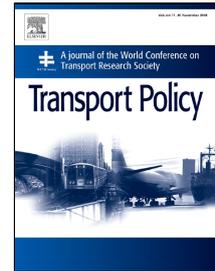


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**Testing the application of participatory MCA: The case of the South Fylde Line**

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**Abstract**

*In recent decades, many authors have claimed that, compared to traditional appraisal techniques such as cost-benefit analysis (CBA), participatory multi-criteria analysis (MCA) methodologies represent a more effective approach to appraising transport projects, largely due to the range of criteria able to be used and the ability to reflect multiple viewpoints. This paper applies a participatory MCA process to appraise potential rail investments in North West England. The results of this analysis show that, while promising, participatory MCA processes also have several limitations, and successful application is subject to several issues which require careful consideration, including selection of participants, identification of appraisal criteria, and the process of assessing impacts.*

## Testing the application of participatory MCA: The case of the South Fylde Line

### Abstract

*In recent decades, many authors have claimed that, compared to traditional appraisal techniques such as cost-benefit analysis (CBA), participatory multi-criteria analysis (MCA) methodologies represent a more effective approach to appraising transport projects, largely due to the range of criteria able to be used and the ability to reflect multiple viewpoints. This paper applies a participatory MCA process to appraise potential rail investments in North West England. The results of this analysis show that, while promising, participatory MCA processes also have several limitations, and successful application is subject to several issues which require careful consideration, including selection of participants, identification of appraisal criteria, and the process of assessing impacts.*

### 1. Introduction

Transport infrastructure investments can have an important and 'catalytic' role in promoting the development of a territory (Banister and Berechman, 2000; Bismark and Agbelie, 2014; Hickman *et al.* 2015). However, decisions on transport projects, especially the complex ones, are often contentious. There are multiple-actor views, sometimes differing significantly to those of the project promoter. This divergence in viewpoint, covering objectives, assessment criteria and impacts, is difficult to incorporate in the current appraisal process, in the UK, and also in many other contexts. Many transport projects involve high capital investment costs and generate multiple economic, social and environmental impacts (Bruzelius *et al.*, 2002; Hickman *et al.*, 2010; Lucas, 2012). Impacts are distributed unevenly over space and time, and hence amongst population groups. They can work in different directions, with some positive and negative features, and are difficult to reconcile and explain to the public and to other actors.

Since the late 1950s, substantial refinements have been made to appraisal practices (Goodman and Hastak, 2006), with new appraisal methodologies and evaluation frameworks developed and modified in an attempt to ensure a more robust assessment of projects (McAllister, 1982; Rogers and Duffy, 2012). In recent decades, participatory multi-criteria analysis (MCA) methodologies have been proposed by a number of authors for the appraisal of transport projects (Macharis and Bernardini, 2015). Compared to traditional cost-benefit analysis (CBA) or analyst-led MCA, participatory MCA methods are capable of incorporating a wider range of interests and values concerning projects, (Macharis *et al.*, 2010; Hickman and Dean, 2017). Public policy based on instrumental rationality (a focus on the most efficient or cost-effective means to achieve a specific end, with little reflection on the value of that end) has had limited success in responding to complex social problems. This can be replaced, or complemented, by a more discursive and deliberative form of policy making (Dryzek, 1990). Participatory MCA has much potential as an important tool here. However, MCA and participative processes are not immune to criticism. Indeed sometimes they tend to suffer from similar difficulties to those experienced with CBA, including issues surrounding the criteria chosen, quantification of impacts, additivity of results, dominance of viewpoints, and process for assessing impacts.

This paper examines the application of a participatory MCA process in practice, using a case study of potential rail investments in North West England. It seeks to test the process, commenting on the benefits and limitations. The work draws from the EU Sintropher project (Hickman and

Osborne, 2017)<sup>1</sup>, assessing potential investment options for the South Fylde Line, including tram, tram-train and heavy rail, linking Blackpool, the Fylde Coast and Preston. Six different stakeholder groups are used in the participatory MCA process. The commentary is critical in nature, exploring the use of participatory MCA, and discussing the problems and difficulties experienced in practice.

The paper consists of five further sections. First, an overview of CBA and MCA is given. Second, an approach to participatory MCA is developed to be used in the case study. Third, participatory MCA is applied, and the results assessed, using three different project options proposed for the South Fylde Line. Fourth, critical discussion is provided on the process and outcomes. Finally, conclusions are made and reflections given for research and practice.

## 2. Transport appraisal practice

### 2.1 Use of CBA

Appraisal can be defined as a process seeking to determine, as systematically and objectively as possible, the extent to which a given course of action accomplishes a set of identified objectives. This can take into account different priorities amongst objectives, scarcity of resources, as well as other constraints (Van Pelt, 1993). CBA was the first formal evaluation method to be applied to the appraisal of major strategic infrastructure projects. In the UK, as well as in many other countries, CBA still represents one of the most common appraisal methodology (Vickerman, 2000; Goodman and Hastak, 2006).

CBA seeks to quantify in monetary terms the value of the positive (benefit) and negative (cost) consequences of a project for all members of society (Boardman *et al.*, 2006). In the case of transport investments, the key benefits may comprise travel time savings, reduced vehicle operating costs, reduced accident costs, as well as reduced emissions to due mode shift (e.g. from road to rail). The main costs may include capital costs, work zone disruption (e.g. noise, delays, etc.), maintenance and operating costs. The potential benefits of a project proposal are evaluated in terms of willingness to pay, namely a financial metric for a person's welfare change derived from a certain action, which is aggregated across persons to obtain the overall net goodness of its outcomes. The costs of a project are estimated in terms of resource costs. Discounting is used to convert all future costs and benefits into their present value, in order to make the costs and benefits comparable when occurring at different points during the project lifecycle. The final results of CBA are often presented by 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 produced by dividing the sum of the discounted costs into the sum of the discounted benefits. The premise of CBA is that scarce resources should be allocated to their most valued uses, namely projects whose benefits outweigh their costs, i.e. projects whose NPV is positive and whose BCR exceeds the value of 1.

