview 1.1). Indeed, at that time, the ACTA was still facing considerable uncertainties, especially regarding the supports from the mid-corridor cities and the financing of the projects.

**Conflicts between the ports and the corridor cities**

The ACTA Board involved several stakeholders, each with its own interests and priorities (Interview 1.4). The main concern of the Port of Los Angeles and Long Beach was to ensure that the San Pedro Bay port complex would remain the major gateway for the US. By comparison, the LACTC (then LACMTA) and the Caltrans were mainly interested in easing traffic congestion. The cities through which the Alameda Corridor was supposed to transit had also very different views on the project (Agarwal et al., 2004). Indeed, whereas the rich port cities of Los Angeles and Long Beach appeared keen to promote the Alameda Corridor, the cities of Carson, Compton, Lynwood, South Gate, Huntington Park, and Vernon, constituting some of the most economically depressed areas of Los Angeles County, were critical of the development proposal (Agarwal et al., 2004; Erie, 2004). These six ‘dissenting’ cities believed they would bear all the negative effects, ranging from disruptions due to construction works, to increased traffic, air pollution, train noise and vibrations (Interview 1.5). They also feared that the project as it was conceived, while promising to deliver several regional and national benefits, was insufficiently attentive to the economic development needs of their communities, characterized by high unemployment and poverty rates (Interviews 1.3 & 1.4).

Concerning the environmental impacts, since the early design of the Alameda Corridor, a major issue of controversy had been represented by whether the proposed project would have to be configured at grade or below grade (FHWA, FRA and Caltrans, 1996). While an at-grade line represented the preferred option for the Ports of Los Angeles and Long Beach, which wanted to contain the costs of the project, the corridor cities contended that a depressed rail line could provide superior mitigation potential for a range of negative effects (Nobbe, 2014). In an effort to move forward with the project, in early 1992, the ACTA identified the depressed rail line as the preferred project configuration (FHWA, FRA and Caltrans, 1996). The ports were hoping in this way to make the Alameda Corridor less invasive and thus more acceptable for the six cities, although this would dramatically increase the costs of the line (Nobbe, 2014).

However, even after this amendment, the mistrust between the cities and the ports still persisted so that, for a long time, the ACTA was unable to make any significant decisions, and the project was more or less stalled (Callahan, 2002). Hence, in late 1993, the San Pedro Bay ports, arguing that the six corridor cities were posing too many demands and presented a totally uncooperative attitude, proposed to reduce the ACTA governing board from 16 to seven members (i.e. the current composition of the board):

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\(^8\) User fees were initially set at $15 for each loaded 20ft equivalent unit (TEU) container, $4 for each empty container, and $8 for other types of loaded rail cars such as tankers and coal carriers. Depending on inflation, fees were supposed to increase by between 1.5% and 3% over a 30-year period. As of 1 January 2016, fees stood at $23.26, $5.57 and $11.14 respectively (ACTA, 2016a).
two representatives each from the two ports and one representative each from LACMTA and the cities of Los Angeles and Long Beach (Agarwal et al., 2004; Nobbe, 2014). By presenting some kind of financial stakes in the project, all these remaining seven members had some interest in quick decisions (Interview 1. 4). This amendment was approved by the board, essentially voting the six corridor cities out of power (see Figure 7.6). In response, the cities of Compton, Lynwood, South Gate and Vernon, contending that on account of this governance change they would have lost control over the impact of the project in their jurisdictions, filed a lawsuit against the ports and the cities of Los Angeles and Long Beach (Erie, 2004). However, in 1996, the court ruled against the corridor cities, thus confirming their removal from the governing board (Agarwal et al., 2004; Nobbe, 2014).

**Figure 7.6 – Agencies and groups responsible for the Alameda Corridor throughout the years.**

Source: Author's own elaboration.
Despite having lost the lawsuit, the six corridor cities were still able to exert influence over the decision-making process in various ways (Interview 1.5) and, in some occasions, they even put the project at risk (Nobbe, 2014). Indeed, firstly, the cities were in control of the crucial local construction permits and thus had to approve design elements that could affect local communities (Callahan, 2002; Agarwal et al., 2004; Erie, 2004). Furthermore, the cities also directly threatened to refuse approval of important project documentations, including critical environmental impact studies (Nobbe, 2014). Last but not least, they almost jeopardized the united front of project stakeholders which the ACTA wanted to create when trying to obtain financial support for the project from the federal government (Nobbe, 2014).

The ACTA had to remain concerned about the attitude of the dissenting cities (Interview 1.1 & 1.4) and, eventually, to avoid significant delays to the project, was obliged to negotiate a separate memorandum of agreement with each city, providing funds (overall $12 million) for mitigation of construction activities (Nobbe, 2014). In addition, the ACTA also committed to incorporate specific local economic development features in the project, including (Callahan, 2002):

- commitment to employ local residents to perform at least 30% of all work hours;
- establishment of training centers for at-construction and non-construction jobs for local residents;
- commitment to enroll graduates of the training centers in union apprentice programmes for jobs after the project; and
- a $1.2 million programme for the local youth including graffiti removal, trash pickup, and other activities.

In return, the cities eventually ensured a timely processing of plans and permits, agreed not to challenge the environmental impact studies and findings and supported the ACTA when seeking federal funding (Callahan, 2002; Agarwal et al., 2004; Nobbe, 2014).

**Funding strategies**

When project planning began in 1989, the Alameda Corridor was thought to cost only a few hundred million dollars (Callahan, 2002; Nobbe, 2014). However, by the time of final budget approval, project costs had risen to $2.4 billion. The major portion of funds, $1.5 billion, went into construction, design and engineering activities (Interview 1.1). The decision to build the project below ground involved a cost of $700 million. The purchase price of the rights-of-way from the rail companies, which was originally unknown and eventually amounted to $394 million, was an extraordinary commitment of cash from the Ports of Los Angeles and Long Beach. Finally, financing costs and legal fees took over $300 million, while $200 million was allocated as a contingency fund (Nobbe, 2014).

The money required for the project were the result of a complicated financing package, consisting in a mix of public and private sources (see Figure 7.7). Each of the funding sources is associated with political efforts. Overall, it took nearly a decade to secure funding for the project (Callahan, 2002; Nobbe, 2014).
As shown in Figure 7.7, $347 million came from the LACMTA as a grant, after two years of intense lobbying by the ACTA. The ACTA, supported in its effort also by the California Transportation Commission, requested the creation of a specific category in which to compete for funds (i.e. freight transport) as LACMTA typically provides funding primarily for commuter rail and highway projects within Los Angeles County (Interviews 1.1 and 1.4). Eventually it was recognized that, although not being a passenger transport project, the Alameda Corridor was essential for reducing traffic congestion and pollution and maintaining a healthy regional economy. The ACTA thus obtained a grant from the LACMTA in exchange for the inclusion of a LACMTA representative on its board (Callahan, 2002; Agarwal et al., 2004).

After long struggles, the ACTA also received a $400 million federal loan. In order to obtain federal support, the lobbying strategy of ACTA was to demonstrate a unique, cohesive regional front in favor of the project (Nobbe, 2014). The California Governor's Office, the Mayors of Los Angeles and Long Beach, the Caltrans, the California Transportation Commission and other several regional agencies and business-oriented groups joined the lobbying fray, arguing that the Alameda Corridor was a critical project providing an enormous boost to California as well as to the whole country (Erie, 2004). The other six corridor cities, as above explained, did not join this coalition at first. Only through the provision of funds and the promise of employment and development opportunities, the ACTA was capable of placating opposition from these cities, thus showing to the US Secretary of Transportation that a widespread support for the project was present (Nobbe, 2014), although only in appearance (Interview 1.5). Furthermore, to demonstrate the national significance of the project, the ACTA commissioned an economic impact study with the view to emphasizing the potential benefits produced by the Corridor at the national scale (Nobbe, 2014). Eventually, the ACTA was successful in its attempt. In 1995, the Alameda Corridor project was designated as ‘high priority corridor of national importance’ (Agarwal et al., 2004; Erie, 2004). This status provided the legal authority for the US Secretary of Transportation to structure a loan, which was ultimately secured in 1997 (Nobbe, 2014). As Nobbe (2014) highlights, the loan was granted thanks
also to the support by the US President Bill Clinton, who, while preparing for presidential election of 1996, made several deals in California as well as in other US States.

The largest source of funding for the project is represented by the $1.16 billion revenue bonds. The bond payments and the debt service on the federal loan were expected to be repaid through future revenue streams (i.e. user fees imposed on cargo owners). Investors, in this way, would have risked losing their money in the event of project delays, cancellation, or lower-than projected revenue stream (Agarwal et al. 2004). The ACTA had thus to convince investors about the profitability of the project, which in turn would depend on the future growth in the volume of cargo handled at the ports. In the attempt to build investor confidence, the ACTA claimed that the results of sophisticated computer simulation models had clearly showed that a growth of the San Pedro port complex at 3-5% per year was over the following decades could be assumed as a conservative estimate (see Weikel, 1998). Hence, eventually, this and other similar public statements, portraying attractive projections of the future project revenues, led to a successful placement of the ACTA bonds (Agarwal et al., 2004).

**The role of appraisal within the decision-making process**

As previously explained a series of transport studies, undertaken during the 1980s and predicting rapidly growing seaborne trade volumes, formed the basis for the planning of the Alameda Corridor (Interview 1.3). However, there is no publicly available information concerning the way in which these forecasts were formulated (Rudin Centre, 2011).

The ACTA began conceptual engineering in 1990 to further develop the project concept (FHWA, FRA and Caltrans, 1996). To comply with the California Environmental Quality Act (CEQA) the project was subject to an EIA procedure (Interview 1.1). A draft environmental impact report was issued in mid 1992 and made available for public comments. A total of six public hearing sessions were held as part of the process. Overall, about 160 people attended the hearing sessions, even though less than 50 people had the possibility to speak. In addition to the formal public hearing, comments on the report were gathered during four (informal) community meetings and through written notes. All the comments were responded to in the final environmental impact report, which was certified by the ACTA governing board in early 1993 (see MFA, 1993). As part of this study, ACTA developed a range of conceptual engineering alternatives, including the ‘no build’ alternative, various project configurations along the Alameda Corridor (in particular an at-grade line, an elevated line, a depressed line) as well as two alternative corridor routes (MFA, 1993). The various project options were assessed against several objectives and related appraisal criteria encompassing economic, environmental, costs, safety and security, traffic, rail operations and construction issues. Therefore, as illustrated in Table 7.2, the EIA took the form of a rather broad multi-criteria assessment. Objectives and appraisal criteria were assigned different numerical weights and the overall performance of each project option was calculated by using a simple weighted additive MCA model (MFA, 1993).

As a result of the appraisal process, the ‘without project’ option and the two alternative corridor routes were eliminated, while different Alameda Corridor configuration alternatives were recommended for further more detailed study. Eventually, depressing
the largest part of the Corridor below surface level was considered as the preferred solution (FHWA, FRA and Caltrans, 1996). However, as highlighted in the previous sections, this option had been already identified by the ACTA as the preferred project configuration in early 1992.

Table 7.2 – Appraisal dimensions and objectives considered in the Environmental Impact Report produced to comply with CEQA guidelines.

<table>
<thead>
<tr>
<th>Appraisal dimensions</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic</strong></td>
<td>- promoting economic development along the corridor</td>
</tr>
<tr>
<td></td>
<td>- minimizing land devoted to port-related freight rail operations</td>
</tr>
<tr>
<td></td>
<td>- sustaining economic growth</td>
</tr>
<tr>
<td></td>
<td>- maintaining and improving existing businesses</td>
</tr>
<tr>
<td></td>
<td>- promoting growth of international trade through the ports</td>
</tr>
<tr>
<td></td>
<td>- minimizing property acquisitions.</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>- improving the overall quality of life</td>
</tr>
<tr>
<td></td>
<td>- minimizing projected air pollution</td>
</tr>
<tr>
<td></td>
<td>- minimizing projected energy consumption</td>
</tr>
<tr>
<td></td>
<td>- developing a project compatible with adjacent land uses</td>
</tr>
<tr>
<td></td>
<td>- resolving present poor or deteriorating situations, and</td>
</tr>
<tr>
<td></td>
<td>- aesthetics</td>
</tr>
<tr>
<td></td>
<td>- minimizing exposure to noise and vibration.</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>- maximizing cost effectiveness</td>
</tr>
<tr>
<td></td>
<td>- maximizing coordination of the corridor project with existing projects and funding sources</td>
</tr>
<tr>
<td><strong>Safety and security</strong></td>
<td>- improving vehicular safety</td>
</tr>
<tr>
<td></td>
<td>- improving safety for pedestrians</td>
</tr>
<tr>
<td></td>
<td>- improving safety for operations and personnel</td>
</tr>
<tr>
<td></td>
<td>- improving security</td>
</tr>
<tr>
<td><strong>Traffic</strong></td>
<td>- reducing vehicle delays at grade crossings</td>
</tr>
<tr>
<td></td>
<td>- improving north/south travel speeds</td>
</tr>
<tr>
<td></td>
<td>- improving level-of-service at intersections</td>
</tr>
<tr>
<td></td>
<td>- improving connections to I-105 Interstate Highway and I-10 Interstate Highway</td>
</tr>
<tr>
<td></td>
<td>- providing an alternative route to parallel freeways,</td>
</tr>
<tr>
<td></td>
<td>- improving emergency vehicle access</td>
</tr>
<tr>
<td></td>
<td>- diverting truck traffic to rail</td>
</tr>
<tr>
<td></td>
<td>- coordinating and interfacing with plans at corridor ends,</td>
</tr>
<tr>
<td></td>
<td>- maximizing convenience to pedestrians crossing Alameda Street.</td>
</tr>
<tr>
<td><strong>Rail operations</strong></td>
<td>- improving rail operating flexibility and efficiency,</td>
</tr>
<tr>
<td></td>
<td>- improving rail speeds</td>
</tr>
<tr>
<td></td>
<td>- providing fair and equal access for all carriers</td>
</tr>
<tr>
<td></td>
<td>- maintaining service to customers.</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>- minimizing disruption to highway and rail users</td>
</tr>
<tr>
<td></td>
<td>- maintaining access to existing businesses and residences</td>
</tr>
<tr>
<td></td>
<td>- minimizing noise and other construction impacts</td>
</tr>
<tr>
<td></td>
<td>- implementing the project in phases.</td>
</tr>
</tbody>
</table>

Source: MFA (1993)

The decision to apply for federal funding also implied the need for performing other EIA studies to comply with the US National Environmental Policy Act (NEPA) (Interview 1.1). As illustrated in Figure 7.8, the CEQA and NEPA environmental impact assessment processes closely resemble each other in terms of intent, content and steps\(^9\).

\(^9\) Environmental impact assessment procedures, required by the NEPA, applies to major federal action (i.e. federal policies, plans, programmes and specific federal projects) which the potential for environmental
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

Figure 7.8 – Steps of environmental impact studies under the CEQA and the NEPA guidelines.


impacts. By comparison, environmental impact assessment procedures, required by the CEQA, applies to actions (which potential significant effect on any environmental resources) of all California state, regional or local agencies. Both the NEPA and CEQA establish that the agency, which has the principal responsibility for carrying out or approving a project, should also run the respective environmental impact assessment procedure (CEQ and CGOPR, 2014). The environmental impact analyses produced under the CEQA guidelines are published in a report, termed Environmental Impact Report (EIR), while those undertaken to comply with the NEPA guidelines are included in an Environmental Impact Statement (EIS).
The Federal Highway Administration (FHWA) and the Federal Railroad Administration (FRA), supported by the California Department of Transportation, agreed to be joint Federal lead agencies for this new environmental impact study. It was decided to make maximum use of the analyses undertaken under the CEQA, so the new study only complemented and integrated the previous one. The environmental analyses undertaken under the NEPA entailed two scoping meetings, which, overall, were attended by approximately 50 people, of whom only six people were given the opportunity of providing oral comments. The a draft environmental impact statement was issued in early 1995 and open to public examination during two formal hearings. Overall, 90 people attended at the two sessions combined, but only 30 people had the possibility of speaking. Several written comments were also received during the public comment period. The final environmental impact statement was issued in February 1996 (see FHWA, FRA and Caltrans, 1996), when, however, the purchase of rights-of-way from the rail companies had been already completed and other pre-construction preparatory works were at an advanced stage. Analogously to the previous CEQA environmental study, also the environmental impact analyses undertaken under the NEPA identified the depressed rail as the preferred alternatives (FHWA, FRA and Caltrans, 1996). This study mentioned the following expected benefits from the project (see FHWA, FRA and Caltrans, 1996).

- **More efficient rail movement**: reduction of train transit time from over 2 hours (depending on congestion) to 45 minutes, as well as increased train reliability and speed (averagely from 20 to 60 kilometers per hour).
- **Improved inland transport capacity**: provision of a capacity of 12.7 million containers per year and 150 trains per day as opposed to the previous 3.5 million along the original four tracks.
- **Modal shift promotion**: by 2020, the Corridor was anticipated to reach almost full capacity (i.e. 100-140 trains per day) and 50% of all containerized cargo entering the Ports of Los Angeles and Long Beach was expected to move by rail, as compared with 35% in the early 1990s.
- **Safety improvements**: elimination of more than 200 street-level railroad crossings, constituting a serious safety hazard;
- **Reduction of delays**: by consolidating rail traffic and eliminating the existing at-grade road crossings, traffic delays affecting cars and trucks were expected to be reduced by 90%.
- **Mitigation of environmental impact**: the project was supposed to reduce rail emission by 28% (since the rail mileage, separating the ports and downtown Los Angeles, would be reduced from over 140 to 32 kilometers), noise pollution from train by 90% (as half of the line would run through a trench), and car and truck idling emissions associated with grade crossing delays by up to 54%.

As previously illustrated, besides environmental impact studies, when seeking federal funding, the ACTA commissioned some EcIA to show the potential contribution of the Alameda Corridor to the national economy. However, as Nobbe (2014) points out, during the project front-end phase, no CBA was conducted to compare the primary costs and benefits of the proposed rail line with the ‘without project’ situation and with possible alternative solutions.
7.2.4 Project performance

The Alameda Corridor was completed in 2002, on time and without any cost overruns (Interview 1.4). Figure 7.9 includes an aerial view of the project. However, differently from the expectation, during the first 15 years, the infrastructure has remained largely underutilized (Interviews 1.2 & 1.3), with an average of 42 trains per day. In 2015, for instance, the Alameda Corridor operated at about 25% of capacity, with only 38 trains per day (see Table 7.3).

Figure 7.9 – Aerial view of the Alameda Corridor.

![Aerial view of the Alameda Corridor.](http://www.khurramhashmi.org/crbasic_info/Alameda-Corridor-Trench.html)

Table 7.3 – Number of trains running on the Alameda Corridor between 2002 and 2016.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Per year</td>
<td>10,259</td>
<td>16,658</td>
<td>15,972</td>
<td>17,306</td>
<td>19,924</td>
<td>17,837</td>
<td>16,105</td>
<td>13,048</td>
<td>14,177</td>
<td>15,196</td>
<td>15,332</td>
<td>16,584</td>
<td>17,061</td>
<td>13,988</td>
</tr>
<tr>
<td>Average per day</td>
<td>39</td>
<td>40</td>
<td>44</td>
<td>47</td>
<td>55</td>
<td>49</td>
<td>44</td>
<td>36</td>
<td>42</td>
<td>42</td>
<td>45</td>
<td>47</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Source: [http://www.acta.org/pdf/CorridorTrainCounts.pdf](http://www.acta.org/pdf/CorridorTrainCounts.pdf)
As a result, while until about 2009, the revenues collected from the use fees and container charges had been sufficient to cover the ACTA's annual debt service obligations, and payments on bonds had been on schedule (Nobbe, 2014), currently the line is saddled with $4 billion in debt (Uranga, 2016). In 2011 and 2012, the ACTA had to borrow several million dollars from the Ports of Los Angeles and Long Beach to meet its debt obligations and in the following years the borrowing is highly likely to continue. It has been estimated that, in the worst case scenario, the two ports might need to lend up to $245 million in the coming two decades if ports’ throughput will not continue to rise by at least 4% through to 2040 (Uranga, 2016).

The reasons for this poor performance rest, at least partially, in the economic recession, which has decreased the amount of cargo coming through the ports (Interview 1.2). However, the problem is not only represented by the low number of containers handled through the Alameda Corridor, but rather also by the modal split (Interview 1.3). Indeed, more than two-thirds of the daily container traffic volume of the two ports is still managed by trucks (Rudin Center, 2011). Therefore, despite a study carried out by ACTA concluded that between 2002 and 2004, the Alameda Corridor eliminated 3,863 tons of pollutants from the study area (see WS, 2005), the project has also progressively come under criticism for not solving the truck traffic problem (Interviews 1.2 & 1.4).

An analysis of the transport and logistics context of Southern California raises many concerns regarding the raison d’etre for the project and its presumed strategic role for intermodal freight distribution. Indeed, it is a well-known fact that, for short-distance trips (i.e. urban traffic), trucks, because of their inherent flexibility, provide a superior service than rail. By comparison, due to relatively high intermodal costs and more demanding terminal handling operations, rail starts to have cost advantages over long distances (i.e. intercity traffic), generally located between 500 and 750 kilometers of the point of departure (see Rodrigue et al., 2013). An examination of traffic flows of Southern California illustrates that approximately 50-60% of all import cargo is not a likely candidate for the Alameda Corridor (Agarwal et al., 2004). Indeed, this region is the destination of nearly 25% of all inbound cargo coming through the ports. In addition, another 25 to 35% of the cargo temporarily transit through local inland freight distribution centres as part of a value-added process within transport and logistics chains. The great majority of these centres had been designed to accommodate trucks so that for them, using the Alameda Corridor would imply additional costs and delays (Agarwal et al., 2004). For the remaining 40-50% of the overall import cargo, which is intended to reach distant markets, it is opportune to consider that, as illustrated in Figure 7.4, the two rail operators, UP and BNSF, operate two rail terminals at the end of the corridor. UP operates also the ICTF, which is located close to the beginning of the corridor. Hence, often, for practical reasons (i.e. to avoid the container-based user fee as well as time-consuming terminal handling operations) they truck the containers form the ports to their rail terminals and send them across the country (by rail) directly from there, thus bypassing partially (in the case of the ICTF) or totally (in the case of the other two terminals) the Alameda Corridor (Monios and Lambert, 2013).

Furthermore, while the Alameda Corridor has improved rail circulation between the ports and the main rail yards located in downtown Los Angeles, it has not solved rail traffic problems on the larger system (Interview 1.3). Indeed, the rail network beyond downtown Los Angeles remains very congested so that the reduced travel time of trains within the
Corridor is somehow offset by congestion to the east (Streeter and Landsberg, 2003). Whereas it has been contended that the full benefit of the Alameda Corridor cannot be realized until the completion of Alameda Corridor-East project and the Orange County Gateway, doubts over possible future improvements remain, as these two projects constitute primarily grade separation projects and do not necessarily add rail capacity (Interview 1.2; Agarwal et al., 2004).

Finally, notwithstanding the fact that that Alameda Corridor has offered some real potential for local economic benefits beyond temporary construction contracts and hiring, overall the economic benefits for the local communities have proven to be marginal (Interview 1.5; Callahan, 2002).

### 7.3 The expansion of the Port of Rotterdam in the shape of the *Maasvlakte 2*

#### 7.3.1 Overview of the Port of Rotterdam

**Geographical context**

The maritime sector plays a vital role for the economy of the Netherlands. In 2013, the Dutch maritime cluster was responsible for 3% of the domestic GDP and approximately 2.5% of the national labour force (NML, 2014). There are 18 ports in the Netherlands (MvVW, 2007), amongst which the three major ones, accounting for over 90% of the total port throughput, are located in Rotterdam, Amsterdam and in the province of Zeeland (de Langen and van der Lugt, 2006).

The Port of Rotterdam, in southwest of the Netherlands, is by far the biggest Dutch port. Every year the port handles more than 400 million tons across all major cargo categories, including crude oil and mineral oil products in particular (Interviews 2.1 & 2.3).

With a container throughput of over 12.3 million TEUs (PoR, 2014 and 2016), Rotterdam is also the most important container port in Europe, although it faces strong competition from other north European container ports, located along the coast between Hamburg and Le Havre (Rodrigue and Notteboom, 2010; Notteboom, 2010). Overall, the container ports within this geographical range (see Figure 7.10) handle about half of the total European container throughput\(^{10}\) (Interviews 2.1 & 2.2).

Table 7.4 illustrates the total throughput of the major container ports in the Hamburg–Le Havre Range in 2014. Whereas, the Port of Rotterdam still maintains the leading position in this sector, it has been losing terrain since the late 1990s, particularly to Hamburg and Antwerp (Interview 2.1 & 2.3).

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\(^{10}\) The container ports in Southeast England, such as Southampton, Felixstowe and Tilbury (see Section 7.4), serve exclusively the niche-market of the British island and therefore do not directly compete with the north European ports (Jacobs, 2007; Notteboom, 2010).
Figure 7.10 - Main ports and trade corridors in Northern Europe.

Source: (Adapted from) http://clgeluardservat.blogspot.co.uk/2013/11/les-espaces-majeurs-de-production-et.html.

Table 7.4 – Major container ports in the Hamburg–Le Havre Range in 2014.

<table>
<thead>
<tr>
<th>Ports</th>
<th>Nations</th>
<th>Container Throughput (Millions of TEUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotterdam</td>
<td>The Netherlands</td>
<td>12.30</td>
</tr>
<tr>
<td>Hamburg</td>
<td>Germany</td>
<td>9.73</td>
</tr>
<tr>
<td>Antwerp</td>
<td>Belgium</td>
<td>8.98</td>
</tr>
<tr>
<td>Bremerhaven</td>
<td>Germany</td>
<td>5.80</td>
</tr>
<tr>
<td>Le Havre</td>
<td>France</td>
<td>2.55</td>
</tr>
<tr>
<td>Zeebrugge</td>
<td>Belgium</td>
<td>2.05</td>
</tr>
<tr>
<td><strong>Total Top 6 Ports</strong></td>
<td></td>
<td><strong>41.41</strong></td>
</tr>
<tr>
<td><strong>Total Euopena Ports</strong></td>
<td></td>
<td><strong>101.50</strong></td>
</tr>
</tbody>
</table>

Source: PoR (2016)

**Infrastructure assets**

Compared to its main competitors, the Port of Rotterdam enjoys superior infrastructure assets. The port covers an area of 10,500 hectares (approximately 7,500 hectares of land and 3,000 hectares of water), stretching over 40 kilometers along the *Nieuwe Waterweg* canal (Interviews 2.1 & 2.3). Figure 7.11 shows the layout of the port.
Located directly on the North Sea, and with a maximum depth of 24 meters, largely unmatched in the Hamburg–Le Havre Range, the port can handle the largest ocean-going vessels (Interviews 2.1 & 2.3). It also presents direct connections with important rivers, flowing through central Europe, and an extended rail network (Interviews 2.1 & 2.3). The latter has been recently further improved by means of the construction of the Betuwe Route, namely a 160-kilometer double-track freight rail line, stretching from the Port of Rotterdam to the German border (Jacobs, 2007). Owing to efficient intermodal rail and barge services, the Port of Rotterdam presents a wide hinterland reach, serving the main industrial and economic centres of Western Europe (Notteboom, 2010; OECD, 2011).

The port region is home to a variety of companies, ranging from terminal operators to logistics services providers, to industrial companies (Interviews 2.1 & 2.3). It provides direct and indirect employment to approximately 90,000 and 55,000 people respectively. The combined (direct and indirect) value added generated by the Port amounts to around € 22 billion (Van Den Bosch et al., 2011).

**Institutional context**

In the Netherlands, similarly to the US, the landlord port model is the dominant management structure, especially for large and medium-sized ports (van Steenderen and Barten, 2015). The Port of Rotterdam is also managed in line with this model. Indeed, all necessary powers and responsibilities for the management and development of the port are vested in the Port of Rotterdam Authority, while the port terminals are generally operated by the private sector (de Langen and van der Lugt, 2006).

The Dutch ports have historically been directly governed by regional or municipal public organizations (de Langen and van der Lugt, 2006), while also required to comply with national policy guidelines related to development, environment and safety issues (van...
However, in 2004, the institutional position of the Port of Rotterdam Authority changed from a municipal department to a public corporation (Interviews 2.1 & 2.3), whose shares are currently owned by the Municipality of Rotterdam (70%), and the national government (30%), in the form of the Ministry of Finance (Jacobs, 2007). This change was regarded as necessary to allow the Port Authority operating more independently and flexibly in a changing environment, with increased competition between ports (Interviews 2.1 & 2.3; Jacobs, 2007).

Owing to the corporatization, the executive board is no longer controlled directly by the municipality, but by a five-member Board of Commissioners, who appoints the Chief Executive Officer. The members of the Board of Commissioners, in turn, are selected by the Municipality of Rotterdam and the Dutch Ministry of Finance, who both can also exert a partial influence on the development strategies and investments of the Port (de Langen and van der Lugt, 2006; Jacobs, 2007). In addition, under the new structure, the Municipality of Rotterdam still maintains full ownership of the port-industrial area, over which the Port of Rotterdam retains the perpetual usufruct. In this way, the Municipality can still exert some degree of coordination in terms of land use and development (Jacobs, 2007). On the other hand, with this institutional change, the Municipality of Rotterdam has lost its control over the two most important sources of income for the Port, namely the lease of sites and the port dues paid by vessels calling at a Port, which are now directly levied by the Port of Rotterdam Authority (Jacobs, 2007).

7.3.2 The development of the Port of Rotterdam: from a small harbour to the Maasvlakte 2

The Port of Rotterdam presents a particularly long and vibrant history. Founded in the 13th century at the border of the Rotte River, over the course of time, the port has developed from a small fishing harbour into the main international European gateway it is today (Schrijnen, 2003; Edelenbos et al., 2008). Figure 7.12 illustrates the chronological development of the port. As it is noticeable from this figure, the first great boom era occurred with the construction of bulk cargo handling facilities in the 1920s, followed by the construction of petrochemical facilities in the 1930s (Kelly, 2005). While it was badly damaged during the Second World War, the port rapidly recovered. By 1960s, it had become the main oil port in Europe, with the construction of the Botlek and the Europoort port complexes and the consequent progressive shift of port activities from the city center to the North Sea (Edelenbos et al., 2008). The advent of containerization led to the conversion of several old port sites in the 1970s, and to the creation of the Maasvlakte complex in the 1980s (Edelenbos et al., 2008; Koppenol, 2012). The latter constitutes an artificial peninsula reclaimed entirely from the sea (Interviews 2.1 & 2.3).

In the early 1990s, the need for new space, especially for the container and chemical sectors, had become again a pressing issue for the Port of Rotterdam Authority, which, in 2008, has thus decided to embark upon the construction of a second artificial peninsula, named Maasvlakte 2 (Koppenol, 2012).
After 2030, once completed, the Maasvlakte 2 will cover more than 2,000 hectares (see Figure 7.13). This artificial peninsula will represent a 20% increase in the Port's footprint, thus constituting the largest expansion project in the history of the Port of Rotterdam (Interviews 2.1 & 2.3). Approximately 1,000 hectares will be available for port and industrial sites, while the other half of the expansion will comprise sea defense and road and railways links, canals and basins. The general allocation of the newly developed sites includes 600 hectares for container services, 300 hectares for (bio-based) chemical industries and 100 hectares for distribution activities (PMR Project Organization 2001; PoR and M2PO, 2010).

In 2008, before the commencement of the construction works, the costs of the project, including basic port infrastructure, maritime and land access as well as compensation measures, were estimated at €3 billion\(^{11}\) (HHCRO, 2008; PoR and M2PO, 2008a). Similarly, to the Alameda Corridor project, the Maasvlakte 2 project has implied a complicated funding scheme, encompassing a series of loan agreements with the European Investment Bank (€900 million), the Bank Nederlandse Gemeenten (€450 million) and with a bank consortium formed by ING, Fortis and Rabobank (€450 million). The project has also benefited from a direct contribution from the Dutch State of €570 million and a further €500 million in shares in the Port of Rotterdam Authority (PoR and M2PO, 2008a). The change in the institutional position of the Port Authority, from a municipal department to a public corporation, was necessary to provide it with the opportune cash flow and borrowing capacity to assume full financial responsibility for the Maasvlakte 2 (de Langen and van der Lugt, 2006; Jacobs, 2007).

\(^{11}\) This figure does not comprise the costs of port terminals, are to be financed by the private sector (see WMN, 2015).
The Maasvlakte 2 is to be developed in two successive phases (Interviews 2.1 & 2.3). The first one, covering 700 hectares for business sites and including two container terminals, has been recently completed on time and at a cost of €1.55 billion, that is €150 million less than what was forecasted at the time of the final budget approval\(^\text{12}\) (PFI, 2013). The two container terminals will be operated respectively by APM Terminals and by Rotterdam World Gateway, which is a consortium comprising Dubai Port (DP) World and four other international container shipping companies. The remaining 300 hectares will be added in a second phase (PoR and M2PO, 2013). According to the Port of Rotterdam Authority, the Maasvlakte 2, once fully operational, will create room for an extra transfer capacity of 17 million TEUs (PoR and M2PO, 2009), an additional 6,000 direct jobs, plus many times this figure in indirect employment (PoR and M2PO, 2014).

The new port complex is part of a wider-scope development programme (Interviews 2.1 & 2.3), including also the re-development of some of the existing port areas, to improve the overall efficiency of the Port of Rotterdam, and the creation of 750 hectares of wildlife and recreational areas in the north and south of Rotterdam, to enhance the living quality of the surrounding regions (PMR Project Organization 2001; PoR, 2011).

\(^{12}\) In early 2008, PUMA (an acronym for ‘Projectorganisatie Uitbreiding Maasvlakte’, namely ‘Maasvlakte Expansion Project Organisation’), which is a partnership between hydraulic engineering firms Boskalis and Van Oord, was selected by the Port of Rotterdam Authority to construct the first part of Maasvlakte 2 (Hamer and de Boer, 2010).
7.3.3 The planning and decision-making process of the Maasvlakte 2

Origin of the project

Analogously to the Alameda Corridor, the planning and decision-making process of the Maasvlakte 2 has been particularly long and intricate. Whereas official procedures started in mid-1997, final approval to the project was given only in late 2008 (Interview 2.5). However, as Jacobs (2007) and Koppenol (2012) underline, its origins date back to about 20 years before. After the Second World War, the Port of Rotterdam came to be regarded as an important generator of jobs and prosperity (Koppenol, 2012). Therefore, between 1950 and 1970, driven by economic concerns and sustained by a broad public and political support, the port became five times larger (Kelly, 2005; Edelenbos et al., 2008). Nevertheless, owing to environmental degradation and other hazards associated with expanding port activities, local community perceptions of port changed progressively to hostility (Pinder, 1981). In the 1970s, during the construction of the first Maasvlakte, which had been deemed by government as absolutely necessary for the national economy, the first citizen resistance arose as this project implied the destruction of a whole nature reserve (Koppenol, 2012). This growing chorus of protest against pollution and harm to nature resulted in the (temporary) halting of the port expansion strategy. Hence, while the ambition to develop a second Maasvlakte already existed in the late 1970s, the government officially refused to finance it (Jacobs 2007; Koppenol, 2012).

On the other hand, as already explained, specific concerns and desires, forming the basis of projects, may remain in drawers for decades until such time a favorable set of circumstances converge to increase their prominence, urgency as well as their acceptability (see Olesen, 2014). Hence, the idea of Maasvlakte 2 re-emerged on the political agenda again in the early 1990s (Interview 2.2), supported by the growth in container trade between Asian and European countries (Koppenol, 2012). In those years, several parties, including the Port of Rotterdam Authority, the City of Rotterdam and a group of private sector companies, expressed the fear that the existing port areas would not be sufficient to handle the projected growth in deep-sea container activities and chemical industries (Kelly, 2005; van Gils, 2007). In 1991, the Port of Rotterdam Authority published its Port Plan 2010, which portrayed a further port expansion as an essential step for sustaining the economic viability of the port (Jacobs, 2007; Koppenol, 2012). In 1994, a project organization, the membership of which included the Port of Rotterdam Authority and the Ministry of Transport, Public Works and Water Management, was set up with the specific objective of promoting the construction of the second Maasvlakte (Klijn, 2003). In 1995, the newly established Maasvlakte 2 Project Organization concluded that in order to avoid any risk of congestion the creation of a second artificial peninsula was necessary and that the project had to be considered of national interest given the relevance of the Port of Rotterdam to the Dutch economy (Klijn, 2003).

In contrast, a second group of stakeholders, led by regional and national environmental organizations, was skeptical about the need for the project (Interview 2.2). They claimed that the first Maasvlakte still had sufficient spare capacity available (Kuipers and Jonkhoff, 2011; Koppenol, 2012) and that a further expansion would produce significant negative environmental consequences (Kelly, 2005). These environmental groups also received support from citizens from nearby villages who were particularly concerned about possible growth in traffic, noise and pollution (van Gent, 2014).
In 1996, the Dutch government decided to initiate a national discussion concerning the lack of space in the Port (Interviews 2.2). The study, termed VERM (‘Verkenning Ruimtetekort Mainport Rotterdam’, namely ‘Exploratory Phase on Space Constraints in the Main Port Rotterdam’) turned out to be rather unique and radical, in that it was conceived as a broad participatory process with the view to allowing a large number of actors and groups to express their view on the matter (Pestman, 1998; Klijn, 2003). Formally, the purpose of the VERM was to arrive at a clear identification of the problem and subsequently decide on the opportunity and salience for taking necessary measures (Interview 2.2). The VERM was thus aimed at answering the following key questions (see Pestman, 1998; and Koppenol, 2012): what is the nature, size and urgency of the shortage of space? What can be achieved for the economy and the local environment by solving the shortage of space? What are the possible solutions? The idea for this process, typical of a collaborative planning style, came from the advice of the Scientific Council for Government Policies. After an investigation of possible improvements in decision-making for large-scale infrastructure projects, this independent government organization, whose members include prominent social scientists, economists and scholars, concluded that ensuring wide discussions over the usefulness and necessity of projects in the early planning stages was critical to reduce conflicts and delays in the subsequent phases\(^{13}\) (see WRR, 1994). Figure 7.14 illustrates the ideal planning and decision-making process envisaged for the possible expansion of the Port of Rotterdam.

\(\text{\textbf{Figure 7.14 – Planning and decision-making process envisaged for the expansion of the Port of Rotterdam.}}\)

\(\text{\textbf{Figure 7.14 – Planning and decision-making process envisaged for the expansion of the Port of Rotterdam.}}\)

\(\text{Source: Author’s own elaboration.}\)

\(^{13}\) According to Pestman (1998), an important impetus for this innovative planning approach came from the general dissatisfaction with the decision-making process of the Betuwe Route, during which, it was contended, little attention was paid to the interests of local authorities and communities (see also van der Aa, 2000).
However, while, the VERM was intended as an exploratory phase aimed at providing a balanced and holistic picture of the problem (Interview 2.2), in the cabinet decision establishing this national discussion, Maasvlakte 2 was already mentioned as one of the possible ‘solutions’ in the event a space shortage had been ascertained (Klijn, 2003).

**Exploratory studies: the VERM process**

The VERM process started in mid-1996 and lasted approximately one year. As illustrated in Table 7.5, several actors, including elected officials, interest groups, experts and private citizens, played a role in the process (Interviews 2.2 & 2.5). In order to facilitate the interactions between the different parties, a project organization, consisting of civil servants from four government departments (*i.e.* Transport, Public Works and Water Management; Agriculture, Natural Resources and Fisheries; Economic Affairs; Public Housing and Zoning) was set up (Klijn, 2003; Van Gils and Klijn, 2007).

**Table 7.5 - Actors in the VERM round.**

<table>
<thead>
<tr>
<th>Stakeholder groups</th>
<th>Members</th>
<th>Moments of Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Citizens</strong></td>
<td>Individual citizens</td>
<td>Especially in workshops &amp; round table meetings</td>
</tr>
<tr>
<td><strong>Interest Groups</strong></td>
<td>Nationally organized economic interest groups (labour unions, employers organizations, Association of Dutch Chemical Industry)</td>
<td>Especially in sounding board Group &amp; also in national presentations &amp; workshops</td>
</tr>
<tr>
<td><strong>(Economic)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interest Groups</strong></td>
<td>National &amp; regional environmental groups (e.g. Society for Nature and Environment, World Nature Fund)</td>
<td>Especially in sounding board Groups plus more modest participation in workshops &amp; round table groups</td>
</tr>
<tr>
<td><strong>(Environmental)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Regional Administrators</strong></td>
<td>Mayors/aldermen of municipalities &amp; counties involved &amp; representatives &amp; directors of harbour companies</td>
<td>Dominant in consultant discussion, amply represented in round table meetings, more modest representation in workshops</td>
</tr>
<tr>
<td><strong>Experts/Researchers</strong></td>
<td>Scholars/researchers with expertise in relevant fields (e.g. regional economics, public administration &amp; the environment sciences)</td>
<td>Especially in expert meetings. Less intensive in sounding board groups, workshops</td>
</tr>
<tr>
<td><strong>National Administrators</strong></td>
<td>Ministers and civil servants</td>
<td>Minimal involvement</td>
</tr>
<tr>
<td><strong>Government Departments</strong></td>
<td>Public Housing and Zoning; Public Works, Transport &amp; Water Management, Finance; Economic Affairs</td>
<td>Minimal involvement but active in interactions around VERM</td>
</tr>
<tr>
<td><strong>Parliament</strong></td>
<td>Political parties &amp; members of parliament</td>
<td>Very limited participation</td>
</tr>
</tbody>
</table>

According to the research of Klijn (2003), and Van Gils and Klijn (2007) within the VERM three main interaction and dialogue platforms were present (see Table 7.6). In a **Condition Arena**, the conditions of the process organization and participation were discussed. The question of whether there was a lack of space in the port and how that could be solved was addressed mainly in two arenas, namely a **Public Discussion Arena**, entailing workshops and panels which were very open for all actors, especially individual citizens, and an **Expert Arena**, which, differently from the other, involved primarily expert meetings.