Notwithstanding its wide use, CBA has been highly criticised for many reasons including problems of quantification, partiality (Ackerman and Heinzerling, 2002, Næss, 2006, Hickman and Dean, 2017), excessive importance given to travel time savings in the estimate of benefits for investments in the transport system (Metz, 2008), disregard of distributional effects and intra-generational

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<sup>1</sup> SINTROPHER (Sustainable Integrated Tram-Based Transport Options for Peripheral European Regions) is an EU INTERREG IVB project, running from 2009 to 2016. It involves 13 Partners, five European Regions and five Member States: Fylde Coast (UK); West Flanders, (Belgium); Valenciennes (France); Nijmegen (Netherlands); and Kassel (Germany). The lead partner is University College London (UCL). The project examines and invests in new tram links to connect peripheral regions with key hubs on the European high-speed rail network, particularly tram trains as developed in Kassel, Germany.

equity (Van Wee, 2012), and the lack of stakeholder involvement during the analysis (Macharis and Bernardini, 2015).

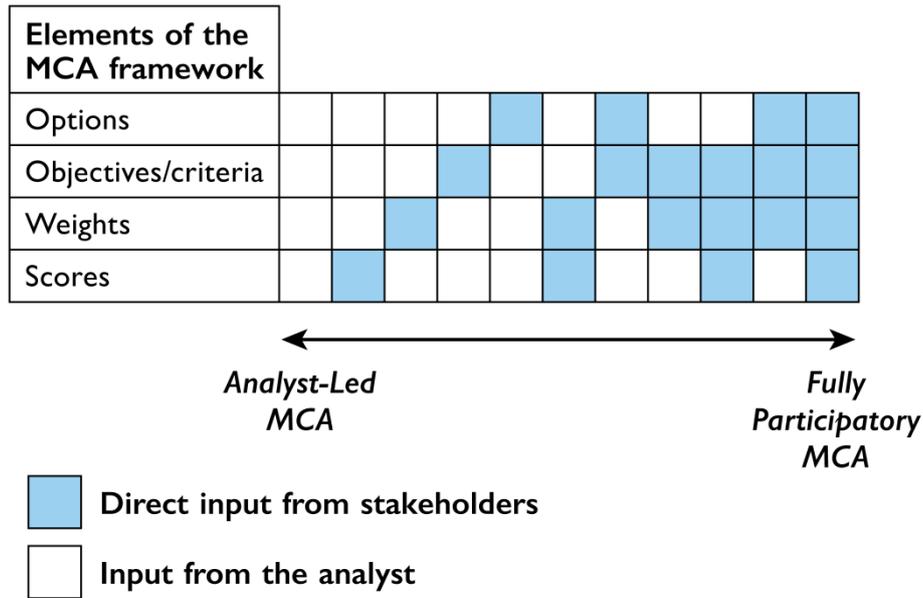
## *2.2 MCA and participatory MCA methods*

Since the 1990s, the increasing prominence of sustainable development as an overarching policy goal has led to consideration as to how projects might achieve a balance between economic, social and environmental objectives. This has resulted in the increasing use of MCA techniques, capable of examining multiple effects of potential infrastructure or development proposals, while highlighting synergies and conflicts between them (Munda, 1995 and 2008; Dalal-Clayton and Sadler, 2014).

MCA, also known as Multiple-Criteria Decision Making (MCDM) and Multi-Objective Decision Analysis (MODA), can be seen as a collective term for a range of different approaches which attempt to take into account multiple decision criteria (Belton and Stewart, 2002). The MCA literature is rich with many different approaches, ranging from highly elaborate mathematical methods to more simple MCA implementations. Typically the key steps implied by most of the approaches include: development of options, identification of objectives and criteria against which to test options, scoring of impacts of options against the different criteria, and sometimes weighting of criteria and hence weighted impact scoring (Dodgson et al., 2009). 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). Differently from sophisticated methods, simplistic MCA approaches adopt basic aggregation rules (e.g. using the weighted sum of the impacts of an option against each criterion) or even avoid any type of calculation to avoid additivity issues. In all of the approaches, there is a balance to be made between complexity and understandability for the analyst and actors involved in the assessment.

MCA approaches also range from analyst-led (non-participatory) methods to those involving multi-actors within the discussion (participatory MCA). Analyst-led MCA methods adopt a technocratic approach to the analysis, where the appraisal is carried out by a single analyst or a team of analysts. Participatory MCA methods, by comparison, adopt a collaborative approach to the decision problem by involving different actors at selected stages in the process (Belton and Stewart, 2002). Participatory approaches include: Three-Stage Multi-Criteria Analysis (Renn et al., 1993), Stakeholder Multi-Criteria Decision Analysis (Banville et al., 1998), Multi-Criteria Mapping (Stirling and Mayer, 2001), Deliberative Multicriteria Evaluation (Proctor and Drechsler, 2006), the Participative Multi-Criteria Analysis (Stagl, 2006), Policy-Led Multi-Criteria Analysis (Ward et al., 2016), and Multi-Actor Multi-Criteria Analysis (Macharis et al., 2010; Macharis and Bernardini, 2015). The last two methods have been specifically applied to the appraisal of transport projects, although all of the approaches present similar features and may thus, in principle, be employed in this sector. These techniques differ by the level of actor involvement (Figure 1) – groups can be involved at different stages of the process and can provide an input for all the elements of the analysis (i.e. options, objectives and criteria, weights, scores) or just for some of these.