In addition, Klijn (2003) and Van Gils and Klijn (2007) identify also two further arenas, in which interaction took place after the conclusion of VERM process (see again table 6.6). In an **Initial Decision Arena**, dominated by government departments, the outcomes of the VERM were discussed and transformed into an official decision. Lastly, a **Political Arena**, in which members of parliament and the Dutch Ministries played a prominent role, concerned the political resolution about the subsequent courses of action.

<table>
<thead>
<tr>
<th>Arenas</th>
<th>Stakeholders</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central arenas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Public Discussion arena</td>
<td>Citizens, regional politicians, regional interest groups (economic and environmental)</td>
<td>Discussion about nature of problem, types of solutions, interests etc.</td>
</tr>
<tr>
<td>2. Expert arena</td>
<td>Scholars, national interest groups, CPB, Port Authority</td>
<td>Reflection on process and substance, development of solutions</td>
</tr>
<tr>
<td>3. Condition arena</td>
<td>Project group VERM, departments, monitoring committee and (sometimes) national environmental organizations</td>
<td>Discussion about VERM design, about types of product, about participation</td>
</tr>
<tr>
<td>Peripheral arenas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Initial decision arena</td>
<td>Departments (Environment, Economic Affairs, Agriculture and Fisheries and Public Works, Transport and Water Management), project group VERM</td>
<td>Preparing initial decision for Cabinet and parliament (both substantively and procedurally)</td>
</tr>
<tr>
<td>5. Political arena</td>
<td>Second chamber, Cabinet, departments</td>
<td>Political decision and its preparation (by Cabinet)</td>
</tr>
</tbody>
</table>


Notwithstanding the stated government objective of ensuring an inclusive planning and decision-making procedure, a very limited support from many parties for such an open and comprehensive process was clearly noticeable (Interview 2.2; Pestman, 1998). Indeed, the Port of Rotterdam Authority, the Municipality of Rotterdam and other related economic interest groups were already convinced about the need for the expansion. Civil servants of the various ministries involved in the process wanted to maintain the right to
ultimately take the decision irrespectively of the results of the debates, thus revealing the existing tensions between the participatory exercise and the formal political sphere. In addition, the *Maasvlakte* 2 Project Organization continued to operate during the VERM process, so that, throughout the process, some of the actors who were involved in the debate concerning the possible lack of space in the Port, continued to work actively on the promotion of the second *Maasvlakte* (Klijn, 2003 and Van Gils and Klijn, 2007). In many workshops, the lack of space in the Port appeared to have been taken as granted and many felt that the debate over possible shortage of port space had been gradually replaced by a discussion about the pros and cons of the *Maasvlakte* 2 (Interview 2.4; Woltjer, 2000).

Estimates concerning the lack of capacity in the Port were based on forecasts carried out by the Dutch Central Planning Agency (Interviews 2.5). Starting from contrasting assumptions about global economic growth and varying degrees of European integration, resulting in three diverse growth paths of the Dutch economy until 2020, namely +1.5%, +2.75% and +3.25% per annum, three different demands for space were forecasted (CPB, 1997). According to Central Planning Agency, in the most optimistic scenario (*i.e.* +3.25% per year) there would have been a shortage of space of about 650 hectares. However, in presenting their results, the Agency also stressed that the expansion should not have to be considered a priority and these discussions could have been postponed for at least a decade (Koppenol, 2012).

The *Maasvlakte* 2 Project Organization, on the other hand, contested these findings, judging these estimates to be excessively conservative and arguing that a small expansion of the Port would have resulted to be almost as expensive as the construction of a bigger area (Klijn, 2003).

After many conflicts, many of which remained unresolved (Interviews 2.2 & 2.4), the VERM process concluded, in mid-1997, with the statement made by the government that, in the near future, there would be a space shortage in the Port of Rotterdam so that solving this problem in fact was necessary (Woltjer, 2000; Kelly, 2005; Van Gils and Klijn, 2007). This decision marked the end of the VERM round and, simultaneously, the commencement of the official planning process (see again Figure 7.14).

Nature preservation and environmental pressure groups showed their discontent with the process and its outcome, claiming that they had only been allowed to discuss limited issues and questioning the objectivity of data and information on which the discussions had been based (Interviews 2.2 & 2.4). Quite striking was also the comments on the shortage of space in the port made by a politician during a parliamentary debate in late 1996: “Sometimes I have the feeling it is possible to conclude that there is no such shortage, but that is out of the question’ (quoted in Pestman, 1998:190).

**Official decision-making procedure: the PMR process**

As stipulated in the Dutch Land-Use Planning Act, in the Netherlands, all major policy decisions affecting land use and spatial planning must be subject to a Key Planning Decision, namely an extensive procedure that results in a legally binding national spatial planning decision (PMR Project Organization, 2001; Stoelinga and Luikens, 2005). The government decided to organize the planning process for the project, termed Rotterdam
Mainport Development (PMR), around a dual objective: firstly, to identify a solution for the growing needs of the Port of Rotterdam; and, secondly, to improve the quality of the living environment in and around the port (PMR Project Organization, 2001; Van Gils and Klijn, 2007).

Similarly to the exploratory phase, the official decision-making process was also characterized by broad participation (Interviews 2.2 & 2.5). Between 1997 and 2001 the decision-making process was undertaken under the supervision of a project organization consisting of various ministries of the Dutch Government (i.e. Transport, Public Works and Water Management; Agriculture, Natural Resources and Fisheries; Economic Affairs; Public Housing and Zoning; and of Finance), plus the Rotterdam Metropolitan Region, the Municipality of Rotterdam and the Province of South Holland. As it is noticeable from Tables 7.7 and 7.8, most of the stakeholders involved in the VERM process were also involved in the Key Planning Decision, with the result that the arenas of dialogue among the various stakeholders in both processes were relatively similar.

### Table 7.7 - Stakeholders involved in the Rotterdam Mainport Development decision-making process.

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Characterization</th>
<th>Moments Of Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interest groups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(economic)</td>
<td>Nationally organized economic interest groups (e.g. labour unions &amp; employers organizations)</td>
<td>Especially in intern co-ordination and partly in regular ONR sessions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interest groups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(environmental)</td>
<td>National and regional environment groups (e.g. the Society for Nature &amp; the Environment) &amp; Representatives of the Port Authority</td>
<td>Especially in ONR sessions &amp; partly in Vision &amp; Heart discussions about the incorporation of environmental values</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Regional administrators</strong></td>
<td>Mayors/aldermen of municipalities and provinces involved; and Association of Water Boards</td>
<td>Especially in Public Consultation Mainports (BOM) and some separately in Vision and Heart</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Project coordinators</strong></td>
<td>PMR Project Organization and individuals (including: Hans Alders/Roel in ’t Veld)</td>
<td>Active in and between different Structures as in the case of the ONR, &amp; between ONR &amp; BOM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>National administrators</strong></td>
<td>Ministers</td>
<td>Minimal involvement, until latter stages of the process</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mixed interest groups</strong></td>
<td>For example, the Automobile Drivers Association, intermediaries</td>
<td>Incorporated in ONR, representing mixed values</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Departments</strong></td>
<td>Public Housing and Zoning; Public Works, Finance; Economic Affairs</td>
<td>Involvement in public consultation mainports and informing the ministers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Parliament</strong></td>
<td>Political parties (national level)</td>
<td>Very limited participation in approval of zoning procedures</td>
</tr>
</tbody>
</table>

According to the analyses of Klijn (2003) and Van Gils and Klijn (2007), the various alternatives for the port expansion were discussed in two closely related arenas, namely the ONR Arena, encompassing various interest groups, and the BOM Arena, composed of national, provincial and local government representatives. Four potential options were proposed (PMR Project Organization, 2001):

- the construction of an artificial peninsula (i.e. Maasvlakte 2);
- landside expansion of the port in a northerly and/or southerly direction;
- optimization of the space/capacity in the existing port areas; and
- utilization of other ports located in Southwest Netherlands.

**Table 7.8 - Arenas in the Rotterdam Mainport Development decision-making process.**

<table>
<thead>
<tr>
<th>Arenas</th>
<th>Key Stakeholders</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central arenas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultation non-public Stakeholder Arena (ONR - formalized in 2000)</td>
<td>Interest groups (economic and environmental)</td>
<td>Discussion about alternatives, representation of interests</td>
</tr>
<tr>
<td>BOM Consultation Public Stakeholders Arena (BOM)</td>
<td>National, provincial and local public stakeholders</td>
<td>Reflection on decision-making process and substance of decisions plus discussion on alternatives.</td>
</tr>
<tr>
<td><strong>Peripheral arenas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision and Heart Arena</td>
<td>Interest Groups (mainly environmental) organized to discuss environmental aspects more prominently than in ONR</td>
<td>Discussion about how to incorporate environmental aspects in the expansion of the port</td>
</tr>
<tr>
<td>Private-Consultation Arena</td>
<td>Firms and Ministry of Public Works, Transport and Water Management</td>
<td>Thinking about possibilities for Public-Private Partnerships (PPPs)</td>
</tr>
<tr>
<td>Political Arena</td>
<td>Parliament, Cabinet, other government departments</td>
<td>Political decision-making and preparations (by Cabinet Office)</td>
</tr>
</tbody>
</table>


The aim of improving the residential and human environment in the Rotterdam region was the focus of the Vision and Heart Arena, where the Municipality of Rotterdam discussed environmental compensation measures for port expansion together with environmental pressure groups. Additionally, in a Private-Consultation Arena, discussions took place regarding the financing structure of the alternative port expansion schemes and the possible introduction of public-private partnership arrangements. Finally, the fifth arena was a Political Arena for government decision-making, concerning subsequent actions (Klijn, 2003; Van Gils and Klijn, 2007).

Similarly to the VERM, also the official planning process turned out to have a less open and more regulated character than was apparent at the start (Interviews 2.2 & 2.4). The
civil servants working and thinking together in the BOM Arena appeared again to be rather hesitant of this open plan process (Van Gils and Klijn, 2007). The Private-Consultation Arena also appeared to focus mainly on the identification of financing options for the Maasvlakte 2, thus implicitly highlighting the ongoing dominance of this alternative over the others in the discussion (Van Gils and Klijn, 2007).

During the process all the alternatives to Maasvlakte 2 were proved to be inadequate and thus ultimately discarded (Interviews 2.2 & 2.5). A landside expansion of the port in a northerly and/or southerly direction was considered unfeasible since it would have conflicted with national and European environmental norms and safety standard requirements. A better utilization of the existing port areas, although extremely valuable and not in conflict with protected ecological values, was judged as an option incapable of ensuring more than 200 extra hectares of space. Finally, due to major infrastructure and logistics constraints (i.e. shallow drafts, poor hinterland connections) the ports in the Southwest Netherlands were regarded as unable to offer adequate opportunities for deep-sea container activities and chemical industries (PMR Project Organization 2001). However, environmental organizations claimed that many of these choices had been taken by the Ministries unilaterally, without disclosing the scientific studies that served as the foundation for these decisions (Interviews 2.2 & 2.4; Kelly, 2005).

In general, the process was dominated by mutual mistrust between stakeholders and strong tensions between economic and environmental interests. Economic interest groups and environmental organizations had reached an extreme state of polarization that ultimately proved to be impossible to address (Interviews 2.2 & 2.4). This conflict reached its climax in mid-2000, when environmental groups temporarily pulled back from deliberations. However, while some of these groups continued to fiercely oppose the projects, others, realizing it was unrealistic to prevent the construction of Maasvlakte 2, shifted their efforts from complete opposition to conditional cooperation, in the attempt to at least minimize the environmental impacts of the project (Kelly, 2005; van Gent, 2014).

The crucial resolution, taken in 2001 at the end of the formal decision-making process, was to favor the Maasvlakte 2 as the ‘solution’ to the problem of lack of space in the Port of Rotterdam (Van Gils and Klijn, 2007; Kelly, 2005). As above illustrated, the Rotterdam Mainport Development initiative took ultimately the form of a programme (Interviews 2.1 & 2.2) including (see PMR Project Organization 2001; IMIEU, 2005; PoR, 2011):

- the Maasvlakte 2;
- a series of measures aimed at increasing the utilization of the existing port and industrial areas and, at the same time, improving the environment quality of the areas surrounding the port;
- the creation of a nature and recreation area of approximately 750 hectares, just below the southernmost boundary of the Municipality of Rotterdam, so as to improve the livability in the region; and
- other mitigation measures to compensate for the potential loss of habitats and species caused by the land reclamation project.
Outcomes of EIA and CBA exercises carried out for the Maasvlakte 2

The decision-making process also required the preparation of a CBA and an EIA report. Presently, in the Netherlands, CBA represents a mandatory methodology for supporting large-scale infrastructure investment decisions (Annema et al., 2015). The CBA of the Maasvlakte 2 was developed by the Dutch Central Planning Agency together with the Netherlands Economic Institute and the National Institute for Public Health and Environment (Interview 2.5). The analysis considered, it was contended, all direct social welfare effects on the national economy generated by the land reclamation project compared against the ‘without project’ situation (see CPB, NEI, RIVM, 2001a and 2001b).

The CBA exercise was undertaken for the three economic scenarios previously developed by the Dutch Central Planning Agency. In addition, noise increase as a result of the port activities in the new port areas was identified as one of major uncertainties surrounding the project. On account of this issue, the CBA study was carried out, for each scenario, both under the assumption that national standard legislations would not impose limits to port activities in the new port complex and under the hypothesis that some restrictions would instead be unavoidable. Hence, overall, six different conditions (i.e. three different scenarios and for each scenario two different situations concerning the noise levels in the port) were investigated (CPB, NEI, RIVM, 2001a and 2001b). The CBA study looked to a horizon date of 2035, employing a discount rate of 4%. A residual economic value after 2035 (i.e. the value of the project at the end of the appraisal period) was also computed and included in the analysis (CPB, NEI, RIVM, 2001a and 2001b).

The results of the analysis are summarized in Table 7.9 below. Annema and colleagues (2007) criticized this analysis as being excessively elaborate and technical, preventing non-economists from understanding the effects of the projects, especially the main benefits. As illustrated in the table, the NPV at 2035 turned out to be, in many cases, negative. Only under the most favorable hypotheses (i.e. GDP Annual Growth Rate in Netherlands equal at least to 3%; and port operations not exceeding noise standard limits) and with the inclusion of residual values after 2035 (which is a parameter that is, of course, extremely difficult to estimate) the NPV of Maasvlakte 2 appears to be slightly positive.

Accordingly, based on the outcomes of CBA exercise, the Dutch Central Planning Agency was quite skeptical of the opportunity to build the project and recommended at least to expand the port in several stages, depending on the arrival of new customers for the port grounds (CPB, NEI, RIVM, 2001a and 2001b).

Adding to this skepticism, the results of the EIA, undertaken under the responsibility of the Port of Rotterdam Authority, indicated that the new artificial peninsula was likely to have more impacts on the ecosystem than the other alternative options (see PMR Project Organization 2001; IMIEU, 2005). However, the Port of Rotterdam Authority claimed that the expansion would not be particular detrimental for the ecosystem and that, however, possible environmental impacts would be outweighed by the economic benefits of the project (van Gent, 2014).
### Table 7.9 - CBA for Rotterdam Port expansion project (in billion Dutch Guilder - 2000 prices).

<table>
<thead>
<tr>
<th>Economic Growth</th>
<th>GDP +3.25%</th>
<th>GDP +2.75%</th>
<th>GDP +1.50%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noise levels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended starting year</td>
<td>Above limits</td>
<td>Below limits</td>
<td>Above limits</td>
</tr>
<tr>
<td>2010</td>
<td>2007</td>
<td>2013</td>
<td>2010</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>-2.1</td>
<td>-2.3</td>
<td>-1.4</td>
</tr>
<tr>
<td>Exploitation</td>
<td>-0.2</td>
<td>0.5</td>
<td>-0.2</td>
</tr>
<tr>
<td>Avoided costs</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Effects on users</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Container sector</td>
<td>1.3</td>
<td>5.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Chemical sectors</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Other industries</td>
<td>0.1</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Environmental impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical sectors</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.1</td>
</tr>
<tr>
<td>Container sector</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other items</td>
<td>0</td>
<td>-0.1</td>
<td>0</td>
</tr>
<tr>
<td><strong>NPV up to 2035</strong></td>
<td>-0.4</td>
<td>3.9</td>
<td>-0.9</td>
</tr>
<tr>
<td><strong>Additional Benefit Period 2035-2050</strong></td>
<td>2.1</td>
<td>4.7</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>NPV up to 2050</strong></td>
<td>1.7</td>
<td>8.6</td>
<td>-0.4</td>
</tr>
</tbody>
</table>

Source: (Adapted from) CPB, NEI, RIVM (2001a) and CPB, NEI, RIVM (2001b).

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### The appeal of the fishermen and farmers

Following the release of the final draft report of the planning application in 2003, several objections were raised by parties, who up until that point felt largely neglected by the overall decision-making process (Interview 2.2). These groups included the National Union of Fishers and the Union of Farmers (Kelly, 2005; Van Gils and Klijn, 2007). The former argued that there had not been sufficient study of the effect of the land reclamation on marine life in the Wadden Sea, namely an intertidal zone in the southeastern part of the North Sea, which, being particularly rich in biological diversity, is protected by the EU’s Birds and Habitats Directives\(^ {14} \). The latter appealed on the ground that the plan to create 750 hectares of natural areas in the South of Rotterdam would have changed the character of that land in such a way that would have made it unsuitable for farming (Kelly, 2005; HHCRO, 2008). Both the fishermen and the farmers claimed that there had not

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\(^ {14} \) The Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 2009/147/EC) represent two important European Union directives in relation to wildlife and nature conservation and aim at ensuring that any development is undertaken in a way that is compatible with the protection of some particular species and habitats of European importance.
been enough consideration of their positions when these decisions were taken. Indeed, while it was assumed that these two groups could be represented adequately by environmental organizations and other parties directly involved in the negotiations, the interests and priorities of fishermen and the farmers ultimately did not align with the specific concerns of those parties (Kelly, 2005).

In 2004, the Dutch Supreme Administrative Court upheld these two appeals (Interviews 2.2 & 2.5). As a result, the planning application had to be redrafted, thus extending the decision-making process by two more years (Van Hooydonk, 2007). Further, more accurate environmental studies had also to be undertaken (EuDA Environment Committee, 2007; HHCRO, 2008). The final environmental report thus turned out to encompass over 6,000 pages (i.e. one of the longest EIA reports ever produced), showing the effect of the project in 14 different areas: traffic and transport; noise; air; external security; water; light; nature; landscape; recreational combined use; maritime safety and accessibility; coast and sea environment; environmental quality; functions; and archeology (Interview 2.5; PoR and M2PO, 2008b). In addition, also a SEA, mapping the environmental effects of the strategic choices in broader terms, was carried out (HHCRO, 2008). On the other hand, as van Gent (2014) points out, no major amendments were made as a result of these further analyses. Eventually, the planned expansion still amounted to 2,000 hectares. With reference to the appeal of the farmers, it was decided to relocate a part of the 750 hectares of wildlife and recreational area from the South to the North of Rotterdam (HHCRO, 2008).

After another round of public consultation, the Rotterdam Mainport Development programme received finally the green light in September 2008 (Interview 2.5). The first phase of Maasvlakte 2 was inaugurated officially in 2013 (PFI, 2013), that is approximately 13 years later than originally planned (van Gent, 2014). However, the project is still facing considerable criticism from environmental groups, scholars but also from Dutch dockers, claiming that, despite the optimistic estimate of the Port of Rotterdam Authority, the new fully automated container terminals built in the new artificial peninsula will result in a loss of as many as 1,000 jobs (Nightingale, 2014).

7.4 The London Gateway port complex

7.4.1 Overview of the UK port system

Geographical context

With an annual total throughput of more than 500 million tons of freight (DfT, 2015; BPA, 2016), the UK ports currently represent the second largest European port system, behind only the Netherlands (which is dominated by the Port of Rotterdam). As regard to the impact on the national economy, a research undertaken by Oxford Economics (2015) has highlighted that in 2013, the ports industry directly employed 118,000 people, which is 0.4% of total employment in the UK, and made a direct value-added contribution of £7.7 billion, which is equivalent to 0.5% of the national GDP. Moreover, in the same year, the indirect and induced impacts of port activities supported further 200,000 jobs and generated an additional £11 billion in GDP (Oxford Economics, 2011).
There are approximately 120 commercial ports and terminal/wharf facilities in the UK (Baird and Valentine, 2007; UKMPG, 2017). However, at present, similarly to other countries, the UK port industry appears to be strongly consolidated, so that the large majority of the traffic is concentrated in just a few large ports. In 2014, for instance, the top 20 ports, led by the Port of Grimsby & Immingham and the Port of London, handled almost 87% of the total UK port throughput (DfT, 2015). This high level of consolidation is even more evident in the container sector (Interview 3.4). As shown in Table 7.10, in 2014, the top 12 container ports were responsible for more than 97 percent of the total container movement (which, in that year, amounted to 9.5 million TEUs), while the four UK largest container ports managed alone almost 81 percent of the national container throughput (DfT, 2015).

Table 7.10 – Container throughput of the top 12 UK container ports in 2014.

<table>
<thead>
<tr>
<th>Ports</th>
<th>Containers (Thousand TEUs)</th>
<th>Container Terminals Ownership</th>
<th>Owners</th>
<th>Other Commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felixstowe</td>
<td>4,072</td>
<td>Private Public trust is responsible for navigation/pilotage only</td>
<td>HPH (Hutchison Port Holdings) Group</td>
<td>Vehicles</td>
</tr>
<tr>
<td>Southampton</td>
<td>1,895</td>
<td>Private ABP (Associated British Ports) – container terminal operated by DP (Dubai Port) World</td>
<td>Dry/liquid bulk; Vehicles</td>
<td></td>
</tr>
<tr>
<td>London Tilbury</td>
<td>1,065</td>
<td>Private Public trust is responsible for navigation/pilotage only</td>
<td>Port of Tilbury owned by Forth Ports</td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
</tr>
<tr>
<td>Liverpool</td>
<td>666</td>
<td>Private Peel Ports</td>
<td></td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
</tr>
<tr>
<td>Tees &amp; Hartlepool</td>
<td>304</td>
<td>Private PD Ports</td>
<td></td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
</tr>
<tr>
<td>Forth</td>
<td>259</td>
<td>Private Forth Ports</td>
<td></td>
<td>Dry/liquid bulk</td>
</tr>
<tr>
<td>Grimsby &amp; Immingham</td>
<td>229</td>
<td>Private ABP (Associated British Ports)</td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
<td></td>
</tr>
<tr>
<td>Hull</td>
<td>227</td>
<td>Private ABP (Associated British Ports)</td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
<td></td>
</tr>
<tr>
<td>Belfast</td>
<td>211</td>
<td>Trust Belfast Harbour Commissioners</td>
<td>Dry/liquid bulk; Vehicles</td>
<td></td>
</tr>
<tr>
<td>Thamesport/Medway</td>
<td>179</td>
<td>Private London Thamesport (Part of HPH Group)</td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
<td></td>
</tr>
<tr>
<td>Bristol</td>
<td>106</td>
<td>Private Port is leased to private operator by the municipality</td>
<td>The Bristol Port Company</td>
<td>Dry/liquid bulk; Vehicles</td>
</tr>
<tr>
<td>Clyde</td>
<td>86</td>
<td>Private Clydeport Ltd (part of Peel Ports Group)</td>
<td>Dry/liquid bulk</td>
<td></td>
</tr>
<tr>
<td><strong>Total UK container ports</strong></td>
<td><strong>9,299</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Figure 7.15, deep-sea container capacity in the UK is concentrated in the southeast of the country, with the major UK container ports, above all Felixstowe, Southampton and London Tilbury, located close to the English Channel. The only major container port outside of this area is at Liverpool (Interview 3.4; Wilmsmeier and Monios (2013)).

Figure 7.15 - Main container ports in the UK.

Source: Author's own elaboration.

**Institutional context**

In the UK, with the exception of a few municipal and trust ports\(^{15}\), the large majority of ports, especially container terminals (see again Table 7.10), are owned and operated by private companies (Interview 3.4). Up until the 1980s, the UK ports were mainly publicly owned and subjected to strong public intervention. However, since the last two decades of

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\(^{15}\) A municipal port is a port which is owned by the local municipal authority, which often acts as a landlord, with private terminal operators as tenants. A trust port, by comparison, is a port which is administered as a trust by an independent statutory body (Baird and Valentine, 2007). The Secretary of State for Transport retains responsibility for appointing chairs and non-executive members to the boards. There are no shareholders or owners and any revenues are ploughed back into the port for the benefit of its stakeholders (i.e. all those using the port, employees of the port and all those individuals, organizations and groups having an interest in the operation of the port) (Butcher, 2013).
the 20th century, this approach has started to be regarded as counterproductive. Consequently, the state has started to withdraw from its port industry (Marshall, 2013).\(^\text{16}\)

Compared with the large majority of countries embracing port privatization, that have opted for terminal lease/concession schemes, while retaining some form of public authority (World Bank, 2002), the approach adopted in the UK remains highly unusual as it entailed the wholesale transfer of all three core functions of the ports, namely landowner, port operations and regulator (Interview 3.4). Hence, in privatized UK ports, port land is privately owned, and port infrastructure and facilities are privately managed. The UK port industry, at present, does not have a specific state regulator body and government policy mainly focuses on providing guidance as opposed to direct intervention, thus allowing the private sector to establish its own investment priorities and formulate its own development plans (Baird and Valentine, 2007).

The approach to port privatization adopted in the UK has raised many debates regarding the aims and objectives of ports and the role of government in this regard. As highlighted by several interviewees (Interviews 3.4, 3.3, 3.8 & 3.10), while the wider purpose of ports as trade facilitators and generators of economic and social benefits can still be stressed by public-owned, but private operated, ports (i.e. landlord port management model), fully private ports may risk focusing exclusively on the narrower profit-making goal of private enterprises (see also Baird and Valentine, 2007). International evidence (see Brooks and Cullinane, 2007) also shows that the state does not need to sell off port land in order to generate private sector investments in port infrastructure. It is also contended that government sold its ports at what subsequently proved to be a very low price, representing a substantial loss of value to the state (Goss, 1998). Finally, while it is possible to argue that port privatization has nevertheless benefited the UK economy, it is also evident that, in the long term, a free market approach and the absence of strategic criteria guiding and regulating port investments can collide with the objective of sustainable development (interviews 3.4 & 3.3)

Notwithstanding these arguments, this non-interventionist approach to ports, encouraged also by globalization trends, has been recently confirmed by several policy documents published by different government administrations (see, amongst others, DETR, 2000; DTLR 2001; and DfT, 2011 and 2012).\(^\text{17}\) All these documents stress that the market is the best place to determine when, how and where to meet the need for additional port capacity, while government support is limited to the planning process.

\(^\text{16}\) Port privatization has to be regarded as part of a more general trend involving infrastructure industries in the UK. Indeed, while by the mid-1970s, the state had achieved a strong position in the ownership and control of different infrastructure sectors (including most ports, the largest airports and main airlines, all road and rail infrastructure and all rail-service provision, and gas and electricity systems), in the 1980s government launched and extensive (and highly controversial) privatization programme, which resulted in the rapid giveaway of state owned assets (Marshall, 2013).

\(^\text{17}\) Due to the devolved political structure, in the UK, public responsibility for planning and infrastructure is spread across different jurisdictions (Marshall, 2013). The above policy documents cover England and Wales, although the Welsh government is responsible for many related functions, including transport and land use planning. The Scottish Executive has devolved responsibilities for ports, and has developed its own ports policy under the Scottish National Transport Strategy. Ports policy in Northern Ireland is also devolved (DfT, 2012).
7.4.2 The appraisal framework for ports

Until the late 1990s, in in the UK, CBA had represented the most common appraisal methodology to assess transport schemes (Vickerman, 2000 and 2007; Worsley and Mackie, 2015). However, in recent years, similar to other countries, UK transport appraisal practice has gone through a significant period of change. In 1998, the New Approach to Appraisal (NATA) was introduced with the view to developing a wider and more transparent assessment framework (DETR, 1998a and 1998b). Figure 7.16 displays the overall planning process entailed by the NATA.

Figure 7.16 - The NATA process.

As it is noticeable from this figure, the NATA adopts a rational problem-solving approach to the planning process. Indeed, the framework entails a linear process, comprising the identification and analysis of transport problems, the determination of a set of objectives which the solution should seek to satisfy, the exploration of the potential alternative solutions for solving the problem and meeting the objectives, the appraisal of the options and, finally, the selection of the preferred solution (see DfT, 2005).

The core of this appraisal framework was represented by an Appraisal Summary Table (AST) in the form of a single sheet summary displaying, together with traditional economic indicators (e.g. travel time savings), environmental, social and other wider appraisal criteria which had been frequently omitted in the past (Interview 3.1). In the AST, these different items were clustered around five dimensions\(^\text{18}\), namely economy, environment, safety, accessibility and integration, reflecting the government’s target areas for transport as outlined in the 1998 government’s White paper (DETR, 1998c).

Initially adopted only for informing the prioritization of trunk road investment proposals (DETR, 1998a and 1998b), the NATA has progressively evolved and has been included into the WebTAG (Web-based Transport Analysis Guidance), namely the Department’s transport appraisal guidance and toolkit (DfT, 2014). The NATA and the AST now forms the basis for the appraisal of multi-modal studies, Highway Agency road schemes, major road and public transport proposals developed as part of local transport plans, the strategic Rail Authority’s appraisal criteria, airports and also ports (DfT, 2014). This is supposed to result in greater consistency between the (economic, environmental and social) appraisal of proposals pertaining to different transport sectors (Interview 3.1).

The project appraisal framework specifically conceived for ports\(^\text{19}\) (see DfT, 2003a), is illustrated in Table 7.11. The framework attempts to account for all the relevant quantitative and qualitative effects of a proposed port development in a systematic manner (DfT, 2003a). In the AST, data and information regarding the impacts of port proposal are typically derived from the results obtained with established appraisal methodologies (e.g. CBA, EIA, SIA).

The framework seeks to assist promoters, objectors, local authorities and any other relevant stakeholders in understanding the degree to which a given project proposal achieves the five government’s transport objectives, by comparing the proposal with a ‘do-minimum’ or ‘do-nothing’ alternative (DfT, 2003a). However, as mentioned in the Chapter 4, the framework is not intended to provide a mechanistic way of reaching decisions (DfT, 2005). Therefore, there is no attempt either to impose any pre-determined weighting on the various elements or to generate a global project score (DfT, 2003a).

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\(^{18}\) These dimensions are totally arbitrary. For instance, the Welsh Transport Planning and Appraisal Guidance (WAG, 2008), while adopting the same impact categories, group them in just 3 dimensions, namely economy, environment and social.

\(^{19}\) The NATA/WebTAG principles are applied in England and Wales (DfT, 2014) and consequently this appraisal framework is intended for port projects in England and Wales. Port projects in Scotland are subject to specific Scottish guidance (DfT, 2003a).
Table 7.11 - DfT’s appraisal framework for ports.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Objectives</th>
<th>Sub-objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>To protect the natural and built environment and human health</td>
<td>To minimize nuisance to people working in, using and living in the vicinity of the ports caused by noise and dust</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirements of the Habitat Directive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To minimize adverse effects on local air quality and greenhouse gases leading to climate change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To protect the character of the landscape and townscape</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To protect the heritage of historic resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To protect the water environment</td>
</tr>
<tr>
<td>Safety</td>
<td>To improve safety</td>
<td>To implement the Port Marine Safety Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To improve the health and safety records in ports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To minimize risks to population surrounding ports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To improve physical security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To minimize accidents on the surface access system</td>
</tr>
<tr>
<td>Economy</td>
<td>To support sustainable economic activities</td>
<td>To provide benefits (reduced costs, shorter in-transit times) to all users of the port and surface transport system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To obtain benefits for the local and regional economy, from the wider economic impacts associated with water transport</td>
</tr>
<tr>
<td>Accessibility</td>
<td>To maintain or improve access to the transport system</td>
<td>To improve accessibility to ports by non-road modes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To improve access for disabled users of port facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To maintain the option of access to water transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To minimize the severance effects on local trips</td>
</tr>
<tr>
<td>Integration</td>
<td>To ensure that decisions are taken in the context of integrated strategies at the national, regional and local levels</td>
<td>To integrate with spatial, economic, transport, environmental protection and regeneration strategies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To intergrate with other element of government policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To improve the facilities for transport interchange at ports</td>
</tr>
<tr>
<td>Further considerations</td>
<td>For scheme that receive public money or are promoted by the public sector, ensure that a scheme would be commercially viable</td>
<td>Effects on competition between ports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To ensure associated developments are delivered on time</td>
</tr>
</tbody>
</table>

Source: DfT (2003a).

While the framework has the status of non-statutory advice, the Department for Transport strongly recommends that it should be used for any port project costing over £10 million and requiring official approval (DfT, 2003a). On account of the Government’s hands-off approach to ports, proposals concerning new port infrastructure are brought forward by private companies, which apply for a planning permission to the Secretary of State for Transport and are required to raise the capital for the investments. Promoters need to demonstrate that there is a clear requirement for additional port capacity, which could be met satisfactorily by their given proposal (Gilman, 2003; Baird and Valentine, 2007). Ideally, port promoters must also show that the project proposal has been identified amongst a range of different options and alternative sites. They are then expected to appraise the proposal against the NATA criteria (DETR, 2000). The applicant's assessment should take account of other relevant policies and plans imposing additional restrictions. These include, amongst other things, environmental directives such as the EIA Directive, imposing procedural requirements where impacts are likely to be significant,
and the Habitat and Birds Directives Directive, precluding the possibilities for development in some environmentally sensitive areas unless there is no alternative (DfT, 2003a).

During the planning process, there could be negotiations with different stakeholders and measures of mitigation could be developed. However, objections may also be raised, especially in the case of major port projects. In this case, a public inquiry is held (Gilman, 2003; Baird and Valentine, 2007). During the public inquiry, mediated by an independent Planning Inspector, evidence may be heard from the promoters, a range of governmental bodies, interest groups and experts. At the end of the inquiry, final recommendations from the Inspector are considered by the Secretary of State, who is then expected to make a judgement about the public interest (King, 2015).

7.4.3 The Port of London and the new London Gateway port complex

History and evolution of the Port of London

The Port of London, lying along the banks of the River Thames, has been a major port since its establishment by the Romans in 50 AD and for many centuries had played a critical role in the history of the UK and the British Empire. Once the largest port in the world, it is still one of the largest ports in the UK, consisting of tens of independently owned terminals and port facilities. The Port of London handles each year millions of tons of cargo across all the types of market segments and supports more than 45,000 full time equivalent jobs (PLA, 2015a).

As explained by Al Naib (1990) and Meyer (1999), until the late 18th century port activities were concentrated within the small section of the Thames, which is currently delimited by London Bridge and Tower Bridge. The situation changed in the early 19th century. Indeed, by 1800, imports and exports had grown dramatically as a consequence of the industrial revolution and the expansion of Britain’s overseas interests. This growth, in turn, had resulted inevitably in congestion and inefficient port operations. Therefore, after a period of petitioning by merchants and debate by Parliament, a massive dock-building programme was undertaken to make the port more efficient (PLA, 1993). The programme, commencing with the construction of a first dock on the Isle of Dogs in 1802 and virtually ending with the opening of the George V Dock in 1921 (see Figure 7.17), had a major role in revolutionizing the position of London as the undisputed focal point of world trade (Al Naib, 1990; Meyer, 1999).

In 1908, simultaneously with this major port expansion programme, the government established the Port of London Authority, a self-funding public corporation having specific responsibility for operating and maintaining all docks, which until that moment had been owned by private dock companies, and for carrying out all conservancy duties from upper docks to the estuary of the Thames (PLA, 1993). In 1992, with government privatization policy, the Port of London Authority ceased to be a port operator. Nowadays, it only maintains and supervises navigation, and protects the river’s environment.
After the heavy bomb damage of the Second World War there were major efforts of reconstruction, which allowed trade in the port to reach briefly a new peak by the early 1960s (Al Naib, 1990). However, since the end of that decade, owing to the container revolution and the use of larger vessels, the importance of the port, especially of its upstream part, started to decline rapidly. Indeed, the upper docks were progressively restricted to a declining volume of general cargo, handled very largely by traditional methods, and, in many cases, eventually closed (Meyer, 1999). New container and bulk handling facilities were established at riverside wharves on the lower Thames and in particular at the Tilbury Dock (number 59 in Figure 7.18), 40 kilometers down the River Thames from London (Al Naib, 1990; Meyer, 1999). This dock, built in 1886 (Vernon-Harcourt, 1885), for more than a century and precisely until the opening of the fifth phase of the London Gateway port complex in the late 2013, had remained the most advanced and deepest dock of the Port of London (Interview 3.4; McCutcheon, 2013).

The closure of many former port areas in east and southeast London led to a vast waterfront revitalization programme (Meyer, 1999). Started in 1981 and steered by the London Docklands Development Corporation, namely a quasi-autonomous non-governmental organization set up by the UK government, this highly controversial (see, amongst others, Brownill, 1990; Falk, 1992; Barnes et al., 1996; Hinsley and Malone, 1996; and Butler, 2007) programme entailed the reconversion of more than 5,000 acres of land, now commonly known as London Docklands, into a new residential and office space.
Figure 7.18 – Map of the Port of London.

<table>
<thead>
<tr>
<th>Location</th>
<th>Terminal</th>
<th>Commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Smugglers Way</td>
<td>Waste</td>
</tr>
<tr>
<td>2</td>
<td>Pier Wharf</td>
<td>Sand and gravel</td>
</tr>
<tr>
<td>3</td>
<td>CEMEX Fulham</td>
<td>Aggregates</td>
</tr>
<tr>
<td>4</td>
<td>Cringle Dock</td>
<td>Waste</td>
</tr>
<tr>
<td>5</td>
<td>Cringle Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>6</td>
<td>Walbrook Wharf</td>
<td>Waste</td>
</tr>
<tr>
<td>7</td>
<td>Brewery Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>8</td>
<td>Victoria Deep Water</td>
<td>Aggregates</td>
</tr>
<tr>
<td>9</td>
<td>Angerstein Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>10</td>
<td>Murphy’s Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>11</td>
<td>Riverside Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>12</td>
<td>Northumberland W.</td>
<td>Waste</td>
</tr>
<tr>
<td>13</td>
<td>Thames Wharf</td>
<td>Recycled materials</td>
</tr>
<tr>
<td>14</td>
<td>Dock Entrance W.</td>
<td>Aggregates</td>
</tr>
<tr>
<td>15</td>
<td>Thames Refinery</td>
<td>Raw Sugar and edible oils</td>
</tr>
<tr>
<td>16</td>
<td>Alexanders Wharf</td>
<td>Scrap metal</td>
</tr>
<tr>
<td>17</td>
<td>Pinns Wharf</td>
<td>Scrap metal</td>
</tr>
<tr>
<td>18</td>
<td>Kierbeck Wharf</td>
<td>Steel reinforcement</td>
</tr>
<tr>
<td>19</td>
<td>Rippleway Wharf</td>
<td>Timber products and general cargoes</td>
</tr>
<tr>
<td>20</td>
<td>Docklands Wharf</td>
<td>Bulk cargoes</td>
</tr>
<tr>
<td>21</td>
<td>CEMEX Dagenham</td>
<td>Aggregates</td>
</tr>
<tr>
<td>22</td>
<td>Stothaven Dagenham</td>
<td>Petroleum, chemicals and agricultural products</td>
</tr>
<tr>
<td>23</td>
<td>No.1 Western Extension</td>
<td>Bulk cargoes - aggregates, salt and coal</td>
</tr>
<tr>
<td>24</td>
<td>Van Dalen UK</td>
<td>Metal recycling and dry bulk</td>
</tr>
<tr>
<td>25</td>
<td>Hanson Aggregates</td>
<td>Marine aggregates</td>
</tr>
<tr>
<td>26</td>
<td>Ford Motor Company</td>
<td>Motor vehicles</td>
</tr>
<tr>
<td>27</td>
<td>Belvedere EPW</td>
<td>Waste</td>
</tr>
<tr>
<td>28</td>
<td>Pioneer Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>29</td>
<td>ADM Erith</td>
<td>Oilseed and vegetable oils</td>
</tr>
<tr>
<td>30</td>
<td>Conway Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>31</td>
<td>European Metal Rec.</td>
<td>Scrap metal</td>
</tr>
<tr>
<td>32</td>
<td>Esso Petroleum</td>
<td>Petroleum products</td>
</tr>
<tr>
<td>33</td>
<td>C RO Ports London</td>
<td>Motor vehicles, containers</td>
</tr>
<tr>
<td>34</td>
<td>Jurgens Jetty</td>
<td>Edible oils</td>
</tr>
<tr>
<td>35</td>
<td>Civil &amp; Marine Jetty</td>
<td>Granulated slag and marine aggregates</td>
</tr>
<tr>
<td>36</td>
<td>Purfleet Aggregates</td>
<td>Marine aggregates</td>
</tr>
<tr>
<td>37</td>
<td>Littlebrook Power Station</td>
<td>Residual fuel oil, gas oil and demineralized water</td>
</tr>
<tr>
<td>38</td>
<td>Thurrock Marine</td>
<td>Bulk cement and aggregates</td>
</tr>
<tr>
<td>39</td>
<td>Vopak Terminal London</td>
<td>Petroleum and chemical products</td>
</tr>
<tr>
<td>40</td>
<td>C RO Ports Dartford</td>
<td>Motor vehicles, containers</td>
</tr>
<tr>
<td>41</td>
<td>Johnson’s Wharf</td>
<td>Marine aggregates</td>
</tr>
<tr>
<td>42</td>
<td>West Thurrock Jetty</td>
<td>Bulk powders</td>
</tr>
<tr>
<td>43</td>
<td>Nustar</td>
<td>Hydrocarbons</td>
</tr>
<tr>
<td>44</td>
<td>Northfleet Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>45</td>
<td>Seacon Terminals</td>
<td>Steel and forest products</td>
</tr>
<tr>
<td>46</td>
<td>Robins Wharf</td>
<td>Coal, petroleum coke</td>
</tr>
<tr>
<td>47</td>
<td>Brett Aggregates</td>
<td>Sea-dredged aggregates</td>
</tr>
<tr>
<td>48</td>
<td>42 Wharf</td>
<td>Bulk cement, bulk powders</td>
</tr>
<tr>
<td>49</td>
<td>Northfleet Terminal</td>
<td>Wood pulp</td>
</tr>
<tr>
<td>50</td>
<td>Red Lion Wharf</td>
<td>Aggregates</td>
</tr>
<tr>
<td>51</td>
<td>Imperial Wharf</td>
<td>Bitumen and general cargo</td>
</tr>
<tr>
<td>52</td>
<td>Tilbury Power Station</td>
<td>Biomass</td>
</tr>
<tr>
<td>53</td>
<td>Clubb’s Marine</td>
<td>Sea-dredged aggregates</td>
</tr>
<tr>
<td>54</td>
<td>North Sea Terminal</td>
<td>Sea-dredged aggregates</td>
</tr>
<tr>
<td>55</td>
<td>London Gateway</td>
<td>Containers</td>
</tr>
<tr>
<td>56</td>
<td>Thames Oil Port</td>
<td>Aviation products</td>
</tr>
<tr>
<td>57</td>
<td>Oikos Storage</td>
<td>Petroleum products, aviation fuels, chemicals</td>
</tr>
<tr>
<td>58</td>
<td>Calor Gas Terminal</td>
<td>LPG</td>
</tr>
<tr>
<td>59</td>
<td>Port of Tilbury</td>
<td>Dry/liquid bulk; Vehicles; Other general cargo</td>
</tr>
</tbody>
</table>

Source: (Adapted from) PLA (2014)
The London Gateway port complex

In February 2010, construction works started on the London Gateway. This new port complex, which is not yet fully operational, is located on the north bank of the River Thames, in Thurrock, about 48 kilometers east of central London (number 55 in Figure 7.18). This large-scale infrastructure programme implies the conversion and regeneration of the Shell Haven area, a 600-hectare brownfield site which had been used for more than a century for oil refining activities (Ciria, 2013; DAFZ, 2014). In particular, this programme comprises (see PLA, 2014, 2015b and 2016):

- a new deep-sea, highly automated container port with six berths along 2,700 meters of quay, partially built on reclaimed land. The port, having a fully developed capacity of 3.5 million TEUs a year, represents the first entirely new major port to be built in Europe in the last 25 years (PortVision, 2013);
- an 83-hectare logistics park, namely the largest logistics centre in Europe, for warehousing, distribution packaging, processing and other activities related to the management of goods; and
- the UK’s largest port rail terminal as a large share of containers are expected to travel to and from the port by rail.

The development initiative, illustrated in figure 7.19, also encompasses the upgrade of some major road and rail links in the area and some dredging works in the Thames, necessary to enable even the largest containerships to call on the port20 (Interviews 3.1, 3.2 & 3.10).

Figure 7.19: Generated rendering of the planned London Gateway port complex.


20 Laing O’Rourke Infrastructure Limited and the Belgian specialist Dredging International NV (DEME Group) is responsible for dredging, land reclamation and construction of the port, under a joint venture contract valued at £400m. The logistics park was set to be built under a separate construction contract. Balfour Beatty Civil Engineering was awarded a multi-million pound contract to build the rail terminal (Gaston, 2013).
The arrival of a 5,000 TEUs containership in early November 2013 marked the official opening of the first berth (PLA, 2014). In 2014, the second deep-water berth was opened (PLA, 2015b). Work has also progressed on the berth 3 and on the logistics park, which opened for business in mid-2015 (PLA, 2015b and 2016).

The programme, which has been described by the former Prime Minister David Cameron as ‘an emblem of ambition’ (PLA, 2014), is privately funded. The port complex is owned by DP World, one of the largest marine terminal operators in the world. The company operates a number of ports and terminal facilities across differently countries, including container terminals at the Port of Rotterdam (see Section 7.3) and at the Port of Southampton (see Table 7.10). Until 2012, it was also the owner of the container terminal at the Port of Tilbury. Over a 10-15 year development period, DP World is planning to invest in the site about £1.5 billion, that is one of the largest ever inward investments into the UK (Interviews 3.4 & 3.5).

The London Gateway port complex potentially represents, it is contended, an opportunity to enhance the position of the Port of London in the deep-sea container trade, assigning it again a primary role, more commensurate with London's status as a global city (Interview 3.10; Wainwright, 2015). Overall, this new port complex is expected to create several thousands of direct and indirect jobs. Hence, by providing employment opportunities and offering a chance to decontaminate a large brownfield site, transforming it into an asset, the London Gateway port complex is also set to play an important role in regeneration of the surrounding region, namely the Thames Gateway Region (DCLG, 2007a and 2007b; DAFZ, 2014).

The Thames Gateway Region

The Thames Gateway is a geographical region in the South-East of England, which extends for 60 kilometers eastwards from London Docklands to the coast, along both sides of the River Thames (see Figure 7.20). The Thames Gateway, whose spatial extent was defined in the 1995 by the Thames Gateway Planning Framework (DoE, 1995), covers approximately 100,000 hectares and encompasses a population of about 3 million (Census, 2012; TGKP, 2011; ORS, 2013). The area crosses three former government regions, namely London, the East of England and the South East of England, and spans 16 local authorities, including several London boroughs. It thus includes a wide variety of localities and assets ranging from major development sites such as Canary Wharf, to strategic infrastructure and areas of environmental value, such as Rainham Marshes and the seaside resort of Southend. However, the Thames Gateway Region also comprises some of the poorest areas of UK and London boroughs, characterized by considerable industrial dereliction, intense environmental degradation and social deprivation (Interviews 3.1 & 3.5; Lucas and Chambers, 1996). In 2007, the National Audit Office pointed out that communities living in the area were suffering from poor skill levels and the overall employment was lower than surrounding regions (NAO, 2007). Housing affordability was

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21 The container terminal at the Port of Tilbury was sold in 2012 to the Scottish ports operator Forth Ports for £95 million (Osborne, 2012).

22 Between 1998 and 2010, Nine English Regions were responsible for physical planning policy through Regional Spatial Strategies. In 2010, they were formally abolished, even though they continue to be used for statistical and some administrative purposes.
also considered to be poor compared to national levels (DCLG, 2006a). In addition, the area was reported to suffer from a high crime rate and high incidence of poor health (GLA, 2004a).

Figure 7.20 – The Thames Gateway Area.

Having recognized the importance of promoting the regeneration of the Thames Gateway area, in early 2000s the UK government announced a £9 billion programme of investment. This ambitious programme, representing one of the largest regeneration project in Europe (Interview 3.5; ODPM 2004), was aimed at delivering all the social and economic infrastructure necessary to provide 225,000 new jobs and accommodating around 350,000 extra residents by 2016 (DCLG, 2007a).

Considerable investments had already been made in the region. Previous waves of investments, focusing mainly on its western part, has encompassed the already mentioned regeneration of London Docklands, the construction of the London City Airport and the Channel Tunnel Rail Link, the hosting of the Olympic and Paralympic Games in 2012 and the redevelopment of Stratford, as well as investments on many other economic assets (DCLG, 2006b). However, to date, investments and development in the other

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23 Notwithstanding the current interest in the Thames Gateway, the planning and development of the area has a long history. According to Church and Frost (1995), the first government recognition of the problem was in 1967, when the South East Economic Planning Council identified the area as in particular need for planning intervention (SEEPC, 1967). Since then a number of planning documents, consultants’ reports and papers had been published. All these studies recognized the great development potential of the area, which was initially branded by Government as the ‘East Thames Corridor’ (Church and Frost, 1995). However, only in 1995, with the publication of the previously mentioned Thames Gateway Planning Framework (DoE, 1995), the area, renamed as the ‘Thames Gateway’, was properly identified as a priority area for development (NAO, 2007).
areas of the Thames Gateway have not fully met the expectations (Interviews 3.5 & 3.8). The programme has been delayed by lack of funding as the result of the current world recession, but also, it is contended (see UTF, 2005; NAO, 2007; and Catney et al., 2008), on the account of a highly fragmented institutional context (see Figure 7.21), which makes it difficult to achieve a unitary vision for the region (Interviews 3.1, 3.5 & 3.8).

**Figure 7.21 – Actors and groups involved in the regeneration of the Thames Gateway Region in the course of time.**

Source: (Adapted from) Brownill and Carpenter (2007) and Catney et al. (2008).
Indeed, while the redevelopment of London Dockland has involved the presence of a single agency (i.e. the London Docklands Development Corporation) and the adoption of a traditional top-down management style, the Thames Gateway has been characterized by a totally different approach (Interviews 3.1 & 3.5). Indeed, over the past decades the regeneration of this region has involved to various extents a number of different government departments, non-departmental public bodies, regional government offices, regional development agencies, local authorities, urban development corporations, several partnerships based on forms of public-private collaboration as well as a myriad of other bodies, at national, regional and local level, representing both the public and private sectors (Brownill and Carpenter, 2007 and 2009; Allmendinger and Haughton, 2009). The following comment describes this situation well:

“Definitely one of the most critical aspects of the Thames Gateway is that this region has too many agencies, whose functions partially overlap but whose agendas are very different” (Interviews 3.5).

7.4.4 The planning and decision-making process of the London Gateway Port complex

Origin of the project

Differently from the Alameda Corridor and Maasvlakte 2, and despite its potential relevance for the city of London and the Thames Gateway Region, not much has been written on the London Gateway port complex. However, from the interviews undertaken, it clearly emerged that, analogous to the other two case studies, the fundamental driver for this project is represented by the general optimism about future container traffic, pervading both government and experts between the late 1990s and the early 2000s (Interviews 3.2, 3.3, 3.4, 3.6, 3.7, 3.8). In those years, the booming import trade to Britain, particularly from Asia, had resulted in alarmism concerning possible imminent capacity deficits affecting especially the main container ports of the Southeast coast (see DTLR, 2001; Asteris and Collins, 2007). As one interviewee stated:

“The fundamental driver for the project was the perception (pre economic crisis) that the UK was rapidly running out of deep-water container port capacity, given the predicted growth of the container traffics (which, eventually, as a result of the crisis, did not of course take place)” (Interview 3.7).

Fast-rising container volumes and increasingly larger ships had also generated, in the UK, a strong competition between terminal operators to promote major port development projects in an effort to enhance total handling capacity (Wilmsmeier and Monios, 2013), and increase the depth of the navigational channels and crane size (Monios, 2017). In this struggle for gaining competitive advantages over their rivals, port operators even started to legally challenge each other’s proposal at the public inquiries (Interviews 3.2 & 3.4).

“[…] Everybody knew that in all probability there would be room for just one big port expansion. So it was imperative to get government approval as soon as possible” (Interview 3.2).
Amongst the UK port expansion schemes put forward at the beginning of the new millennium, the major ones were presented by the Port of Southampton and the Port of Felixstowe, which also at that time constituted the main UK container ports (Interviews 3.2 & 3.4). In particular, DP World submitted a planning application for a new container terminal at the Port of Southampton with an annual capacity of 2.3 million TEUs, while Hutchison Port Holdings, the owner of the Port of Felixstowe, made an application for an expansion plan of 1.5m TEUs. Southampton’s proposal was rejected in 2004 after a lengthy and costly planning and inquiry process lasting almost three years. The decision was due to the fact that the project would have significantly and negatively affected the integrity of some environmentally sensitive areas. By comparison, the expansion of container capacity at Felixstowe was approved in 2006 after a planning process commenced in 2004 (Monios, 2017).

In the same period a proposal for an entirely new container terminal and logistics park located on the north bank of the River Thames and to the east of London, namely the London Gateway port complex was put forward by the Peninsular and Oriental Steam Navigation Company (P&O), an important British shipping and logistics company, which, however, could be considered relatively inexperienced in the development of major infrastructure projects. The marketing position of P&O was that, although requiring longer sailing times than the Ports of Felixstowe and Southampton, this new port complex would be best place to serve London, that is the UK’s largest consumption market. The London Gateway represented thus also an attempt to ‘rationalize’ logistic flows and potentially take hundreds of trucks (coming from Felixstowe or Southampton) off Britain’s roads (Interviews 3.2 & 3.4). Moreover, on account of its inland location, the port would be able to operate also with adverse weather conditions, differently from terminals located along the coast such as Felixstowe and Southampton (Interviews 3.2 & 3.4).

In the original plans of P&O, the container port and the logistics park forming the London Gateway port complex were assumed to be two clearly distinct and independent projects, managed by two different teams. Initially the container port was assigned to the P&O’s Port Division, whereas the Logistics and Property Division of the company took responsibility for the logistics park (Interview 3.2). However, due to the strong interdependence between the two projects as well as communication problems and conflicts between the two teams, it became evident quite soon that this management structure was totally inadequate to deliver these projects. Hence, it was successively decided to appoint one person to provide leadership and coordination for the whole initiative (Interview 3.2). Overall a number of people were employed to explore and address a large variety of interdependent issues related to engineering design (e.g. definition of the layout of the port complex, determination of the amount of space required for the different activities, selection of cranes other port equipment); construction works (e.g. decontamination of the Shell Haven site, dredging); funding source (e.g. project cost estimate, identification of possible funding sources); planning permits (e.g. acknowledgment of all the guidelines, directives and laws which the London Gateway port

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24 According to Asteris and Collins (2007), form a commercial point of view, amongst the various container port expansion proposals, this represented the best option on account of its optimal location, (i.e. differently from other ports, the Port of Southampton does not require the deep-sea containerships to significantly diverge from the main trade routes) and the rather short construction period required for its construction (i.e. the new container berths in the Port of Southampton could have been made operational by the end of 2006).
complex would have to comply with); transport and logistics (e.g. investigation of trends and uncertainties in the global supply chain, supply and demand analysis); potential customers (e.g. preliminary negotiations with major shipping lines and logistics operators in an effort to secure clients for both the port and the logistics park); and other potential port stakeholders (e.g. initial examination of the concerns of the local communities, environmental agencies and all the other regional and local agencies and planning authorities affected by the initiative). As one interviewee said:

_There were too many issues to address, too many conditions to comply with, too many actors and groups, who were imposing further constraints […] and too many unknown aspects […] P&O was constantly facing new issues and problems_” (Interview 3.2).

The official planning application for this large-scale infrastructure programme was made in 2002 (Interview 3.6). Three different forms of approval were necessary (Greenwood and Newman, 2010). P&O applied to the Department for Transport for a Harbour Empowerment Order to establish a new port authority and construct a deep-sea container port on the north bank of the Thames estuary. This application was accompanied by a request to the Secretary of State for Transport, Environment and the Regions to grant planning permission for railway facilities under the Transport and Work Act. Finally, an Outline Planning Application approval for the logistics park was also made by P&O to the Thurrock Council (DfT, 2003b, sect. 1).

These applications were accompanied by master plan documents, various technical reports and Environmental Statements regarding both the single components of the programme and the three proposals together. Information regarding the environmental impacts of the projects, estimates for employment generation and evidence provided by P&O were ultimately included in an appraisal summary table developed following the NATA/WebTAG standards and guidelines (DfT, 2003b, sect. 1). From the interviews undertaken, it appears that neither the whole infrastructure programme nor its single components was assessed through CBA (Interview 3.2).

**The London Gateway public inquiry**

Given the close interrelationship between the three departmental decisions, central government decided that they would be taken in conjunction at a public inquiry (Interview 3.6). The inquiry, conducted by an independent Planning Inspector reporting to central government, ran between February and September 2003 (Greenwood and Newman, 2010). A number of different stakeholder groups were present at the London Gateway inquiry. The involved parties included: Thurrock and Essex County Councils; English Nature (the current Natural England25) and the Environmental Agency; local protest groups such as Shell Haven Project Environmental Action Committee (SPEAC); the Strategic Rail Authority, the Highways Agency, the Port of London Authority, the National Farmers Union, the Royal Society for the Protection of Birds (RSPB); and the owner of the

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25 Natural England ceased to exist in October 2006. The Agency was integrated with parts of both the Rural Development Service and the Countryside Agency from 1 October 2006, to form a new body called Natural England.
rival Port of Felixstowe, that is Hutchison Port Holdings (DfT, 2003b and 2003c). As emerged from the interviews, many regional and local bodies having a prominent role in the regeneration of Thames Gateway Region, such as the East of England Development Agency, Thurrock Urban Development Corporation, played a relatively minimal role in the official decision-making process (Interview 3.6; Greenwood and Newman, 2010). In particular, the Greater London Authority and the London Development Agency chose not to be involved in the public inquiry (Interview 3.10). However, many of these agencies and groups exerted influence over the project's objectives and outcomes, outside the inquiry arena (Interview 3.2). The London Gateway inquiry thus captured only a small part of the stakeholders’ concerns and interactions surrounding the project.

The public inquiry provided the forum for considerations about the need for the programme and its impacts, especially on the socio-economic and environmental spheres. In general, as illustrated in Table 7.12, several aspects discussed at the inquiry were somehow captured by the NATA/WebTAG appraisal summary table. However, the findings from the interviews led to the conclusion that the framework proposed by the Department for Transport did not feature prominently in the debate (Interviews 3.2, 3.3 & 3.7). In effect, the NATA/WebTAG appraisal summary table is barely mentioned in the Public Inquiry Report (see DfT, 2003b and 2003c).

At the inquiry, P&O presented evidence regarding the perceived clear need for a new deep-sea container port. Based on the correlation between data concerning UK port throughput and UK GDP between 1990 and 2001, the project promoter forecasted that shipping demand would grow by between 3.9% and 4.4% per annum over the period to 2020. These estimates led to the conclusion that, without immediate actions, demand would be expected to exceed capacity by 2009 (Interview 3.2). According to P&O, to avoid this risk, resulting in a loss of competitiveness of UK container port sector and more in general of the whole national economy, the provision of additional port capacity for at least 3.3 million TEUs a year was necessary (DfT, 2003c, sect. 4). The London Gateway port complex, with a capacity of approximately 3.5 million TEUs a year, was thus presented as a project capable of meeting this future demand. These forecasts, however, were judged to be too optimistic by SPEAC, which argued that it would have been irresponsible not to consider the possible consequences of a downside economic scenario for both the London Gateway port complex and, more in general, for the whole Thames Gateway Region (DfT, 2003c, sect. 4). By comparison, Hutchison Port Holdings made a criticism of a completely opposite nature. They argued that the expected throughput of 3.5 million TEUs a year could not be achieved at the London Gateway so that it was wrong to claim that this port alone could solve the UK container port capacity shortfall (DfT, 2003b, sect. 4).

The project promoters also argued that, the Shell Haven site was the optimal location to meet the requirements of the shipping industry (DfT, 2003c, sect. 11), although from the interviews it transpired that a comprehensive assessment of possible alternatives sites was not carried out (Interviews 3.2, 3.3 & 3.7). Whereas this aspect was not challenged in any real depth at the inquiry, several parties, amongst whom the National Farmers Union and RSPB, considered that there was a need for the Government to take an overview of the various proposals being brought forward at the start of the millennium (DfT, 2003c, sect. 11). On the contrary, during the public inquiry, the Inspector did not seek to compare the proposed location for the London Gateway port complex with other possible
sites along the UK coast. He also did not attempt to confront the proposed new port complex with other port proposals promoted across the UK in those years (by, for instance, examining and comparing the appraisal summary tables developed for the other port project proposals).

Table 7.12 – Aspect discussed at the London Gateway public inquiry.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>DfT’s Appraisal framework for ports</th>
<th>Public inquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>To minimize nuisance to people working in, using and living in the vicinity of the ports caused by noise and dust</td>
<td>Discussions over noise, vibration &amp; air quality</td>
</tr>
<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirements of the Habitat Directive</td>
<td>Extensive discussions</td>
</tr>
<tr>
<td></td>
<td>To minimize adverse effects on local air quality and greenhouse gases leading to climate change</td>
<td>Extensive discussions</td>
</tr>
<tr>
<td></td>
<td>To protect the character of the landscape and townscape</td>
<td>Limited discussions</td>
</tr>
<tr>
<td></td>
<td>To protect the heritage of historic resources</td>
<td>Some discussions with reference mainly to fishery and tourism</td>
</tr>
<tr>
<td></td>
<td>To protect the water environment</td>
<td>Extensive discussions</td>
</tr>
<tr>
<td>Safety</td>
<td>To implement the Port Marine Safety Code</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To improve the health and safety records in ports</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To minimize risks to population surrounding ports</td>
<td>Discussions over risks related to floods, traffic, air pollutions</td>
</tr>
<tr>
<td></td>
<td>To improve physical security</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To minimize accidents on the surface access system</td>
<td>No discussions</td>
</tr>
<tr>
<td>Economy</td>
<td>To provide benefits (reduced costs, shorter in-transit times) to all users of the port and surface transport system</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To obtain benefits for the local and regional economy, from the wider economic impacts associated with water transport</td>
<td>Discussions over employment and socio-economic effects</td>
</tr>
<tr>
<td>Accessibility</td>
<td>To improve accessibility to ports by non-road modes</td>
<td>Discussions over rail mode share of inland freight transport</td>
</tr>
<tr>
<td></td>
<td>To improve access for disabled users of port facilities</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To maintain the option of access to water transport</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To minimize the severance effects on local trips</td>
<td>Discussions over possible impacts on local and strategic road network</td>
</tr>
<tr>
<td>Integration</td>
<td>To integrate with spatial, economic, transport, environmental protection and regeneration strategies</td>
<td>Extensive discussions the relationship between the project and the Thames Gateway Region</td>
</tr>
<tr>
<td></td>
<td>To integrate with other element of government policy</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To improve the facilities for transport interchange at ports</td>
<td>No discussions</td>
</tr>
<tr>
<td>Further considerations</td>
<td>For scheme that receive public money or are promoted by the public sector, ensure that a scheme would be commercially viable</td>
<td>Non applicable</td>
</tr>
<tr>
<td></td>
<td>Effects on competition between ports</td>
<td>No discussions</td>
</tr>
<tr>
<td></td>
<td>To ensure associated developments are delivered on time</td>
<td>No discussions</td>
</tr>
</tbody>
</table>

P&O sought also to emphasize the ‘perfect’ alignment between the London Gateway port complex and the policy objective of bringing economic development and regeneration to the Thames Gateway Region (Interview 3.2; DfT, 2003c, sect. 3). Indeed, an analysis of the planning and policy context of the area reveals that there is a vast array of national, regional, sub-regional and local strategy documents, which can be regarded as clearly supportive of the London Gateway Port. At the regional level, for instance, both the London Plan 2004 (GLA, 2004b:110) and the London Plan 2008 (GLA, 2008:133) highlight the Mayor’s strong support for proposals which increase port capacity in east London. The Thames Gateway Delivery Plan (DCLG, 2007a:6) identifies the new port complex as one of four ‘economic transformers’ having a strategic importance for the regeneration of the Thames Gateway Region, with the other three sites being at Canary Wharf, Ebbsfleet and Stratford. It also emphasizes the potential positive effects of the project on the national competitiveness, employment and also on the environment (DCLG, 2007a:26). Analogue considerations can be found in the other documents produced by the Department for Communities and Local Government’s (see, for instance, DCLG, 2006b and DCLG, 2007b), and also in the Thames Gateway Economic Development Investment Plan (LDA, SEEDA and EEDA, 2008:36) and in the Regional Spatial Strategy for the East of England (EERA, 2008:87). At the local level, rather similarly, the Thurrock Economic Development Strategy (TTGDC, 2007:2), the Thurrock Transport Strategy (TC, 2013:2) and the Thurrock Economic Growth Strategy (TC, 2016:11) indicate the London Gateway port complex as a key growth hub of the region. The Thurrock Community Strategy (TC, 2012:2) stresses that major development projects such as the London Gateway could provide Thurrock with a fantastic opportunity to secure greater economic prosperity for its communities and residents. Finally, the Economic Plan for Essex (ECC, 2014:18) also refers to the strategic significance of the port in terms of economic growth and well-being of communities.

On the other hand, as Greenwood and Newman (2010) note, whereas all these documents clearly highlight the relevance of the London Gateway development, they do little more than acknowledge the existence of the port complex. There is also an absence of any specific discussion of the project in strategy documents prior to the original planning applications made by P&O in 2002 (Interview 3.6; Greenwood and Newman, 2010). As some interviewees highlighted:

“This London Gateway port complex was never conceived as an integral economic driver of the region. It was just a transport and logistics project”
(Interview 3.8).

“[...] in reality, the port didn’t feature in the original strategic blueprint for the Thames Gateway Region and did not emerge as a result of the strategic planning for the area” (Interview 3.3).

“Only in a second moment the project was embraced as a key part of Thames Gateway regeneration programme through a process of post hoc rationalization”
(Interview 3.7).

With reference to employment opportunities, the applicants claimed that, over a period of about 15 years, the programme, besides of a significant number of construction
j "Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

jobs, would create about 14,500 direct jobs and support approximately 6,900 induced and indirect jobs in the region (Interview 3.2; DfT, 2003c, sect. 5). However, these figures were challenged by SPEAC on four different fronts. Firstly, local protest groups claimed that the need for job creation had been overplayed, as across Thurrock and South Essex there was not a significant unemployment problem (DfT, 2003c, sect. 5). Concerns were also expressed over the fact that many jobs, especially those potentially provided at the logistics park, would be of a casual nature and/or absolutely not commensurate with the aspirations of young people currently in education and seeking to raise their future prospects (Interview 3.9; DfT, 2003c, sect. 5). Similar arguments, in this respect, were made also by the Thurrock and Essex County Councils, whose main concern was to make sure that benefits of regeneration would accrue to residents of their authority’s area (DfT, 2003c, sect. 5). SPEAC also argued that, given the highly automated nature of both the container port and the logistics parks it would be impossible to create such a high number of jobs (Neale, 2007). Finally, it was also contended that the construction of a new container port and a large logistics park would almost certainly result in the closure of other port and logistics facilities across Thurrock, thus leading to loss or transfer of jobs rather than creation of new employment opportunities (Interview 3.9; DfT, 2003c, sect. 5).

The question of rail and road infrastructure was discussed in considerable detail at the public inquiry (Interview 3.2). The Strategic Rail Authority, although not expressing any preference for or against the London Gateway container port, sought to ensure that adequate provision of rail infrastructure would be made to guarantee an approximate 25-30% rail mode share of inland freight transport, namely a target in line with those achieved by the other major UK container ports such as Southampton and Felixstowe (Interview 3.4; DfT, 2003c, sect. 6B). Thurrock Council, Essex County Council, the Highways Agency and the local protest groups, on the other hand, were quite critical over the possible adverse impacts of the London Gateway on the local and strategic road network (Interviews 3.9 & 3.10). Road enhancements and mitigation measures proposed by P&O were not considered sufficient by these parties to accommodate the traffic potentially generated by the new port complex (DfT, 2003c, sect. 6A).

Environmental concerns also featured prominently at a public inquiry (Interview 3.2). According to SPEAC, the proposal, which, when fully operational, would be likely to add approximately 50,000 vehicles a day to the road network, would increase dramatically air pollution levels (Interview 3.9; DfT, 2003c, sect. 7). English Nature, by comparison, objected to the proposed development on account of its potential adverse effects on several valuable areas designated as protected sites under the EU Habitats and Birds Directives (Interviews 3.3 & 3.7; DfT, 2003c, sects. 10 and 11). Other issues discussed at the public inquiry concerned noise, vibration, flood defence, marine and coastal processes, sea quality and the possible consequences of the project for the fishing industry in the Thames Estuary (Interviews 3.3 & 3.7; DfT, 2003b and 2003c.).

Results of the public inquiry and successive events

The enquiry officially closed in early September 2003 and the Inspector reported to central government in 2004. The Inspector largely accepted the evidence provided by the promoters in terms of demand for the additional container handling capacity, scale of development and economic opportunities generated by the London Gateway port complex
(Interviews 3.2, 3.3 & 3.7). Specifically, the container traffic forecasts presented at the inquiry were judged to be rather conservative by the Planning Inspector, on account also of the fact that these studies turned out to be substantially in line with government expectations and other traffic analyses undertaken in that period (DfT, 2003b, sect. 4). While it was accepted that the proposed port complex was likely to significantly damage the environment, the need for the port terminal and its potential economic and social benefits were found to outweigh those adverse effects (Interviews 3.3 & 3.7). However, many parties, unhappy with the decision, contended that a thorough investigation to ensure that this was in fact the case had not really been undertaken by the Inspector (Interviews 3.3, 3.7 & 3.9), who appeared to have simply accepted the justifications put forward by the project promoter (Clutton and Tafur, 2012). The Inspector also concluded that with opportune mitigation and compliance with relevant legislation the proposal would have no unacceptable impacts on air quality standards (DfT, 2003b, sect. 7) and that, overall, the overall risk of disrupting fishing stocks was low (DfT, 2003b, sect. 10).

While agreeing with the development in outline, the Inspector recommended significant conditions to minimize the multifold impacts of the development (Interviews 3.2, 3.3, 3.7 & 3.9). The Secretary of State for Transport, in turn, concurred with the Inspector’s recommendation and in July 2005 issued a ‘minded to’ decision, indicating that the application was approved subject to a number of prerequisites being met. Key elements of the agreement included (see DfT, 2003b, sect. 15):

- investments for tens of millions of pounds to the enhance the road and highway network of the area (see Coxon, 2007);
- the provision of two habitat compensation sites (i.e. Stanford Wharf Nature Reserve, located directly west of the development and completed in 2010, and Site X, located across the Estuary in Kent and realized in 2015) and the relocation of existing wildlife to a number of suitable areas;
- a compensation scheme for operators within the fisheries industry to replace lost profits;
- small changes in the layout of the container ports and some adjustments in dredging and construction techniques; and
- the implementation of an integrated environmental surveillance programme to constantly monitor the impacts of works and the effectiveness of those mitigation measures.

P&O, on the other hand, considered these conditions, especially road improvements and environmental mitigations measures, as excessively strict (Interview 3.2). Moreover, notwithstanding the London Gateway port complex had just been through a planning inquiry and had (almost) obtained final approval, there were still many uncertainties threatening its effective realization as many of the issues discussed above had not been entirely addressed.

“The project still looked pretty scary […] there were still many uncertainties concerning costs, funds, future traffic and so forth” (Interview 3.2).

In 2006 P&O was acquired by DP World, which then continued to take the project forward. The decision of DP World might be regarded as a sort of reaction to the refusal of
Southampton’s expansion proposal and the contemporary approval of the one submitted by the rival port of Felixstowe (Interview 3.4). This event might also be regarded as a sort of window of opportunity for the port complex, with otherwise might have risked not to be realized (Interviews 3.2).

While with the change of ownership the proposal itself changed little, it proved more challenging to convince DP World to accept all these stringent conditions and mitigation measures (Interview 3.7), and further negotiations were necessary before final approval was given on 30th May 2007. Work on site was due to start in early 2009. However, in 2008, financial and economic downturns created considerable problems for DP World and its global expansion strategy and put the project at serious risk. Eventually a loan with the European Investment Bank had to be negotiated and secured to allow the scheme to go ahead (Gardiner, 2009). Construction works thus only started in 2010, after a preparatory phase of almost a decade.

7.5 Summary of findings

This chapter has presented an investigation into the planning and related decision-making of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex. Overall, what emerged from this comparative analysis, which is however subject to some intrinsic limitations (i.e. limited number of case studies and people interviewed), is that all these projects share some important aspects. These aspects, as highlighted below, appear also to reinforce the insights of the previous chapters.

7.5.1 Drivers for the projects

All the three projects were furthered by a general pro-growth political climate. These projects were deemed essential for supporting the future growth and competitiveness of their respective ports and their wider regional and national economies. The Alameda Corridor was championed by the San Pedro Bay ports as a critical project, which would allow them to remain the major cargo hub and gateway for the US. It was also seen by many parties as a strategic piece of infrastructure capable of providing an enormous boost to Southern California. The Maasvlakte 2, in turn, was portrayed by the Port of Rotterdam Authority as an essential measure for avoiding the risk of losing container market share to the other container ports within the Hamburg–Le Havre range. The City of Rotterdam and the national government at large also pushed for the port expansion on account of the fact that it could benefit the Dutch economy in terms of jobs and value added creation. Finally, the London Gateway port complex was fostered by a general alarmism over an imminent shortfall in UK deep-sea container port capacity and its strategic significance in terms of economic growth and employment has been highlighted by many planning and policy documents.

The three projects were justified by (largely arbitrary and excessively optimistic) assumptions of continuing and substantial economic growth. As already illustrated, in the early 1990s a growth of the San Pedro port complex at 3-5% per year over the period to 2020 was even seen as a conservative estimate. In those years, the Maasvlakte 2 was expected to fulfil the projected growth in deep-sea container activities associated with an
annual Netherlands GDP increase of +3.25% over the following decades. In the early 2000s, in the UK, there seemed to be a general consensus over the fact that the national deep-sea container port sector would continue to grow by between 3.9% and 4.4% per annum until 2020.

The projects were furthermore supported by rhetorical discourses concerning sustainable development. The Alameda Corridor was presented also as a measure to promote freight modal shift from road to rail, so as to reduce highway traffic congestion and air pollution. Moreover, it was eventually sold as a project capable of reducing social inequality by providing job opportunities for deprived local communities. The *Maasvlakte 2* was ultimately embedded in a large development programme including a series of measures aimed at improving the quality of the living environment. The London Gateway port complex was also meant to play an important role in the regeneration of the Thames Gateway Region, an area characterized by considerable industrial dereliction, intense environmental degradation and social deprivation.

Infrastructure interdependencies also appear to have contributed to create favorable conditions for embarking upon the constructions of these projects, particularly in the case of the Alameda Corridor and the *Maasvlakte 2*. Indeed, port expansion schemes undertaken in Los Angeles and Long Beach had spawned opportunities for the Alameda Corridor as, it was contended, more cargo could only be properly managed if goods could be transported efficiently to and from the ports. The Alameda Corridor, in turn, has also supported the Alameda Corridor-East project and the Orange County Gateway railroad grade separation project, both aiming at complementing the Alameda Corridor. The *Maasvlakte 2* was made possible also by the construction of the *Betuwe Route*, which had improved direct connections between the Port of Rotterdam and central Europe, thus creating the prerequisite for a port expansion. Lastly, the London Gateway port complex has spawned other rail and road construction projects, as it was envisaged that the correct functioning of the new port complex required improvements in road and rail links.

Innovative financing models and instruments (particularly in the case of the Alameda Corridor), engineering advancements (especially in the case of the *Maasvlakte 2*) and the increasingly great involvement of private sector in infrastructure and service provision (preeminently in the case of the London Gateway port complex) were also amongst the major factors boosting these mega project developments.

### 7.5.2 Project complexity

As highlighted in the previous section, all the three projects turned out to be complex infrastructure programmes consisting of different interdependent projects, which, although planned and constructed under a unique policy umbrella, in some cases, presented very different features.

The planning and decision-making procedures of the Alameda Corridor, the *Maasvlakte 2* and the London Gateway port complex also involved a large variety of different stakeholders. These different groups and actors presented major differences in interests and priorities, culminating in clashes over the framings of these projects (programmes) and contrasting assessments of their benefits and costs. For instance, in the case of the Alameda Corridor, the Ports of Los Angeles and Long Beach were
focusing on improving port hinterland connection capacity and efficiency. Regional agencies such as LACMTA and the Caltrans, by comparison, were mainly interested in easing traffic congestion. Local and regional governments, while in principle supporting the project, were particularly concerned with the wider economic impacts of the projects. Although welcoming the idea of having a more efficient transport system, railroads companies were also particularly keen to exploit to the maximum extent possible the advantages derived from the sale of the rights-of-way. Finally, the mid-corridor cities considered the Alameda corridor primarily as an economic development programme rather than a pure transport link. These cities were thus looking at it for possible economic salvation.

Preparatory works for the *Maasvlakte 2* entailed controversies especially between two major coalitions. On the one hand, the Port of Rotterdam Authority, private sector companies, local and national governments shared the idea (although to a different extent) that the economic advantages provided by a port expansion would outweigh the changes to the ecosystem. On the other hand, environmental groups, members of the local communities, the National Union of Fishers and the Union of Farmers supported the idea that the port expansion was unnecessary and particular detrimental to the environment. However, as already underlined, while sharing some overarching goals and opinions, also actors and groups belonging to this (anti-project) coalition presented different agendas.

Lastly, also the planning and decision-making process of the London Gateway port complex took place in a complex network of interdependent actors and organizations. P&O (and successively DP World) were promoting the project in the attempt to attract global shipping companies and logistics operators, thus obtaining competitive advantages over their rivals and generating profit. Although also embracing primarily the transport dimension of the project, the Strategic Rail Authority and the Highways Agency were mainly interested in understating the future impact of the port complex on the local road and rail networks. By comparison, the Thurrock and Essex County Councils considered the new port complex as an opportunity to secure greater economic prosperity for their communities. English Nature, the Environmental Agency, the Port of London Authority and RSPB were particularly concerned about the multifold impacts of the project on the environment. SPEC and other local protest groups seemed unwilling to accept any form of development in the area, while Hutchison Port Holdings, for obvious reasons of competition, also tried to challenge the project to the largest extent possible. Finally, as previously highlighted, also several local and regional development agencies and other parties operating in the Thames Gateway Region, although not directly involved in the official public inquiry procedure, tried to exert their influence over the project.

### 7.5.3 Conflict resolution

In all the cases examined, many conflicts of interests and contentious issues proved to be impossible to solve through democratic exchange of ideas and opinions. Especially the tension between economic concerns and socio-environmental interests reached an extreme state of polarization, which prevented the identification of common objectives. The final decisions to implement the projects were ultimately taken due to the strong power imbalance between the project coalitions and the opposing stakeholder groups.
The San Pedro Bay ports were able to make significant progress in the approval of the Alameda Corridor only by removing the representatives of the six corridor cities from the ACTA board and compensating these cities for their loss of power through funds and the promise of incorporating specific local economic development features in the project. In any case, as Erie (2004) points out, even if they had won the lawsuit, the corridor cities would have continued to be at a major disadvantage within the ACTA Board as they did not have, the staff, the technical expertise and the financial resources to deal as equals with the representatives of the rich cities of Los Angeles and Long Beach and the San Pedro Bay ports.

The *Maasvlakte* 2 represents a rather unique case. Indeed, as explained above, the planning and related decision-making process of this project was conceived from the outset as a broad participatory process, according to an ideal collaborative planning style. However, notwithstanding its experimental character, the process turned out to have a less open and more regulated character than was apparent at the start. The stakeholders involved in the process turned out to have limited influence on the final decision taken in 2008, which appeared to differ little from the proposal advanced by the Port of Rotterdam Authority in the 1990s. Environmental groups and other parties, which were opposing to the project, had only the possibility to marginally discuss compensation measures.

The London Gateway inquiry entailed debates over the need for the port complex and the balance between the economic benefits of the project, in terms of increased employment, growth and regeneration, and its potential negative implications for the environment and local communities. However, the economic growth agenda can be seen to have largely eclipsed any considerations of opening up the planning process to wider discussions of sustainability and any effort to identify mutual gains solutions. These discussions thus left the original positions of the different actors involved in the process substantially unaltered. At the end of the inquiry, both the Planning Inspector and the Secretary of State for Transport approved the project, thus largely accepting the evidence provided by the promoters, and only indicated a series of measures for mitigating its multifold impacts.

### 7.5.4 Discrepancies with the rational-comprehensive planning model

This analysis has also demonstrated once again that the rational-comprehensive planning paradigm, which pervades many academic papers and books and which, as highlighted in this chapter, can be found reflected also in many government guidelines (see in particular Figures 7.8, 7.14 and 7.16), clearly clashes with the reality of the planning and related decision-making process of major infrastructure projects. With reference to the original conception of the projects, for instance, as already pointed out, the Alameda Corridor seems to have emerged as a pencil sketch on a cocktail napkin (see Nobbe, 2014), rather than as the product of technical analyses and systematic investigations of the transport and logistics features of Southern California and its associated needs. The project was recognized and presented since the beginning as the ‘best’ and ‘only’ solution to the inefficiencies in the transport network of the region. Headed by the San Pedro Bay ports and supported also by politicians and other special interest groups, a major discourse-coalition was created around the urgency, salience of the project and its beneficial effects to the regional and national economy. This entailed the production of a range of rather
optimistic traffic forecasts, projecting massive port growth, several transport studies recommending the construction of the corridor, (seemingly) comprehensive appraisal exercises, emphasizing its potential benefits, and (apparently sophisticated) computer simulation models illustrating its ‘enormous’ profitability. Furthermore, a policy framework was retrospectively created to justify the project and allow the project to compete for funding from LACMTA, and intense lobbying strategies were undertaken to obtain the federal loan.

Similar considerations can also be made for the Maasvlakte 2, which was not really the result of a comprehensive primary problem analysis (i.e. the envisaged ‘need and purpose’ debate), but rather the product of ambitions of the Port of Rotterdam Authority, which had been striving since the 1970s to place its visions at the center of the political agenda. Notwithstanding other three alternative project options were proposed and discussed during the planning and decision-making process, the ongoing dominance of the Maasvlakte 2 over the others alternative proposals was apparent to almost anyone. As already indicated, then, in the attempt to make the project more publicly acceptable the port expansion was eventually embedded in a large programme presenting also environmental and social objectives. This nevertheless represented a reversal of the ideal decision-making hierarchy, according to which programmes always precede projects.

As indicated by several interviewees, the London Gateway port complex also represents another case of a post hoc rationalization. While the port complex was widely promoted as a critical piece of infrastructure for the Thames Gateway Region, the project did not emerge as a result of the strategic planning for the area. Due also to the Government’s hands-off approach to port infrastructure, the project was brought forward by P&O which, given the general optimism about future container traffic, conceived it as a very profitable investment project. The different planning and policy documents at various scales only retrospectively acknowledged the significance of the project, trying to frame it as a legitimate use for the Shell Haven site.

The case studies have also provided evidence of the fact that major projects emerge progressively through a rather chaotic, unstructured and at least partially undetermined process, where hardly any aspect, including even the project scope and the key stakeholders, can be entirely and precisely defined at the outset. The Alameda Corridor, for instance, was apparently an uncomplicated idea and originally was thought to cost only a few hundred million dollars. However, over the course of 15 years, the project evolved into a $2.4 billion dollar construction project, encompassing a number of smaller sub-projects and incorporating also economic development programmes for to the corridor communities. The governing structure of the project also changed significantly in the course of time as a response to long and complicated negotiations with the different stakeholders groups, unanticipated problems and considerable uncertainty, especially regarding to project funding. This case study also demonstrated the extreme fluidly of the stakeholder context, with groups and individuals that constantly came and went during the process due to merges, acquisitions, court decisions and government alternations.