**Figure 1: Level of participation within MCA**



(Dean, 2018)

Participatory processes attempt to include different viewpoints in the decision-making process. However, the difficulty is that different stakeholder groups, and also members within the same nominal group, present diverse interests and priorities, and tend to frame the underlying issues in different ways (Schön and Rein, 1994). Hence, the integration of multiple perspectives often turns out to be a difficult task. There are two main approaches for handling data and information provided by different stakeholder groups (Leyva-Lopez and Fernandez-Gonzalez, 2003, and D'Este, 2009):

- Input level aggregation: the different stakeholder groups are required to assess a common set of options by adopting a common list of objectives and appraisal criteria and agreeing also on scores and weights. This results in an overall common ranking (i.e. a multi-actor view), expressed in the form of tables, charts or graphs;
- Output level aggregation: this model does not require stakeholders to employ a common multi-criteria framework. While the practical need for ensuring basic comparability implies the use of a common set of options, stakeholder groups are given the possibility to adopt their own objectives, criteria, weights and/or ascribe their own scores. Different combinations are possible. The outcome is again expressed in the form of tables, charts or graphs illustrating the performances of the different options according to the viewpoints of the different stakeholder groups (i.e. single-actor views). The single-actor views can sometimes be aggregated together to obtain a multi-actor view.

Macharis and Bernardini (2015), Stirling (2006), and Stirling and Mayer (2001) claim that output level aggregation, allowing stakeholders to assess the alternative in terms of their own objectives/criteria and to assign their own weightings, represents the most appropriate approach when the stakeholder groups present very different concerns.

According to their proponents, MCA and participatory MCA methodologies have several important properties that make them appealing and practically useful. For instance, Macharis *et al.* (2010) and Macharis and Bernardini (2015) emphasise how MCA approaches can give better insights on project impacts relative to mono-criterion and monetary appraisal methods (e.g. CBA). This can therefore lead to more justifiable decisions (Munda, 1995, 2008, Belton and Steward, 2002). In

addition, the illustration of the process through tables or charts, with all the criteria and data identified for assessment as well as the specification of all the assumptions adopted throughout the analysis (e.g. the relative weighting amongst the criteria employed) provides a cleared and more transparent approach to decision-making (OMEGA Centre, 2010, Dodgson *et al.*, 2009), and allows a more deliberative process to be followed. Finally, stakeholder participation can enhance the quality of the decision by better capturing the full range of interests and values in dispute, and improving the likelihood of acceptance of the results of the process by the stakeholders (Banville *et al.*, 1998, and Stirling, 2006).

There are, however, potential problems in using a participatory MCA process. It is often contended (Van Pelt, 1993; D'Este, 2009; Dobes and Bennett, 2009) that MCA constitutes an excessively arbitrary approach to appraisal. Different to CBA, which entails 'well-established' principles for the selection of the benefits and costs to consider and for their measurement, in MCA there are no accepted and specific guidelines concerning the selection of objectives and criteria, scoring and weighting procedures, and aggregation methods, through which all the elements of the MCA framework (i.e. criteria, scores and weights) are ultimately brought together. Manheim *et al.* (1974) and Steele *et al.* (2009) also argue that many actors may experience difficulties in formulating meaningful and exhaustive statements of objectives, a complete and consistent set of weights, or even more simply understanding the meaning of criteria, scores and weights. Finally, Miller (1956) and Arrow and Raynaud (1986) suggest that the inherent limitations of short-term memory make an individual unable to consider too many factors simultaneously 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 – this practicality threshold limits the scope of the MCA process.