The Maasvlakte 2 was opened 13 years later than originally planned, after very long and complicated negotiations and costly legal procedures. This case study, perhaps better than others, illustrates that decisions on large-scale infrastructure projects as well as on other major initiatives, normally present a highly fragmented character (i.e. multiple
decision arenas, multiple discussions, multiple policy games between a number of actors operating at different administrative levels). The analysis of the decision-making process of the Maasvlakte 2 also shows that decision-making processes are fluid and constantly changing. Indeed, the change in project scope (i.e. the inclusion of the expansion project in a broader programme comprising also 750 hectares of wildlife and recreational area) did affect the farmers, who originally were not considered as relevant stakeholders for the project and whose interests, in any case, were (erroneously) judged to be represented by environmental organizations. This also indirectly demonstrates how stakeholder engagement, although important, may be extremely problematic to realize effectively on the account of the great number of parties which potentially may be considered stakeholders for a project (as already pointed out, virtually, large-scale infrastructure projects affect the whole society) and the difficulties with properly mapping the interests of all the groups.

The planning and related decision-making of the London Gateway can be seen as a long exploratory phase, with a number of different actors engaging in a process of mutual influence and negotiation (within and outside the public inquiry arena), while searching for solutions, over arrays of rising, intertwined issues. Until the moment P&O was acquired by DP World there were still many uncertainties related to engineering design, construction works, funding sources, traffic figures and potential customers. Furthermore, even after the project received the green light, promoters were obliged to revise its strategies on account of the consequences of the economic and financial crisis of 2008.

7.5.5 Role of appraisal

In none of the cases investigated, appraisal seems to have played any decisive role in the final decision to implement the project. In particular, contrary to common assumptions, portraying CBA as ‘the king’ of appraisal, and NPV and BCR as the most crucial assessment criteria, CBA was used neither in the case of the Alameda Corridor nor for the London Gateway port complex. Moreover, while CBA was employed to support the planning and decision-making process of Maasvlakte 2, its outcomes were completely disregarded. Indeed, as previously illustrated, the values of NPV calculated under different conditions (i.e. three different scenarios and for each scenario two different situations concerning the noise levels in the port) turned out to be, in many cases, negative. Therefore, had the results of the analysis been really taken into account, the expansion of the Port of Rotterdam would not have received the green light.

Various forms of EIA procedures were also conducted for all the three projects. However, it is evident that these environmental studies were unable to significantly affect the type and scale of the proposals. In the case of the Alameda Corridor, the environmental impact study carried out in the early 1990s to comply with CEQA took ultimately the form of a comprehensive multi-criteria framework, accounting for a number of different objectives belonging to different dimensions. However, the alternative compared were essentially mere different engineering solutions of the same project, which had been already identified as the ‘best’ project since the 1980s and for which negotiations with the railroad companies over the purchase of the rights of way had been already commenced. The environmental impact study undertaken in accordance with NEPA appeared to be a mere compulsory step for applying for federal funding. It almost
replicated the previous CEQA study and it was issued in early 1996 when, nonetheless, the purchase of rights-of-way had been already completed and other pre-construction preparatory works were at an advanced stage. Furthermore, despite the large share of population potentially affected by the project, the environmental impact assessment procedures involved only a few hundreds of people, of whom only some of them were allowed to speak during the meetings. It should also be noted that, after the provision of funds and the promise of employment opportunities, the corridor cities agreed not to challenge explicitly the results of these analyses, thus raising even further doubts over the real usefulness of these procedures.

In Rotterdam, no major amendments were made to the Maasvlakte 2 as a result of the big thick 6,000-page EIA report and the SEA study. The SEA in particular was undertaken only at a very late stage of the planning and decision-making process, mainly to show compliance with the requirements imposed by the Dutch Supreme Administrative Court. Hence, contrary to the technocratic view of planning and appraisal, SEA was carried out long after the EIA study that ideally was supposed to inform.

Environmental studies conducted for the London Gateway port complex led to the establishment of a series of mitigation and compensation measures, which did not alter the nature of the proposal substantially. As already pointed out, there is no evidence that the NATA/WebTAG multi-criteria framework proposed by the Department for Transport had been really at the heart of the planning and decision-making process of this project. Surely, one of the reasons for the limited role played by appraisal methodologies in this process is represented by the absence of alternative project options to compare. Indeed, in sharp contrast with the ideal planning model, the London Gateway port complex was considered from the beginning the best and the only possible course of action.

7.5.6 Uncertainty

This chapter has also further demonstrated that, for large-scale projects, involving a long-term perspective, the possibility of foreseeing with any degree of precision their future implications and consequences is severely limited. As previously illustrated, by 2020 more than 100 trains were supposed to move along the Alameda Corridor daily. However, so far this infrastructure has remained largely underutilized and more than two-thirds of the daily container traffic volume of the Ports of Los Angeles and Long Beach is still managed by trucks. The line, whose debts currently amount to $4 billion, has thus turned out to be a much more expensive project than what originally sold. As Uranga (2016) points out, in a near future there may be also a risk that the money to pay higher debt loads could rob spending on anti-pollution or other community programmes. Therefore, while the ACTA was able to strategically manage local dissent in the short term, in the long run, if congestion and pollution will continue to grow and debts will keep to pile up, communities who accepted the project may be expected to protest again.

Although it is difficult to express any judgment on projects which still need to be completed, also the Maasvlakte 2 and the London Gateway do not seem to perform according to the original expectations. Indeed, since the opening of the new Maasvlakte, container traffic has not increased significantly in the Port of Rotterdam, which, almost paradoxically, appears also to be losing the race for container traffic to the Belgian port of Antwerp (DN, 2017).
On account of the largely unforeseen economic and financial crisis of 2008 leading to the fall in seaborne container traffic, so far, for the London Gateway port complex attracting business has resulted to be harder than expected. While, since the opening of the first berth, several shipping services have been welcomed to the port, no service from Asia, where the biggest containerships come from, has been secured yet (Wainwright, 2015; Interview 3.4). The logistic park seems also to be struggling, with some of the expected clients, above all Marks & Spencer and Uniserve, withdrawing their plan to invest on it (Landon, 2014; Monios, 2017). In general, in the UK, over the last decade, besides Felixstowe and London, major deep-water container port expansion schemes have been proposed at approved at Harwich26 (1.7 million TEUs), Teesport, (1.25 million TEUs), Liverpool (0.6 million TEUs) and Bristol27 (1.5 million TEUs) (Wilmsmeier and Monios, 2013). After the refusal to its expansion proposal, the Port of Southampton has advanced plans to expand the port complex within its existing footprint (Monios, 2017). The Port of London Tilbury has also recently announced an imminent expansion plan (ForthPort, 2016). Accordingly, also in consideration of China’s economic slowdown, the situation appears to have changed completely (see Figure 7.22) and now the danger may be represented by over-capacity rather than capacity constraints.

Figure 7.22 - Main container port expansion projects in the UK.

Table 7.13 below summarizes the main findings of this chapter with reference to the main themes investigated

26 Due to the recession this expansion proposal seems unlikely to be taken forward (Monios, 2017).

27 The Port of Bristol has recently applied for a ten-year extension to its permissions to build the container terminal as the current economic conditions are not considered particularly favorable to make such an investment (Bache, 2016).
### Main drivers for the projects

- All the three projects were furthered by a general pro-growth political climate. These projects, justified by arbitrary and excessively optimistic assumptions about economic growth and deep-sea container activities, were deemed essential for supporting the future growth and competitiveness of their respective ports and their wider regional and national economies.
- The projects were furthermore supported by rhetorical discourses concerning sustainable development. These projects were eventually sold as projects capable of reducing traffic congestion and air pollution, mitigating social inequalities by providing job opportunities for deprived local communities and playing an important role in the regeneration of the surrounding areas.
- Previous projects and infrastructure interdependencies also appear to have contributed to create favorable conditions for embarking upon the constructions of these projects, particularly in the case of the Alameda Corridor and the Maasvlakte 2.
- Innovative financing models and instruments (particularly in the case of the Alameda Corridor), engineering advancements (especially in the case of Maasvlakte 2) and the increasingly great involvement of private sector in infrastructure and service provision (preeminent in the case of the London Gateway) were also amongst the major factors boosting these mega project developments.

### Key features of the projects

This analysis has demonstrated that the key features of mega transport projects as identified in Chapter 3 (see Section 3.4) can also be found in the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex.

- All the three projects turned out to be complex infrastructure programmes consisting of different interdependent projects, which, although planned and constructed under a unique policy umbrella, in some cases, presented very different features (i.e., structural complexity). The planning and decision-making procedures of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex also involved a large variety of mutually interdependent actors and groups operating at different scale (i.e., organizational complexity).
- All these projects involved many conflicts of interests and in the following years are extremely likely to result in uneven distributions of the gains and losses over space and consequently amongst stakeholder groups, thus raising issues of social and territorial justice.
- The current performance of these projects (clearly differing from the expected ones) demonstrates that for large-scale projects, involving a long-term perspective, the possibility of foreseeing with any degree of precision their future implications and consequences is severely limited.

### Transparency and openness of the planning and decision-making processes

It is possible to argue that the planning and decision-making of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex assumed the features of proposal-oriented processes, where the preferred course of action had been identified at the beginning of the process.

In all the cases examined, many conflicts of interests and contentious issues proved to be impossible to solve through democratic exchange of ideas and opinions. Especially the tension between economic concerns and socio-environmental interests reached an extreme state of polarization, which prevented the identification of common objectives. The final decisions to implement the projects were ultimately taken due to the strong power imbalance between the project coalitions and the opposing stakeholder groups.

Even in the case of the Maasvlakte 2, whose planning and decision-making process was 2 was conceived from the outset as a broad participatory process, environmental groups and local communities turned out to have limited influence on the final decision.

### Structure of the decision-making processes

Totally in line with the findings of Chapter 6 (see Section 6.4), this analysis has emphasized that the planning and decision-making of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex have not followed a simple and neat path, from project conception to implementation. Rather, these projects have emerged progressively through a rather chaotic, unstructured, highly fragmented and largely undetermined process. Hardly any aspect could be entirely and precisely defined at the process outset, including the project scope and its key attributes, and the members of the stakeholder coalitions respectively supporting the projects or opposing to them.

### Impacts of ex-ante appraisal analyses on decision-making

This analysis has clearly shown that ex-ante appraisal (whether in the form of CBA, EcIA EIA, SEA or MCA) has not played any decisive role in the final decision to implement these projects. This thus further confirms the findings of Chapter 6 (see Section 6.5).

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Table 7.13 – Summary of the main findings of the case studies analysis.

<table>
<thead>
<tr>
<th>Main themes investigated</th>
<th>Research findings</th>
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<tbody>
<tr>
<td><strong>Main drivers for the projects</strong></td>
<td>Many trends identified in Chapter 3 (see Section 3.3) seem to have played an important role in the promotion and development of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex.</td>
</tr>
<tr>
<td><strong>Key features of the projects</strong></td>
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<tr>
<td><strong>Impacts of ex-ante appraisal analyses on decision-making</strong></td>
<td>This analysis has clearly shown that ex-ante appraisal (whether in the form of CBA, EcIA EIA, SEA or MCA) has not played any decisive role in the final decision to implement these projects. This thus further confirms the findings of Chapter 6 (see Section 6.5).</td>
</tr>
</tbody>
</table>
Chapter 8

A Practical Application of Participatory Multi-Criteria Analysis Methodologies:
Appraisal of the London Gateway Port Complex

In my view a participatory MCA exercise can hardly add anything to what can be obtained from full, open and transparent, non-prejudicial ‘traditional’ consultation processes.

(Anonymous quote from one of the people involved in this exercise, 2017)

8.1 Chapter overview

This chapter describes a practical application of participatory MCA methodologies. Specifically, a multi-actor multi-criteria appraisal exercise was carried out to assess the London Gateway port complex. As part of this process, several project stakeholders and experts were asked to develop their own multi-criteria framework to compare this development, which is currently under construction at the edge of the Thames Estuary, with a hypothetical ‘do-minimum’ alternative option, consisting in a better use of the existing port terminals and infrastructure along the Thames.

It needs to be made clear that the scope of this exercise was neither to arrive at a series of policy recommendations concerning the best course of action for the Port of London, nor to express any judgments on the UK government’s approach to port development. The process was also not ran with the view to arriving at a general multi-criteria appraisal framework for appraising port proposals, which could replace the already discussed NATA/WebTAG Appraisal Summary Table for ports. Rather this chapter has mainly an illustrative purpose. It integrates and complements the previous chapters and aims at further examining possible strengths and weaknesses of participatory MCA methodologies and further exploring possible (methodological and non-methodological) issues surrounding the practical applications of such techniques to the appraisal of major transport projects.

The rest of this chapter consists of five more sections. Section 8.2 illustrates the main characteristics of the participatory MCA method that was employed in this exercise. Section 8.3 concerns the specific application of the methodology to the appraisal of the two different project options proposed for the Port of London. The results of the appraisal
exercise are presented in Section 8.4. Section 8.5 critically discusses these outcomes. Finally, Section 8.6 concludes the chapter by summarizing the main findings and key lessons learned from this exercise.

8.2 Key features of the participatory MCA method employed

As illustrated in Chapter 5, participatory MCA exercises can be undertaken in many different manners. Critical choices, potentially having a dramatic impact on the final results of the process, need to be made with reference to:

- The role of the research team (i.e. an independent consultancy group or a team of analysts and specialist advisors representing the interests of a specific client);
- the type of group-decision making participants (i.e. stakeholders and/or experts; individual participants and/or representatives of organized groups);
- the selection of group-decision making participants (i.e. who amongst those groups and how many people overall should be actually involved in the process?);
- the number of participatory process carried out as part of the multi-criteria appraisal exercise (i.e. one single process or multiple participatory processes running in parallel);
- the specific participatory techniques employed to engage with participants (e.g. interviews, questionnaires, in-depth group discussions or so forth);
- the level of involvement of group-decision making participants (i.e. how many elements of the multi-criteria framework should participants be allowed to define?);
- the specific strategies adopted to incorporate the information provided by the group decision-making participants in the model (i.e. exclusion, filtration, sharing, aggregation and/or disaggregation strategies);
- the specific MCA technique employed to bring together the various elements of the framework and arrive at the final rankings (i.e. sophisticated or elementary methods, full aggregation or partial aggregation methods).

As already pointed out, in most of the literature reviewed, proponents of participatory MCA methods do not offer any justifications or valid explanations concerning their choices with reference to the above points. However, it is evident that the selection of a specific approach turns out to depend on some key factors. It is possible to argue that, amongst these factors, probably, the most important are represented by the nature of the problem under investigation, the purpose of the participatory exercise and the resource available to run the process (i.e. money, time and level of expertise).

This exercise, in particular, was undertaken with the view to avoiding, to the largest extent possible, the introduction of bias or deliberate conditioning influence during the process. Therefore, the researcher (i.e. the author of the present work) ran the process by trying to adopt an impartial perspective on the problem, that is without representing the interest of any stakeholder group\(^1\). In the effort to combine and integrate knowledge

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\(^1\) This approach was also facilitated by the fact that the author of the present work does not have any vested interested in the London Gateway port complex and he is not directly affected (either positively or negatively) by this infrastructure programme.
derived from social interest advocacy with knowledge based on technical expertise both project stakeholders and experts were involved in the process. Several parties, spanning a diverse range of interests and perspectives were approached and invited to take part in the process. Given the limited budget available, stakeholders and experts were involved in one single participatory process. Furthermore, the absence of expert facilitators and the practical impossibility of scheduling a general meeting (i.e. the people involved in the exercise have many business commitments, and live and work in different part of the UK) led to the employment of individual interviews to engage with group decision-making participants. It was also decided to allow ample scope for participation, thus directly involving stakeholders and experts in the identification of objectives, weights and scores. As a result of the practical impossibility of using sharing strategies (i.e. this approach explicitly required participants to be in the same room) and the intention of accounting as much as possible for participants’ preferences (thus avoiding exclusion and filtration strategies), the decision about which strategies to employ to handle the different points of view ultimately leaned prevalently towards a disaggregation approach. Finally, to minimize possible problems for participants with the framing and treatment of the different issues and to enhance the transparency of the process a simple weighted additive MCA technique was employed.

Essentially, the process adopted in this exercise encompassed the same key steps, typical of all the participatory MCA methodologies (see Figure 8.1):

- primary problem analysis;
- definition of the options to be appraised;
- identification, mapping and engagement of group decision-making participants;
- selection of the objectives (with input from group decision-making participants);
- ascription of weights to the objectives (with input from group decision-making participants);
- assignment of scores to reflect the performances of each alternative against the different objectives (with input from group decision-making participants);
- presentation and examination of the outcomes of the process as support for the (hypothetical) final decision.

More specifically, the process began with a primary problem analysis undertaken by the researcher in the attempt to investigate the nature and dynamics of the problem at hand, identify the key group decision-making participants (i.e. stakeholders and experts) to be involved in the participatory exercise, and to formulate a preliminary list of objectives. Successively, stakeholders and experts were asked to appraise two different project options, the London Gateway port complex and a ‘do-minimum’ option, by selecting their own objectives, ascribing their own set of weights and also assigning their own scores to the performances of the options against the different objective. Figure 8.2 illustrates the level of participant involvement adopted in this exercise (Type L). As it is possible to observe this represents almost a fully participatory exercise.
In accordance with a disaggregation strategy, the objectives, weights and scores of the different participants were kept separate. The outcomes of the process were represented by a series of tables displaying the performances of the project options according to the viewpoints of the various participants (i.e. single-actors views). The
various single-actor views thus obtained presented different value trees (i.e. number and types of objectives), different level of importance ascribed to the various objectives, and also different performance scores.

A multi-actor view was also produced adopting an aggregation approach. A global ranking was derived as the arithmetic mean of the single-actor views. Figure 8.3 shown the strategies adopted to determine the key elements of the multi-criteria framework and derive the project rankings, while dealing with the different participants’ viewpoints. As it is noticeable, the structure of the exercise resembles that of the Multi-Actor Multi-Criteria Analysis (see Figure 5.6 in Chapter 5).

Figure 8.3 – Approach adopted in this study to handle the participants’ viewpoint.

<table>
<thead>
<tr>
<th>Elements of the MCA framework</th>
<th>Stakeholder Non-Engagement</th>
<th>Stakeholder Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Framework</td>
<td>Exclusion</td>
<td>Filtration</td>
</tr>
<tr>
<td></td>
<td>Stakeholder Engagement</td>
<td>Sharing</td>
</tr>
<tr>
<td></td>
<td>Aggregation</td>
<td>Disaggregation</td>
</tr>
<tr>
<td>Inputs</td>
<td>Options</td>
<td>Options are identified directly by the analyst</td>
</tr>
<tr>
<td></td>
<td>Objectives/ Criteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scores</td>
<td></td>
</tr>
<tr>
<td>Possible Outputs (final ranking)</td>
<td>CASE I (Common Framework): single multi-actor view</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>CASE II (Discordant Framework): multiple single-actor views</td>
<td>–</td>
</tr>
</tbody>
</table>

8.3 Application of the method to the case study

8.3.1 Primary problem analysis and definition of the options to be appraised

The participatory MCA method described above was applied to a hypothetical (on-going) appraisal of the London Gateway. The analysis of this project, undertaken as part of the case study analysis, helped frame the exercise. As highlighted in Section 7.4, this new port complex was fostered by a general alarmism over imminent shortfall in the UK deep-sea container port capacity. According to the project promoters, the new port represents an opportunity to enhance the position of the Port of London in the container trade. It is also expected to create several thousands of direct and indirect jobs, thus playing an important role in the regeneration of Thames Gateway Region. On the other hand, English Nature, the Environmental Agency, Shell Haven Project Environmental Action Committee (SPEAC) and other local protest groups expressed many concerns regarding the possible environmental impacts of the project and potential disruption for local residents (e.g. growth of congestions, noise, pollutions, etc.). SPEAC also argued that the need for the project had been based on too optimistic forecasts concerning container throughput growth.
In line with the UK transport appraisal practice for ports (see Section 7.4.2), in this multi-actor multi-criteria exercise the assessment of the London Gateway port complex was undertaken with reference to a ‘do-minimum’ alternative, entailing only relatively small interventions, aimed at ensuring a better use of the existing infrastructure and port terminals along the Thames. The main characteristics of the two project options, which, for the purpose of the exercise, were considered mutually exclusive, are presented in Table 8.1.

Table 8.1 – Key features of the two alternative options to be appraised.

<table>
<thead>
<tr>
<th>LONDON GATEWAY PORT COMPLEX</th>
<th>‘DO-MINIMUM’ OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction of a new deep-sea container port with an annual capacity of 3.5 million TEUs, a logistics park and a port rail terminal. This proposal also encompasses the upgrade of some major road and rail links in the area and some dredging works along the Thames.</strong></td>
<td><strong>Small interventions, aimed at ensuring a better use of the existing infrastructure and port terminals, which currently make up the Port of London.</strong></td>
</tr>
<tr>
<td>Potential pros</td>
<td>Potential cons</td>
</tr>
<tr>
<td>Possible important contribution to the objective of regenerating the Thames Gateway Area.</td>
<td>There seem to be no strong links between the port complex and the Thames Gateway Area.</td>
</tr>
<tr>
<td>Possible important contribution to the objective of increasing the competitiveness of London and the UK.</td>
<td>There are too many port expansion projects in the UK. This may lead to port overcapacity in the country.</td>
</tr>
<tr>
<td>Need for job in the area may have been overestimated. The types of jobs provided may not be aligned with the needs of local communities. The proposal may also result in the closure of other port facilities across Thurrock</td>
<td>Given the current state of the economy, this options is likely to ensure enough port capacity in the short- to medium-term</td>
</tr>
<tr>
<td>Major mitigation measures and monitoring programmes have been undertaken</td>
<td>Possible loss of competitiveness of London and the UK port system and possible risk of capacity constraints if container traffic will grow again in future</td>
</tr>
<tr>
<td>The new port may take hundreds of trucks off Britain’s roads as, compared with the Ports of Felixstowe and Southampton, it is closer to London.</td>
<td>Less impacts on valuable natural areas, marine and coastal processes.</td>
</tr>
<tr>
<td>It may lead to more traffic and congestion in the area surrounding the port.</td>
<td>Possible greater environmental impact spread over other port developments</td>
</tr>
<tr>
<td>The option entails the conversion and regeneration of a former oil refinery.</td>
<td>Less impacts on the landscape</td>
</tr>
<tr>
<td>The port complex may have major impacts on the landscape</td>
<td>Great impacts elsewhere across a number of sites</td>
</tr>
</tbody>
</table>
It is important to further emphasize that the scope of this exercise was not to undertake a revision of the decision-making process of the London Gateway port complex, which was approved more than 10 years ago, with the view to suggesting an alternative project option. Rather its purpose was simply to test the applicability and effectiveness of participatory MCA techniques, while complying with the current UK planning and appraisal guidance.

The use of only two (pre-selected) options was also dictated by the need for limiting the complexity of the process and, at the same time, making it as realistic as possible, by avoiding the possible inclusion (by participants) of options handicapped by impracticalities.²

8.3.2 Identification, mapping and engagement of group decision-making participants

In Section 7.4 it has been illustrated that the Thames Gateway Region and the London Gateway Port complex entail a complex networks of different actors and organizations, operating at different administrative levels and representing both the public and private sectors. Therefore, including in the process or representing in the exercise all these different interests was deemed unrealistic. Noticeable efforts were however made to involve in the process a wide range of perspectives. On the basis of the analysis of key planning and policy documents and also on the availability of contact information the following people (all having a good knowledge of the problem under investigation) were approached and asked to take part in the participatory multi-criteria process:

- a former Government planning advisor, who had worked on the regeneration of Thames Gateway Region;
- a strategic planning manager working at the Greater London Authority (GLA);
- a member of the Thurrock Council;
- two former members of English Nature, who had been involved in the London Gateway public inquiry;
- a former member of P&O, who had been responsible for the planning of the London Gateway port complex;
- three members of the local communities, who lives in the areas surrounding the new port complex;
- a planner, who had been involved in regeneration of Thames Gateway Region;
- a transport and port expert, who had undertaken several research on the UK port system;
- an environmental expert with a good knowledge of the problem under investigation;
- an expert in economics and politics, who had carried out some studies on the Thames Gateway and the London Gateway port complex.

² While many proponents of participatory MCA methodologies tend to argue that one of key strengths of this methods is the ability to identify new options not otherwise on the table, allowing participants to identify entirely new options, without any preliminary assessment regarding their real feasibility, risks compromising the reliability and validity of the whole process (see Yearley, 2001)
However, not everybody accepted the invitation. The former member of P&O refused to participate in the exercise on account of the fact that he could not disclose confidential or privileged information. Both the former members of English Nature decided not to be involved in the process as they were quite skeptical on the nature and real usefulness of the exercise. One of them in particularly argued that, in all probability, a participatory MCA process would not add anything to what had already emerged from the London Gateway public inquiry (see opening quote at the beginning of this chapter). Scheduling constraints and pressures of work prevented the member of the Thurrock Council from taking part in the exercise. Finally, SPEAC has been closed down and it was not possible to involve any previous member of this committee in the process.

All the other people, who were guaranteed individual anonymity, accepted the invitation. Overall, as illustrated in Table 8.2, nine people (five project stakeholders and four experts) were involved in the participatory multi-criteria exercise. This number is substantially in line with those reported in many of the articles reviewed in Chapter 5. However, it is evident that this figure cannot be seen to represent a statistically valid sample of the all people involved or affected by the project.

Table 8.2 – Group decision-making participants involved in the process.

<table>
<thead>
<tr>
<th>Types</th>
<th>Groups</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Stakeholders</td>
<td>National government (former Government planning advisor)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Greater London Authority (strategic planning manager at GLA)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Local communities (people living in Thurrock, participating on an individual basis)</td>
<td>3</td>
</tr>
<tr>
<td>Experts</td>
<td>Planning experts</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Transport and port experts</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Environmental experts</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Economics and politics experts</td>
<td>1</td>
</tr>
</tbody>
</table>

As above explained, getting stakeholder in same room at the same time was not possible. Therefore, the nine participants were involved in the exercise on an individual basis, between March and June 2017. For six people it was possible to carry out the exercise through face-to-face interviews. Each interview lasted approximately 2 hours. The first part of each interview consisted in an introduction to the case study and the key principles of MCA so as to ensure that both the problem under investigation and the participatory exercise were clear to the interviewees. The second part of the interview entailed the identification of objectives, weights and scores. For the remaining three people, due to scheduling constraints and pressures of work the exercise was conducted through a series of phone and email interviews.
8.3.3 Selection of the objectives

In this multi-actor multi-criteria exercise, the nine participants were asked to assess the two project options, as previously identified by the researcher, against their own objectives and priorities. To assist stakeholders and experts in the appraisal exercise, a preliminary list of objectives was elaborated by the researcher based on an analysis of some key planning and policy documents at international, national, regional and local international levels. The regional and local planning and policy documents focused mainly on the London Gateway port complex and the Thames Gateway Regions, while the international and national documents concerned primarily themes such as economy, transport, ports, port-city relationship, environment and climate change, which were all deemed pertinent with the general purpose of the new port complex. The large majority of these documents, included in Table 8.3, have been already presented and discussed in the previous chapter (see Section 7.4).

Table 8.3 – Planning and policy documents examined to identify a primary list of objectives.

<table>
<thead>
<tr>
<th>International Level</th>
<th>National Level</th>
<th>Regional/Sub-regional Level</th>
<th>Local level</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC (2013a), Ports: An Engine for Growth;</td>
<td>DfT (2014), Transport Analysis Guidance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC (2013b), Building the Transport Core Network: Core Network Corridors and Connecting Europe Facility;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overall, 19 project objectives belonging to three different appraisal dimensions, namely ‘economic’, ‘environmental’ and ‘social’, were identified. These preliminary objectives, which were meant to represent purely a guide for the group decision-making participants, are displayed in Table 8.4.

Participants were given the freedom to choose objectives from the list and also to identify entirely new project objectives, if they felt these were necessary. There was no restriction placed on the number and type of objectives which participants could select and/or specify.

Table 8.4 – List of preliminary objectives identified by the researcher.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Preliminary list of objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>1. To increase the competitiveness of the UK, making it more attractive for business</td>
</tr>
<tr>
<td></td>
<td>2. To support London’s role as a world city</td>
</tr>
<tr>
<td></td>
<td>3. To assist the regeneration of the Thames Gateway area</td>
</tr>
<tr>
<td></td>
<td>4. To increase the capacity of ports along the River Thames</td>
</tr>
<tr>
<td></td>
<td>5. To provide employment opportunities</td>
</tr>
<tr>
<td></td>
<td>6. To provide benefits to all users of the port and surface transport system in terms of reduced costs and shorter in-transit times</td>
</tr>
<tr>
<td></td>
<td>7. To minimize the negative effect on competition between UK ports</td>
</tr>
<tr>
<td>Environmental</td>
<td>8. To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
</tr>
<tr>
<td></td>
<td>9. To minimize noise and dusts</td>
</tr>
<tr>
<td></td>
<td>10. To protect the water environment</td>
</tr>
<tr>
<td></td>
<td>11. To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
</tr>
<tr>
<td></td>
<td>12. To improve flood safety</td>
</tr>
<tr>
<td></td>
<td>13. To encourage modal shift (from road to rail) for freight traffic</td>
</tr>
<tr>
<td>Social</td>
<td>14. To minimize risk to population surrounding ports</td>
</tr>
<tr>
<td></td>
<td>15. To improve health and safety record in ports</td>
</tr>
<tr>
<td></td>
<td>16. To minimize disruption to residents and businesses</td>
</tr>
<tr>
<td></td>
<td>17. To protect the character of the landscape and townscape</td>
</tr>
<tr>
<td></td>
<td>18. To protect the archeological and cultural heritage</td>
</tr>
<tr>
<td></td>
<td>19. To provide opportunities to local populations</td>
</tr>
</tbody>
</table>

As underline in Section 4.6.2, these dimensions are totally arbitrary (but commonly adopted). In principle, objectives could have been clustered also around other additional dimensions such as ‘transport’ or ‘regeneration’.
8.3.4 Ascription of weights to the objectives

Once objectives had been established, stakeholders and experts were invited to ascribe weights to these objectives to reflect their relative importance. In MCA, as already explained, different weighting methods are possible. For this exercise, the 100-point allocation method was initially adopted. With this method each participant is asked to allocate a budget of 100 points over the selected criteria to reflect their relative importance. In particular, participants were required, first of all, to allocate these 100 points over the three appraisal dimensions (i.e. economic, environmental and social) and, successively, further split these amounts to the different objectives selected within each dimension (see Macharis et al., 2010).

However, during the process it became clear that some people had difficulties in understanding and applying this technique. Therefore, in the attempt to simplify the weighting procedures, a new system was successively adopted. Under this new approach to weighting, stakeholders and experts were only required to rank the various objectives according to a 3-point scale as illustrated in Table 8.5.

<table>
<thead>
<tr>
<th>Table 8.5 – Interval scale adopted for weights.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weights</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

8.3.5 Scoring procedures

Lastly, stakeholders and experts had to score the performances of the two project options. An ideal exercise would have then required the research team to operationalize and transform such objectives into more measurable appraisal criteria. However, given the rather qualitative nature of the exercise no identification of appraisal criteria was undertaken. Stakeholders were thus required to score the performance of the three different project options directly against their own list of project objectives.

As already pointed out in Chapter 4, in MCA, different interval scales can be employed for scoring the performances of the options. For this exercise a nine-point numerical scale, ranging from -4 (i.e. severe negative effects) to +4 (i.e. extremely positive effects) and where 0 represents a neutral value (i.e. no significant effects), was adopted (see Table 8.6).

Score were based on the information available and on the knowledge and experience of the various group-decision making participants. As part of the scoring procedures, participants were also asked to justify their scores as well as to provide any other comments they may have.
Table 8.6 – Interval scale adopted for scores.

<table>
<thead>
<tr>
<th>Score</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>Extremely positive (the proposal/project option fulfils completely the criterion under consideration)</td>
</tr>
<tr>
<td>+3</td>
<td>Very good (the proposal/project option performs very well against the criterion under consideration)</td>
</tr>
<tr>
<td>+2</td>
<td>Good (the proposal/project option performs satisfactorily against the criterion under consideration)</td>
</tr>
<tr>
<td>+1</td>
<td>Moderately positive (the proposal/project option performs moderately well against the criterion under consideration)</td>
</tr>
<tr>
<td>0</td>
<td>Neutral (the proposal/project option does not have any significant effect (either positive or negative) with respect to the criterion under consideration)</td>
</tr>
<tr>
<td>-1</td>
<td>Slightly negative (the performance of the proposal/project option with respect to the criterion under consideration is not so satisfactory)</td>
</tr>
<tr>
<td>-2</td>
<td>Poor (the proposal/project performs poorly against the criterion under consideration)</td>
</tr>
<tr>
<td>-3</td>
<td>Very poor (the proposal/project option performs very poorly with respect to the criterion under consideration)</td>
</tr>
<tr>
<td>-4</td>
<td>Extremely poor (the performance of the proposal/project option with respect to the criterion under consideration is totally unacceptable)</td>
</tr>
</tbody>
</table>

8.3.6 Final aggregation

For reasons of simplicity and only for illustrative purpose, a linear multi-criteria model was adopted to calculate the overall performance scores of the two project options, although, as pointed out in Section 4.5.5, this aggregation rule is potentially prone to many inconsistencies. The final results were presented to participants, who were allowed to change some parameters in their multi-criteria framework if they were not happy with them. The outcomes of the process are presented in the following section.

8.4 Results of the process

8.4.1 Objectives

Table 8.7 shows the objectives identified by the various project stakeholders and experts. As this table illustrates, only the representative of the Greater London Authority and the economist selected all the objectives included in the preliminary list prepared by the researcher, whereas all the other group decision-making participants employed for their analysis a relatively low number of objectives. Two members of the local community identified eight objectives, whereas the third member selected nine objectives from the list. The environmental expert chose ten objectives. The transport expert, by comparison, considered eight objectives. The representative of the National Government and the planning expert were the people who selected the lowest number of objectives, namely six. Several participants commented during the interview that they felt more comfortable with using a limited number of objectives.
All the objectives included in the preliminary list were selected once by at least one party. However, only two objectives out of 19, namely ‘to assist the regeneration of the Thames Gateway area’ and ‘to encourage modal shift (from road to rail) for freight traffic’ were included by all the different stakeholders into their own multi-criteria framework. Notwithstanding stakeholders and experts, in principle, had the possibility to propose their own objectives in addition to the ones included in the preliminary list, only one objective, namely ‘to guarantee security of supply’ was added by the representative of the National Government. Hence, with the exclusion of this person, all the other participants only adopted objectives which had been identified by the researcher at the beginning of the process.

The selection of objectives was, in many cases, strongly affected by the interests and perspectives of the participants. For instance, the environmental experts chose mainly environmental objectives, while the representatives of the local community adopted prevalently social and environmental objectives. However, as showed in Table 8.7, the majority of stakeholder groups selected objectives pertaining to all the three appraisal dimensions. The exception was represented by the representative of the National Government and the transport expert, who, in their analysis, considered objectives belonging only to the economic and environmental spheres. According to the representative of the National Government, in particular, environmental objectives are already covered by specific laws and directives so that there was no need to further emphasize this aspect. This person also claimed that there was too much overlapping between the economic objectives included in the preliminary list, so that there was no need for selecting all of them. By comparison, the transport expert declared in the feedback to consider this mainly as a transportation problem.

8.4.2 Weights

Table 8.8 illustrates that the different interests and priorities of the various participants resulted in very different weighting schemes across the selected objectives. With the exception of the representative of the Greater London Authority, who considered the various objectives to have the same importance, all the other participants ascribed different weights to their objectives. By analyzing Table 8.8, it is be possible to argue that the representative of the National government, the planners and the transport expert gave the highest weights to economic objectives, while the environmental expert ascribed the highest importance to environmental objectives. The expert in economics and policy seemed to pay more attention to economic and environmental aspects, while the member of the local community appeared somehow to be equally interested in all the three appraisal dimensions. It is, however, difficult to make such a comparison, since, as indicated in the previous section, the participants selected very different objectives.

As is noticeable, there is no objective which was assigned the same weight by all respondents. For instance, the objectives of ‘assisting the regeneration of the Thames Gateway area’ and ‘encouraging modal shift’, while selected by all the different stakeholders and experts, were ascribed very different weights, ranging from 1 (i.e. slightly important) to 3 points (i.e. very important). The objectives of ‘providing employment opportunity’ and ‘minimizing adverse effect on local air quality’, which were both selected by seven participants out of nine, also obtained very different weights.
### Table 8.7 – Objectives adopted by the different group decision-making participants.

<table>
<thead>
<tr>
<th>Dim.s</th>
<th>Objectives</th>
<th>National government</th>
<th>GLA</th>
<th>Local com. (1)</th>
<th>Local com. (2)</th>
<th>Local com. (3)</th>
<th>Transport expert</th>
<th>Planner</th>
<th>Env. expert</th>
<th>Economist</th>
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</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
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<td>To support London’s role as a world city</td>
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<td>To assist the regeneration of the Thames Gateway area</td>
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<td>To increase the capacity of ports along the River Thames</td>
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<td>To provide employment opportunities</td>
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<td>To provide benefits to all users of the port and surface transport system in terms of reduced costs and shorter in-transit times</td>
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<td>To minimize the negative effect on competition between UK ports</td>
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<td>TO GUARANTEE SECURITY OF SUPPLY</td>
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<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouse gases leading to climate change</td>
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<td>To minimize noise and dusts</td>
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<td></td>
<td>To protect the water environment</td>
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<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
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<td>To improve flood safety</td>
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<td>To encourage modal shift (from road to rail) for freight traffic</td>
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<td>Social</td>
<td>To minimize risk to population surrounding ports</td>
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<td>To improve health and safety record in ports</td>
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<td>To minimize disruption to residents and businesses</td>
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<td></td>
<td>To protect the character of the landscape and townscape</td>
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<td></td>
<td>To protect the archaeological and cultural heritage</td>
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### Table 8.8 – Weighting schemes adopted by the different group decision-making participants.

<table>
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<tr>
<th>Dim.s</th>
<th>Objectives</th>
<th>National government</th>
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<th>Local com. (2)</th>
<th>Local com. (3)</th>
<th>Planner</th>
<th>Transport expert</th>
<th>Env. expert</th>
<th>Economist</th>
</tr>
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<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
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<td>3</td>
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<td>To support London’s role as a world city</td>
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<td></td>
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<td>To minimize the negative effect on competition between UK ports</td>
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<td></td>
<td>To maximize the capacity of the UK’s national transport system</td>
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<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
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<td>To minimize noise and dusts</td>
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### 8.4.3 Scores

Tables 8.9 to 8.17 display the performances of the different options according to the perspective of the different participants (i.e. single-actor views). Analogously to weights, performance scores clearly highlighted major differences in the opinions amongst stakeholders. Figure 8.4 displays, for instance, the performance scores of the two project options against the objective of ‘regenerating the Thames Gateway Region’ (which was selected by all the participants), according to the viewpoint of stakeholders and experts. This graph shows that the scores assigned by the various participants are very different from each other. In general, there was no agreement on the performance of any of the two options against any objective.

The scoring of individual options was influenced by the system boundaries adopted, the specific timescale adopted and different expectations concerning the future conditions. In particular, according to the representative of the National Government (see Table 8.9), the London Gateway port complex will perform well against all the selected objectives and will be particularly important to increase the competitiveness of UK, while the ‘do-minimum’ option would not represent any substantial change to the current situation.

A similar opinion was also shared by the representative of the Greater London Authority (see Table 8.10), who, in addition, emphasized the particular critical role of the new port complex for the regeneration of the Thames Gateway area. Interestingly enough, while initially selecting all the objectives included in the preliminary list, this participant judged the two options to be indifferent against many of them (i.e. nine out of 19 objectives turned out to be irrelevant to compare the two project options).

The scores ascribed by the members of the local community (see Tables 8.11, 8.12 and 8.13), highlighted the trade-off between economic benefits and environmental quality. The ‘do-minimum’ alternative was considered by these three participants as an option able to minimize environmental impacts and preserve the local environment, while the London Gateway port complex was generally recognized as a project potentially capable of fostering greater economic development and prosperity. However, notwithstanding the positive scores ascribed to the performance of this latter option against economic objectives, concerns were expressed over the high-density development vision envisaged for the Gateway Region by the UK Government. Differences of opinion were also identified between the representatives of the local community themselves. For example, while two community members believed that the construction of the new port rail terminal and the improvement of the existing rail network would allow modal shift for freight traffic coming to/from the London Gateway port complex (see Tables 8.12 and 8.13), the other member was rather skeptical on that (see Table 8.11). A community member, who, at the time of the interview, differently from the other two, was unemployed, was also the one to ascribe the highest score to the new port complex against the objective of ‘providing opportunity to local populations’ (see Table 8.13).

In the interviews, both the transport expert (see Table 8.14) and the planner (see Table 8.15) tended to emphasize particularly transport and economic aspects. Both of them assigned relatively high scores to the performance of the London Gateway port complex against economic objectives. The transport expert, however, differently from the planner, ascribed rather positive scores to the ‘do-minimum’ option. Indeed, according to this participant, notwithstanding a new modern port will probably be more attractive for
major shipping companies, the existing infrastructure and port facilities along the Thames (above all the Port of Tilbury) would theoretically have been able to accommodate deep-sea container traffic in the short- to medium-term.

Table 8.16 displays the appraisal summary table produced by the environmental experts. As it is noticeable, the London Gateway port complex performed poorly under the majority of selected objective (mainly belonging to the environmental dimensions), while the ‘do-minimum’ option received generally positive or neutral scores. According to this participant, the new port complex does not comply with environmental sustainability criteria and the mitigation measures included in the project will not be sufficient to avoid major negative impacts.

The transport expert, the planners and the environmental expert all experience difficulties in assigning numbers to the performance of the two options giving the lack of exact data and specific information concerning several objectives (as pointed out in Chapter 7, much of the data and information concerning the possible effects of the London Gateway port complex are still uncertain and debatable). The huge uncertainty surrounding the future performance of the new port complex was also emphasized by the expert in economics and politics (see Table 8.17), who appeared to be rather critical especially on the environmental and social effects of this project. Due to time constraints, this participant did not complete the scoring procedure for the ‘do-minimum’ option.