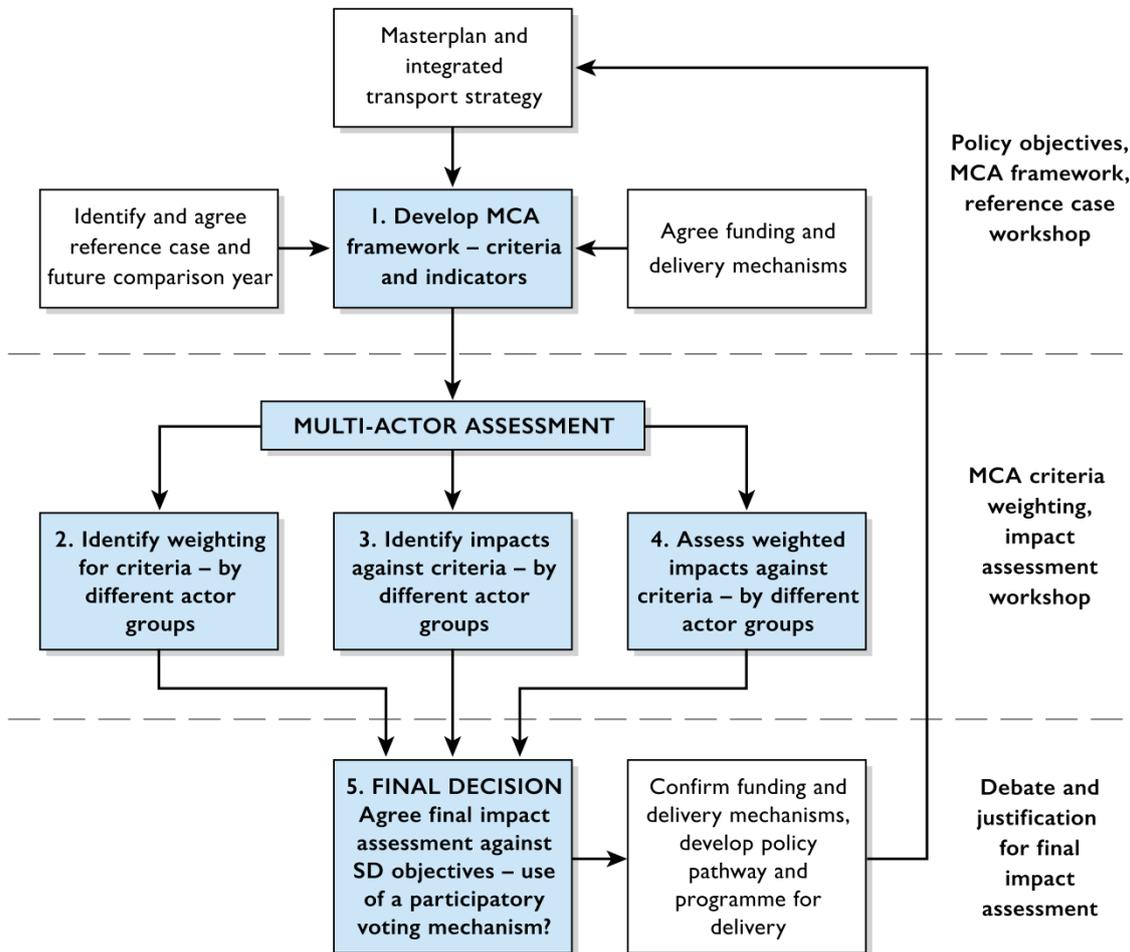
### 3. The participatory MCA approach

The participatory method developed for use in the case study comprises five main stages (Figure 2), drawing on similar approaches from Macharis (2007), Leleur (2012), Macharis and Bernardini (2015) and Stirling and Mayer (2001). The transport project should be considered within the planning strategy for the context and hence contribute to objectives drawn from the planning and transport strategies. Projects developed without reference to a planning strategy, or where a planning strategy is not available, often suffer from poor focus, e.g. the projects might help achieve 'transport' objectives, such as reduced journey times, but are poorly integrated with the strategic planning direction. The project options to be appraised are formulated and stakeholders identified, based on consideration of the strategic planning objectives and also the problems and opportunities found within the context. The following MCA stages are carried out:

- Stage one: MCA framework and criteria – these are developed by the project analyst, informed by the planning and transport strategy objectives.
- Stage two: criteria weighting – this is carried out by multi-actors, using a workshop, informed by the planning and transport strategy objectives.
- Stage three: impact assessment – again carried out by multi-actors, using a workshop, informed by impact studies such as the business case, environmental and social impact assessment, depending on availability.
- Stage four: criteria weighting and impacts are multiplied, by the project analyst, to gain the weighted impact assessment by actor group.
- Stage five: the final decision is made following a debate, highlighting the commonalities and differences between the different actor viewpoints.

One workshop was used for the analysis in this paper, but depending on the size of the project, this could involve multiple workshops and even a decision conference to debate the different viewpoints (after Leleur, 2012).

**Figure 2: Participatory MCA**



The project analyst team leading the participatory exercise help to inform and record the debate between the multiple actors. The process may begin with a primary problem assessment undertaken by the analysts, concerning the nature and dynamics of the problems and opportunities under investigation, and to select the possible project options. A preliminary list of objectives and appraisal criteria will also be developed to inform the multi-actor discussion. The process is hence participatory at stages 1-4. The outcomes of the process are illustrated by a number of tables and charts displaying the overall performances of the project options according to the viewpoints of the single stakeholder groups and a summary multi-actor view, obtained as the average of the single-actor views (output level aggregation).

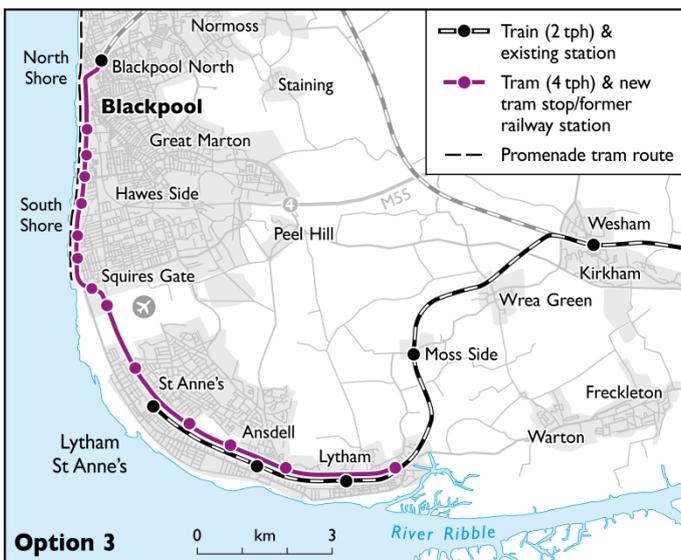
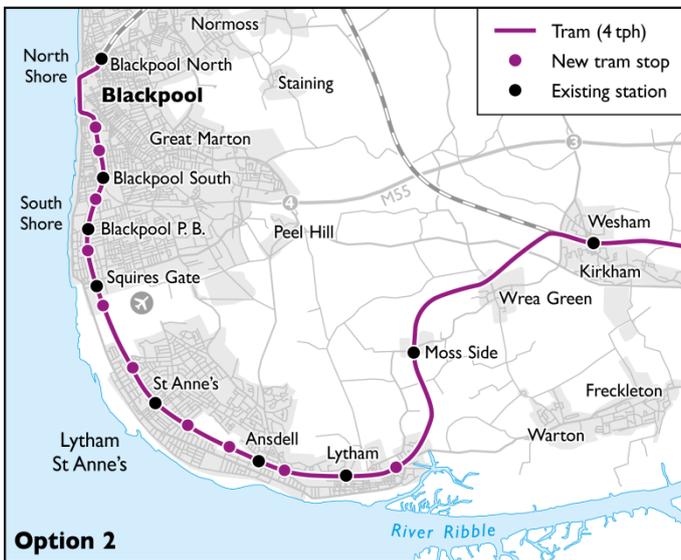
#### 4. Case study: the South Fylde Line

The participatory MCA approach is tested on potential project options for the South Fylde railway line, a 19-km non-electrified and single-tracked railway line linking Blackpool, along the Fylde Coast, to Preston in North West England. Blackpool is a large town and seaside resort (Figure 3) with a resident population of 140,000 and 13 million tourism visits per annum. Blackpool has high levels of social deprivation – it is the sixth most deprived local authority area in the country and first in terms of deprivation concentration, according to the 2010 Indices of Deprivation. The

commissioning authority for the project would be Lancashire County Council, but the UK Department for Transport would need to provide funding, hence a case has to be made for the project. The Sintropher project has helped to provide evidence for the development of the tram-based options, examining the role that transport may have in helping in the regeneration of Blackpool and in particular the potential beneficial effects of the improvement of the South Fylde line. Several possible alternative improvements of the South Fylde Line were considered, and the following options were shortlisted (Jacobs, 2015):

- Option 1: Improvement of the existing regional rail services, with an increase in service frequency of the existing services on the South Fylde Line, from one train per hour to two trains per hour. This option includes an extension of the service to Manchester and Manchester Airport, but no new stations will be created along the line.
- Option 2: introduction of a tram-train service in place of the existing regional rail service. A tram-train service will replace the existing regional rail service between Blackpool South and Preston. The service will be extended to Blackpool North and 10 new stations will be added along the line.
- Option 3: combination of regional rail services and a tram-train service. This is a compromise between the first two options. It entails the doubling of the service frequency of the existing regional rail services and the introduction of a tram service from Saltcotes to Blackpool North. This implies an overlap between tram and train services between Lytham St Anne's and Saltcotes. It also entails the provision of 13 new stations along the line.

**Figure 3: South Fylde Line project options**



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(Based on Jacobs, 2015)

A one-day workshop was held at Lancashire County Council in July 2015 to discuss potential project options. Six different stakeholder groups, encompassing a wide range of institutional interests and views, were involved in the process:

- Group 1: local authorities (district-level government);
- Group 2: Lancashire County Council (county-level government);
- Group 3: local communities;
- Group 4: business groups;
- Group 5: environmental groups;
- Group 6: transport planners.

There were 26 participants who held a good knowledge of the issues under investigation; each group consisted of 3 to 5 participants. A series of short presentations and panel discussions were used to brief participants on the key principles of the participatory MCA exercise, the issues affecting Blackpool, and the possible alternative project options and their features.

The stakeholder groups were asked to assess the project options against a preliminary list of policy objectives developed by the analyst team. 16 project objectives belonging to four different dimensions were identified, namely transport and development, economic, environmental and social. The criteria were more closely related to the UK sustainable development indicators (DEFRA, 2013) than the criteria included in the UK Department for Transport's appraisal guidance (see DfT, 2014), and to local policy priorities rather than national. For example, there was no criteria based on time savings – this was not seen as a policy objective. Stakeholders were given the freedom to choose objectives from the list as well as to identify entirely new project objectives. Table 1 gives the objectives adopted by the different groups.

**Table 1: Objectives adopted by the different stakeholder groups**

Themes	Objectives	Description					
		Group 1: Local Authorities	Group 2: Lancashire County Council	Group 3: Local Community	Group 4: Business Community	Group 5: Environment -al Groups	Group 6: Transport Planners
<i>Transport and development</i>	Increased non-car mode share					•	
	Improved journey integration, comfort, and convenience	•	•	•	•	•	•
	Improved regeneration potential	•	•	•	•		•
<i>Economic</i>	Increased economic prosperity	•	•	•	•		•
	Reduced unemployment	•	•	•	•		•
	Reduced poverty	•					•
	Increased diversity of local economies						•
<i>Environmental</i>	Reduced greenhouse gas emissions		•		•	•	
	Reduced noise, pollution and vibration	•		•		•	
	Improved safety					•	
	Improved urban quality		•		•	•	

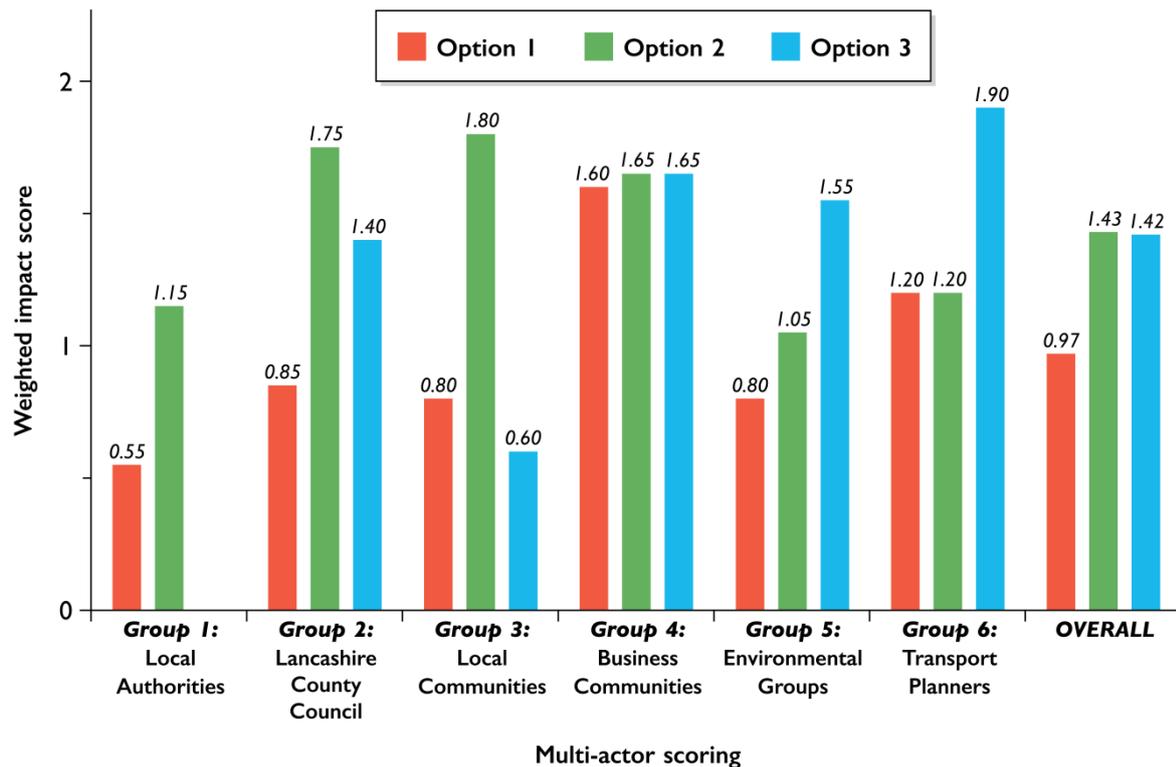
<i>Social</i>	Improved healthy life expectancy	•				•	
	Improved social and community facilities and social capital		•	•			
	Improved social mobility	•	•		•	•	•
	Improved housing provision				•		