8.4.4 Final rankings

As explained above, a linear multi-criteria model was adopted to calculate the overall performance scores of the two project options. Tables 8.9 to 8.17 also include the unweighted and weighted overall performances of the two project options. Specifically, unweighted and weighted overall performances were computed respectively as the arithmetic average of the different performances scores against the different project objectives and the weighted average of the single weighted scores against the different project objectives. The viewpoints taken by the different participants in terms of objectives, weights and scores eventually produced very different rankings. As a result of the analysis, the London Gateway port complex turned out to be the preferred option for the representative of the National Government, the member of the Greater London Authority, the transport expert and the planner. In particular, the overall scores assigned to the ‘do-minimum’ option by the representative of the National Government, the member of the Greater London Authority and the planner were slightly negative, while the transport expert, as previously underlined, judged this option as however capable of delivering some benefits to the regional and national economy. By contrast, the appraisal undertaken by the members of the local communities and the environmental expert showed that these parties were in favor of a better use of the existing port infrastructure. Amongst these participants, the environmental expert clearly resulted to be the most critical about the new port.

Table 8.18 illustrates the multi-actor view. The global ranking was obtained by simply calculating the average of the overall performances of the single project options according to the point of view of the different participants. In the multi-actor view, option 1 ranked first.
Figure 8.4 – Performance of the project options against the objective of ‘regenerating the Thames Gateway area’, according to the point of view of the various group decision-making participants.

Table 8.9 – Appraisal undertaken by a representative of the National Government (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>NA</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scores</td>
<td>Scores</td>
</tr>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>2</td>
<td>+1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>1</td>
<td>+2</td>
<td>0</td>
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<td></td>
<td>to guarantee security of supply</td>
<td>1</td>
<td>+1</td>
<td>0</td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>1</td>
<td>+2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>1</td>
<td>+2</td>
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<tr>
<td></td>
<td>Unweighted Overall Performances</td>
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<tr>
<td></td>
<td>Weighted Overall Performances</td>
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<td>-0.66</td>
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</tbody>
</table>
Table 8.10 – Appraisal undertaken by a representative of the Greater London Authority (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX Scores</th>
<th>Option 2 DO-MINIMUM OPTION Scores</th>
</tr>
</thead>
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<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To support London’s role as a world city</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To increase the capacity of ports along the River Thames</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>3</td>
<td>+3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To provide benefits to all users of the port and surface transport system in terms of reduced costs and shorter in-transit times</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To minimize the negative effect on competition between UK ports</td>
<td>3</td>
<td>0</td>
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<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>3</td>
<td>+2</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>To minimize noise and dusts</td>
<td>3</td>
<td>+3</td>
<td>0</td>
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<tr>
<td></td>
<td>To protect the water environment</td>
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<td>0</td>
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<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
<td>3</td>
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<tr>
<td></td>
<td>To improve flood safety</td>
<td>3</td>
<td>+3</td>
<td>0</td>
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<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td>Social</td>
<td>To minimize risk to population surrounding ports</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To improve health and safety record in ports</td>
<td>3</td>
<td>+3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To minimize disruption to residents and businesses</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To protect the character of the landscape and townscape</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To protect the archeological and cultural heritage</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To provide opportunities to local populations</td>
<td>3</td>
<td>+3</td>
<td>-2</td>
</tr>
<tr>
<td>Unweighted Overall Performances</td>
<td>+1.68</td>
<td>-0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted Overall Performances</td>
<td>+1.68</td>
<td>-0.74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 8.11 – Appraisal undertaken by a representative of the local community (1) (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>1</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>3</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>2</td>
<td>+1</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To provide benefits to all users of the port and surface transport system in terms of</td>
<td>2</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>reduced costs and shorter in-transit times</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to</td>
<td>2</td>
<td>-1</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>climate change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To minimize noise and dusts</td>
<td>2</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To protect the water environment</td>
<td>3</td>
<td>-3</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+1</td>
<td>+1</td>
</tr>
<tr>
<td>Social</td>
<td>To provide opportunities to local populations</td>
<td>2</td>
<td>+2</td>
<td>+1</td>
</tr>
</tbody>
</table>

Unweighted Overall Performances: +0.44 +0.55
Weighted Overall Performances: +0.26 +0.47

Table 8.12 – Appraisal undertaken by a representative of the local community (2) (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>3</td>
<td>+3</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>2</td>
<td>+3</td>
<td>-1</td>
</tr>
<tr>
<td>Env.</td>
<td>To protect the water environment</td>
<td>2</td>
<td>-3</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
<td>2</td>
<td>-3</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+3</td>
<td>-1</td>
</tr>
<tr>
<td>Social</td>
<td>To protect the character of the landscape and townscape</td>
<td>3</td>
<td>-3</td>
<td>+3</td>
</tr>
<tr>
<td></td>
<td>To protect the archeological and cultural heritage</td>
<td>1</td>
<td>-3</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To provide opportunities to local populations</td>
<td>3</td>
<td>+1</td>
<td>-1</td>
</tr>
</tbody>
</table>

Unweighted Overall Performances: -0.25 +0.38
Weighted Overall Performances: 0 +0.17
Table 8.13 - Appraisal undertaken by a representative of the local community (3) (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 'DO-MINIMUM' OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>2</td>
<td>+3</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>2</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To minimize noise and dusts</td>
<td>2</td>
<td>-3</td>
<td>+1</td>
</tr>
<tr>
<td>Env.</td>
<td>To protect the water environment</td>
<td>3</td>
<td>-4</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+3</td>
<td>-1</td>
</tr>
<tr>
<td>Social</td>
<td>To minimize risk to population surrounding ports</td>
<td>2</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To improve health and safety record in ports</td>
<td>2</td>
<td>+1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To provide opportunities to local populations</td>
<td>3</td>
<td>+3</td>
<td>+1</td>
</tr>
</tbody>
</table>

Unweighted Overall Performances: +0.38  Weighted Overall Performances: +0.11

Table 8.14 – Result of the appraisal undertaken by a transport and port expert (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 'DO-MINIMUM' OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>3</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>1</td>
<td>+2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To increase the capacity of ports along the River Thames</td>
<td>2</td>
<td>+4</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>1</td>
<td>+3</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To provide benefits to all users of the port and surface transport system in terms of reduced costs and shorter in-transit times</td>
<td>3</td>
<td>+2</td>
<td>+2</td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>2</td>
<td>+2</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
<td>1</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+2</td>
<td>+2</td>
</tr>
</tbody>
</table>

Unweighted Overall Performances: +1.88  Weighted Overall Performances: +2.07
### Table 8.15 – Appraisal undertaken by a planner (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX Scores</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To support London’s role as a world city</td>
<td>2</td>
<td>+2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>3</td>
<td>+1</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>3</td>
<td>+1</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To minimize the negative effect on competition between UK ports</td>
<td>1</td>
<td>-2</td>
<td>+2</td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>2</td>
<td>-1</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+3</td>
<td>-1</td>
</tr>
<tr>
<td>Social</td>
<td>To provide opportunities to local populations</td>
<td>3</td>
<td>+1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Unweighted Overall Performances</strong></td>
<td></td>
<td>+0.71</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Weighted Overall Performances</strong></td>
<td></td>
<td>+0.94</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

### Table 8.16 – Appraisal undertaken by an environmental expert (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX Scores</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ.</td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>2</td>
<td>+1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>2</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>To minimize noise and dusts</td>
<td>2</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To protect the water environment</td>
<td>3</td>
<td>-4</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
<td>3</td>
<td>-3</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>To improve flood safety</td>
<td>2</td>
<td>0</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>2</td>
<td>+1</td>
<td>-2</td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize risk to population surrounding ports</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>To protect the character of the landscape and townscape</td>
<td>1</td>
<td>-1</td>
<td>+1</td>
</tr>
<tr>
<td>Social</td>
<td>To protect the archeological and cultural heritage</td>
<td>1</td>
<td>0</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td><strong>Unweighted Overall Performances</strong></td>
<td></td>
<td>-0.9</td>
<td>+0.44</td>
</tr>
<tr>
<td></td>
<td><strong>Weighted Overall Performances</strong></td>
<td></td>
<td>-1.20</td>
<td>+0.50</td>
</tr>
</tbody>
</table>
Table 8.17 - Appraisal undertaken by an expert in economics and politics (single-actor view).

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Objectives considered</th>
<th>Weights</th>
<th>Option 1 LONDON GATEWAY PORT COMPLEX</th>
<th>Option 2 ‘DO-MINIMUM’ OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scores</td>
<td>Scores</td>
</tr>
<tr>
<td>Econ.</td>
<td>To increase the competitiveness of the UK, making it more attractive for business</td>
<td>2</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To support London’s role as a world city</td>
<td>2</td>
<td>+3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To assist the regeneration of the Thames Gateway area</td>
<td>3</td>
<td>+2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To increase the capacity of ports along the River Thames</td>
<td>2</td>
<td>+3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To provide employment opportunities</td>
<td>3</td>
<td>+3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To provide benefits to all users of the port and surface transport system in terms of reduced costs and shorter in-transit times</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To minimize the negative effect on competition between UK ports</td>
<td>1</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td>Env.</td>
<td>To minimize adverse effects on local air quality and greenhouses gases leading to climate change</td>
<td>3</td>
<td>-2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To minimize noise and dusts</td>
<td>2</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To protect the water environment</td>
<td>3</td>
<td>-3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To maintain and enhance biodiversity and meet the requirement of the Habitat directive</td>
<td>3</td>
<td>-3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To improve flood safety</td>
<td>3</td>
<td>-2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To encourage modal shift (from road to rail) for freight traffic</td>
<td>3</td>
<td>+2</td>
<td>-</td>
</tr>
<tr>
<td>Social</td>
<td>To minimize risk to population surrounding ports</td>
<td>3</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To improve health and safety record in ports</td>
<td>2</td>
<td>+1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To minimize disruption to residents and businesses</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To protect the character of the landscape and townscape</td>
<td>2</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To protect the archeological and cultural heritage</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>To provide opportunities to local populations</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Unweighted Overall Performances</strong></td>
<td></td>
<td>-0.05</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Weighted Overall Performances</strong></td>
<td></td>
<td>-0.11</td>
<td>-</td>
</tr>
</tbody>
</table>
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

Table 8.18 – Multi-actor view.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Weighted Overall Performances</th>
<th>Preferred options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Option 1</td>
<td>Option 2</td>
</tr>
<tr>
<td></td>
<td>LONDON GATEWAY PORT COMPLEX</td>
<td>‘DO-MINIMUM’ OPTION</td>
</tr>
<tr>
<td>National Government</td>
<td>+2.00</td>
<td>-0.66</td>
</tr>
<tr>
<td>Greater London Authority</td>
<td>+1.68</td>
<td>-0.74</td>
</tr>
<tr>
<td>Local community (1)</td>
<td>+0.26</td>
<td>+0.47</td>
</tr>
<tr>
<td>Local community (2)</td>
<td>0</td>
<td>+0.17</td>
</tr>
<tr>
<td>Local community (3)</td>
<td>+0.11</td>
<td>+0.44</td>
</tr>
<tr>
<td>Transport expert</td>
<td>+2.07</td>
<td>+1.40</td>
</tr>
<tr>
<td>Planner</td>
<td>+0.94</td>
<td>-0.27</td>
</tr>
<tr>
<td>Environmental expert</td>
<td>-1.20</td>
<td>+0.50</td>
</tr>
<tr>
<td>Economist</td>
<td>-0.11</td>
<td>-</td>
</tr>
<tr>
<td>global perspective*</td>
<td>+0.64</td>
<td>+0.16</td>
</tr>
<tr>
<td>global perspective**</td>
<td>+0.73</td>
<td>+0.16</td>
</tr>
</tbody>
</table>

* including the perspective of the economist for option 1
** excluding the perspective of the economist

8.5 Discussion

8.5.1 Toward a more holistic appraisal?

As highlighted in the previous chapters (see in particular Section 1.3.2 and 5.2), many authors argue that, compared to analyst-led tools and techniques, participatory MCA methodologies, by better capturing the full spectrum of interests and values in dispute, can lead to the employment of more comprehensive and holistic appraisal frameworks. However, in this case, it seems that the direct involvement of stakeholders and experts in the appraisal exercise did not increase the breadth of the appraisal compared to a purely analyst-led MCA approach. Indeed, the value trees adopted by the various participants turned out to be based almost exclusively on the objectives identified by the researcher at the outset of the process. Only one new objective was added by a participant, while the large majority of the people taking part in the exercise selected a limited number of objectives (i.e. six to 10 objectives) from the preliminary list.

It needs also to be noted that the preliminary list of 19 objectives was intended to serve only as a general guide for the group decision-making participants, who were then expected to review the list, validate or reject some of the objectives contained in it and successively incorporate additional objectives if necessary. Consequently, while the objective included in the preliminary list prepared by the researcher covered important

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policy domains, this list was not prepared with the view to developing an exhaustive appraisal framework. Almost surely, the objectives included in the list could have been expressed differently and other additional objectives could have been added. However, no input was obtained from participants in this regard.

8.5.2 Toward a more transparent and clearer approach to decision-making?

Proponents of participatory MCA techniques also frequently contend that such method can provide a more transparent and clearer approach to decision-making. This process nevertheless highlighted participants’ hurdles and doubts concerning the use of MCA and their skepticisms over the exercise itself. As above explained, two former members of English Nature, who were quite skeptical on the nature and real usefulness of the exercise, decided not to take part in the exercise. A former member of P&O, who was not willing to reveal sensitive data and information, also refused the invitation, despite the theoretical nature and purely illustrative purpose of the appraisal exercise. Therefore, the assumption that, in a participatory multi-criteria appraisal exercise carried out as part of a real planning and decision-making process, project stakeholders, including project promoters and private sector parties, would accept to make their list of objectives and their set of weights totally public, result to be problematical and disputable.

Furthermore, as previously discussed, during the process some participants also experienced problems with the weighting technique originally adopted, so that it was deemed necessary to replace it with a simpler one. A few people also had difficulties in understanding the differences between scores and weights and several concerns were expressed over the fact that numeric scales were inappropriate to really express judgments over all the different issues and aspects entailed by the London Gateway port complex. As also underlined, data and information available to express a judgement over the performances of the different project options, especially the London Gateway port complex, were judged, in many cases, insufficient to arrive at meaningful and realistic scores.

The identification of objectives was also problematic in some respects. Eight participants out of nine did not add any new objective and only adopted objectives originally selected by the researcher. It is debatable whether the reason for this rests on a general satisfaction of participants with the preliminary list of objectives, or lies instead on the limited time available to undertake the exercise and problems with formulating meaningful and specific goals. On the basis of the interviews carried out during the process, it is almost certain that had participants been asked to develop autonomously their objectives from scratch, the process would have turned out to be much more difficult to manage. The expert in economics and policy and the representative of the Greater London Authority were the people who selected the highest number of objectives. However, the former was unable to complete the analysis due to time constraints, while, as pointed out in Section 8.4.3, some concerns emerged over the actual use of the selected objectives by the representative of the Greater London Authority. Finally, as already illustrated, the representative of the National Government appeared to be quite critical on how objectives had been selected and expressed by the researcher. According to this participant, the list was incomplete, biased and was likely to lead to problems of double counting. However, while, as a result of these critiques, it was reasonable to
expect that this person would formulate a complete new list of objectives, this participant only added one new objective to the original list.

Overall, all these aspects ineluctably pose serious doubts over the reliability of the final results produced by this participatory exercise. In general, it can be argued that by allocating more time for discussions, clarifications and reflection, thus giving participants more time to familiarize themselves with the exercise, it would have been possible to obtain better and more reliable outcome. On the other hand, had the process been longer, securing engagement from the participants would have probably been even harder (with the chosen structure, already one of the participants found it impossible to complete the exercise entirely).

8.5.3 Toward better and more legitimate decisions?

The multi-criteria exercise provided ample scope for participation. Indeed, while options had been defined in advance by the researcher, group decision-making participants were given the opportunity to identify their own objectives, weights and scores. The use of disaggregation strategies has thus allowed better highlighting both differences and similarities in the positions of the different actors, in line with what affirmed by several authors (see, for instance, Stirling and Mayer, 2001; Stirling, 2006; and Macharis & Nijkamp 2011). Subject to the already discussed inconsistencies and reliability issues, Tables 8.7 to 8.17 and Figure 8.4 in effect can potentially provide a hypothetical decision-maker with a wide array of information concerning the way the different stakeholders framed the problem.

On the other hand, at least two points need to be made here. First of all, these tables and diagrams do not seem to add much to what had already emerged from the London Gateway public inquiry. The analysis of the planning and decision-making process of this new port complex, presented in Section 7.4, had already highlighted the existing tensions between the potential economic, transport and logistics benefits of the project, acknowledged by many planning and policy documents, and its possible negative implications for the environment and local communities. Hence, the fact that the representative of the National Government, the member of the Greater London Authority, the planner and the transport expert ultimately selected the London Gateway as the preferred option, while members of the local communities and the environmental expert opted instead for a 'do-minimum' option is not surprising. A careful examination of the tables and figures included in Section 8.4 reveals that there are several other aspects which probably could have easily predicted at the outset of the process. For instance, it is also not surprising, that the environmental expert paid more attention to environmental objectives, that the transport expert focused more on the transport and economic aspects of the problem, and that local community members were particularly concerned about the local impacts of the new port complex, although they were hopeful about possible job opportunities (see Table 8.7). Therefore, in this respect, the objections raised by the former members of English Nature over the real value of the participatory MCA techniques if compared to traditional consultation processes do not appear to be totally groundless.

Secondly, as already pointed out, any appraisal exercise, irrespectively from the specific method adopted (e.g. CBA or MCA, participatory or non-participatory appraisal
process), is typically undertaken with the view to supporting decisions on future actions. However, it is absolutely unclear how a decision-maker (e.g. a Planning Inspector or a government minister) could ideally use Tables 8.9 to 8.17 to arrive at a final decision on the best course of action for the Port of London. Indeed, these tables clearly illustrate that a dramatic difference of opinion exist amongst the various group decision-making participants. Even between the members of the local communities there is little agreement over any parameter of the analysis. In this multi-actor multi-criteria exercise, the employment of a disaggregation approach led, in other words, to nine different lists of objectives, nine different weighting schemes, nine sets of scores and nine different project rankings. The overall number of factors that theoretically would have to be considered was thus far higher than the magical number 7 set by Miller (1956) (see Section 5.4.1). While, in the case of only nine participants, processing this variation in a comprehensive and meaningful way turns out to be extremely complicated, achieving this intent when the process involve a higher number of parties (as a participatory process on a large-scale project would theoretically require) appears to be impossible. Any decision based on these large amount of data and information would unavoidably turn out to be biased and incomplete (i.e. given the practical impossibility of considering simultaneously too many factors, any decision-maker would tend to focus only on a relatively limited number of aspects, while neglecting all the others) and thus not necessarily better than those which could be taken on the basis of traditional consultation procedures. Moreover, independently from the choices ultimately made, on account of this major clash of values the goal of increasing decision legitimacy is extremely likely to recede.

The necessity of reconciling and synthetizing, somehow, these different multi-criteria frameworks in the attempt to arrive at only a few parameters and indicators, which may potentially provide decision justification, is thus incontrovertible. However, as already pointed out, this is not a straightforward and easy task. In this exercise a multi-actor view has been obtained by simply aggregating together, in a rather mechanical way, the various single-actor views (see Table 8.18). However, as discussed in Chapters 4 and 5, the mathematical aggregation of individual preferences with the view to deriving a group preference does not seem to be a particularly consistent approach. Furthermore, in this specific case, the effective meaning of the multi-actor view is made even more questionable by the fact that the multi-criteria frameworks employed by the various group decision-making participants differ not only in term of weights and scores, but also in terms of objectives. The nine project rankings produced by the project stakeholders and experts appear thus to be totally incomparable as they account for different aspects of the same project options. Therefore, there seem to be really little point in attempting to reconcile project assessment if totally different frames are used by stakeholders for representing the same problem.

As above explained, sharing strategies were not employed to achieve consensus over the various elements of the multi-criteria framework on account of the practical impossibility of getting stakeholders and experts in the same room and the absence of an expert facilitator. However, in this specific case, given this huge clash of values, the assumption that discussions and negotiations between participants would have led, differently from what happened in the real Public Inquiry, to clear recommendations, upon which decision-makers could have then acted, appear to be a heroic one. Reflections and speculation over the effective possibility of producing consensus amongst group-decision
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

making participants need also to take into account the fact that, the employment of MCA in this participatory appraisal exercise, by forcing people to frame the problem under investigation in a rather simplistic and schematic manner (i.e. in terms of options, objectives, weights and scores), implicitly concealed or underplayed many important differences between participants' viewpoints, which otherwise would have been more evident. For example, as already highlighted, the fact the group-decision making participants were assessing the same project option, did not ensure that they were actually adopting the same system boundaries. Indeed, from the discussions and interviews carried out as part of the process, it was apparent that, compared to the members of the local communities, other participants such as the representative of the National Government, the member of the Greater London Authority, the planner and the port expert framed the London Gateway port complex at a much higher scale, including also considerations about other national ports and transport infrastructure and issues related to international shipping and global supply chain. The fact that different stakeholders and experts agreed on some general objectives also does not imply that they were really talking about the same things. For instance, while everybody identified the ‘regeneration of the Thames Gateway area’ as an important objective, participants expressed a wide variety of development visions for that region. Hence, just to cite a few cases, the representative of the Greater London Authority adopted this objective assuming the possibility of delivering hundred thousands of new jobs and homes (as envisaged by numerous planning and policy documents), whereas members of the local communities clearly supported a much lower density development scenario. Lastly, as described in Section 8.4.3, there were also major differences, surely bigger than those captured by a numerical scale, in the assumption adopted by participants during the assessment of the performances of the options against the different objectives (e.g. timescales adopted for appraisal; possible future economic, social and political conditions; and other critical events, which may potentially impact on the project options).

8.5.4 On the subjectivity issue

The participatory exercise indirectly shed also further light on the arbitrary and subjective nature of MCA and participatory MCA methodologies as discussed in Sections 4.5.5 and 5.4. Indeed, all the choices made concerning the structure of the process (e.g. role of the researcher, the type and number of group-decision making participants, level of involvement of participants, strategies to incorporate the different viewpoints in the framework and so forth), although motivated by the purpose of the exercise and the resource available to run it (see Section 8.2), were totally discretionary. It is extremely likely that another researcher or a team of analysts would have carried out the participatory exercise in a different manner, thus probably producing different outcomes. It is evident, for instance, that by involving in the process also SPEAC or other group notoriously opposing to the London Gateway port complex, the multi-actor view obtained through the aggregation of the different perspectives (although its meaning is largely questionable) would have probably led to the identification of the ‘do-minimum’ option as the preferred course of action. Totally different results would have also be obtained by deciding to, for example, involve in the appraisal exercise only project stakeholders, thus excluding experts, and/or allowing group-decision making participants to only define weights, thus leaving to the researcher the responsibility of determining objectives and
scores. The specific MCA technique employed (i.e. a simple weighted additive model), the specific weighting and scoring procedures adopted and the interval scales used for weights and scores also represented largely arbitrary decisions, which had noticeable impacts on the outcome of the process. In this regard, the possibility of effectively using the 100-point allocation method for determining weights could have substantially altered the overall performances of the project options. Indeed, while extremely simple, a 3-point scale might have been not adequate to entirely capture differences in the positions of the different group-decision making participants. Hence, had a broader interval scale of measurement being employed, the final ranking (in term of distance between options or even preference ordering) would have been certainly different.

8.5.5 Underlying assumptions of the method

Finally, another aspect that has to be further emphasized is the apparent contrast between the ideal approach to planning, appraisal and decision-making of major transport projects and the realities of such projects. Analogous to many analyst-led appraisal methods, participatory MCA methodologies implicitly adopt a rational problem-solving approach. Indeed, the steps of a typical multi-actor multi-criteria exercise incontrovertibly mirror those of the classic rational-comprehensive planning model. The underlying assumptions behind such methods also clearly bear a resemblance with those characterizing the rational-comprehensive position (see Section 6.3). In particular:

- The process is assumed to be entirely led by an independent research team;
- The research team is supposed to have adequate skills and resources for analyzing the problem at hand, identifying and mapping the most relevant stakeholders and ultimately building, with the help also of these stakeholders, an inclusive MCA framework, offering indications concerning the best course of actions to address the problem at hand.
- The participatory MCA exercise is presumed to be undertaken in a society where all the different interests and priorities are (or can be made) clear and well-articulated. Moreover, no substantial power imbalances exist between the stakeholders, who appear to behave as purely passive actors, limiting themselves to provide the research team with data and information concerning their preferences;
- The number and types of stakeholders, the list of options, the set of objectives and appraisal criteria, their relative importance, the expected performance scores of the options as well as all the other key parameters of the decision are implicitly expected to remain fixed (or relatively stable) during the decision-making process period.

In this respect, Hill, towards the end of his career, stated that, his methodology (i.e. the Goal-Achievement Matrix) was probably most fitting for a planning system organized according to a top-down model, with a central information gathering system serving a single decision-maker and with very few conflicts to be solved (see Hill. 1985). In contrasts, the analysis undertaken in Chapters 6 and 7 has led to the conclusion that planning and related decision-making procedures concerning large-scale transport projects are highly fragmented. They entail, in other words, a number of mutually interdependent actors operating at different administrative levels, multiple discussions over arrays of intertwined issues and numerous coupled decision arenas, whose
outcomes cannot be completely captured by using a list of criteria and a set of weighted scores.

In light of this fragmentation, it is also hardly possible for a single party (e.g. a hypothetical team of analysts and specialist advisors) to steer the decision making process. The individuals and groups of individuals who have a vested interest in the problem, in many cases, are not passive actors but actively concur to shape the problem definition as well as its solution through a process of mutual influence and negotiation. Often, then, incentives for strategic and uncooperative behaviors (e.g. the former member of P&O) and for misrepresenting data and information are high. The most powerful actors typically tend to use their influence opportunistically to turn possible conflicts to their own advantages.

In addition, resources to undertake analyses are general limited and the decision-making process is largely undetermined, with very low possibility for identifying from the outset the key parameters of the analysis. As highlighted in Section 7.4, in the case of the London Gateway port complex for instance, there are still many uncertainties and disagreements over traffic figures, potential customers, impacts on the environments, number and types of job that will be provided, and real contributions to area regeneration. It is also clear that in the absence of sound and widely respected information on the attributes and effects of the proposal(s) under examination, a participatory MCA process (but also any other appraisal exercise or any other participatory procedure) can easily break down into a purely vague and rhetorical debate.

The long-term perspective of mega transport projects also has major implications for any appraisal exercise. As explained in the previous chapter, the preparatory phase of the London Gateway port complex, similarly to many other major projects, lasted almost a decade. During such a long period of time, problem perceptions, stakeholders' interests, roles and mutual relationships are likely to change, even substantially. It is thus evident that, in a multi-actor multi-criteria exercise, tables, graphs, charts and/or diagrams, illustrating the perspectives of the single actors and/or the multi-actors view, represent exclusively a snapshot of (some) stakeholders' opinions at a particular point in time.

8.6 Summary of findings

This chapter has illustrated a practical application of participatory MCA methodologies to the appraisal of the London Gateway port complex. The findings of this multi-actor multi-criteria appraisal exercise do not seem to support many of the key arguments put forward by proponents of such methods. In particular, the following points were noted:

- The participatory appraisal exercise did not increase, to any important extent, the breadth of the assessment compared to a purely analyst-led approach.
- Several people also experienced difficulties in understanding the basic principle of MCA, with consequent doubts over the reliability of the outcome of the process.
- The outcome of the process also did not seem to have added much to what had already emerged from the London Gateway public inquiry (see Section 7.4).
- MCA, by forcing people to frame the problem under investigation in a rather simplistic and schematic manner (i.e. in terms of options, objectives, weights and scores),
implicitly excluded critical information, essential for arriving at a rich representation of the problem at hand, and hid or underplayed many important differences between participants’ viewpoints, which otherwise would have been more evident.

- Further questions were also raised over the real willingness of stakeholders to share entirely their agendas during a multi-actor multi-criteria exercise carried out as part of a real decision-making process. Therefore, it is rather debatable whether such methods could really represent a more transparent approach to appraisal.

- The exercise also showed that, irrespectively of the manner in which is undertaken, a participatory multi-criteria appraisal exercise, does not seem to be capable of leading to more informed and legitimate decisions than traditional consultation procedures. As above discussed, allowing group-decision making participants to frame the problem according to their own perspective (i.e. disaggregation approach), while representing a democratic and holistic approach to appraisal, does not point clearly to any constructive way forward to reach a decision on the problem at hand. The mathematical aggregation of the various participants’ preferences is methodologically weak and entails many ethical and equity issues. Although not adopted in this exercise, a negotiation process carried out in the attempt to produce a common multi-criteria framework (i.e. sharing approach) was also envisaged to be rather problematic. Indeed, there seem to be no reason to think that, in sharp contrast to what happened in the London Gateway public inquiry, during the participatory MCA process the local communities and environmental groups, project promoters, government agencies and all the other actors involved or affected by this project could have reached an agreement over the best course of action.

- The process has also further emphasized the arbitrariness of participatory MCA methodologies, showing that there are a number of variables (e.g. number and types of group decision-making participants, weighting and scoring procedures, level of participants involvement, and approach adopted to handle the participants’ point of views), whose selections can alter substantially the results of the process.

- Finally, it is also difficult to see how the linear and regular character of participatory multi-criteria exercises (but also other appraisal methodologies) could fit in the turbulent, fragmented, unstructured and highly uncertain nature of mega transport project decision-making.

As highlighted throughout the chapter, there were a number of limitations to this multi-actor multi-criteria exercise. The budget was low and the research team consisted of only one researcher (i.e. the author of the present work). The participants were selected informally and they cannot be seen to represent a statistically valid or otherwise representative sample of the people involved or affected by the project. Due to their business commitments, participants had only a limited amount of time to complete the MCA exercise and it was impossible to have mutual interactions and discussions between them. However, while with reference to the first three points above it would be possible to argue that a better process (e.g. presence of expert facilitators, more time for analysis, discussions and further iterations of the process) could have increased the breadth of the assessment and led to some critical insights, all the other points appear to be rather general issues. These issues are likely to affect any participatory MCA process, irrespectively from the manner in which is undertaken.
Chapter 9
Exploring and Addressing Issues of Participatory Multi-Criteria Analysis Methodologies:
Analysis of Survey Responses

In principle, MCA and participatory MCA can be powerful tools to support decision-making but the analysis needs to be based on a robust theoretical underpinning.

(Anonymous quote from interview, 2017)

9.1 Chapter overview
This chapter presents and analyses the results of a survey questionnaire, conducted amongst participatory MCA experts in the attempt to critically examine the issues of such methods as identified in the previous chapters (see Table 9.1). As explained at the beginning of this thesis (see Section 2.3.2), for the purpose of this work, the issues and problems potentially affecting the application of participatory MCA methodologies to the appraisal of major transport infrastructure have been categorized in two main categories:

• methodological issues: technical problems associated with the implementation of participatory MCA methodologies;
• non-methodological issues: problems related to the position of participatory MCA methodologies (and, more in general, of the appraisal process) within the wider decision-making context.

Methodological issues have been discussed especially in Chapters 4, 5 and 8. In particular, it has been highlighted that, by combining conventional participatory processes with MCA techniques, any multi-actor multi-criteria exercise turns out unavoidably to be subject, in the first place, to (methodological) problems and dilemmas typical of both deliberative procedures and (analyst-led) MCA methodologies. The latter issues concerns, amongst other things, the rather arbitrary nature of MCA, the impossibility of making exact predictions about the future consequences of a project proposal, and the difficult compromise between the need for understanding all the issues and implications of a proposal (which would require to present its effects in a disaggregated form) and the necessity of deciding and acting (which, in contrast, would benefit from the use of only a
few indicators, synthetizing different arrays of data and information) (see Sections 4.6.5 and 8.5).

Participatory procedures, by comparison, must deal, amongst other things, with the difficult questions of who should be involved in the process, and how and at which stage. The management of such processes is also a challenging task (see in particular Sections 4.5.5, 5.4 and 8.5).

There are then further methodological issues associated with the specific approach adopted to the multi-actor multi-criteria appraisal exercise, particularly in terms of how many elements of the multi-criteria framework (i.e. options, objectives/criteria, weights and scores) should be defined by group-decision making participants and how to integrate the different stakeholders’ perspectives in the analysis (i.e. exclusion, filtration, sharing, aggregation, disaggregation strategies) (see Sections 5.4 and 8.5).

Besides methodological problems, participatory MCA methodologies, similarly to all the other appraisal methods, are also affected by non-methodological issues. These issues have been discussed mainly in Chapters 6 and 7 and 8, where the discrepancies between the rational problem-solving approach (at the heart of almost all the appraisal methodologies) and the reality of planning and decision-making for mega transport projects have been highlighted (see in particular Sections 6.4, 6.5, 7.5 and 8.5.5).

Table 9.1 – Types of issues of participatory MCA methodologies as identified in the previous research stages.

<table>
<thead>
<tr>
<th>Research stages</th>
<th>Chapters where this stage is addressed</th>
<th>Issues identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature review of mega transport projects</td>
<td>Chapter 3</td>
<td>Methodological &amp; Non-Methodological</td>
</tr>
<tr>
<td>Focus group interview with managers of the PANYNJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature review of traditional transport appraisal methods</td>
<td>Chapter 4</td>
<td>Mainly Methodological</td>
</tr>
<tr>
<td>Informal and unstructured interviews with transport appraisal experts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature review of participatory MCA methodologies</td>
<td>Chapter 5</td>
<td>Mainly Methodological</td>
</tr>
<tr>
<td>Informal discussions with proponents of participatory methodologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature review of infrastructure planning and decision-making</td>
<td>Chapters 6, 7</td>
<td>Mainly Non-Methodological</td>
</tr>
<tr>
<td>Semi-structured interviews with practitioners and experts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case studies analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical application of participatory MCA methods</td>
<td>Chapters 8</td>
<td>Methodological &amp; Non-Methodological</td>
</tr>
</tbody>
</table>

Table 9.2 offers a brief overview of all the methodological and non-methodological issues, potentially affecting participatory MCA methodologies, identified in this research. It is evident that the possibility of successfully applying multi-actor multi-criteria techniques to the appraisal of large-scale infrastructure projects is related to the capacity of exploring and addressing, to the largest extent possible, these critical aspects.
With this aim in view, a questionnaire was developed and sent to several experts in MCA and participatory MCA techniques. Overall, 24 people were contacted by email and invited to take part in this survey. Recipients comprised academics, who enjoy a high reputation in the field, and also specialists, who had applied such methods quite extensively. The large majority of these people present a strong background in transport and infrastructure planning. Many of the recipients are also the authors of some of the journal articles and papers on participatory MCA methodologies reviewed in Chapter 5.

The questionnaire included 34 questions and was divided in three sections. The first section included three questions and focused on the background and experiences of recipients. The second section contained nine questions and dealt mainly with general features of participatory MCA methodologies. Finally, the third section comprised 22 questions, which were tailored to the specific steps of a typical multi-actor multi-criteria appraisal exercise. As illustrated in Table 9.2, the questions contained in the second and third sections of the questionnaire tried to cover, to the largest extent possible, all the issues identified in the previous steps of the research. It proved, however, impossible, to ensure complete coverage of all these themes, given the need, for practical reasons, to limit the number of questions asked.

Almost the totality of the questions sought responses through checkbox questions, although, for each question, respondents had also the opportunity to provide additional information and comments so as to better qualify their answers.

The original questionnaire sent to experts is included in Appendix C. Recipients were informed that participation was purely voluntary and that all the information obtained from the questionnaire would remain anonymous. The survey ran for two months, from June to July 2017. Eventually, 14 people (of which 9 with a deep knowledge of transport and infrastructure planning) participated in the survey (overall response rate of 58%). The questionnaire provided a measure of experts’ opinions, attitudes and perceptions about the issues affecting participatory MCA methodologies and the possibility of effectively addressing them.

The chapter includes two further sections. The results of the survey questionnaire are presented and critically discussed in the Section 9.2, while Section 9.3 includes some final reflections.
Table 9.2 – Overview of the issues entailed by participatory MCA methodologies as identified in the previous chapters.

<table>
<thead>
<tr>
<th>Types of Issues</th>
<th>Specific Issues</th>
<th>Correspondent Survey Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodological Issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issues typical of MCA techniques</td>
<td>• With MCA there are no universally agreed rules for defining the various elements of the framework (e.g. number and types of objectives, weighting and scoring procedures). Therefore, the analysis results largely arbitrary.</td>
<td>3.1, 3.12, 3.14, 3.17</td>
</tr>
<tr>
<td></td>
<td>• Simple MCA methods are prone to inconsistencies and often lead to the oversimplification of the problem at hand, while sophisticated MCA methods can hardly be understood by non-expert.</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>• MCA, especially in its simplest form (i.e. simple weighted additive technique), does not seem to be capable of addressing issues typical of CBA (e.g. time, equity, quantification of 'soft' issues and so forth).</td>
<td>3.16, 3.19</td>
</tr>
<tr>
<td></td>
<td>• MCA and other appraisal methods rely ultimately on forecasts to derive the performances of the project options under investigation. However, for a project to be realized one or more decades in the future, the possibility of foreseeing with any degree of precision its effects is severely limited.</td>
<td>3.16</td>
</tr>
<tr>
<td></td>
<td>• Appraisal implies a difficult compromise between the need for understanding entirely the multiple implications of a project proposal and the necessity for summarizing all the various aspects into a (more manageable) single index.</td>
<td>3.19, 3.20</td>
</tr>
<tr>
<td>Issues typical of participatory and deliberative procedures</td>
<td>• There are no clear criteria on how to do identify and select group decision-making participants. These tasks always pose issues of justice, equity and fairness.</td>
<td>3.2, 3.4, 3.5, 3.6</td>
</tr>
<tr>
<td></td>
<td>• Especially in the case of major planning and policy problems it is difficult (if not impossible) to identify and involve in the participatory process all the parties potentially affected by the specific conflict.</td>
<td>3.3, 3.8</td>
</tr>
<tr>
<td></td>
<td>• For large-scale projects, and other major planning and policy problems, one single participatory process may not be sufficient to capture all the issues and implications entailed by the problem under examination. However, it may be difficult to reconcile the results of multiple processes.</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>• Some people may lack the skills and resources that are required to participate effectively.</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>• Especially when many people are involved in the process, the management of group dynamics can be very challenging.</td>
<td>2.3, 3.7, 3.8</td>
</tr>
<tr>
<td></td>
<td>• Chances of arriving at consensus are quite low, particularly when stakes are high, facts are uncertain and ambiguous and stakeholders present totally opposite interests.</td>
<td>3.12, 3.14</td>
</tr>
<tr>
<td>Issues concerning the specific structure of the participatory MCA exercise</td>
<td>• A multi-criteria framework not always perfectly reflects the way in which people frame an issue.</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>• It is not clear what is the optimal level of involvement of group-decision making participants and how many elements of the multi-criteria framework (i.e. options, objectives/criteria, weights and scores) they should be allowed to define</td>
<td>3.9, 3.12, 3.13, 3.14, 3.15, 3.17, 3.18</td>
</tr>
<tr>
<td></td>
<td>• All the strategies adopted to incorporate in the model the information provided by the group decision-making participants (i.e. exclusion, filtration, sharing, aggregation and/or disaggregation strategies) entail some issues with reference to the practical feasibility of the process, the reliability and usefulness of the outcome of the exercise and the resources required to run the process.</td>
<td>2.3, 2.8, 3.12, 3.13, 3.14, 3.15, 3.17, 3.18</td>
</tr>
<tr>
<td>Non-Methodological Issues</td>
<td>Issues related to the position of the appraisal process within the wider decision-making context</td>
<td>• MCA and other appraisal methodologies adopt a technical-rational problem-solving approach. However, often assumptions about comprehensiveness, predictability, regularity and linearity are hardly reflected in the decision-making procedures of major infrastructure projects (and other major policy problems).</td>
</tr>
<tr>
<td></td>
<td>• Not everybody is necessarily willing to cooperate and/or take part in the process</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>• Social dynamics and power imbalances can hardly be excluded from a participatory process.</td>
<td>3.10</td>
</tr>
</tbody>
</table>
9.2 Analysis of questionnaire responses

9.2.1 Part 1: background information

The first section of the questionnaire focused on the background and experiences of respondents with the view to gauging their level of expertise and understanding how homogeneous the survey sample was. This section consisted of three questions as reported below.

1.1 From what academic field or discipline is your experience with participatory MCA methodologies?

Question 1.1 investigated the research areas and competences of the respondents. As above explained, overall 14 people took part in the survey. Besides transport and infrastructure planning, the research interests of the interviewees covered a broad range of disciplines, including geography, logistics, housings, energy, economics, ecology, sociology and operation research.

1.2 How many times have you applied these methods for primarily academic research purposes?

<table>
<thead>
<tr>
<th>Choice</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 times</td>
<td>0 people</td>
</tr>
<tr>
<td>1-3 times</td>
<td>6 people (~43%)</td>
</tr>
<tr>
<td>4-10 times</td>
<td>6 people (~43%)</td>
</tr>
<tr>
<td>more than 10 times</td>
<td>2 people (~14%)</td>
</tr>
</tbody>
</table>

1.3 How many times have you applied these methods to ‘live’ practice (i.e. real policy, programme or project appraisal)?

<table>
<thead>
<tr>
<th>Choice</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 times</td>
<td>0 people</td>
</tr>
<tr>
<td>1-3 times</td>
<td>8 people (~57%)</td>
</tr>
<tr>
<td>4-10 times</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>more than 10 times</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

Questions 1.2 and 1.3 concerned the practical experience of interviewees with participatory MCA methodologies. As it is noticeable from the above tables, all the respondents confirmed to have a relevant experienced in this field and declared to have applied such techniques as part of both academic research projects and real decision-making procedures.