Once the agreed set of objectives had been established, stakeholders were invited to give a weight to the different objectives to reflect their relative importance. The point allocation method was adopted; this allowed an easily-understandable method to be followed by actors. Each stakeholder group was asked to allocate a budget of 100 points over the selected criteria to reflect their relative importance. Participants were required, first of all, to allocate the points over the four appraisal dimensions (i.e. transport and regeneration, economic, environmental and social) and, successively, further split these amounts to the different objectives selected within each dimension. All of the groups, with the exclusion of the transport planners, ascribed the highest level of importance to transport and development objectives – which is interesting as often these integrative objectives are not directly used in transport appraisal. Transport planners, conversely, assigned the highest weight to economic objectives.

Stakeholders were then required to score the performance of the three different project options against their own list of project objectives. In MCA, different interval scales can be employed for scoring the performances of the options. Following Macharis et al. (2010), a five-point scale was adopted, ranging from -2 (severe negative effects) to +2 (important positive effects) and where 0 represents a neutral value (no significant effects). The participants in the workshop were all knowledgeable on the project and impact assessment was supported by evidence in the form of a consultancy report on impacts (see Jacobs, 2015). The overall performance of each project option was computed as the weighted sum of its single performances against the different objectives, according to a simple linear MCA model. The outcomes of the process were expressed in the form of tables illustrating both the performances of the different options according to the viewpoint of the different stakeholder groups and an aggregated multi-actor view – both can be used to help the choice of the preferred option. Due to time constraints and other difficulties on assessing information, group 1 did not complete the scoring procedure for the third option. Figure 4 provides a summary of the multi-actor scoring according to an output level aggregation approach<sup>2</sup>.

**Figure 4: Multi-actor and overall performance of the options**

<sup>2</sup> A web-based participatory MCA process was also developed within Sintropher to help run these types of participatory exercises, allowing calculation of weighted impacts during the workshop.



NB. If Group 1 is discounted as being incomplete, Option scores 1.05, Option 2 scores 1.49, and Option 3 scores 1.42.

## 5. Discussion

### 5.1 Assumptions of completeness

As explained above, many authors argue that participatory MCA approaches can lead to a more comprehensive evaluation framework for the assessment of projects relative to CBA or even analyst-led MCA. This can happen, in theory, as a greater range of criteria can more easily be developed which reflect stakeholder concerns. However, it is possible to argue that, at least in this case, the participatory MCA process does not significantly increase the breath of the appraisal compared to an analyst-led MCA approach. The different stakeholder groups selected a limited number of criteria, ranging between six and eight. Developing and using a longer list of criteria can be difficult in a workshop setting, where there may be some reticence to offer wider criteria and a limit to the amount of information that can be processed. All the objectives included in the preliminary list were selected once by at least one stakeholder group and no new criteria were identified or proposed. Issues such as travel time savings, and construction, operating and maintenance costs were missing from the list, and these would usually be an important part of CBA. Since these welfare benefits and costs were not included in the MCA framework, the criteria can be viewed as incomplete. This is a key point being made through the exercise – that projects should be judged against locally-derived policy criteria, and perhaps time savings, in particular, do not relate well to local policy objectives (Hickman and Dean, 2017). However, there are concerns that participatory MCA can be applied in a narrow manner, with similar resulting problems to a more conventional CBA process. Hence, participatory MCA might be best developed alongside a more thorough analyst-led MCA, and even CBA, rather than acting as a complete substitute for it. It is likely that a number of appraisal studies are carried out for the more complex projects, and summarised and discussed through the participatory MCA.

The employment of six stakeholder groups and 26 participants in total, although fine to test the application of the process of participatory MCA methods, cannot be regarded as a statistically valid sample of the people involved or affected by the project. This choice of workshop participants and different framings of the exercise could usefully be tested in further work using different projects and contexts.

### *5.2 Transparency in decision-making*

The findings of the participatory process undertaken in the workshop do not seem to support entirely the argument that MCA represents a more easily comprehensible and straightforward evaluation framework than CBA and other conventional appraisal methodologies. The case of the business group (group 4) can be considered as a case in point. During the selection of objectives, this group argued, relative to the second and the third options, that option 1 would deliver many of the benefits of the other two options at a much lower cost and within a more realistic timescale. However, this group did not select any objectives concerning cost and duration of the project. Moreover, according to the MCA appraisal carried out by this group, option 1 performs slightly worse than the other two options. It is thus clear that the way group 4 conceived the problem was not directly translated into the MCA framework adopted by the group.

The experience of the business group raises doubts over the consistency in the process carried out by the other groups and thus ultimately over the reliability of the results produced by the exercise. For instance, it is possible to speculate that the reason the different stakeholder groups identified only a small number of objectives may be attributed to major difficulties in formulating meaningful and exhaustive lists of criteria, alongside narrow political agendas. These problems, in turn, might be exacerbated by the limited time available to perform particular tasks within a workshop; often the time given to stages can be limited.

Beside the selection of objectives, a number of concerns were expressed by participants over the scoring procedure. Specifically, there seemed to be a broad agreement over the numeric scale as being inappropriate to capture all the potential issues that the construction of a transport project entails. Stakeholders also felt that the nature of the process placed severe restrictions on their effective capacity to judge options. In effect, with only a one-day workshop there was not enough time to explore the characteristics of different options in depth. In this respect, the local authorities (group 1) found it impossible to complete the scoring procedure within the assigned time.

Hence, the design and running of the workshop is critical, with experienced facilitators required. It is easy for a participatory process to be tokenistic, with difficulties in application. The process can be little more transparent than an analyst-led MCA or CBA process. Many authors (Stirling, 2006, and others) recommend that impact scores are determined by stakeholders with the view to increasing the transparency and democratic nature of the process. There is also an argument to be made that impacts can be contested – e.g. one person's view on environmental impacts will differ relative to another, largely depending on the framing of the assessment (such as boundaries, timescale, etc.). However, there can be problems in participants making valid judgement on impacts based on limited knowledge and even in terms of the risks of bias and strategic misrepresentations (i.e. conscious or unconsciously choice of objective, scores and weights to support a particular position). Hence, lessons can be learnt in application: sufficient time should be given for discussions, clarifications and reflection, with the process iterated several times. This will give both participants and the appraisal team the possibility to modify some parameters of the analysis, after having developed a new or deeper understanding of the problems and potential solutions. In this way, the completion of the process would have required far more time, with the consequent growth of the costs of the process and possible occurrence of other issues (e.g.

dropout of stakeholders during the process). But, certainly, the process is much more effective if it is run as a deliberative process, with the understanding of the issues and impacts developed as the discussions are held.

### 5.3 Arbitrariness

The participatory exercise has indicated that there is potential arbitrariness within MCA. As highlighted before, all the objectives comprised in the preliminary list were selected once by at least one stakeholder group, while no additional objectives were proposed. This is plausibly due to time constraints and stakeholders' difficulties in familiarising themselves with the MCA process, and meant that the appraisal of the three different project options was based entirely on the objectives identified by the analyst team. It is possible to argue that the selection of the preliminary list of objectives has strongly affected the outcomes of the process – the shape of the appraisal framework has been largely given by the analyst team, or at least there has been an element of priming in the discussion. It is possible that a different analyst team would have assembled a different set of objectives – hence there is some subjectivity to the process.

The identification of the stakeholder groups involved in the process also has potential for substantial impacts on the final results. Some may argue, for instance, that by including economists or transport engineers, parameters related to costs and other more 'quantitative' information will receive more consideration. Urban designers or social scientists may be more interested in the built environment and public realm and qualitative impacts arising from the project. Moreover, whereas many proponents of participatory MCA methodology seem to assume that it is possible to subdivide stakeholders into rigorously defined categories, very few stakeholder groups are in reality internally homogeneous. For instance, what is commonly referred to as 'local community' is in reality the aggregation of several people who live in a specific area but might have very different, often contrasting, values, interests or priorities. This is the case with many other categorisations; including planners and economists who may have different views within their group. This is handled by ensuring the group discuss their views and agree on a consensus position. However, further analysis could examine this procedure and test different ways to form and use group opinion. The commissioning authority and project funder may also be given an actor role to ensure cost is considered.

Similarly, the selection of the interval scale adopted for the scoring procedure has potential implications for the outcomes of the process. As specified, the three project options were the ones which, amongst a long list of alternatives, were judged the most suitable for promoting regeneration in Blackpool and surrounds. As shown in Table 1, the appraisal objectives focused more on the potential benefits of a project (e.g. 'improved regeneration potential', 'increased economic prosperity', 'improved social mobility', etc.) rather than on the possible negative consequences of a proposed development (e.g. costs, duration, disruption during work, etc.). Therefore, it is not surprising that the three project options received almost exclusively neutral (0), positive (+1) or very positive (+2) scores. However, a two-point scale may be not so adequate to capture differences in the positive performances of the options. In many cases, the scores ascribed by the different stakeholder groups to the three project options are similar, so that in the overall ranking (Figure 4) options 2 and 3 differ only marginally. Had a broader interval scale of measurement being employed (e.g. -5 to +5 or 0 to 10), the final ranking (in term of distance between options or even preference ordering) might have been different. But, in this case, it is often difficult to score between the points if there is not detailed impact evidence available.

To increase the accuracy of the results, it would have been possible to adopt a more sophisticated MCA technique, based on more rigorous principles, rather than on simplistic calculations. On the

other hand, more complex methodologies tend to reduce the understandability and transparency of the process, thus further preventing the achievement of effective stakeholder engagement. This is a key tension in participatory appraisal.

#### *5.4 Aggregation of group preferences*

The consideration and discussion of data by the various stakeholder groups is a key feature of participatory MCA processes, but also leads to some potential problems. In the workshop, stakeholders were asked to employ their own objectives, weights and scores to assess a common set of project options, using an output level aggregation approach. Ultimately, the final results were presented both as single-stakeholder views and a multi-stakeholder view, by aggregating the different single-stakeholder views according to an output level aggregation approach (Figure 4).

The avoidance of a common MCA framework at the input level allows differences and similarities in the positions of the different actors to be highlighted, including the framing of the criteria against which the impacts can be assessed, in line with Stirling and Mayer (2001), Stirling (2006) and Macharis and Bernardini (2015). Subject to the potential inconsistencies and reliability issues discussed above, the graphical outputs can potentially provide the decision-maker, in this case, Lancashire County Council and the Department for Transport, advised by consultants, with a range of information concerning the way the different stakeholders frame the problem and impacts of options. This includes how the different groups perceive the project objectives, criteria, the weighting of criteria and assessment of impacts.

However, project appraisal faces a critical dilemma (McAllister, 1982, Stirling, 2006). 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. On the other hand, there is a need for deciding and acting on a final decision. In this respect, a decision-maker needs to reconcile and synthesise the different scoring of objectives and criteria, weighting schemes and impacts into a more manageable and understandable whole. Hence, in many MCA techniques, the points of view of the various actors are ultimately aggregated together into a multi-actor view, towards the aim of providing decision justification. An overall performance score also presents limitations, as a single index may result in the loss of important information concerning the project options under investigation (McAllister, 1982; Stirling, 2006). The aggregation of the individual preferences with the intention of deriving a group preference is highly problematic from the point of view of equity, as important counter views can be lost or offset. In this regard, Arrow (1951), in his 'impossibility theorem', has demonstrated that, in a plural society, there exists no analytical procedure through which individual preferences can be aggregated in a democratic manner, irrespective of how much information is available and how much consultation and consideration are involved.