In particular, several people claimed to have used participatory MCA methodologies many times during real appraisal exercises. However, quite disappointingly, none of them provided any details about these applications, so that it was not possible to understand what kind of problems had been appraised (i.e. large-scale, highly uncertain problems or small-scale, simple problems). It was also not clear whether, in those decision-making procedures, the multi-actor multi-criteria exercise had represented the main appraisal methodology or it had been undertaken alongside with the fulfilment of traditional analyst-
led appraisal exercises and ordinary consultation processes. Finally, it was also totally unclear whether, how and to what extent the results of the participatory MCA process had informed the final decisions.

### 9.3.1 Part 2: general questions on participatory MCA methodologies

The second section of the questionnaire included nine questions, which dealt mainly with the general features of participatory MCA methodologies, their potential strengths and the possible barriers to their effective application.

| 2.1 | According to your experience, what are the main advantages of participatory MCA methods compared to ‘traditional’ analyst-led appraisal methodologies? |

Question 2.1 looked into the potential benefits of participatory MCA methods and their possible advantages over traditional analyst-led appraisal methodologies. The answers obtained from the respondents largely confirmed the findings of the literature review (see Chapter 5). Indeed, the people surveyed contended that the key strengths of participatory MCA techniques are mainly represented by the possibility of:

- considering a wide range of different perspectives;
- identifying similarities and differences in stakeholders’ point of views;
- obtaining a better insight into the problem and issues under investigation;
- creating a learning process, which enables stakeholders to understand each other and build trust between one another;
- helping stakeholders to achieve a sense of ‘ownership’ of the decision-making process; and
- arriving at more informed decisions, which are also more likely to be accepted by the different parties.
2.2 Differently from what envisaged by the rational comprehensive planning model, a real
decision-making process concerning major planning and policy problems (e.g. the
construction of a new high-speed rail line) often turns out to be non-linear,
unstructured and highly fragmented (i.e. multiple decision arenas, multiple
discussions, multiple policy games between a number of actors operating at different
administrative levels) and partially indeterminate (i.e. very low possibility for
identifying from the outset the key parameters of the problem).

a. To what extent do you agree or disagree with this statement?

- □ Strongly Agree 5 people (~36%)
- □ Agree 8 people (~57%)
- □ Neither Agree nor Disagree 1 person (~7%)
- □ Disagree 0 people
- □ Strongly Disagree 0 people

b. The linear and regular character of a participatory MCA process, envisaging a
clear sequence of steps, appears to collide with the realities of infrastructure
decision-making (and other major policy problems). In light of this, can
participatory MCA methods be successfully adopted in major policy and planning
decisions, or should their use be limited only to small-scale and simple issues?

- □ Only major decisions 0 people
- □ Only minor decisions 0 people
- □ Both 12 people (~86%)
- □ None 1 people (~7%)
- ■ Do not know/no answer 1 people (~7%)

* In the tables a black check box (■) indicates answers not originally provided in the
questionnaire (see Appendix C). Black check boxes typically correspond to either a ‘do
not know’ answer or ‘no answer’.

Question 2.2 focused on the conflict between the apparent logical, sequential and smooth
structure of MCA, on the one hand, and the rather casual, turbulent and undetermined
nature of large-scale infrastructure projects, on the other. As it is observable from the
above tables, almost all the respondents agreed on the fact that decision-making
processes concerning major planning and policy problems often turn out to be non-linear,
unstructured and highly fragmented, in line with what discussed in Chapters 6 and 7 (sub-
question 2.2a).

At the same time, a large part of the people surveyed (i.e. 12 out of 14) considered
possible to successfully apply MCA and participatory MCA techniques to such complex
problems (sub-question 2.2b). Unfortunately, only minor comments were provided to
complement and further qualify these checkbox questions. A few people only stated that
for large-scale infrastructure the multi-actor multi-criteria exercise should be applied in a
more iterative manner. On the one hand, undoubtedly, going through the steps of the
process several times (as new issues become known, new ideas emerges and new
information became available) can lead to better results. On the other hand, many
problematic aspects were not touched upon in the comments of the respondents. These aspects, which have been already presented in the previous chapters, include, for instance:

- The highly fragmented nature of the planning and decision-making processes of mega transport projects, and how to properly capture all the stakeholders’ discussions and interactions taking place in different arenas;
- The extreme fluidity of the stakeholder context, and how to properly monitor the evolution of stakeholder groups, their problem perception and their mutual relationships during the front-end planning stage;
- The dynamicity of the external environment and how to constantly ensure a proper context scanning; and
- How to integrate this complex array of (constantly changing) data and information in the multi-criteria framework, while avoiding the risk of simplifying excessively the problem at hand.

In question 2.3 respondents were asked to express their opinion concerning the management of the participatory process. Overall, the answers received from the participatory MCA experts widely reflected the discussion presented in Section 5.3.1 of Chapter 5. Indeed, all of them agreed on the fact that independence and neutrality is a necessary prerequisite for the correct and successful fulfilment of a multi-actor multi-criteria exercise. For 11 people out of 14, the process should be ideally run by a research team, consisting of independent analysts and specialist advisors. Three respondents, by comparison, argued that the process could be conveniently managed by a government agency, which should be capable of ensuring a general and impartial perspective on the problem at hand. As part of their checkbox answer, some people also specify that the process could be directly led by the project promoter, or a research team representing the interest of a specific party, exclusively when the purpose of the exercise is to understand the potential implications of a decision for that party.
2.4 In the case of the application of participatory MCA methods to the appraisal of a large-scale project, would it be preferable to have only a single process to capture all the information, or would it be better to have different processes (e.g. divided according to the scale/geography of the analysis: global, national, regional, local) running in parallel?

<table>
<thead>
<tr>
<th>Option</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One single process</td>
<td>2 (~14%)</td>
</tr>
<tr>
<td>Multiple processes</td>
<td>11 (~79%)</td>
</tr>
<tr>
<td>Depends on the problem</td>
<td>1 (~7%)</td>
</tr>
</tbody>
</table>

Question 2.4 sought to investigate whether, according to participatory MCA experts, to capture the multiple implications of large-scale projects it could be sufficient to undertake a single multi-actor multi-criteria process, or instead it would be better to run two or more participatory exercises in parallel (e.g. divided according to the scale/geography of the analysis). Almost 80% of respondents stated that multiple parallel processes could potentially represent the best approach to arrive at a more comprehensive examination of all the issues, implications and consequences entailed by major projects.

As the practical application of participatory MCA methods to the appraisal of the London Gateway port complex (see Chapter 8) has highlighted, objectives, criteria, weights and scores are generally scale dependent. This implies that the results of participatory processes carried out at different geographic or administrative levels are highly likely to differ substantially from each other. The key challenge is thus represented by how to properly reconcile different multi-criteria frameworks, without trivializing them or losing detail. However, contrary to what was reasonable to expect, no comments were provided on how to possibly integrate and harmonize the outcome of multiple parallel processes.

2.5 The analysis of large-scale infrastructure projects or other complex policy problems can best approached from a solid background of scientific knowledge. Asking citizens and other non-experts to determine the key parameters of the analysis (e.g. objectives, scores and/or weights) may lead to unscientific results. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0</td>
</tr>
<tr>
<td>Agree</td>
<td>0</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>3 (~21%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>10 (~71%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1 (~7%)</td>
</tr>
</tbody>
</table>

Question 2.5 investigated whether and to what extent stakeholders’ opinions, including those of citizens and non-expert people, can be really considered a reliable source of information, especially for taking decision on major transport projects and on other technical issues. As illustrated in the above table, the large majority of respondents did not believe that the involvement of a variety of different stakeholder groups in the process can lead to unscientific results. According to these respondents, a participatory process can
enhance decision-making as stakeholders, including also those individuals and groups not having a solid background of scientific knowledge, are in the best position to express judgments on the issues which affect them. Some of the interviewees, however, recognized that there are methodological problems associated with deliberative practices. Especially the identification of a common language, capable of making the concepts tackled in the process understandable to all participants, was seen as problematic.

**2.6 According to some studies several people participating in MCA processes have difficulties in formulating meaningful and exhaustive statement of objectives, a complete and consistent set of weights or even understanding the meaning of criteria, scores and weights. In light of this issue and according to your experience, do you think participatory MCA methods are an effective way for eliciting people's opinion?**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12 people (~86%)</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Only sometimes</td>
<td>2 people (~14%)</td>
</tr>
</tbody>
</table>

Question 2.6 concerned possible difficulties experienced by stakeholders and other group decision-making participants with the use of MCA techniques. As the practical application of participatory MCA methods to the London Gateway Port complex has highlighted, some people may not to be capable of understanding the actual meaning of the basic elements of a multi-criteria appraisal framework (e.g. difference between scores and weights), formulating meaningful and exhaustive statement of objectives and criteria, and applying complicated weighting and scoring techniques.

As above displayed, 12 people out 14 considered MCA as an effective way for structuring stakeholder dialogue. Several people, however, acknowledged that, in some circumstances, asking people, having different cultural and educational background, to conceptualize a problem and articulate their concerns according to a standard multi-criteria framework can be quite challenging.

**2.7 Some parties (especially the private sector) may not be willing to make their (real) list of objectives and their (real) set of weights totally public. Referring to your experience of participatory MCA, do you think this could seriously hamper the process?**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Yes</td>
<td>9 people (~64%)</td>
</tr>
<tr>
<td>No</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Only sometimes</td>
<td>4 people (~21%)</td>
</tr>
</tbody>
</table>

The practical application of participatory MCA methods presented in Chapter 8 has also posed serious doubts over whether, during a multi-actor multi-criteria exercise, some parties would accept to make their (real) list of objectives and their (real) set of weights totally public. This issue represented the focus of question 2.7. According to more than 60% of respondents (i.e. 9 people out of 14), lack of transparency and strategic behaviors are extremely likely to jeopardize the democratic nature of participatory MCA methods,
irrespective of the nature of the decision situation. By comparison, four people claimed that these factors can become particularly problematic, especially for decisions in which private sector parties play a prominent role.

Some respondents argued that a possible way to address this issue would be to involve in the process only the actors and groups who clearly manifest their willingness to cooperate and learn about each other’s social identities, while excluding from the exercise conflictive and reticent people. This approach, however, appears rather questionable, particularly with regard to decisions on mega transport projects and other major policy issues. Such decisions, as already pointed out, involve a number of groups and actors, whose relationships often turn out to be partially or even entirely adversarial. It is due also to this fact that some information, especially that of commercially confidential nature, cannot be easily disclosed. For large-scale infrastructure projects it seems thus extremely difficult to create the condition typical of a cooperative group decision-making procedures (see Figure 5.1 in Chapter 5), without excluding from the process a large number of key stakeholder groups. A process involving only the (few) most cooperative and ‘loyal’ actors would also be inappropriate for deriving meaningful conclusions over the problem at hand. Moreover, it is difficult to think that the outcome of such a process could really become legally binding.

2.8 In the literature it is hard to find specific indications concerning the costs of the participatory MCA methods. Referring to your experience of participatory MCA, how much would it cost to apply a participatory MCA process to the appraisal of a major planning and policy problem (e.g. a large-scale transport project)? Could you provide a rough estimate of the costs?

As underlined in Chapter 5, in the literature, it is hard to find precise information concerning the costs associated with participatory MCA methodologies. Therefore, question 2.8 attempted to obtain some rough estimates, with particular reference to the application of a multi-actor multi-criteria exercise to the appraisal of a large-scale transport project. Whereas it was reasonable to expect that respondents would draw on their experiences to derive some figure concerning the costs of such a process, the large majority of the people were unable to produce any estimate. Only four people out of 14 tried to address the question, although they provided widely contrasting information. In particular, one person indicated a potential cost of about £1,800; the second person contended that the costs could be estimated at £45,000; the third person thought the process could cost approximately £250,000; while the fourth respondents claimed that such a process could cost up to £600,000.

2.9 Are there any other significant barriers to the use of these techniques that you are aware of?

In question 2.9, interviewees were asked to specify further barriers and shortcomings, which could prevent the successful application of participatory MCA methods. The answers given by respondents to this question largely confirmed the findings of the
literature review (see Chapter 5). Indeed, The factors mentioned by the respondents included:

- the intrinsic subjectivity of MCA;
- the possible dropouts of stakeholders during the process, especially for participatory MCA processes running for several weeks or months;
- the large number of people and high level of expertise required to manage a process, especially when the problem at hand is particularly complex and involves and affects different stakeholders;
- power imbalances and resources inequalities, which make it difficult to organize a fair process; and
- strong tensions between stakeholder groups, which can make the management of the process and the identification of a mutually convenient solution particularly problematic.

9.3.1 Part 3: questions regarding the steps of the process

The third section of the questionnaire comprised 22 questions, which were tailored to the specific steps of a typical multi-actor multi-criteria appraisal exercise.

Step 1: Primary problem analysis

3.1 Similarly to other appraisal methodologies and participatory techniques, also participatory MCA methods are based on extensive value judgments. Indeed, the identification of the problems to be solved, the distinction between critical and less important issues, the way in which these issues are framed, and the design of the process may provide ample scope for either inadvertent bias or the exercise of power. Therefore, from this point of view, the adoption of participatory MCA methods does not lead to a totally value free evaluation approach. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of People (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>Agree</td>
<td>7 people (~50%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 3.1 concerned the primary problem analysis and the possible scope for either inadvertent bias or the exercise of power during the framing of the participatory process. According to a large majority of the interviewees, tasks such as the framing of the problem and associated issues, the identification and recruitment of participants, the provision of information, the phrasing of questions, the facilitation of group discourses, the management of potential conflicts and the displaying of findings all provide ample room for (unintended or intentional) conditioning influence. In this regard, several respondents, in line with the answers given to question 2.3, emphasized the importance of ensuring that the process is managed by an independent and impartial research team or agency.
Steps 2: stakeholder identification, mapping and engagement

3. 2  Who should identify and select stakeholders?

- The project promoter 1 person (~7%)
- A government agency 2 people (~14%)
- An independent team of analysts and specialist advisors 9 people (~64%)
- Other 2 people (~14%)

Question 3.2 dealt with the identification of stakeholders and who ideally should perform this task. Also in this case the answers obtained from the respondents turned out to be substantially in line with those received for question 2.3. In particular, nine people contended that the identification of stakeholder (but also the management of the whole process) should be undertaken by an independent team of analysts and specialist advisors, so as to ensure impartiality. Two people argued that stakeholder identification should be carried out by a government agency capable of taking a broad societal perspective on the problem at hand. Other two people argued that ideally the identification of stakeholders could be derived through brainstorming between the members of a steering group, consisting of key project stakeholders. Only one person claimed that stakeholder identification should be performed by the project promoter, without however justifying or better qualifying this answer.

3. 3  In the literature, it is hard to find specific indications concerning the optimal number of people who can take part in the process. In your opinion what is the optimal group size of a participatory MCA exercise (e.g. number of stakeholder groups; number of people per group)?

Question 3.3 attempted to identify information concerning the optimal number of people to involve in a multi-actor multi-criteria exercise. Almost all the experts involved in the survey reported to have worked with no more than 4-6 stakeholder groups and, overall, with no more than 20-25 people. This figure largely corresponds to that identified from the review of the journal articles on participatory MCA methodologies (see Chapter 5).

In particular, many contended that, although there is no theoretical upper limit to the number of people who can participate in a multi-actor multi-criteria exercise, more than 30 people risk making the management of the process extremely difficult. However, as already pointed out, this number is extremely low in comparison to the number of actors and groups involved or potentially affect by a large-scale transport project or other major planning and policy issues.
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

3.4 In the literature, it is also hard to find specific indications concerning how stakeholders should be mapped and clustered in different groups.

a. Referring to your experience of participatory MCA, should government agencies be included as stakeholders, or should these be viewed as representatives of other stakeholders?

☐ Government agencies as stakeholder groups 7 people (~50%)
☐ Government agencies as representatives of other stakeholders 5 people (~36%)
■ Depends on the problem 1 person (~7%)
■ Do not know/no answer 1 person (~7%)

b. Referring to your experience of participatory MCA, should researchers and experts be included as a separate stakeholder group?

☐ Yes 4 people (~21%)
☐ No 5 people (~43%)
☐ Only sometimes 5 people (~36%)

Question 3.4 dealt with some issues associated to the selection of group decision-making participants. As illustrated in the above tables, there was no real agreement amongst experts on whether government agencies should be involved in the process as specific stakeholder groups or as representatives of other stakeholders (sub-question 3.4a).

There were even more contrasting opinions on whether experts should simply play the role of facilitator of the process, helping the research team to carry out the analysis, or should be considered as specific stakeholder groups on account of the fact they may represent, better than other parties, sustainability issues and other specific concerns (sub-question 3.4a). Unfortunately, in the majority of cases no additional comments were provided besides the checkbox answers so that it was not possible to understand the rationale behind the responses given.

3.5 What are, in your opinion, the most important considerations that need to be made when selecting participants and forming groups for the purpose of a multi-actor multi-criteria exercise?

In question 3.5 respondents were asked to indicate the most important considerations, which need to be made when selecting participants and forming groups for the purpose of a multi-actor multi-criteria exercise. Several people pointed out that a participatory process should try to involve or represent all parties that are affected by the issue under discussion. However, while based on democratic principles and common sense, these answers appeared to be in sharp contrast with the responses given to question 3.3, where most MCA experts indicated that a multi-actor multi-criteria exercise should not involve more than 30 people. Hence, in the case of a decision-making process concerning a large-scale project, it is hard to think that three
tens of people split in 5-6 groups could really represent a balanced and meaningful sample of all the stakeholders involved or potentially affected by the project.

With reference to the criteria adopted for subdividing stakeholders into different groups for the purpose of the participatory MCA exercise, socio-demographic profile, distance from the considered area, and homogeneity of objectives and weights were the factors most commonly mentioned by respondents. Respondents, nevertheless, recognized that even amongst the members of the same group there might be differences in objectives and priorities (as also the practical application of participatory MCA techniques to the appraisal of the London Gateway port has highlighted, in the case of the members of the local communities), which increase drastically the difficulty of the task.
3.6 Ideally, participatory processes should involve all interested parties that are affected by the issue under discussion. In practice, there are a number of constraints that drastically limit the number of the people involved in the process (e.g. time and budget constraints, logistics problems with scheduling meetings, difficulties in the identification of all the relevant stakeholder groups, stakeholders’ refusal to take part in the process, etc.). In light of this:

a. Can the insight offered by a process involving only a few people be judged to be really representative of the various themes, concerns and issues pervading society?

- ☐ Yes 2 people (~14%)
- ☐ No 10 people (~71%)
- ■ Do not know/no answer 2 people (~14%)

b. Involving only a few people in a participatory exercise may also reinforce existing patterns of power imbalance if only the most important and powerful groups take part in the process. This could expose the process to the risks of bias as not all the different points of views are equally represented in the process. Do you agree?

- ☐ Strongly Agree 4 people (~29%)
- ☐ Agree 6 people (~43%)
- ☐ Neither Agree nor Disagree 2 people (~14%)
- ☐ Disagree 0 people
- ☐ Strongly Disagree 0 people
- ■ Do not know/no answer 2 people (~14%)

c. It is very hard to make sure that the people involved in the participatory exercise really represent who they say they represent and can speak and ultimately make agreements on behalf of that group. Do you agree?

- ☐ Strongly Agree 4 people (~29%)
- ☐ Agree 5 people (~36%)
- ☐ Neither Agree nor Disagree 2 people (~14%)
- ☐ Disagree 2 people (~14%)
- ☐ Strongly Disagree 0 people
- ■ Do not know/no answer 1 person (~7%)

Question 3.6 looked into the possible issues surrounding the identification, mapping and engagement of stakeholders. With reference to sub-question 3.6a, as it is possible to observe, approximately 70% of the interviewees concurred that the outcome of a participatory process involving only a few participants can hardly mirror the various themes, concerns and issues pervading society. Together with the answers received for questions 3.3 and 3.5, the responses given to question 3.6a highlighted the difficult compromise between the objectives of inclusiveness and comprehensiveness and the more practical need for creating a workable and efficient process.

Respondents also appeared to largely agree on the fact that involving only a few people in a participatory exercise may also reinforce existing patterns of power imbalance.
Chapter 9 - Exploring and Addressing Issues of Participatory Multi-Criteria Analysis Methodologies: Analysis of Survey Responses

if only the most organized, and often most powerful, groups, which have consolidated themselves as a public presence, are invited to take part in the process (sub-question 3.6b).

Finally, the answers given to sub-question 3.6c somehow demonstrated that most MCA experts seem to be aware of the difficulties and challenges entailed by stakeholder identification and selection, even though no comments were made on how to possibly address these challenges.

3.7 The literature suggests various methods to engage with stakeholders in the process:

a. Eliciting stakeholder groups’ preferences through simple questionnaires and email surveys may not be the best approach to stakeholder management. Indeed, in this way, stakeholders may not have enough time and support to properly understand the nature of the exercise. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>5</td>
<td>(~36%)</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>(~50%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2</td>
<td>(~14%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

b. Eliciting stakeholder groups’ preferences through individual face-to-face interviews does not leave any room for discussions between stakeholders (i.e. the different parties are not required to be in the same room). Therefore with this approach there are very limited possibilities for mutual understanding, trust and consensus building. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>2</td>
<td>(~14%)</td>
</tr>
<tr>
<td>Agree</td>
<td>8</td>
<td>(~57%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td>(~29%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

c. Involving stakeholders through public meetings and workshops may also be problematic as the more people and groups are allowed to participate, the more challenging the management of the process becomes (e.g. costs, time, skills and experience required). To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>8</td>
<td>(~57%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2</td>
<td>(~14%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>3</td>
<td>(~21%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
<td>(~7%)</td>
</tr>
</tbody>
</table>
Question 3.7 focused on the strengths and weaknesses of the various participatory techniques, through which group-decision making participants can be involved in the process. As it is noticeable from the above tables, participatory MCA experts seemed to be aware that all the engagement techniques present some limitations. The large majority of respondents concurred that simple questionnaires and email surveys do not represent a particularly valid method to engage with stakeholders, as this approach does not enable a proper interaction between participants and analysts (sub-question 3.7a).

Approximately 70% of respondents also agreed on the fact that face-to-face interviews, although extremely useful for eliciting participants’ opinions, does not leave any room for discussions between stakeholders (sub-question 3.7b). Therefore, with this approach there are very limited possibilities for mutual understanding, trust and consensus building, which are often regarded as potential important outcomes of participatory processes (see answers given to question 2.1).

Finally, more than half of the interviewees contended that, although particularly appropriate for fostering dialogue and mutual understanding, general meetings may not be the best way to identify stakeholders’ perspective, as participants may influence each other’s responses. Moreover, some interviewees emphasized again that general meetings could be very difficult to manage, especially when many people are involved.

3.8 In your opinion, what is the best way to involve stakeholders in the process?

In question 3.8, proposed as follow-up to the preceding question, experts were required to indicate their preferred engagement techniques. According to the totality of respondents a combination of individual (i.e. face-to-face interviews) and collective (i.e. general meetings) participatory methods could represent the best way to engage with group-decision making participants. Indeed, such an approach was unanimously recognized as capable of combining the advantages of the various participatory and engagement techniques, while mitigating or reducing the disadvantages of each of them.

3.9 How much freedom should stakeholder have in the process? What elements (i.e. options, objectives/criteria, weights, scores) of the multi-criteria framework should stakeholders be allowed to determine?

<table>
<thead>
<tr>
<th>Options</th>
<th>Objective/Criteria</th>
<th>Weights</th>
<th>Score</th>
<th>5 people (~36%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options + Objective/Criteria</td>
<td>Weights</td>
<td>4 people (~29%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective/Criteria + Weights</td>
<td>Score</td>
<td>2 person (~14%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective/Criteria + Weights</td>
<td>3 people (~21%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 3.9 considered the optimal level of participation entailed by a MCA exercise. This question required respondents to indicate, according to their opinion, what elements of the multi-criteria framework (i.e. options, objectives/criteria, weights, scores) group decision-making participants should be allowed to determine as part of the participatory process. Major differences in opinion among the various MCA experts were noticeable.
Five respondents contended that group decision-making participants should be given the opportunity to determine all the parameters of the multi-criteria framework. These experts justified their answer by arguing that the more participants are involved in the process, the more credible the results become.

Four people, by comparison, claimed that participants should identify all the parameters of the analysis with the exception of scores, which, being a more technical parameter, should instead be defined by analysts and specialist advisors.

Two people argued that participants should determine objectives/criteria, weights and score but no option. These people, nonetheless, did not justify their answer.

Finally, other three respondents affirmed that group decision-making participants should be involved only in the definition of objectives and weights. Also in this case no justification was provided for the answer given.

**Question 3.10** sought to explore whether, according to the MCA experts surveyed, group decision-making participants should be given the same importance in the process. Some of the answers received were quite surprising in some respects. Nine people, echoing the principles of discursive democracy, claimed that all the information and opinions provided by the different groups and individuals taking part in the multi-actor multi-criteria exercise should be considered equally important. By comparison, four people contended that some groups should be given higher weight in the final decision. This answer was justified based on the fact that differences in roles (i.e. project directly involved in a project versus stakeholders only affected by the project), knowledge (i.e. people having a strong knowledge of the financial, legal and other technical aspects of a project versus non-expert people) and power (i.e. very powerful stakeholder groups versus less organized groups), all provide some parties with a stronger opportunity to promote their agendas.

The answer given by these four respondents appear somehow to clash with the pattern of answers obtained for question 2.5, where the large majority of respondents contended that, in a multi-actor multi-criteria exercise, also citizens and non-expert people can be considered a reliable source of information. Moreover, whereas it is true that differences and imbalances between stakeholder groups cannot be easily overcome by a participatory process (this has been highlighted also by the analysis of the case studies presented in Chapter 7), it is obvious that a participatory MCA process, undertaken without any real attempt to achieve a redistribution of power between participants, turns out to be an empty and frustrating process for those who do not have a real chance to influence decision.
Step 3: Option definition

3.11 The ability of an appraisal methodology to demonstrate the comparative merits of possible courses of action is limited, ultimately, by the quality of the project options put forward for assessment (i.e. a good plan cannot be chosen from a ‘poor’ set of alternatives). To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>2 people (~14%)</td>
</tr>
<tr>
<td>Agree</td>
<td>9 people (~64%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2 people (~29%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

Question 3.11 concerned the definition and selection of the options to be appraised. It is evident that the potential benefits of an appraisal exercise, regardless of whether in the form of CBA, analyst-led MCA or participatory MCA, can be nullified or impaired by the selection of a rather ‘poor’ set of alternative options to be appraised. In simple words, a good plan cannot be chosen from a ‘poor’ set of alternative options, irrespectively of the methodology, which is being employed to appraise these options. As illustrated in the above table, approximately 80% of respondents agreed with the above statement.

To address this issue, many interviewees emphasized the importance of undertaking a systematic problem analysis and structuring phase at the beginning of the process. However, this (rational-comprehensive) approach, seems to clash with the way in which major transport infrastructure projects are frequently conceived. In this regard, the analysis of the case studies, presented in Chapter 7, has shown that the Alameda Corridor, the Maasvlakte 2 and the London Gateway Port complex were all portrayed since the beginning as the ‘best’ options for addressing the needs of their respective territories. In the case of the Alameda Corridor, the appraisal of different alternative options was reduced to a banal assessment of slightly different technical variants of the same conceptual solution, while in the case of the London Gateway there were no even alternative options to be compared. It is therefore questionable whether, for projects originating as a specific solution to the particular concerns and desires of some powerful stakeholder groups, a multi-actor multi-criteria appraisal exercise can lead to better outcome than other traditional appraisal procedures.
Step 4: Identification of Objectives and Appraisal Criteria

3.12 In MCA there are no accepted guidelines concerning the way in which objectives and criteria should be identified.

a. If objectives and criteria are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. This seems also undemocratic as stakeholders may be required to adopt objectives/criteria colliding with their beliefs and values. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>7 people (~50%)</td>
</tr>
<tr>
<td>Agree</td>
<td>6 people (~43%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

b. If objectives/criteria have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0 people</td>
</tr>
<tr>
<td>Agree</td>
<td>10 people (~71%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

c. If each stakeholder group is allowed to use their own objectives and criteria (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>2 people (~14%)</td>
</tr>
<tr>
<td>Agree</td>
<td>2 people (~14%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Disagree</td>
<td>7 people (~50%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>2 people (~14%)</td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

Question 3.12 looked into the potential issues associated to the different possible approaches for identifying objectives and appraisal criteria. As displayed in the first table, related to sub-question 3.12a, almost all the respondents agreed (or largely agreed) on the fact that if objectives and criteria are established autonomously by the analysts (i.e. exclusion approach), the final value tree included in the multi-criteria framework risks not to reflect the value and interests of the various stakeholders. Many interviewees, in this respect, pointed out the importance of involving stakeholders in the definition of objectives and criteria.
With reference to sub-question 3.12b, on the other hand, 10 people out of 14 also concurred that when the various group decision-making participants present conflicting agendas, they can hardly produce consensus (i.e. sharing approach) over a common set of objectives and criteria.

Finally, with reference to sub-question 3.12c, approximately 65% of respondents disagreed with the assumption that allowing group decision-making participants to select their own objectives and criteria might expose the process to bias and strategic misrepresentations. Indeed, these people contended that, compared to weights and scores, objectives and criteria represent a relatively neutral parameter, which is unable to significantly affect the overall results of the analysis. It should be noted, however, that this is not totally correct. As the practical application of participatory MCA methods to the appraisal of the London Gateway Port complex (see Chapter 8) has demonstrated, the selection of objectives and criteria can have major impacts on outcome of the process. Assessing this port complex against objectives and criteria pertaining mainly to the economic dimension (see, for instance, the appraisal undertaken by the transport expert) may make the project appear more favorable than an appraisal undertaken almost exclusively against environmental criteria (see, for instance, the appraisal undertaken by the environmental expert). More generally, it is evident that the selection of only a few objectives, perhaps belonging also to the same dimension, makes the outcome of the appraisal appear more extreme than an assessment undertaken by considering a large variety of appraisal criteria.

3.13 In your opinion, what is the best way to identify objectives and appraisal criteria?

Question 3.13, offered as follow-up to the preceding question, asked interviewees to indicate, according to their experience, the best strategy to determine objectives and criteria. A few people claimed that stakeholders should be given the possibility of identifying their own objectives. In contrast, the large majority of respondents contended that the multi-actor multi-criteria exercise should entail a common set of objectives and associated appraisal criteria. This set should be developed by the analysts, based on the analysis of relevant policy and planning documents, and should be then complemented, where necessary, with some inputs from stakeholders (i.e. a filtration approach to the identification of objectives and criteria). However, while, undoubtedly, this represents a valid and licit approach to the task of identifying objectives and criteria, there seem to be a contradiction between this answer and the responses received for question 3.12c, from which it was possible to notice a marked preference for allowing group decision-making participants to develop their own value tree of objectives and criteria (i.e. disaggregation approach).
Step 5: Assignment of Weights to each Criterion

3.14 In MCA there are no accepted guidelines concerning how weights should be defined.

a. if weights are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of People</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>7</td>
<td>-50%</td>
</tr>
<tr>
<td>Agree</td>
<td>6</td>
<td>-43%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1</td>
<td>-7%</td>
</tr>
</tbody>
</table>

b. if weights have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach (e.g. in practice, only a very naive group would be willing to agree on a set of weights, which ultimately undermines their interests). To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of People</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3</td>
<td>-21%</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
<td>-64%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>-7%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1</td>
<td>-7%</td>
</tr>
</tbody>
</table>

c. if each stakeholder group is allowed to use their own weights (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations (e.g. use of excessively high or low weights in the attempt to undermine the position of antagonist groups). To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of People</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>-29%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>4</td>
<td>-29%</td>
</tr>
<tr>
<td>Disagree</td>
<td>5</td>
<td>-36%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1</td>
<td>-7%</td>
</tr>
</tbody>
</table>

Question 3.14 concerned the issues associated to the different approaches for ascribing weights to objectives and appraisal criteria. In particular, with reference to sub-question 3.14a, it is possible to observe that more than 90% of respondents concurred that weights should not be defined independently by the analysts (i.e. exclusion approach), because with this approach the weighting scheme may result largely arbitrary and may not reflect completely stakeholders’ perspectives.

With reference then to sub-question 3.14b, 12 people out of 14 claimed that, although extremely appealing, the identification of a common set of weights (i.e. sharing) is likely to
represent an unrealistic ambition as the level of importance of objectives and criteria tend to vary according to the different stakeholders’ interests and priorities.

Finally, with regard to sub-question 3.14c, there seemed not to be any agreement over the adoption of a disaggregation approach to weights. Four people contended that allowing participants to use their own weights may expose the process to the risk of bias and strategic misrepresentations (e.g. use of excessively high or low weights in the attempt to undermine the position of antagonist groups). Five respondents, by comparison, clearly disagreed with this position, emphasizing that this approach allows analysts and decision-makers to properly understand differences and commonalities in the positions of the different actors. These five experts, however, recognized that, eventually, arriving at a final solution or at a multi-actor view starting from different weighting schemes can be quite challenging. Four people, lastly, maintained a rather neutral position on this matter, while one person did not provide any answer.

3.15 In your opinion, what is the best way to identify weights?

Question 3.15, proposed as follow-up to question 3.14, asked respondents to indicate the best approach to determine weights. Interestingly enough, there was no agreement amongst participatory MCA experts. Respondents provided several different answers, some of which appeared to be rather vague and/or to collide with responses provided to previous questions:

- stakeholders should be allowed to use their own weights;
- weights should be determined as part of a negotiation process between the different group decision-making participants;
- weights should be defined through discussions and interactions between the analysts, experts and the stakeholders;
- a common set of weights should be determined by the analysts on the basis of the information derived from interviews and discussions with group decision-making participants;
- the analysts should create several weighting schemes based on participants’ opinions.
Step 6: Construction of the performance profile of each project options

3.16 The quality of any assessment, whether this is in the form of CBA or MCA, depends primarily on the availability, accuracy and validity of the mathematical and statistical models, forecasts, surveys and other studies used to estimate the possible future performances of the various project options. However, for a project to be realized one or more decades in the future, the possibility of foreseeing with any degree of precision its effects is severely limited. From this point of view, participatory MCA methods do not substantially differ from other conventional appraisal methods. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0 people (~0%)</td>
</tr>
<tr>
<td>Agree</td>
<td>3 people (~21%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1 person (~7%)</td>
</tr>
</tbody>
</table>

Question 3.16 dealt with the construction of the performance profile of each project options. As highlighted in Chapter 4, all the various appraisal methodologies rely on different types of forecasts to derive information concerning the performance of the options, which are being appraised. It seems thus apparent that the quality of any appraisal exercise, irrespective of whether this is in the form of CBA or MCA, depends ultimately on the accuracy and validity of these forecasts. As the above table illustrates, there were some differences in opinion on this matter.

In particular, six people (i.e. more than 40% of respondents) disagreed with the above statement, arguing that, differently from CBA or analyst-led MCA, participatory MCA methodologies should not necessarily rely on quantitative data and information. These respondents contended that a multi-actor multi-criteria process should encourage a more qualitative debate about the various impacts of the options under examination. This position, however, appears to be, at least partially, questionable. On the one hand, this research has pointed out that forecasting the future impacts and consequences a project is not an exact science. The quantitative assessment of many environmental, social, cultural, health and other ‘intangible’ effects, in particular, is very difficult (if not impossible) and almost always debatable. Therefore, it is somehow reasonable to assume that forecasts, surveys and other similar studies would inform the participatory MCA process, without nonetheless dictating it. On the other hand, it is also clear that in the absence of sound and widely respected information on the consequences of alternatives, a participatory MCA exercise (but also any other appraisal methodologies) can easily break down into a purely rhetorical debate, where the group who talk the loudest and longest (e.g. the most powerful groups) can have the most influence. In the previous chapter, it has also pointed out that several parties involved in the multi-actor multi-criteria appraisal exercise of the London Gateway port complex expressed concern over the lack of sufficient data and information to arrive at meaningful scores.
Step 7: Scoring the options against each criterion

3.17 In MCA there are no accepted guidelines concerning scoring procedures.

a. if scores are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0 people</td>
</tr>
<tr>
<td>Agree</td>
<td>8 people (57%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>3 people (21%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>2 people (14%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Do not know/no answer</td>
<td>1 person (7%)</td>
</tr>
</tbody>
</table>

b. if scores have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach. To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>3 people (21%)</td>
</tr>
<tr>
<td>Agree</td>
<td>9 people (64%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2 people (14%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 people</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
</tbody>
</table>

c. if each stakeholder group is allowed to use their own scores (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations (e.g. use of excessively high or low scores in the attempt to undermine the position of antagonist groups). To what extent do you agree or disagree with this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0 people</td>
</tr>
<tr>
<td>Agree</td>
<td>8 people (57%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2 people (14%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>4 people (29%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
</tbody>
</table>

Question 3.17 concerned the issues associated to the different approaches for assigning scores to the performances of the options against objectives and appraisal criteria. With reference to sub-question 3.17a, several people contended that scores should not be determined exclusively by analysts and specialist advisor and that some input from group decision-making participants could be beneficial.

The large majority of the respondents concurred that, analogously to the identification of objectives and criteria and the ascription of weights, the possibilities for group decision-making participants to achieve consensus over scores are quite low (sub-question 3.17b).

On the other hand, differently from the identification of objectives and criteria and the ascription of weights, the adoption of a disaggregation approach for determining scores
was seen more problematic. Indeed, there seemed to be more agreement over the fact that allowing group decision-making participants to use their own scores could potentially expose the process to the risk of bias and possible strategic misrepresentation (sub-question 3.17c).

### 3.18 In your opinion, what is the best way to identify scores?

In question 3.18, representing a follow-up to the previous question, respondents were asked to indicate the best approach to define scores. Once again, there was no agreement amongst participatory MCA experts. Specifically, the following answers were given:

- scores should be determined by independent analysts and specialist advisors on the basis of modelling and forecasting, and sensitivity analysis;
- scores should be determined by independent experts and specialist advisors and successively validated by group decision-making participants;
- scores, particularly those related to the performance of the project options against very subjective and qualitative objectives and criteria, should be defined autonomously and independently by each group or individual involved in the multi-actor multi-criteria exercise;
- the different group decision-making participants should be able to arrive at consensus over the scores.

As it is noticeable, some answers turned out to clash with some responses given to previous questions. In particular the first type of answer, which was given by several respondents, clearly collided with what stated by experts in questions 3.16 (i.e. MCA methodologies should not rely on quantitative data and information) and question 3.17a (i.e. scores should not be determined exclusively by analysts and specialist advisors).

The fourth type of answer, which was given by some MCA experts, also collided with what declared by respondents in question 3.17b (i.e. the possibilities for group decision-making participants to achieve consensus over scores are quite low).
Step 8: Aggregation of scores and weights and examination of the outcomes of the process (e.g. final ranking in the form of single actor views and/or multi-actor view) as support for the final decision.

3.19 In many cases, reconciling the perspective of actors who share no common ground is almost impossible. Therefore, a process undertaken in an effort to produce consensus over objectives/criteria, weights and scores (i.e. sharing approach) may ultimately prove impossible. However, there seem to be issues with the outcome of the process even if other approaches are adopted:

a. if during the process stakeholders are allowed to use their own objectives/criteria, weights and/or scores (i.e. disaggregation approach) the final output is represented by multiple single-actor views. However, when actors present very different agendas, any attempt to arrive at a final decision starting from this clash of frames (i.e. several tables or chart displaying different arrays of objectives and criteria, weighting schemes and scores) may prove impossible, without reconciling and synthetizing the single-actor views into a more manageable and understandable multi-actor view. To what extent do you agree or disagree with this statement?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Agree</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>4 people (~29%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>4 people (~29%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
</tbody>
</table>

b. On the other hand, the mechanical aggregation of different perspectives (i.e. aggregation approach) may produce inconsistent outcomes (e.g. do average values of scores and weights have meaning at all?) and may be exposed to the jeopardy of bias and strategic misrepresentation. To what extent do you agree or disagree with this statement?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>6 people (~43%)</td>
</tr>
<tr>
<td>Agree</td>
<td>5 people (~36%)</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>2 people (~14%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>1 person (~7%)</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0 people</td>
</tr>
</tbody>
</table>

Question 3.19 concerned the most appropriate way to present the outcome of the process. With regard to sub-question 3.19a, there seemed to be great difference of opinion over the utility of presenting the result of the process in a disaggregated form. Six people claimed that arriving at a final decision starting from multiple single-actor views might result particularly problematic. In contrast, four people seemed to be supportive of the use of a disaggregated form and emphasized that multiple tables (or charts or diagrams) can be used by decision-maker for understanding the way in which different parties frame the problem at hand. However, no real comments were made on how to arrive at a final decision starting from this clash of frames. One person only claimed that specific computer software could help analysts and decision-makers to process the various single-actor views in a comprehensive and meaningful way, although he specified
that with more than five groups these tools risks to became unclear. Lastly, four respondents maintained a rather neutral position on this matter.

With reference to the sub-question 3.19b, by comparison, almost 80% of respondents agreed (or largely agreed) over the fact that a mechanical aggregation of the various single-actor views, through the calculation of average values, does not represent a particular meaningful approach to produce a global multi-actor view.

3.20 In your opinion, how should the data and information obtained from the process be treated?

In question 3.20, proposed as follow-up to question 3.19, respondents were asked to indicate the most convenient way to present and use the data and information (i.e. single-actor views or multi-actor views) obtained from the process. Interestingly enough, almost half of the interviewees did not provide any answer, while the people who responded to this question seemed to have very contrasting opinion as illustrated below:

- the people involved in the decision-making process should decide how to use the results obtained from the process and in which form (i.e. disaggregated or aggregated results);
- the results of the process, either in a disaggregated or aggregated form, should be presented to the group decision-making participants who need to validate them;
- the results of the process should be presented, in a disaggregated form, to a decision-maker who is then required to take the final decision on the basis of these data and information (although it was not specified how the decision-maker is supposed to process these data and information);
- different aggregation outputs (based on different systems of aggregation) should be obtained to inform the final decision;
- single-actor views and overall views should be presented (although it was not specified to whom) to feed the political debate.
3.21 The planning and decision-making process of a major project lasts several years, during which stakeholders’ perceptions of the problem and attitude, and also stakeholder groups themselves, may change substantially. The outcome of the participatory exercise thus represents only a snapshot of stakeholders’ opinions at a particular point in time. To really capture stakeholders’ viewpoints it would be necessary to repeat the process on regular basis but this would be extremely costly and hard to realize in practice. To what extent do you agree or disagree with this statement?

- [ ] Strongly Agree: 0 people
- [ ] Agree: 12 people (~86%)
- [ ] Neither Agree nor Disagree: 2 people (~14%)
- [ ] Disagree: 0 people
- [ ] Strongly Disagree: 0 people

Question 3.21 considered the interpretation of the results of the process. 86% of respondents agreed on the fact that the outcome of the participatory exercise represents only a snapshot of stakeholders’ opinions at a particular point in time and. Many people, nonetheless, recognized that while, ideally, it would be necessary to repeat the process on regular basis in order to really capture stakeholders’ viewpoints, implementing such an iterative process would be extremely hard to realize in practice.

3.22 How the outcomes of the participatory exercise should be included in the decision-making process? Should participatory MCA techniques replace CBA, Environmental Impact Assessment techniques and traditional public inquiry procedures, or should they be simply intended as complementary to the latter?

The final question dealt with the possible role of a participatory MCA methodologies in decision-making process. Respondents were asked to indicate, according to their point of view, the possible relationship between a multi-actor multi-criteria exercise, and traditional analyst-led appraisal methods (e.g. CBA) and ordinary consultation procedures. Once again, there was no agreement amongst participatory MCA specialist. Specifically, the following answers were given:

- The multi-actor multi-criteria exercise should replace traditional appraisal methodologies and consultation procedures;
- The multi-actor multi-criteria exercise should be carried out in parallel with traditional appraisal methodologies and consultation procedures. The results of various exercises should be seen as complementary (although it was not specified how to arrive at a final decision, when the results obtained with the two approaches point to different directions);
- CBA should be used as a screening tool to identify feasible projects, which should be then appraised through a participatory MCA process focusing more on environmental and social issues;
• Some form of MCA could be used to discuss the strategic case for a project options, while CBA should be undertaken at a later stage;
• The multi-actor multi-criteria exercise should be used as part of environmental impact assessment procedures;
• The multi-actor multi-criteria exercise should be seen as a broader appraisal framework capable of including the results obtained from other appraisal methodologies and consultation procedures.

9.3 Discussion of findings

A number of key themes emerged from the analysis of the questionnaire data. First of all, there seemed to be a great difference of opinion amongst participatory MCA experts on several critical aspects, including:

• The real costs of a multi-actor multi-criteria exercise (see question 2.8);
• whether government agencies should be involved in the process as specific stakeholder groups or as representatives of other stakeholders (sub-question 3.4a);
• whether experts should be involved in the process as group decision-making participants (with the possibility of affecting the parameter of the analysis) or they should simply play the role of facilitator of the process, helping the research team to carry out the analysis (sub-question 3.4b).
• what elements of the multi-criteria framework (i.e. options, objectives/criteria, weights and scores) should be defined by the group decision-making participants (see question 3.9);
• how to define weights (see question 3.15);
• how to define scores (see question 3.18);
• how to present and use the data and information (i.e. single-actor views and/or multi-actor views) obtained from the process to support decisions on the problem at hand (see question 3.20);
• The role of the multi-actor multi-criteria appraisal exercise in the decision-making process and its relationships with traditional appraisal methodologies (see question 3.22).

Furthermore, there seemed also to be many contradictions between the answers given by the respondents to the various questions. In particular:

• in question 3.3, it was clearly pointed out by almost everybody that a multi-actor multi-criteria exercise including more than 30 people may result very difficult to manage. However, successively most respondents emphasized the importance of involving in the process all parties that are affected by the issue under discussion (see question 3.5). At the same time, a large majority of respondents largely acknowledged that the outcome of a participatory process involving only a few participants can hardly mirror the various themes, concerns and issues pervading society (see question 3.6a);
• approximately 65% of respondents appeared to support a disaggregation approach to the identification of objectives and criteria, which allows the group decision-making
participants to develop their own value tree (see sub-question 3.12c). On the other hand, in the following question, the large majority of respondents contended that the multi-actor multi-criteria exercise should entail a common set of objectives and associated appraisal criteria, which should be developed independently by the analysts, with only some inputs from stakeholders (see question 3.13);

- in question 3.16, many respondents argued that participatory MCA methodologies should not rely on quantitative analysis. In contrast, in question 3.18, several people claimed that, in the multi-criteria framework, scores should be determined by analysts and specialist advisor on the basis of modelling and forecasting, and sensitivity analysis;

- while almost the totality of respondents concurred that the possibilities for stakeholders to achieve consensus over the parameters of the multi-criteria framework are quite low (see sub-questions 3.12b, 3.14b and 3.17b), several MCA experts then suggested that weights (see question 3.15) and scores (see question 3.18) could be determined as part of a negotiation process between the group decision-making participants.

Accordingly, from this survey no approach seems to emerge as the most effective way of undertaking a multi-actor multi-criteria exercise. The answers given by some respondents to some questions resulted somehow surprisingly or questionable. These answers included:

- the necessity of excluding from the process all the individuals and groups who are unwilling or unable to disclose information and/or do not seem particularly interested in engaging with the other stakeholder groups (see question 2.7);

- the necessity of considering the viewpoint of some individuals and groups more important than others (see question 3.10);

- the possibility of using a disaggregated approach to the identification of objectives and criteria based on the assumption that these represent relatively neutral parameters (i.e. not affected by bias and strategic misrepresentations), which are unable to significantly affect the overall results of the analysis (see sub-question 3.12c).

- the opportunity for creating mainly a qualitative debate over options, impacts and scores, without the need for using quantitative data and information to inform the discussion (see question 3.16).

In many cases, the questionnaire responses appeared to highlight a sort of impasse between the acknowledgement of possible issues surrounding the practical application of participatory MCA methodologies and the possibility of effectively addressing them:

- as previously pointed out, the patterns of answers received for questions 3.3, 3.5 and 3.6 clearly underlined the difficult (impossible) compromise between the objectives of creating an inclusive and democratic deliberative procedure and the more practical need for having a workable and efficient process;

- multiple, coordinated participatory MCA processes running in parallel were almost unanimously recognized as the best approach to the appraisal of large-scale transport projects and other major planning and policy problems (see question 2.4).
However, no comments were provided concerning how to reconcile the results of these parallel processes, particularly in the eventuality that their outcomes would largely differ from one another.

- Many interviewees emphasized the importance of undertaking a systematic problem analysis and structuring phase at the beginning of the process so as to identify clearly the problem at hand and all the possible alternative project options to address it (see question 3.11). However, this (rational-comprehensive) approach clash with the way in which major transport infrastructure projects are frequently conceived (see Chapter 7).
- While it was clearly acknowledged that all the different strategies for dealing with multiple viewpoints (i.e. exclusion, filtration, sharing, aggregation and disaggregation) present some disadvantages, no suggestions were offered on how to potentially tackle these issues (see questions 3.12, 3.14, 3.17 and 3.19);
- Whereas it was envisaged that, during the planning and decision-making process of a major transport project, it would be beneficial to iterate the multi-actor multi-criteria exercise several times (see questions 2.2 and 3.21), it was also recognized that this is also extremely hard to realize in practice (see questions 3.21)

Finally, one of the most striking aspects of this survey questionnaire was undoubtedly the vagueness of respondents over their experience with participatory MCA methodologies. Indeed, whereas several respondents declared to have applied such techniques many times during real decision-making procedures, none of the experts taking part in this survey provided any details about these practical applications (see questions 1.2 and 1.3). The large majority of the respondents were also unable to offer even a rough estimate of the costs of multi-actor multi-criteria exercise, when applied to the appraisal of a large-scale project (see question 2.8).

There are of course evident limitations to this survey. First of all, only 14 people participated in the survey. As already pointed out, then, given the numbers of potential issues, problems and dilemmas emerged from the previous steps of the research, the questionnaire comprised a high number of questions. Overall, very few questions very skipped by only a couple of people. However, it is not possible to know whether all the respondents have really read all the questions carefully before answering. Moreover, despite all the people involved in this survey were MCA experts and effort was made to make the questions clear and unambiguous, respondents may have interpreted some questions differently. Finally, even though the survey participants were anonymized, some of them may still have not felt totally comfortable providing answers that publicly criticize their own methods.

Notwithstanding these limitations, the results of the questionnaire seem to have confirmed the findings of the literature review of participatory MCA methodologies (see Chapter 5). Despite its growing popularity, participatory MCA methodologies represent an under researched area, where some critical themes have been treated with superficiality; important issues have received limited consideration; contrasting views still exist on many fundamental aspects, including the real purpose of the multi-actor multi-criteria exercises themselves; and where, in many cases, the disconnection between theory and practice is apparent.
Chapter 10

Conclusions and Final Reflections

For every complex problem there is an answer that is clear, simple, and wrong.

(Mencken, 1917)

10.1 Chapter overview

Motivated by the growing popularity of participatory MCA methodologies in the field of transport and infrastructure planning, this Ph.D. research was undertaken with the specific aim to investigate the applicability and effectiveness of such methods to the (economic, environmental and social) appraisal of mega transport projects, which at present dominate development agendas worldwide. This research entailed several steps, different methods of investigation and multiple sources of information. First of all, given the lack of consensus amongst practitioners and experts about the key features of mega transport projects, a comprehensive review of the literature was carried out in the attempt to determine the most important aspects that require careful consideration when appraising such projects. The findings of the literature review were validated and complemented through a focus group interview with managers of the Port Authority of New York and New Jersey, which allowed the examination of the above aspects with specific reference to major container ports and large-scale port-related infrastructure as a sub-set of mega transport projects. The findings of this research step, which have been presented in Chapter 3, immediately highlighted the ‘wicked’ character of mega transport infrastructure decision-making and the difficulty of doing any kind of ex-ante analysis of mega projects because of their complexity, uncertainty, and multifold and uneven impacts.

An investigation into transport appraisal practice and traditional appraisal methodologies, which were also deemed to represent a rather under researched area, was then undertaken through a comprehensive analysis of the existing literature on transport and infrastructure appraisal, complemented with unstructured interviews and informal discussions with some international experts (see Chapter 4). This investigation shed light was on the fact that, in contrast to common belief, all the different appraisal methodologies (including CBA and MCA) share many similarities and, almost paradoxically, are also equally affected by several issues and concerns.

Successively, an examination of over 60 publications on participatory MCA methodologies was performed with the objective of determining the general characteristics
of such methods and the possible manners in which multi-actor multi-criteria exercises can be undertaken (see Chapter 5). An examination of the various approaches to participatory MCA however revealed that each one presents some advantages and drawbacks, although very little has been written on these aspects.

Furthermore, starting from the assumption that the appraisal of major transport projects cannot be considered in isolation from the wider decision-making context, an analysis of the current trends in mega transport infrastructure planning and decision-making practice was undertaken. Two converging lines of inquiry, namely an examination of both academic and empirical literature on infrastructure planning and decision-making, and expert interviews, were carried out to determine how major infrastructure projects emerge and key decisions are made (see Chapter 6). Following this general analysis, a more detailed and empirical investigation into these aspects was then performed through the review of the planning and decision-making process of three large-scale port-related infrastructure projects, namely the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex. The three projects were examined by using multiple sources of data and information, both primary and secondary (see Chapter 7). What emerged from this analysis is that the rational-comprehensive planning paradigm, pervading the academic literature and many government guidelines, clearly clashes with the highly fragmented, turbulent and uncertain reality of mega transport infrastructure planning and decision-making. This analysis also brought to light the marginal role typically played by ex-ante appraisal in the decision-making process of major projects.

The London Gateway port complex was also adopted as case study for a practical application of participatory MCA methodologies. Specifically, a multi-actor multi-criteria appraisal exercise, involving several project stakeholders and experts, was carried out to compare this development, which is currently under construction at the edge of the Thames Estuary, with a hypothetical do-minimum alternative option, consisting in a better use of the existing port terminals and infrastructure along the Thames (see Chapter 8).

The outcomes of the multi-actor multi-criteria exercise, together with the findings from the previous steps of research, led to the identification of several methodological and non-methodological issues, and other critical aspects potentially surrounding the practical application of participatory MCA techniques to the appraisal of major transport projects. These issues were ordered and collected in a questionnaire, which was then sent to several specialists and proponents of such methods (see Chapter 9). Despite its intrinsic limitations, the questionnaire further confirmed the contrasting views of experts in relation to several fundamental aspects of participatory MCA methodologies, the limited consideration received so far by several other key aspects, and the uncertainties surrounding the resolution of many of the identified issues due to a marked disconnection between theory and practice. Overall, this research thus shed a more realistic light on the expected benefits of participatory MCA methodologies and on their effective capacity of improving the planning, appraisal and decision-making of mega transport projects.

This concluding chapter discusses the main findings of the research in relation to the questions set out at the beginning of the thesis (Section 10.2). It also includes some reflections about the key contribution of the research (Section 10.3) and its limitations (Section 10.4). Finally, it also contains some recommendations for further research in this area (Section 10.5).
10.2 Answers to the research questions

10.2.1 Research sub-questions

i. **What are the main attributes of mega transport projects and what are the most important aspects which need to be considered when appraising such projects?**

Mega transport projects are large-scale undertakings, frequently consisting of a variety of different elements framed as a single unitary package, which attract a high level of public attention and political interest on account of the vast amount of (financial, technical, human, temporal and material) resources required for their development, and the multiple implications and substantial (direct and indirect, positive or adverse) impacts they can have on the context into which they are placed. Major projects present, in particular, three characteristics which need careful consideration as they risk hampering any *ex-ante* analysis:

- their inherent complexity, both structural and organizational;
- their multifold and uneven impacts and consequences; and
- their long-term perspective.

While these aspects are widely mentioned in the literature, their real meaning and implications for planning, appraisal and decision-making seem to have been poorly understood and examined, especially by many proponents of participatory MCA methodologies. The adjective ‘complex’, for instance, is often used to refer to complicated projects, entailing huge costs, intricate financial structures, new and untried technologies, engineering challenges, hundreds of different works and activities, multiple contractual agreements, and long processes to obtain approvals and permits. In contrast, here, it has been contended that the (real) complexity of mega transport infrastructure stems from the fact that such undertakings, in many cases, are not single schemes. Rather, frequently, they constitute programmes of different major projects, which cross various territories and regions, connect different transport networks at different scales, and transcend the boundaries of established policy fields (*i.e.* structural complexity). For example, as highlighted in Chapter 3, a major gateway port can be ideally conceived as a wider infrastructure, economic, transport and logistic system, consisting of: as a set of multiple specialized port terminals; freight logistic parks located in proximity of the port; logistics facilities and inter-modal terminals situated even several hundred kilometers away from the coastline; and road, rail and inland waterway corridors, which connect the port, the logistic parks and the inter-modal terminals each other and with various urban settlements. Hence, what seems ostensibly to be a unique project may turn out instead to have multiple, intertwined dimensions, which may need to be investigated at different levels. Therefore, any analysis of a major transport project/programme is unavoidably affected by the way in which its boundaries are drawn as well as by the number and types of elements and components considered in the analysis. The complexity of mega projects is also reflected in the network of mutually interdependent actors and groups operating at different scale, who represent the project stakeholders (*i.e.* organizational complexity). For instance, as illustrated in Chapter 7, port stakeholders may comprise international transport and logistics companies; national, regional and local governments; regional development agencies; communities groups; labour unions; regional firm associations,
environmental groups; and other non-governmental organizations. By presenting different belief and value systems, the various stakeholders are likely to frame the same situation in different ways, thus producing multiple (and often conflicting) interpretations of what the problem and the associated issues are, and what might be the right course of action to address them. Accordingly, it is evident that the difference between complicated and complex projects is more than a mere semantic and etymological matter. Whereas the successful delivery of complicated projects requires (simply) a high level of expertise and attention, dealing with complexity ideally implies the need for acknowledging the unavoidable existence of multiple contrasting, but often legitimate, perspectives concerning a given decision-making situation.

Furthermore, while, many discussions can be found in the literature on the transformational impacts of mega projects and their change agent role, less attention seems to have paid to the fact that the benefits generated by such projects and the unavoidable associated costs tend to manifest at different scales. Consequently, despite the possibility of achieving win-win solutions represents a captivating idea, which is frequently mentioned in the literature, multi-stakeholder consensus over large-scale projects can hardly be obtained as what may appear as an ideal solution by some parties may instead be seen as a threat by others. This aspect has also been highlighted in the analysis of the case studies (see Chapter 7). In the planning and decision-making of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex, many conflicts of interests and contentious issues proved to be impossible to solve through democratic exchange of ideas and opinions. Especially the tension between economic concerns and socio-environmental interests reached an extreme state of polarization, which prevented the identification of common objectives. As pointed out, the final decisions to implement the projects were ultimately taken only due to the strong power imbalance between the project coalitions and the opposing stakeholder groups.

Lastly, the long-term planning horizon of mega transport projects and their consequent dynamic and uncertain perspective is also largely acknowledged among academics. Despite this, improvements in forecasts and data collections, and the search for the ‘right’ information are constantly advocated as possible solution for improving decision-making for such projects. However, as also shown by the case studies analysis, the disappointing reality is that, notwithstanding forecasting techniques and computer modeling have become increasingly advanced in recent years, for projects whose preparation and construction require one or even several decades, the possibility of making reliable predictions about the future effects and consequences remains extremely limited. In the large majority of cases, some data and information are simply not available beforehand to shed light on yet-to-come projects.

**ii. What are the basic characteristics, and strengths and weaknesses of the appraisal methodologies most commonly adopted to appraise the economic, environmental and social effects of mega transport projects?**

The review of CBA, EcIA, EIA (and SIA) and MCA, namely the appraisal methodologies most commonly adopted to assess the economic, environmental and social effects of transport infrastructure projects, led to the conclusion that all these methods present both advantages and disadvantages. In sharp contrast with what argued by many authors, little
objective evidence was found to support the proposition that of the techniques reviewed, one could be singled out as clearly superior to the others and capable of providing decision-makers with the full breadth of information necessary to decide on the opportunity to proceed with a given project proposal. As pointed out in Chapter 4, CBA represents a well-known, rigorous and straightforward way to assess whether a proposed project constitutes an economically efficient allocation of resources from society's point of view. Notwithstanding its long history and popularity, CBA presents, however, numerous shortcomings. The most prominent flaws encompass, amongst other things, the lack of consideration of different policy objectives, besides economic efficiency; the adoption of highly disputable techniques for monetizing social, environmental and other ‘soft’ effects of a proposed development; the dismissal of many important impacts, not easily quantifiable in monetary term, beyond welfare gains; the disregard of distribution effects and intra-generational equity considerations; the underestimation of the potential long-term negative environmental consequences of a project proposal due to discounting procedures; the use of a single indicator (i.e. NPV and/or BCR), expressing the conclusions of the analysis from calculation in monetary terms; and the implicit adoption of a ‘weak sustainability’ position, according to which environmental and social items risk being addressed as secondary to purely economic factors.

While offering a broader perspective concerning the economic implications of a project proposal, thus complementing the results of CBA, EcIA methodologies do not address to any extent environmental and social considerations.

By comparison, EIA (and SIA) procedures aim at ensuring that decisions on projects are authorized in the full knowledge of their environmental and social consequences. However, such procedures also constitute only partial appraisal methodologies as, in many cases, they deal only limitedly with economic aspects.

Whereas, in principle, MCA provides for a more holistic, clearer and transparent approach to appraisal, it does not offer any clear indications concerning the net social economic benefits generated by the proposal under examination. Moreover, this review clearly showed that, almost paradoxically, MCA, especially in its simplest and most used form, namely the simple weighted additive technique, turns out to be affected by the same issues typical of CBA, which MCA is generally expected to solve. These issues include, for instance, the problematic incorporation of the time dimension into the analysis; equity considerations; the difficult quantification (although not in monetary terms) of ‘soft’ issues; the ‘reductio ad absurdum’ of the quality of a given proposal into one single indicator; and the consequent adoption of a ‘weak sustainability’ approach.

Furthermore, one of the most interesting findings of this review, presented in Chapter 4, was that, differently from what commonly assumed, all the different appraisal methodologies seem to share many similarities, but also several issues and concerns.

- The key principles, steps and structure of all these methods are (directly or indirectly) based on the technical-rational approach to planning and decision-making.

- Despite the assumption of strict separation between facts and values (typical of the rational-comprehensive position) inbuilt in these methodologies, all the appraisal methods are also based on extensive value judgments concerning the definition of the system boundaries, the types of data to be considered, the key variable to be
incorporated in the model and other key parameters and procedures (e.g. specific monetary values for various categories of costs and benefits, discounting and social discount rate, in the case of CBA; number of criteria, weighting and scoring procedures, in the case of MCA). Therefore, in principle, all the appraisal methodologies can be easily manipulated to support a particular position.

- All the appraisal methods ultimately rely on several mathematical and statistical models, forecasts, surveys and other studies regarding the future impacts of the proposal, whose accuracy and precision level, in the case of mega projects, is, for the reasons already explained, unavoidably low.

- Lastly, any appraisal exercise is subject to a critical dilemma for which there is no clear solution. On the one hand, to understand entirely the multiple implications of a project proposal, it would be convenient to divide its effects into many component parts. However, due to the intrinsic limitations of the human mind, a hypothetical decision-maker would find it extremely complicated (if not impossible) to process at the same time different types of quantitative and qualitative measures and judgments. Hence, to arrive at a final decision of the merits of the proposal, a grand index, reconciling and synthesizing these different arrays of data and information into a more manageable and understandable whole, potentially represents an appealing and elegant technical solution. On the other hand, although apparently easy to interpret, a single index tends to oversimplify and to mask the basic components of the analysis, thus receding from its purpose of providing decision justification.

iii. What are the key features of participatory MCA methodologies and how do they differ from traditional appraisal methodologies?

Participatory MCA methodologies combine conventional analyst-led MCA methods with traditional participatory techniques, typically adopted as part of ordinary planning processes and EIA procedures, in the attempt to increase the participatory character of the appraisal exercise and provide a higher level of structure to stakeholder dialogues. The key difference between an analyst-led and a participatory approach to MCA is thus represented by the fact that, while, with the former, the key elements of the multi-criteria framework (i.e. options, objectives and criteria, weights and scores) are determined by the analysts, with the latter, these parameters can also benefit from inputs from the various group decision-making participants. Proponents of participatory MCA methodologies contend that participation can strengthen the key qualities of MCA, by capturing even more accurately the full spectrum of interests and values in dispute, and further improving the transparency of the process. This, in turn, is assumed to significantly improve the quality of the final decision and increase its legitimacy.

A typical multi-actor multi-criteria exercise, whose steps, as illustrated in Chapter 5, clearly resemble those of analyst-led MCA (and thus those of the classic rational-comprehensive planning model), is generally expected to be led by an independent research team of analysts, specialist advisors and group decision facilitators. Such exercises can be undertaken in many different manners. In particular, critical choices, potentially having a dramatic impact of the results of the process, need to be made with reference to several aspects.
• **Type of group-decision making participants:** these may comprise simply project stakeholders or also experts in the area to be investigated, who, due to their knowledge, may be deemed to represent better than other stakeholders some specific concerns. Moreover, participants can take part in the process individually or as representative of organized groups.

• **Selection of group-decision making participants:** since for major projects and other major planning and policy problems it is clearly impossible to involve everyone, a decision needs to be made on who and how many people actually need to be involved in the process.

• **Level of involvement of group-decision making participants:** group decision-making participants (i.e. stakeholders and, in some cases, experts) can be given the possibility of affecting only partially the multi-criteria framework or, vice versa, they can provide an input for options, objectives and criteria, weights and scores.

• **Specific participatory techniques employed to engage with participants:** in order to engage with stakeholders (and experts), a large variety of participatory techniques, ranging from simple interviews and structured questionnaires to in-depth group discussions, can be employed.

• **Number of participatory process carried out as part of the multi-criteria appraisal exercise:** whereas a participatory MCA exercise generally entails only one single participatory process, ideally, in the attempt to arrive at a more comprehensive examination of all the issues under investigation, it may be also possible to run, in parallel, two (or more) distinct participatory processes. These different processes can be organized around the scale/geography of the analysis (e.g. global, national, regional, local), the types of group decision-making participants (e.g. primary stakeholders, secondary stakeholders, experts), the nature of the issues being investigated (e.g. transport, economy, environment, equity) and so forth.

• **Specific strategies adopted to incorporate the information provided by the group decision-making participants in the analysis:** options, objectives and criteria, weights and scores can be identified:

  - by the research team, totally independently from the stakeholders’ agendas (i.e. exclusion);
  - by the research team, based on the data and information provided by the group decision-making participants (i.e. filtration);
  - through a mediation and consensus-building process between the various group decision-making participants (i.e. sharing);
  - by the research team, through the calculation of the average between the various participants’ preferences or the construction of a representative value, which minimizes the differences between participants’ opinions (i.e. aggregation); or
  - by allowing participants to select their own objectives/criteria, scores and/or weights (i.e. disaggregation).

As emerged from this research (see in particular Chapters 5 and 9), so far, there has been limited consideration and very little written on some of these aspects. Some others
of these aspects, by comparison, generate a wide disagreement amongst practitioners and specialists.

**iv. How are mega transport infrastructure planning and related decision-making currently undertaken and what is the role of appraisal within the process?**

In general, there seems to be two different viewpoints about how major infrastructure projects emerge and critical decisions on such projects are made. On the one hand, in many academic papers and textbooks large-scale infrastructure projects are often portrayed as the product of detailed and systematic analyses, which follow a unitary, logical and chronological sequence of steps. According to this purely technical-rational perspective on planning, which can also be found reflected in many legislative texts and government guidelines of many countries, data search, forecasting and value free *ex-ante* appraisal analyses plays a critical role within the planning process by providing the factual basis of the issues for decision.

On the other hand, an examination of the empirical literature on mega infrastructure planning and decision-making, a series of interviews with practitioners and experts (see Chapter 6) and the analysis of the planning and related decision-making process of the Alameda Corridor, the *Maaslakte 2* and the London Gateway port complex (see Chapter 7) led to the opposite conclusion. The initiation of such projects is rarely based on comprehensive analysis of the problems and opportunities of a territory. Indeed, projects originate as a specific solution to the concerns and desires of some powerful groups and individuals, sometime sketched out even on restaurant napkins, without any clear acknowledged links to the existing planning and policy framework. The planning and decision-making process does not follow a simple and neat path, from project conception to implementation. Rather, major projects emerge progressively through a rather chaotic, unstructured and at least partially undetermined process, where hardly any aspect can be entirely and precisely defined at the outset, including the project scope and its key attributes, and the members of the pro-growth coalition supporting the project.

Decisions on large-scale infrastructure projects normally present also a highly fragmented character and thus entail various arenas at various government levels and multiple interrelated policy games. Within these arenas, several mutually interdependent actors and groups, presenting conflicting agendas, negotiate and compromise with each other, over arrays of rising, intertwined issues, in an effort to gain what they perceive as their objectives. The various actors and groups tend to frame the same situation in their own ways by using different (often incompatible) languages and rationalities. They are thus likely to adopt different observation scales, employ different logics of time, focus on different aspects and make different trade-offs between the various objectives and concerns. Sometimes, rather than being characterized by openness and social responsibility, the process results to be rather narrow, and even deceptive and irresponsible, with stakeholders refusing to collaborate with other parties and simply using their power opportunistically to turn possible conflicts to their own advantages.

Moreover, major infrastructure projects are developed within a world that is not static. During the years, which intervene between the initial conceptualization and the effective realization of a large-scale project, political, financial, economic, social and technological
changes and other unexpected events are likely to produce substantial alterations in the project scope, its objectives and attributes, and also in the composition and strategies of stakeholders groups themselves.

Finally, contrary to what implied by the rational-comprehensive approach to planning, the outcomes of appraisal (whether in the form of CBA, EIA and/or MCA) tend to carry little weight in the final decision. This aspect was also confirmed by the analysis of the three case studies. The planning and decision-making processes of these projects assumed the features of proposal-oriented procedures, where the preferred course of action was identified from the beginning, a few alternative options were developed only to justify the final selection, and appraisal was undertaken mainly to show compliance with laws and regulations. Nevertheless, in general, it should be noted that, even in the presence of ‘real’ project options to compare, the inherent uncertainty and complexity of the problem at hand implicitly undermine the presumed disciplining role of ex-ante appraisal analyses. Indeed, data and information are always incomplete and can be interpreted in different ways, with no clear criteria to distinguish valid interpretations from less valid ones. Any study is thus potentially contestable, either justly or unjustly, by someone who looks at the same problems through the perceptual lens of a different frame and comes to divergent conclusions.

v. What are the possible issues surrounding the application of participatory MCA methodologies to the appraisal of mega transport projects and how can these issues be addressed?

Analogously to the other appraisal methodologies, the application of participatory MCA techniques to the appraisal of major transport projects is potentially affected by many issues. These issues can be ideally distinguished into two main categories:

- **methodological issues**: technical problems associated with the implementation of participatory MCA methodologies; and
- **non-methodological issues**: problems related to the position of participatory MCA methodologies (and more in general of appraisal) within the wider decision-making context.

First of all, by relying on conventional MCA techniques to structure stakeholder dialogues, any multi-actor multi-criteria exercise turns out unavoidably to be subject to the same methodological issues of analyst-led MCA methods.

Moreover, similarly to all the other participatory techniques employed as part of traditional planning procedures of major transport projects, also multi-actor multi-criteria exercises must deal with the problematic (methodological) issues of who should be involved in the process, and how and at which stage. In particular, as highlighted in Chapters 4 and 5, due to the practical impossibility of identifying and involving all the interested parties in the process, deliberative procedures and participatory MCA methods can hardly be considered a way for deriving consistent conclusions on social preferences. Hence, compared to CBA, which somehow attempts to include in the final judgment the values of all people rather than a selected few, such methods, expressly developed and proposed with the view to increasing the democratic and deliberative character of the
appraisal exercise, risk even representing a step backwards with regard to equity considerations. Participatory processes can also be very long, complicated and costly and, particularly when stakes are high, facts are uncertain and ambiguous and stakeholders present totally opposite interests, with little room for compromise, do not always lead to better, clearer and more legitimate solutions.

As highlighted in Chapter 5 (see Section 5.4.2), then, any approach to participatory MCA methodologies (especially in terms of the level of stakeholder involvement and how to integrate the different participants’ perspectives in the analysis) presents some advantages, disadvantages and methodological issues with reference to the practical feasibility of the process, the reliability and usefulness of the outcome of the exercise, and the resources required to run the process.

Many of the above criticalities of MCA and participatory MCA methods were also further confirmed by the practical application of participatory MCA methodologies to the appraisal of the London Gateway port complex, described in Chapter 8. Despite its intrinsic limitations (discussed also in Section 10.4), this exercise raised also doubts over the expected benefits of such methods. It was shown in particular that, compared to a traditional consultation processes, MCA, by forcing people to frame the problem under investigation in a rather simplistic and schematic manner (i.e. in terms of options, objectives, weights and scores), risks hiding critical information, essential for arriving at a rich representation of the problem at hand. Participatory MCA techniques also tend to underplay important differences between participants’ viewpoints, which with other deliberative procedures would probably turn out to be more evident.

The multi-actor multi-criteria exercise also raised questions over the real willingness of stakeholders to share entirely their agendas during a participatory MCA process carried out as part of real decision-making procedures. Indeed, besides methodological problems, participatory MCA methodologies, similarly to all the other appraisal methods, are also affected by non-methodological issues, such as lack of transparency, power imbalances, hidden agendas and strategic misrepresentations, which weaken the role of appraisal within the wider decision-making context. All these issues have been discussed in Chapters 6 and 7, where the discrepancies between the rational problem-solving approach (at the heart of almost all the appraisal methodologies) and the reality of planning and decision-making for mega transport projects have been highlighted.

In general, many of these methodological and non-methodological issues, which have been summarized in Table 9.2 of Chapter 9, seem difficult to solve completely. The survey questionnaire carried out amongst participatory MCA experts, in the attempt to further explore and possibly address these issues, highlighted that, in many cases, experts have remained in an impasse between the acknowledgement of these problems and the possibility of effectively addressing them. In other cases, the possible solutions suggested by proponents of such methodologies clearly highlighted the disconnection between theory and practice. The results of the survey also demonstrated that a great difference of opinion exists amongst experts concerning several critical aspects, including how to undertake the different steps of the multi-actor multi-criteria process and the real purpose of such exercises themselves.

Looking back retrospectively, it is quite interesting that, as pointed out in the previous chapters, Morris Hill, whose work on the Goal-Achievement Matrix largely pioneered
important principles of participatory MCA techniques, appears somehow to have recognized some of these critical aspects, including the problematic determination of weights (see Hill, 1968), the difficult interpretation of the outcome of the process (see Hill, 1985), the impossible resolution of some conflicts and the difficult applicability of such methods in a turbulent political environment (see Hill, 1985). It was perhaps the practical impossibility of addressing these issues, which led Hill, during the last years of his activity, to abandon the *Goal-Achievement Matrix* as a tool in participatory planning in favor of other methodologies\(^1\) (see Hill, 1985).

### 10.2.2 Main overarching question

*To what extent can the use of participatory MCA methodologies enhance the current appraisal practice of mega transport infrastructure?*

As highlighted at the beginning of this thesis, to date participatory MCA methodologies seem to have enjoyed very limited use in the appraisal of mega transport infrastructure. In this research, however, no clear evidence supporting the claim that such methods can represent a better approach than traditional appraisal methods and existing participatory consultation procedures was found. As shown in this thesis, multi-actor multi-criteria techniques are affected by a number of issues, which are likely to prevent their successful application. In particular, whereas some technical problems may be addressed (at least partially) by further empirical research and a closer collaboration between transport appraisal specialists and MCA experts, other issues, especially non-methodological ones, are much more difficult to be tackled entirely. Indeed, what appears to have been largely neglected by the proponents of such methods is that making decisions regarding mega projects is rarely a matter of simply weighing the pros and cons of the project in a neutral manner. In this respect, all the participatory MCA methodologies proposed for the appraisal of major transport projects seem to be based on too idealistic assumptions regarding the wider decision-making context. The conditions implicitly required for the effective implementation of such methods (*e.g.* the existence of a unitary decision process; the presence of a single party governing and steering the process; the existence of a society where interests are well articulated and the public is relatively well organized; the willingness of the various stakeholder groups to cooperate, learn about each other’s social identities, and refrain from using power to influence decision-making; and the clear separation between fact and values) are precisely those ones which the empirical evidence obtained from this research suggests are not met in real world (see Table 10.1). Any multi-actor multi-criteria exercise is thus extremely likely to flounder at the critical point of converting concepts into practice.

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\(^1\) Hill was not quite satisfied with the Goal-Achievement Matrix as a tool in participatory planning (Hill, 1985; Sager, 2003). In the attempt to facilitate the resolution of planning conflicts between interest groups seeking different objectives, towards the end of his career, he started working with one of his colleagues on the development of a new methodology, termed *Minimal Requirements Approach* (see Hill, 1985). However, there is not too much information available on this method, which seems to have remained in its embryonic stage.
### Table 10.1 – Comparison between underlying assumptions of participatory MCA methods and research findings.

<table>
<thead>
<tr>
<th>Underlying assumptions of participatory MCA methodologies</th>
<th>Research findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existence of a unitary decision-making process.</td>
<td>Decision-making procedures concerning large-scale transport projects result to be highly fragmented (i.e. multiple coupled decision arenas, multiple discussions over arrays of intertwined issues, multiple policy games between a number of mutually interdependent actors, operating at different administrative levels). Such processes cannot be completely captured by using a list of criteria and a set of weighted scores.</td>
</tr>
<tr>
<td>Presence of a single party (e.g. an independent team of specialist advisors or a government agency) governing and steering the process. Project stakeholders are implicitly expected to behave as purely passive actors, limiting themselves to provide the steering team with data and information concerning their preferences.</td>
<td>The decision-making process of major transport projects takes place in a network of mutually dependent actors and organizations, who actively concur to shape problem definition as well as its solution through a process of mutual influence and negotiation. It is thus hardly possible for a single party to steer the decision making process.</td>
</tr>
<tr>
<td>Possibility of defining all the key parameters of the analysis at the outset.</td>
<td>Major projects emerge progressively through a rather chaotic, unstructured and at least partially undetermined process, where hardly any aspect (including the key stakeholders and the project scope) can be entirely and precisely defined at the outset. Even after several iterations the multi-criteria framework may result largely incomplete (e.g. missing objectives, incomplete data and information concerning the performance of the options against the different criteria, rough scoring and weighting schemes).</td>
</tr>
<tr>
<td>Clear separation between facts and values.</td>
<td>Due to the inherent uncertainty and complexity of the problem at hand, data and information are always incomplete and prone to different possible interpretations. By presenting different belief and value systems, the various stakeholders are likely to frame the same situation in different way, thus producing multiple (and often conflicting) explanations of what the problem and the associated issues are, and what might be the right course of action to address them. It may prove very difficult to reconcile these conflicting frames.</td>
</tr>
<tr>
<td>Possibility for all the individuals and stakeholder groups to take part in the process.</td>
<td>Major transport projects involve and affect a large number of stakeholders. Some trade-offs need to be made between the objectives of democracy, inclusiveness and comprehensiveness and the more practical need for creating a workable and efficient process, thus involving a limited number of people. However, a participatory exercise involving only a few stakeholder groups can hardly be considered a way for deriving consistent conclusions on social preferences.</td>
</tr>
<tr>
<td>Existence of a society where interests are well articulated and the public is relatively well organized.</td>
<td>There are major difficulties with stakeholder mapping and identification. Few stakeholder groups are in reality internally homogeneous in terms of values, interests or priorities. Many groups fail to make their views known due to lack of resources or experience. People are also not necessarily aware of the things that affect them and may not be able to abstract or conceptualize impacts in the way consultants would like them to.</td>
</tr>
<tr>
<td>Willingness of the various stakeholder groups to cooperate and share their own agendas.</td>
<td>The decision-making process of major transport projects often seems to be characterized by lack of transparency, hidden agenda and mutual distrust between the various parties.</td>
</tr>
<tr>
<td>Absence of power imbalances.</td>
<td>Power can hardly be excluded from the deliberative dialogue.</td>
</tr>
<tr>
<td>The key parameters are implicitly expected to remain fixed (or relatively stable) during the decision-making process period.</td>
<td>The decision-making process of major transport projects presents a turbulent character. During the process problem perceptions, stakeholders groups, and their interests and priorities may change substantially. This call for a continuous monitoring of the decision-making environment, which, however, is extremely difficult to realize in practice.</td>
</tr>
</tbody>
</table>
Accordingly, at the conclusion of this Ph.D. research, it seems possible to argue that, given the current state of the art, the contribution that participatory MCA methodologies can potentially provide to the improvement of decision-making for mega transport infrastructure is limited at best. In principle, multi-actor multi-criteria procedures might be employed alongside conventional ex-ante analyses in the attempt to make further information available to decision-makers. However, it is difficult to see how such methods could replace traditional planning and appraisal methods and/or significantly improve the outcome of the decision-making process.

To further justify this conclusion, it could be useful trying to describe a possible multi-actor multi-criteria process, led by an independent research team (consisting of several analysts and specialist advisors, trained facilitators and mediators, as well as a number of assistants) with the view to aiding the planning and appraisal of a major transport project. First of all, it easy to speculate that, at the process outset there would already be many conflicts of opinions between the research team, different experts, governments, project promoters and other project stakeholders, but also amongst members of the research team themselves, over the most appropriate way to conduct the participatory exercise. As already pointed out, some of the most important questions regarding the design of the appraisal exercise are as follows:

- What types of participants are needed? *i.e.* Project stakeholders, experts and/or government agencies; individual participants or representatives of organized groups?
- Who amongst those groups should be actually invited to take part in the process and how many people overall should be involved in the exercise?
- How should group decision-making participants be involved in the process? *i.e.* Interviews, questionnaires, in-depth group discussions or so forth?
- Would it be preferable to have only a single general participatory process or would it be better to have different processes (divided according to the scale/geography of the analysis, the types of group decision-making participants and/or the nature of the issues being investigated) running in parallel? And in the case of multiple processes, what approach should to be adopted to reconcile the results of the various multi-actor multi-criteria exercises?
- What types of MCA should be employed to capture the viewpoint of the different group decision-making participants? *i.e.* Sophisticated or elementary MCA techniques; full aggregation or partial aggregation MCA technique?.
- How many elements of the multi-criteria framework should participants be allowed to define? *i.e.* Options, objectives and criteria, weights and/or scores?
- How should data and information provided by the group decision-making participants be included in the multi-criteria framework? *i.e.* Exclusion, filtration, sharing, aggregation and/or disaggregation strategies?

As emphasized in this research, there is not any 'best' way to carry out the process. Each approach implies both advantages and drawbacks with respect to factors such as cost, time, inclusiveness, transparency, democracy, feasibility of the process and reliability of the results. Hence, drawing on the ‘decision-making paradox’ identified by Triantphylou and Mann (1989) (see Section 4.6.2), it could be argued that, ideally, a preliminary multi-actor multi-criteria process would be needed to take a decision on how to undertake the
multi-actor multi-criteria exercise. A more easy and straightforward, although less democratic, way to determine the key features of the participatory MCA process would see a government department imposing arbitrarily some specific requirements and constraints shaping the participatory appraisal exercise.

Without going into too much detail, assuming that the overarching purpose of the process was to perform a broad and comprehensive assessment of the project, allowing a very large number of actors and groups to freely express their view on the matter according to a typical collaborative planning style, multiple participatory processes, running in parallel, would probably be needed. Moreover, considering that project stakeholders typically present very different cultural and educational backgrounds, it is also relatively easy to imagine that a great effort would be required by the research team to help all participants to abstract and conceptualize their priorities and concerns in a uniform and consistent fashion, compatible with the requirements of the specific MCA technique employed. Several introductory crash courses would also have to be organized, especially for those unable to understand entirely the basic MCA principles. Different participatory engagement techniques and slight adjustments of the process might also be necessary to cope with the different education and understanding levels of the various participants. The research team might also find it indispensable to repeat the analysis a few times to make sure that all the participants had completely comprehended the scope and the nature of the exercise.