The meaningfulness of the overall performance score becomes even more questionable when stakeholders do not employ a common set of objectives and criteria. In effect, as explained by Vari (1989), conflicts between stakeholders can manifest at different levels during a decision-making process, including problem to be solved, objectives and hierarchies of goals, possible alternative actions and evaluation of the consequences of those actions. According to Humphrey and Berkeley (1984), these conflicts have to be solved only in a top-down manner. Hence, there is little point, or no effective way, to reconcile data assessment if different frames are used by stakeholders for representing the same problem. Ideally, more meaningful results can be produced when stakeholders have less freedom for setting the parameters of the analysis, i.e. the process assumes the features of an analyst-led approach, and a common MCA framework is employed by the different parties. This, as explained before, represents an input-level aggregation approach.

This approach, however, unavoidably raises questions about who is really in the position to set the project objectives and ascribe weights, and why different stakeholder groups should employ appraisal criteria and weighting schemes which do not reflect their value systems. Such an approach suffers from problems of tolerance and democracy, namely the underlying principles behind participatory practices.

The aggregation problem hence remains unresolved. Indeed many of the problems of CBA are repeated if aggregation is used in MCA. The only solution is to allow debate around different multi-actor scoring – with the project promoter then deciding which final decision to take. If the project promoter is from the public sector, such as a city authority, then at least there is some accountability to the decision. A refined approach might be to use a voting mechanism to help with the final decision, similar to the referendum process used in Switzerland on infrastructure and public policy proposals. This process would assist in widening the democratic nature of the process, but would need to be deliberative, and is dependent on a knowledgeable electorate.

## 6. Conclusions

Macharis and Bernardini (2015) show how MCA has gained importance as an evaluation method for transport projects. Many papers present MCA, and particularly participatory MCA, as a more effective approach to appraising transport projects, largely due to the range of criteria able to be used and the ability to reflect multiple viewpoints. This research, although limited in scope to one case study, has critically discussed the application of participatory MCA and some of the potential problems and decisions to be made in framing the assessment. Participatory MCA approaches can, in theory, increase the breath of the assessment compared to a purely analyst-led MCA approach or CBA. But, this is not necessarily the case, and careful design of the exercise and selection of participants is required. Overall, the MCA framework employed in the South Fylde Line case study was arguably incomplete. While including many objectives linked to long-term effects of a transport investment, it did not account for information concerning the economic and financial viability of project options. It could be argued that this was not necessary, as these issues were not presented as local policy objectives, against which to test project options. But, usually costing will need to be an important criteria within MCA, or a CBA could be applied alongside the participatory MCA process.

The proceedings of the workshop have also offered an empirical counterpoint to the quite appealing, but perhaps unproven, claim that MCA is easy to understand by the non-expert, since it clearly mirrors the way people think and make decisions. The difficulties experienced by some participants during the process pose doubts over the reliability of the final results obtained, as well as highlighting the difficulties and potential problems in carrying out this type of exercise. There are also concerns over the arbitrariness of MCA, including the selection of objectives and criteria, weighting methods, the interval scale employed for scores, and so forth. The selection of stakeholder groups and participants is a critical parameter which can strongly affect the outcomes of the analysis.

Finally, this paper has highlighted that many questions remain concerning the role of participatory MCA methodologies in the appraisal process and the way that they should be applied. For example, should participatory MCA techniques replace CBA and other more conventional appraisal methodologies, or should it be intended as a complementary approach? Should participatory MCA techniques be carried out in an 'open' manner, allowing stakeholders to provide inputs for several stages of the analysis, including giving the different parties the freedom to adopt their own MCA framework? Or, conversely, should they be undertaken in a more 'closed' manner with the view to provide more prescriptive recommendations concerning the best project to fund?

We argue that participatory MCA approaches offer much potential, but that they need to be very carefully framed and applied. They can offer a representation of the discursive democracy in transport project development – where a range of locally-derived criteria and multi-actor views are used to help prioritise projects. But, this is a lofty ambition, and needs careful definition. There is a clear need for further empirical research, using different case studies to test which approaches to participatory MCA might work best and why, and how a different framing of the process might affect the results. The limits of the more conventional technocratic approaches to appraisal, including CBA and even analyst-led MCA, are very evident, especially when applied to large-scale and complex infrastructure projects with uneven spatial impacts (Hickman and Dean, 2017). However, participatory MCA techniques can also be problematic, with potential problems in completeness, transparency, arbitrariness and aggregation. There is no clear and simple method to follow for decision makers, and this is what decision makers do not wish to hear. But, our final call is to further test and refine the approaches to participatory MCA – there is much potential here – so that transport project appraisal can become part of a much more deliberative exercise in decision making.

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ACCEPTED MANUSCRIPT

## Testing the application of participatory MCA: The case of the South Fylde Line

### Highlights

This paper contends that, while promising, participatory MCA methodologies should not be regarded as a panacea for better decisions and their application is also subject to several issues which require careful consideration. In particular:

- Participatory processes are not always capable of enhancing the quality and the breadth of the assessment compared to a traditional analyst-led approach;
- Some people may also experience difficulties in understanding the basic principle of MCA, with consequent doubts over the reliability of the outcome of the process;
- There is an undeniable potential for arbitrariness in such processes, with a number of variables (e.g. number and types participants, appraisal criteria, weighting and scoring procedures) whose selections can alter substantially the results of the appraisal exercise.

Accordingly, there is a clear need for further empirical research, using different case studies to test which approaches to participatory MCA might work best and why, and how a different framing of the process might affect the results.