During the process, owing to the different participants’ agenda, the complex nature of major transport projects (i.e. multiple and intertwined components, policy dimensions, spatial scales, planning horizons, impacts and issues) and the controversial nature of these developments (i.e. uneven distributions of the gains and losses over space and time), major differences of opinion over the multi-criteria appraisal framework would then be easily identifiable across stakeholder groups and even within the same groups (e.g. the local communities). If, for instance, the various groups of participants were given the possibility of selecting their own objectives and appraisal criteria, most probably as many multi-criteria appraisal matrices as the number of groups would be obtained. Hence, the research team might easily end up managing an overall list of more than 100 different criteria against which to judge the various project options. Analogous considerations can also be made for scores and weights. Notwithstanding by iterating the process several times and providing space for discussions and negotiations it would be eventually possible to smooth out some differences, most probably, many conflicts of interests and contentious issues would prove impossible to solve. Surely, it is not realistic to expect that, in a participatory MCA process, any interest group would be willing to agree to a list of objectives and criteria, a weighting scheme and/or a set of scores which place its own interest (i.e. its preferred options) lower than others in the overall ranking.

Therefore, any person who was ultimately required to take any kind of decision on the basis of the results of the process, almost certainly would find himself/herself overwhelmed by such a large amount of information. Despite the use of computer software might help both the research team and the decision-makers with the analysis of data, processing this large variety of frames and values in a systematic, consistent and
comprehensive way would remain extremely complicated\(^2\). While some may argue that the primary purpose of such an exercise is exclusively to supply politicians and decision-makers with a wide array of information concerning the interests and priorities of the various parties involved or affected by a given issue, the need for deciding and acting, once the relevant data and facts about that issue have been collected, still remains incontrovertible. In this respect, in line with what argued by several authors (see Section 5.4.2), here it has been contended that an exercise which serves only to uncover a fundamental clash of frames and does not clearly point to any constructive way to solve the deadlock does not seem to be particularly valuable and, in any case, does not appear to be more useful than the other more traditional participatory consultation procedures already in place. The practical impossibility of considering simultaneously too many factors, would thus produce the necessity of summarizing and simplifying, explicitly (through the artificial construction of one or a few overall indicators) or implicitly (simply focusing on some aspects, while neglecting others), the large number of graphs, charts, and performances tables obtained from the process. However, as also largely explained in this research, any attempt to synthetize these different arrays of objectives and criteria, weighting schemes and/or scores into a more manageable and understandable whole is marred by ethical, practical and logical pitfalls.

On the other hand, the reduction of the number of group decision-making participants and/or the decision of giving them less freedom for setting the key parameters of the multi-criteria framework in the attempt to make the process more manageable (as less data will be obtained) and ultimately arrive at more prescriptive advice concerning the best course of action, would represents an equally problematic approach. Although still useful to reveal some insight into the problem at hand, such a process would certainly not satisfy the requirements of statistical representativeness. Therefore, it could not be considered an appropriate way to derive clear conclusions on social preferences, upon which decision-makers could then act. A small-scale and ‘narrow’ process could only be adopted to complement the results obtained with other conventional appraisal methodologies, rather than replace them. The selection of only a few participants and/or the imposition of some constraints over options, objectives, weights or scores would also pose issues of justice, equity and fairness and would result in some people and groups feeling deprived of a fundamental democratic right to participate and/or express their opinion. Moreover, as shown by the practical application of participatory MCA discussed in this thesis, even when the multi-actor multi-criteria exercise involves only a few people the amount of data and information obtained from the process and the clash of values across participants can still be very hard to process.

Finally, it should also not be forgotten that the holistic assessment potentially provided by such a multi-actor multi-criteria appraisal exercise would be extremely likely to be hampered by the complex and uncertain nature of any mega transport development. For several of the objectives identified through this participatory process it would probably

\(^2\) If the multi-criteria appraisal exercise is carried out for different assumptions concerning possible future exogenous (economic, environmental, social, political and technological) conditions (as ideally required by the long-term planning horizon and uncertain nature of major transport projects), the task faced by the research team and the decision-maker(s) becomes even more complicated. As pointed out in Section 4.6.4, under different scenario, parameters such as weights, scores and also objectives and criteria can change. Hence, in this eventuality, the decision-maker(s) is theoretically required to deal with different arrays of objectives and criteria, weighting schemes and/or scores for each one of the investigated scenario.
not be possible to identify simple and meaningful appraisal criteria through which judging the various project options. For some others objectives, despite costly analyses, only rough and vague estimates concerning the performance of the options could be produced. The appraisal exercise might thus risk to be based only on the few objectives and criteria for which enough data and information were collected. Conversely, it might also easily break down into a purely rhetorical debate, fueled by unprovable statements, unrealistic assumptions and mere speculations.

What has been presented so far is a complicated process, which, especially if conducted in a very ‘open’ manner and with the objective of trying to involve or represent (to the largest possible extent) all the parties affected by the investigated issue, can result to be also extremely long and expensive, characteristics that make them hardly applicable on a regular basis. However, the above process (which largely corresponds to what presented, although in a more optimistic and positive fashion, by proponents of participatory MCA methodologies in their articles) still represent only a purely technical and value-free assessment exercise, conducted according to a logical and chronological sequence of steps. Further and even more critical issues and questions, regarding the position of appraisal within the wider decision-making process, would need to be addressed to make the participatory MCA exercise really effective. Some of these key questions are as follows:

- What is required to ensure that major projects are initiated and planned according to comprehensive, systematic and impartial analysis, despite the huge economic and political interests involved?
- In consideration of the highly unstructured and fragmented nature of mega project decision-making, how is a single party (e.g. a research team) supposed to capture stakeholder interactions taking place in different, but highly interrelated, formal and informal political arenas, account for the concerns of parties who may not even represented in the official multi-actor multi-criteria process, and ultimately exert any real form of control over the process?
- In light of this fragmentation, how can the outcomes of several interconnected policy games and multiple discussions over arrays of intertwined issues be completely represented by employing a list of criteria and a set of weighted scores, while avoiding the risks of simplifying excessively the problem at hand?
- Given the extreme fluidity of the context, how should the complex array of data and information regarding the decision-making situation (i.e. overall scope, objectives and key attributes of the project; constraints, rules, laws and requirements to comply with; economic, environmental, social, political and technological trends; composition of the different stakeholder groups and coalitions, and their problem perception and mutual relationships) constantly monitored, updated and integrated during the multi-actor multi-criteria exercise so as to avoid that the results of the process represent only a snapshot of (some) stakeholders’ opinions at a particular point in time?
- And finally how is it really possible to cope with factors such as lack of transparency, power imbalances, hidden agendas, uncooperative behaviors and strategic misrepresentations?
Practically feasible approaches capable of effectively tackling all this complexity and reducing the influence of politics and power on mega project decision-making have not been conceived yet and are not likely to be developed. However, until when practical guidelines that could be applied in actual practice to address these issues will not be developed, faith in the ability of participatory MCA methodologies (as well as of any other methods relying on rational-technical principles and simplistic assumptions) to enhance significantly the appraisal of major transport infrastructure may be deeply misplaced.\(^3\)

10.3 Contributions of the research

Participatory MCA methodologies have been increasingly advocated as an effective approach to the appraisal of major transport projects. Through the employment of different methods of investigation, including reviews of the pertinent literature, interviews with tens of infrastructure practitioners, expert surveys and analysis of several case studies, this research has, however, demonstrated that such methodologies should not be regarded as a panacea for complex decisions and their application is also subject to a number of (methodological and non-methodological) issues which require careful consideration. In particular it has been emphasized that any further research on participatory MCA techniques need to start from:

- A clear understanding of the nature of large-scale infrastructure projects, as such projects are not only bigger (and more expensive) versions of conventional infrastructure investments. In this respect, the analysis undertaken has led to the identification of three fundamental aspects, which need to be taken into account when appraising such projects: (1) the inherent complexity of major projects which implies the need for acknowledging the unavoidable existence of multiple contrasting, but legitimate, perspectives concerning a given decision-making situation; (2) their multifold and uneven impacts and consequences, which always generate both winners and losers and make consensus over such projects hard to secure; and (3) their long development cycle, which unavoidably generates many uncertainties regarding the outcomes and the future impacts of these massive undertakings.

- A deep appreciation of the current transport appraisal practice and the key features, of traditional appraisal methodologies. In this regard, this research has demonstrated that CBA, EIA and MCA all present both strengths and weaknesses and, differently from what commonly assumed, share many similarities and common issues. As a result, it is possible to argue that the long-standing debate about which methodology constitutes the best approach (e.g. CBA versus MCA) to appraisal is absolutely inappropriate and misplaced, and generally reflects a poor understanding of the topic.

- The recognition that ‘participatory MCA’ should only be intended as an umbrella term for a number of very different approaches to the involvement of stakeholders in the

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\(^3\) Once again, it has to be further emphasized that the findings of this research are only referred to the possible applicability of participatory MCA methodologies to the appraisal of major transport projects. Notwithstanding, several participatory MCA methodologies proposed for different types of problems have been examined in the attempt to arrive at some conceptual frameworks, no general considerations can be made regarding the possible use of such methods in other fields, as transport planning, appraisal and decision-making practices are different from those of other sectors. Obviously, it goes beyond the scope of the thesis to consider whether, how and to what extent participatory MCA methodologies are used in other fields.
Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI

(multi-criteria) appraisal process, and that each approach presents some advantages and disadvantages. Notwithstanding the growing popularity of such methodologies, several critical aspects, such as the selection of group decision-making participants, the level of involvement of participants in the process, the treatment and inclusion of the individual preferences in the multi-criteria framework, appear to have been largely neglected in the literature. This research has attempted to fill this knowledge gap, by proposing some conceptual frameworks and classification systems, which can allow a better comprehension of the key features of such methods, possibly guiding also the design of the structure of a multi-actor multi-criteria exercise so as to best suit the requirements of the problem at hand.

• The acknowledgement that the technical process of appraisal cannot be regarded in isolation from the wider political decision-making context, and the refusal of the rational-comprehensive planning model as the dominant paradigm to explain the way major projects are conceived. This research has highlighted that major projects emerge progressively through a rather chaotic, largely unstructured, highly fragmented and at least partially undetermined process, where hardly any aspect can be precisely defined at the process outset. Often, multiple decision arenas, power struggles between stakeholders, contextual changes and other unexpected events undermine the presumed disciplining role of ex-ante analyses. Appraisal techniques that presuppose and/or depend upon being part of a rational-comprehensive process are thus unlikely to be effective.

So far, the research presented in this Ph.D. thesis has led to two papers, published in edited books:


This book chapter conceptualizes the planning and decision-making process of mega transport projects as a typical example of ‘wicked’ problems. The chapter consequently illustrates all the issues and challenges entailed by hypothetical participatory procedures undertaken in an effort to produce consensus over the best course of action. It also warns against making simplistic assumptions about the successful outcome of such processes.


This book chapter compares traditional CBA and participatory MCA methodologies. It considers in particular the case of Blackpool, a large town and seaside resort in North West England, which has been ranked as one of the most deprived towns in the UK,
and the South Fylde line, a rail line linking the Fylde Coast with the city of Preston. The chapter critically discusses the appraisal of three different alternative improvements of the rail line (proposed with the view to unblocking regeneration in the area), undertaken by means of CBA and also through a multi-actor multi-criteria process, involving six different stakeholder groups. The chapter contends that no method is superior to the other in absolute terms, and both the approaches present many limitations.

The following papers will be also completed and submitted to academic journals in the following months

  
  This paper, extracted from Chapter 4 of this thesis, includes a comparative analysis of CBA and (analyst-led) MCA. It argues that, while CBA and MCA are generally seen as two opposite appraisal approaches, they share many commonalities and their application to the appraisal of transport projects entails very similar methodological issues.

  
  As highlighted in Chapter 5, one of the most critical aspects of participatory MCA methodologies is represented by the ways in which multiple perspectives can be opportunely processed to determine the key elements of the multi-criteria framework (i.e. options, objectives/criteria, weights and scores). However, quite surprisingly, this aspect does not seem to have received much attention in the literature. This paper, illustrates the conceptual framework, developed as part of this research, which classifies the possible approaches through which the key elements of the multi-criteria framework can be determined, while dealing with multiple viewpoints. It also discusses possible advantages, disadvantages and issues entailed by each approach.

  
  This paper, based on Chapters 7 and 8 of this dissertation, describes the practical application of participatory MCA methodologies to the appraisal of the London Gateway port complex, with the objective of assessing the real effectiveness of such methodologies. Overall, this paper contributes to shed a more realistic light on the possible outcomes of such techniques.

  
  This paper builds on the analysis and concepts presented in Chapters 6 and 7. It discusses the London Gateway Port Complex with the view to analyzing the extent to
which the rational-comprehensive model reflects the planning and decision-making process of major infrastructure projects. The key argument of the paper is that it is almost impossible to proactively describe the reality of mega project planning and decision-making with the help of the technical-rational paradigm.

10.4 Limitations of the research

As underlined in Chapter 2, all research and studies present some limitations irrespective of the manner in which they are undertaken. While it is here contended that this research arrived at some interesting findings and provided some significant contributions to the body of knowledge related to mega transport project appraisal and decision-making, and participatory MCA methodologies, it is also necessary to discuss possible problems and issues associated with the design of the research strategy and its application. As already pointed out, this represented an exploratory research carried out with the view to gaining new insight into the key features and issues of participatory MCA techniques and investigating their applicability and effectiveness to the appraisal of mega transport projects. The lack of previous studies exploring this topic, which could have served as both foundation and benchmark, surely represented a disadvantage for the design of the present research. In addition, as discussed below, the specific methods and techniques adopted during the various stages of the research to address the different research sub-questions also presented some weaknesses.

- **Case study analysis (Chapter 7):** the investigation of the planning and related decision-making process of the Alameda Corridor, the Maasvlakte 2 and the London Gateway port complex was affected by problems and issues, which can also be found in many other studies and research. These problems include inaccessibility of some key documents, difficulties with findings and contacting people, unavailability of potential interviewees, unwillingness of some people to speak against their organizations, and difficulties of some people with recalling past events. As indicated in Chapter 7, the fact that only three cases studies were examined constitutes another important limitation of the research. The analysis of more case studies would have surely enhanced the reliability of the results. It should be noted, however, that both a brief and preliminary review of the literature on the planning and decision-making process of other major port projects (see, for instance, Coeck and Tessier, 2007 and Van Hooydonk, 2007 in the case of the decision-making process around the recent expansion of the Port of Antwerp), and other studies on other major transport projects conducted by the author of the present work appear to confirm the findings of the present research in terms of how mega transport infrastructure planning, appraisal and decision-making is currently undertaken.

- **Practical application of participatory MCA methods (Chapter 8):** in Section 8.6 it has been pointed out that the practical application of participatory MCA methodologies to the appraisal of the London Gateway port complex suffered from a number of limitations related mainly to the lack of resource (i.e. money, time and level of expertise) to run the process. In particular, the exercise was led only by one person (i.e. the author of the present work); it involved only nine people; and participants, due to their business commitments, had a limited amount of time to go through the different steps of the process. However, as pointed out several times in thesis, the
Chapter 10 – Conclusions and Final Reflections

multi-actor multi-criteria exercise was simply undertaken with the objective of further exploring possible issues affecting such methods, thus complementing the previous stages of the research. In any case, arguably this research would have surely benefited from the inclusion of more empirical tests. For instance, had a higher budget been available, it would have been possible to try to apply participatory MCA methodologies in different manners (e.g. by also involving all the stakeholders of the London Gateway port complex in a general meeting in the attempt to foster dialogues and negotiations between them). Moreover, had stakeholders and experts been more willing to cooperate, it would have been very interesting to try to run a multi-actor multi-criteria exercise also for the Alameda Corridor and Maasvlakte 2. Factors such as the lack of budget, the practical impossibility of involving to many participants in the participatory process and their general unwillingness to take part in this exercise are perhaps the (main) reasons why, so far, empirical testing of such methods have not been particularly common in the field of transport. Such factors are likely to constitute a serious barrier to any future study seeking to test such methods.

- **Survey questionnaire (Chapter 9):** there were also evident limitations to the final survey conducted amongst participatory MCA experts. As highlighted in Chapter 9, only 14 people participated in the survey and it is not possible to know whether all the respondents have carefully read and understood all the questions before answering. In principle, it may be possible to contend that, perhaps, the use of a shorter questionnaire would have provided respondents with more time to answer to the questions more carefully and exhaustively (i.e. providing also more comments to better qualify their checkbox answers). On the other hand, fewer questions would have not ensured the complete coverage of all these issues, potential problems and themes identified in the previous stages of the research. Ideally, a series of long face-to-face individual interviews with the different experts, followed by a few general workshops could have represented a better way to explore and address the issues surrounding the practical application of participatory MCA methodologies. As also discussed in Chapter 2, however, the use of a survey questionnaire was dictated mainly by practical reasons (i.e. the experts, who were contacted, work and live in different countries and typically have a rather busy schedule).

- **Literature reviews and interviews (Chapters 3-7):** whereas, in this research, a very high number of literature sources were examined, the literature reviews covered almost exclusively the English literature. Finally, it is also evident that, despite several people were interviewed as part of this research, the inclusion of more people would have allowed gaining an even better insight into the investigated phenomena.

### 10.5 Concluding remarks and recommendations for further research

The large majority of Ph.D. studies focusing on appraisal and decision-making practices conclude by recommending more research aimed at further improving appraisal methodologies and decision support systems. As already mentioned, many studies on major infrastructure projects also contend improvements in forecasts, data collection and assessment frameworks to be the possible solution against the strikingly poor performance records of many of such projects. On the one hand, the development of new appraisal methodologies and/or the refinements of the existing ones can surely be
beneficial. In the specific case of participatory MCA methods, for instance, more empirical research would allow to test which approaches and strategies can work best and why, and to understand how different framings of the process can affect the outcomes of the participatory exercise.

On the other hand, CBA and different types of EcIA techniques, the dozens of MCA methodologies already available, the wide array of methods and tools entailed by EIA and SIA procedures, hundreds of different participatory techniques as well as SWOT analysis, scenario analysis, probabilistic trees, Monte Carlo simulations, real option analysis, system dynamics, risk matrices and so forth seem to represent already a fully adequate, and perhaps excessively rich, toolkit, which practitioners can draw on. It seems that more is generally expected of tools and techniques than they are able to deliver. The reasons for this clearly lie in the persistent dominance of the rational-comprehensive planning paradigm in the transport and infrastructure planning literature. While the rational-comprehensive planning paradigm has been discredited, it still continues to be (directly or indirectly) invoked, especially by scholars, in theoretical debates on decision-making, where ‘optimal’ solution for society is assumed to be derived through careful analyses and scientific procedures, and the failure of projects to produce the intended outcomes is described as a purely technical problem. Morçöl (2007: 3-4) summarizes this problem well when he observes that the rational-comprehensive model has become “a ghost in the middle of the debates - a ghost that refuses to go away, despite that it was criticized to death and buried, particularly in the second half of the 20th century”.

It is here contended that the objectives of increasing the impartiality, accountability, transparency, democracy and inclusiveness of the planning and decision-making processes, replacing social conflict, mistrust and rivalry with an atmosphere of mutual respect among the opposing parties, and creating an environment in which effective communication, mutual learning, constructive debate, and compromise can take place all depend primarily on the effective possibility of establishing opportune legal and institutional frameworks. Therefore, rather than focusing on the development of the ‘perfect’ appraisal tool, further research efforts should be more conveniently directed towards the exploration of the possible attributes of these frameworks and the conditions under which the latter might successfully operate.
References


Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI


References


Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI


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References


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Assessing the Applicability of Participatory MCA Methodologies to the Appraisal of MTI


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Appendix A

List of People Interviewed

Focus group interviews on the key features of major container ports – Chapter 3

<table>
<thead>
<tr>
<th>People</th>
<th>Affiliation</th>
<th>Interview dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewee A1</td>
<td>Transport Planning Specialist, Port Authority of New York and New Jersey</td>
<td>2/10/2015</td>
</tr>
<tr>
<td>Interviewee A2</td>
<td>Freight Management Specialist, Port Authority of New York and New Jersey</td>
<td>2/10/2015</td>
</tr>
<tr>
<td>Interviewee A3</td>
<td>Regional Planning Specialist, Port Authority of New York and New Jersey</td>
<td>2/10/2015</td>
</tr>
<tr>
<td>Interviewee A4</td>
<td>GIS Specialist, Port Authority of New York and New Jersey</td>
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Unstructured interviews and informal discussion on transport appraisal practice and appraisal methodologies – Chapter 4

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<tr>
<td>Interviewee B1</td>
<td>MCA expert, University of Southern California, Los Angeles</td>
<td>25/09/2015</td>
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<tr>
<td>Interviewee B2</td>
<td>Senior Economist at the Urban Development Division of the European Investment Bank</td>
<td>Several discussions between 2014 and 2016</td>
</tr>
<tr>
<td>Interviewee B3</td>
<td>Senior Economist at the Urban Development Division of the European Investment Bank</td>
<td>Several discussions between 2014 and 2016</td>
</tr>
<tr>
<td>Interviewee B4</td>
<td>Expert Financing for Development at United Nations. Sometime Junior Professional Officer Associate at the European Investment Bank.</td>
<td>Several discussions between 2014 and 2015</td>
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<tr>
<td>Interviewee B5</td>
<td>Senior Economist, European Investment Bank</td>
<td>Several discussions between 2014 and 2015</td>
</tr>
<tr>
<td>Interviewee B6</td>
<td>Economist at the Aviation, Maritime and Innovative Transport Division of the European Investment Bank (EIB)</td>
<td>Several discussions between 2014 and 2015</td>
</tr>
<tr>
<td>Interviewee B7</td>
<td>Former UK Prime Minister's advisor on Environment Planning and Housing</td>
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### Semi-structured interviews on mega infrastructure planning and decision-making practice – Chapter 6

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<tr>
<td>C1</td>
<td>Professor of Transportation Policy and Planning, US</td>
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</tr>
<tr>
<td>C2</td>
<td>Marine Transportation/Seaport Specialist, US</td>
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</tr>
<tr>
<td>C4</td>
<td>Professor of Transportation Planning and Sustainability, US</td>
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<tr>
<td>C5</td>
<td>Regional and Metropolitan Planning Officer, US</td>
<td>03/10/2015</td>
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<tr>
<td>C6</td>
<td>Professor of City Planning and former City Planning Officer, UK</td>
<td>27/10/2016</td>
</tr>
<tr>
<td>C7</td>
<td>Private Transport Consultant, UK</td>
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</tr>
<tr>
<td>C8</td>
<td>Private Planning and Transport Consultant, UK</td>
<td>04/11/2016</td>
</tr>
<tr>
<td>C9</td>
<td>Private Planning Consultant, UK</td>
<td>08/11/2016</td>
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<tr>
<td>C10</td>
<td>Transport Economist, UK</td>
<td>14/11/2016</td>
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<td>C11</td>
<td>Professor of Urban and Regional Planning, UK</td>
<td>15/11/2016</td>
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<td>C12</td>
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<tr>
<td>C13</td>
<td>Professor of Project Management, UK</td>
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<td>C14</td>
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<td>C15</td>
<td>Private Economic, Investment and Finance Consultant</td>
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<td>C16</td>
<td>Private Planning Specialist</td>
<td>30/01/2017</td>
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<tr>
<td>C17</td>
<td>Expert in Infrastructure Procurement and Management, UK</td>
<td>08/02/2017</td>
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<tr>
<td>C18</td>
<td>Land Planning and Law Expert, UK</td>
<td>14/03/2017</td>
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**Case study interviews – Chapter 7**

**Alameda Corridor**

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<td>Interviewee 1.3</td>
<td>25/09/2015</td>
</tr>
<tr>
<td>Interviewee 1.4</td>
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<td>Interviewee 1.5</td>
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**Maasvlakte 2**

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<td>Interviewee 2.3</td>
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<td>Interviewee 2.4</td>
<td>10/05/2015</td>
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<td>Interviewee 2.5</td>
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**London Gateway port complex 10**

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<tbody>
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<td>Interviewee 3.2</td>
<td>13/3/2017</td>
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<td>18/4/2017</td>
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<td>19/5/2017</td>
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<tr>
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<td>Interviewee 3.7</td>
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<td>Interviewee 3.8</td>
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<td>Interviewee 3.9</td>
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<td>Interviewee 3.10</td>
<td>29/06/2017</td>
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Participatory MCA exercise (appraisal of the London Gateway port complex) – Chapter 8

<table>
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<th>Group Decision-Making Participants</th>
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<tr>
<td>Project Stakeholders</td>
<td>National government</td>
<td>(former Government planning advisor)</td>
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<tr>
<td></td>
<td>Greater London Authority</td>
<td>(strategic planning manager at GLA)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Local communities</td>
<td>(people living in Thurrock, participating on an individual basis)</td>
<td>3</td>
</tr>
<tr>
<td>Experts</td>
<td>Planning experts</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Transport and port experts</td>
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<td>1</td>
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<tr>
<td></td>
<td>Environmental experts</td>
<td></td>
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<tr>
<td></td>
<td>Economics and politics experts</td>
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Survey amongst experts on the issues surrounding the application of Participatory MCA methodologies – Chapter 9

Overall, 14 people, including MCA specialists and proponents of participatory MCA methodologies, were surveyed
Appendix B

Sample Interview Questions

Generic questions on mega infrastructure planning and decision-making practice - Chapter 6

- According to your experience, how are major transport projects conceived?
- Are major infrastructure projects always the product of comprehensive analyses of the problems and needs affecting a territory?
- Are major infrastructure projects always the product of comprehensive, balanced and coherent visions, strategies and policy objectives?
- How would you describe a typical planning and decision-making process regarding a large-scale transport project?
- Does the planning and decision-making process of a large-scale project follow a logical sequence of phases and steps?
- What do you consider to be the factors and actors that have the most influence on the planning and decision-making process of major transport projects?
- What are presently the appraisal methodologies most commonly used to appraise major transport projects?
- What is the role of appraisal within the planning and decision-making process?
- What are the most important appraisal criteria for major transport projects?
- Do concerns about sustainable development influence the planning and appraisal of such projects?

Specific questions on the case studies investigated (i.e. Alameda Corridor, Maasvlakte 2 and London Gateway port complex) – Chapter 7

- What was your role/position in the decision-making process of the project?
- How and when did you become involved in the project?
- When can the origins of the project be traced back to?
- How was the project conceived and what were the main objectives for building this project?
- Which were the most relevant actors involved in the decision-making process and what were their objectives?
- What were the key decisions and events which had the most influence on the planning and decision-making process of the project?
- How was the project appraised? What were the appraisal methodologies employed?
- What was the role of appraisal within the planning and decision-making process of the project?
- Did concerns about sustainable development affect the planning and appraisal of the project?
• How was stakeholder engagement undertaken? To what extend were the concerns of local communities, environmental groups, NGOs and other (secondary) stakeholder groups taken into account into the final decision?
Appendix C
Survey Questionnaire

INTRODUCTION

Typically, in a multi-criteria analysis (MCA) appraisal exercise, one or more project options are assessed against a number of different objectives, for which a set of appraisal criteria have been identified. The performances of an option against the various appraisal criteria, which may be assigned different weights, are then evaluated by means of scores.

MCA can be conducted in a number of ways, but those exercises which emphasize the direct participation of stakeholders are often referred to as ‘participatory’. Especially in the fields of policy and planning, methodologies integrating MCA with participatory techniques have appeared in a rather diffuse way over the past decades. In operational terms, the application of participatory MCA methods usually entails the following steps (which can be ordered differently depending upon appraisal context):

1. Primary problem analysis (e.g. identification of the problems and the relevant issues, preliminary determination of the boundaries of the system under investigation, definition of the objectives of the process, etc.);
2. stakeholder identification, mapping and engagement;
3. definition of the options to be appraised;
4. formulation of the objectives and the correspondent appraisal criteria;
5. ascription of weights to the objectives/criteria;
6. Construction of the performance profile of each project option (i.e. the prediction of all the effects produced by the project options under examination against the various objectives/appraisal criteria);
7. assignment of scores to reflect the performances of each alternative against the different objectives and appraisal criteria;
8. aggregation of scores and weights and examination of the outcomes of the process (e.g. final ranking) as support for the final decision.

According to my research, the different participatory MCA techniques differ essentially in the level of stakeholder involvement (see Figure 1). Indeed, in methods combining MCA and participatory techniques, stakeholder groups can be given the opportunity to identify all the elements of the MCA framework (i.e. options, objectives and criteria, weights, scores) or just for some of them.

Figure 1 – Types of participatory MCA methods (Dean, 2017).
Conversely from analyst-led analyses, in participatory processes it is extremely likely to have different views concerning the decision-making situation. Generally, in fact, different stakeholders groups, but also members within the same group, present diverse interests and priorities and tend thus to frame the underlying issues in different ways. Hence, the integration of multiple perspectives often may turns out to be a critical task. According to my research there are essentially three main approaches through which the elements of the multi-criteria framework (i.e. objectives/criteria, weights, scores) can be defined (see Figure 2):

- **exclusion**: the parameters of the analysis are established directly by the analyst, irrespectively from the stakeholders’ preferences;
- **sharing**: the various parties engage in a process of negotiation, mediated by a facilitator, with the view to reaching a consensus of opinion over objectives/criteria, weights and/or scores;
- **disaggregation**: stakeholder groups are given the freedom to adopt only their objective/criteria, to use their own weights and/or to ascribe their own scores. The outcome of participatory MCA methods based on this approach are represented by several tables (or charts or graphs) mapping the performances of the different options according to the viewpoint of the different stakeholder groups (i.e. single-actor views). At the end of the analysis, the points of views of the different stakeholder groups can also be combined together to obtain a multi-actor view.

**Figure 2 – possible approaches for setting the parameters of the analysis in participatory MCA (Dean, 2017).**

![Possible Approaches in Participatory MCA](image)
QUESTIONS

The main aim of following questionnaire is to identify and explore possible issues surrounding the application of participatory multi-criteria analysis (MCA) methodologies to the appraisal of large-scale infrastructure projects and other major planning and policy problems.

The questionnaire is divided into three sections. Questions in section 1 & 2 focus on your background and the general MCA process. Questions in section 3 are tailored to specific steps in the MCA process. I am very grateful for your time in responding to my survey, and I have tried to ensure the majority of the questions seek your responses through multiple choice type responses. However for each of these questions I have included a free text box where you can qualify your choice, or provide other feedback regarding the question if time permits.

Part 1: background information

1.1 From what academic field or discipline is your experience with participatory MCA methodologies?

1.2 How many times have you applied these methods for primarily academic research purposes?

1.3 How many times have you applied these methods to ‘live’ practice (i.e. real policy, programme or project appraisal)?

Part 2: general questions on participatory MCA methodologies

2.1 According to your experience, what are the main advantages of participatory MCA methods compared to ‘traditional’ analyst-led appraisal methodologies?

2.2 Differently from what envisaged by the rational comprehensive planning model, a real decision-making process concerning major planning and policy problems (e.g. the construction of a new high-speed rail line) often turns out to be non-linear, unstructured and highly fragmented (i.e. multiple decision arenas, multiple discussions, multiple policy games between a number of actors operating at different administrative levels) and partially indeterminate (i.e. very low possibility for identifying from the outset the key parameters of the problem).

   a. To what extent do you agree or disagree with this statement?
b. The linear character of a participatory MCA process, envisaging a linear sequence of steps, appears to collide with the realities of infrastructure decision-making (and other major policy problems). In light of this, can participatory MCA methods be successfully adopted in major policy and planning decisions, or should their use be limited only to small-scale and simple issues?

☐ Only major decisions
☐ Only minor decisions
☐ Both
☐ None

Please provide any further comments below

2.3 Who should ideally run the MCA process during major infrastructure planning and development (or the analysis of other major policy problems)?

☐ The project promoter
☐ A government agency
☐ An independent team of analysts and specialist advisors
☐ Other

Please provide any further comments below

2.4 In the case of the application of participatory MCA methods to the appraisal of a large-scale project would it be preferable to have only a single process to capture all the information, or would it better to have different processes (e.g. divided according to the scale/geography of the analysis: global, national, regional, local) running in parallel?

☐ One single process
☐ Multiple processes

Please provide any further comments below
2.5 The analysis of large-scale infrastructure projects or other complex policy problems can best approached from a solid background of scientific knowledge. Asking citizens and other non-experts to determine the key parameters of the analysis (e.g. objectives, scores and/or weights) may lead to unscientific results. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below (e.g. how is it possible to tackle this issue?)

2.6 According to some studies several people participating in MCA processes have difficulties in formulating meaningful and exhaustive statement of objectives, a complete and consistent set of weights or even understanding the meaning of criteria, scores and weights. In light of this issue and according to your experience, do you think participatory MCA methods are an effective way for eliciting people’s opinion?

☐ Yes
☐ No
☐ Only sometimes

Please provide any further comments below (e.g. how is it possible to tackle this issue?)

2.7 Some parties (especially the private sector) may not be willing to make their (real) list of objectives and their (real) set of weights totally public. Referring to your experience of participatory MCA, do you think this could seriously hamper the process?

☐ Yes
☐ No
☐ Only sometimes

Please provide any further comments below (e.g. how is it possible to tackle this issue?)
2.8 In the literature it is hard to find specific indications concerning the costs of the participatory MCA methods? Referring to your experience of participatory MCA, how much would it cost to apply a participatory MCA process to the appraisal of a large-scale infrastructure project? Could you provide a rough estimate of the costs?

2.9 Are there any other significant barriers to the use of these techniques that you are aware of?

Part 3: questions regarding the steps of the process

Step 1: Primary problem analysis

3.1 Similarly to other appraisal methodologies and participatory techniques, also participatory MCA methods are based on extensive value judgments. Indeed, the identification of the problems to be solved, the distinction between critical and less important issues, the way in which these issues are framed, and the design of the process may provide ample scope for either inadvertent bias or the exercise of power. Therefore, from this point of view, the adoption of participatory MCA methods does not lead to a totally value free evaluation approach. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

Steps 2: stakeholder identification, mapping and engagement

3.2 Who should identify and select stakeholders?

☐ The project promoter
☐ A government agency
☐ An independent team of analysts and specialist advisors
☐ Other

Please provide any further comments below
3.3 In the literature it is hard to find specific indications concerning the optimal number of people who can take part in the process. In your opinion what is the optimal group size of a participatory MCA exercise (e.g. number of stakeholder groups; number of people per group)?

3.4 In the literature it is also hard to find specific indications concerning how stakeholders should be mapped and clustered in different groups.

a. Referring to your experience of participatory MCA, should government agencies be included as stakeholders, or should these be viewed as representatives of other stakeholders?

☐ Government agencies as stakeholder groups
☐ Government agencies as representatives of other stakeholders

Please provide any further comments below

b. Referring to your experience of participatory MCA, should researchers and experts be included as a separate stakeholder group?

☐ Yes
☐ No
☐ Only sometimes

Please provide any further comments below

3.5 In what do you think are the most important considerations when selecting participants and forming groups for the purpose of an MCA exercise?

3.6 Ideally, participatory processes should involve all interested parties that are affected by the issue under discussion. In practice, there are a number of constraints that drastically
limit the number of the people involved in the process (e.g. time and budget constraints, logistics problems with scheduling meetings, difficulties in the identification of all the relevant stakeholder groups, stakeholders’ refusal to take part in the process, etc.). In light of this:

a. Can the insight offered by a process involving only a few people be judged to be really representative of the various themes, concerns and issues pervading society?

☐ Yes
☐ No

Please provide any further comments below

b. Involving only a few people in a participatory exercise may also reinforce existing patterns of power imbalance if only the most important and powerful groups take part in the process. This could expose the process to the risks of bias as not all the different points of views are equally represented in the process. Do you agree?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below (e.g. how is it possible to tackle this issue?)

c. It is very hard to make sure that the people involved in the participatory exercise really represent who they say they represent and can speak and ultimately make agreements on behalf of for that group. Do you agree?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below (e.g. how is it possible to tackle this issue?)
3.7 The literature suggests various methods to engage stakeholders in the process:

a. Eliciting stakeholder groups’ preferences through simple questionnaires and email surveys may not be the best approach to stakeholder management. Indeed, in this way, stakeholders may not have enough time and support to properly understand the nature of the exercise. To what extent do you agree or disagree with this statement?

☐ Strongly Agree  ☐ Agree  ☐ Neither Agree nor Disagree  ☐ Disagree  ☐ Strongly Disagree

Please provide any further comments below

b. Eliciting stakeholder groups’ preferences through individual face-to-face interviews does not leave any room for discussions between stakeholders (i.e. the different parties are not required to be in the same room). Therefore with this approach there are very limited possibilities for mutual understanding, trust and consensus building, which are often regarded as potential important outcomes of participatory processes. To what extent do you agree or disagree with this statement?

☐ Strongly Agree  ☐ Agree  ☐ Neither Agree nor Disagree  ☐ Disagree  ☐ Strongly Disagree

Please provide any further comments below

c. Involving stakeholders through public meetings and workshops may also be problematic as the more people and groups are allowed to participate, the more challenging the management of the process becomes (e.g. costs, time, skills and experience required). To what extent do you agree or disagree with this statement?

☐ Strongly Agree  ☐ Agree  ☐ Neither Agree nor Disagree  ☐ Disagree  ☐ Strongly Disagree

Please provide any further comments below
3.8 In your opinion, what is the best way to involve stakeholders in the process?

3.9 How much freedom should stakeholders have in the process? What elements (i.e. options, objectives/criteria, weights, scores) of the multi-criteria framework should stakeholders be allowed to determine? (MULTIPLE ANSWERS POSSIBLE)

☐ Options
☐ Objective/Criteria
☐ Weights
☐ Scores

Please provide any further comments below

3.10 Should different stakeholder groups be given the same importance in the process?

☐ All the different stakeholder groups should be given the same importance
☐ Some stakeholder groups (e.g. project promoters, government, experts, etc.) should be considered more important than others

Please provide any further comments below

*Step 3: Option definition*

3.11 The ability of an appraisal methodology to demonstrate the comparative merits of possible courses of action is limited, ultimately, by the quality of the project options put forward for assessment (i.e. a good plan cannot be chosen from a ‘poor’ set of alternatives). To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree
Step 4: Identification of Objectives and Appraisal Criteria

3.12 In MCA there are no accepted guidelines concerning the way in which objectives and criteria should be identified.

a. if objectives and criteria are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. This seems also undemocratic as stakeholders may be required to adopt objectives/criteria colliding with their beliefs and values. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

b. if objectives/criteria have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

c. if each stakeholder group is allowed to use their own objectives and criteria (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations. To what extent do you agree or disagree with this statement?
3.13 In your opinion, what is the best way to identify objectives and appraisal criteria?

Please provide any further comments below

Step 5: Assignment of Weights to each Criterion

3.14 In MCA there are no accepted guidelines concerning how weights should be defined.

a. if weights are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. To what extent do you agree or disagree with this statement?

Please provide any further comments below

b. if weights have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach (e.g. in practice, only a very naive group would be willing to agree on a set of weights, which ultimately undermines their interests). To what extent do you agree or disagree with this statement?

Please provide any further comments below
c. if each stakeholder group is allowed to use their own weights (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations (e.g. use of excessively high or low weights in the attempt to undermine the position of antagonist groups). To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

3.15 In your opinion, what is the best way to identify weights?


Step 6: Construction of the performance profile of each project options

3.16 The quality of any assessment, whether this is in the form of CBA or MCA, depends primarily on the availability, accuracy and validity of the mathematical and statistical models, forecasts, surveys and other studies used to estimate the possible future performances of the various project options. However, for a project to be realized one or more decades in the future, the possibility of foreseeing with any degree of precision its effects is severely limited. From this point of view participatory MCA methods do not substantially differ from other conventional appraisal methods. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

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Step 7: Scoring the options against each criterion

3.17 In MCA there are no accepted guidelines concerning scoring procedures.

a. if scores are established by analysts and specialist advisors (i.e. exclusion approach) they may turn out to be largely arbitrary. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

b. if scores have to be established jointly by stakeholders (i.e. sharing approach), in practice, consensus may be difficult to reach. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

c. if each stakeholder group is allowed to use their own scores (i.e. disaggregation approach), the process may be exposed to bias and strategic misrepresentations (e.g. use of excessively high or low scores in the attempt to undermine the position of antagonist groups). To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below
3.18 In your opinion, what is the best way to identify scores?

Step 8: Aggregation of scores and weights and examination of the outcomes of the process (e.g. final ranking in the form of single actor views and/or multi-actor view) as support for the final decision.

3.19 In many cases, reconciling the perspective of actors who share no common ground is almost impossible. Therefore, a process run in an effort to produce consensus over objectives/criteria, weights and scores (i.e. sharing approach) may ultimately prove impossible. However, there seem to be issues with the outcome of the process even if other approaches are adopted:

a. If during the process stakeholders are allowed to use their own objectives/criteria, weights and/or scores (i.e. disaggregation approach) the final output is represented by multiple single-actor views. However, when actors present very different agendas, any attempt to arrive at a final decision starting from this clash of frames (i.e. several tables or chart displaying different arrays of objectives and criteria, weighting schemes and scores) may prove impossible, without reconciling and synthetizing the single-actor views into a more manageable and understandable multi-actor view. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
☐ Disagree
☐ Strongly Disagree

Please provide any further comments below

b. On the other hand, the mechanical aggregation of different perspectives (i.e. aggregation approach) may produce inconsistent outcomes (e.g. do average values of scores and weights have meaning at all?) and may be exposed to the jeopardy of bias and strategic misrepresentation. To what extent do you agree or disagree with this statement?

☐ Strongly Agree
☐ Agree
☐ Neither Agree nor Disagree
3.20 In your opinion, how should the data and information obtained from the process be treated?

3.21 The planning and decision-making process of a major project lasts several years, during which stakeholders’ perceptions of the problem and attitude, and also stakeholder groups themselves, may change substantially. The outcome of the participatory exercise thus represents only a snapshot of stakeholders’ opinions at a particular point in time. To really capture stakeholders’ viewpoints it would be necessary to repeat the process on a regular basis but this would be extremely costly and hard to realize in practice. To what extent do you agree or disagree with this statement?

3.22 How the outcomes of the participatory exercise should be included in the decision-making process? Should participatory MCA techniques replace CBA, Environmental Impact Assessment techniques and traditional public inquiry procedures, or should they be simply intended as complementary to the latter?