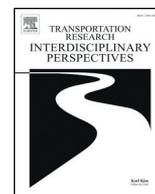


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Caught in a crossfire: Front-end decision-making in airport expansion programmes

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ABSTRACT

This paper revisits the main factors and considerations that drive the decision to invest in major capital projects in airport infrastructure, specifically airport expansion programmes.

To this end, the paper explores how governments, operators and investors have navigated the project front-end considerations (strategic assessment, business justification, option decision, investment decision) in the planning of Heathrow, Schiphol and Dublin Airport expansion programmes. Through inductive research on publicly available material, professional conference reports, planning documentation and exploratory interviews with key personnel involved in the selected projects, the study compares and contrasts the three projects and contributes to the current debates on the role that governments have into fostering economic growth whilst taking into account environmental restriction and climate change. The goal of the study is to inform the upcoming restructuring and transformation of business models in air travel as a response to the Covid-19 crisis.

1. Introduction: the aviation sector

Airport organisations provide services to multiple stakeholders involved in the aviation industry (Sumathi and Parthasarathi, 2018). The air transport industry which includes the aviation division (airlines, airports and air navigation service providers) and the aerospace division (manufacture and maintenance of aircraft and systems), operates in a fast changing environment (Kwakkel et al., 2016) which went through a process of liberalization and privatisation first in the U.S.A. and some years later, in the 1990's, in Europe (Vogel, 2006). As a result, the air transport industry has experienced changes, in the form of the rise of low-cost carriers and airline alliances (Forsyth, 2001; de Neufville & Odoni, 2013). Similarly, the aviation sector has witnessed an increasing environmental awareness, resulted in more attention to externality effects such as noise and pollutants emissions. The problem of carbon emissions associated with airport traffic has been emphasised in airport expansion projects as a critical issue. Research acknowledges that the only realistic goal is to mitigate the rates of growth of negative impacts rather than eliminating them as airport capacity will mainly shift the traffic away from more congested toward less constrained airports and affect the growth in total traffic only marginally (Schäfer & Waitz, 2014).

Furthermore, safety and security, following the events of the 9/11, pushed the overall industry to major investment (Blalock et al., 2007). According to the [European Commission Annual Analysis related to the Air](#)

[Transport Market \(2017\)](#) air traffic trends show a number of air passengers carried worldwide growing by 6.3% to 3.7 billion in 2016, in a recovery trend since the 2008 and 2009 Global Financial Crisis.

Since March 2020 we have seen a significant disruption of air travel due to the coronavirus pandemic. Whilst it is emerging that the consequences of the economic slowdown are likely to be long-lasting and significant, there is little clarity about the specific implications on the operational and business models of air travel. One of the important consequences, however, is likely to be that major capital projects associated with the investment in airport infrastructure might take a different form in the future. In an effort to assist airports in the upcoming restructuring and transformation of their business models, this paper will revisit the main factors and considerations that drive the decision to invest in airport expansion projects.

According to a [Boeing research \(2018 Market Outlook\)](#), the factors determining a region's air-travel growth are economic activities, ease of travelling (agreements between countries, liberalization of regulations in domestic market, business-model innovation, emerging technology and airline-network improvement), and local market influences. A key trend highlighted by the European Commission annual report on aviation industry is the consolidation of hub airports around the world (2016 European Commission Annual Air Transport Industry Report). This strengthening has to be attributed to the airline industry alliances. In fact, as airlines come together, they are capable to combine their operations within their hubs. This consents to offer better services and increase yields as well as

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profitability. As a result, the implication of connecting passengers has pushed airlines to target services to passengers choosing the airport hubs as a stopover.

Essential in understanding the different governance structure of airport infrastructure, is to frame the ownership models which in the last decades have determined a substantial change in the delivery and organisation of airport infrastructures. The evolution of airport governance has seen the move either to full private ownership or partial privatisation from a traditional public control. According to Gillen (2011), there are different possible ownership/governance structures can be currently applied to major international airport.

A key difference between public and private airports, shown by Vasigh and Gorjidoz (2006) and Francis et al. (2002), is the ability of private airports to pursue financial return whilst public airports are output-maximisers. Oum et al. (2008) show that complete private or publicly owned airports are more cost efficient than mixed public-private organisations because the homogeneity of ownership and fewer conflicting objectives drive cost efficiencies. Likewise, Vogel (2006), examining financial performance of privatised European airports, found that efficiency is driven by a better operating management, asset utilization and capital structure. When regulators see airports holding substantial market power, they typically subject them to regulation (Guiomard, 2018). Otherwise, as shown by Basso (2008), unregulated profit-maximising airports would overcharge for the congestion externalities (Zuidberg, 2017). For instance, in the UK, the airport return is calculated with the Regulated Asset Base (RAB) mechanism (Fig. 1) that limits the amount of airport charges that can be imposed per passenger over the price control period resembling the incentives generated by competitive markets (Makovek & Veryyard, 2016; Stern, 2013; Helm, 2009). Nonetheless, it should be noted that between the manager and the regulator exists an information asymmetry problem, as the regulator forecasts the weighted average cost of capital (WACC) associated with the manager investments. In addition, the regulatory framework entails transaction costs, sustained by the regulator to ensure the WACC set for the regulatory period is aligned with the market conditions (Coase, 1937; Makovek, & Veryyard, 2016; OFWAT, 2011). Despite regulatory environments vary in different jurisdictions, according to Forsyth (2001) the regulator must take on the role of evaluating investments. Nevertheless, capital efficiency studies in airport investments are complex because of the

heterogeneity of investment programmes, the variation in input and output mix, and the lumpy and cyclical investment with no synchronous cycles (Starkie, 2006).

This complex mix of market trends and forecasts, regulatory environment and finance conditions will determine the investment in airport infrastructure upgrades.

Specifically, in this paper, we will reconsider the common factors and considerations that have led to the decisions about expansion of airport infrastructure, considering both airside projects aiming to increase the capacity of the airport to handle aircraft movements, and landside projects, intended to expand the capacity to handle passenger and freight. Improved airside capacity enables growth in the rate of departure and variety of flight routes from the airport, thus reducing the frequency of delays and the cost of transport (Santos & Robin, 2010). Investment in landside capacity instead, helps to avoid terminal congestion and to improve surface access conditions in term of sustainability and congestion (Doramas & Rus, 2004). Whilst it has been demonstrated that airport expansion is important and relevant to both government, owners and users, and it require large capital investment (land and property acquisition, compensation costs and construction costs) and operating costs, yet there is currently surprisingly little understanding as to how the decision to expand the existing infrastructure takes place. This is specifically relevant during the Covid-19 crisis and in its repercussion when airport operators will be faced with the challenge to either continue or abolish capital investment and expansion plans. If on the one hand airport investment might suffer a slower return to stability compared to other transport projects post-Covid-19, the compensation effect (Colonna and Intini, 2020), which is caused by the trade-offs between social costs caused by Covid-19 and saved costs from the reduction in traffic, could potentially open to opportunities due to less operational disruption, necessary to optimize expansion or renovation programmes. For example, the high demand for people to travel could surge again when a vaccine or reliable antibody tests become widely available. By contrast, the coronavirus crisis may permanently reduce business travel as remote working changes the need for physical interaction at a global level. To this, end the paper aims to revisit the key decision-making challenges and tensions during the development of three major European airport expansion projects in an effort to provide some clarity for decision makers regarding their expansion projects going forward.

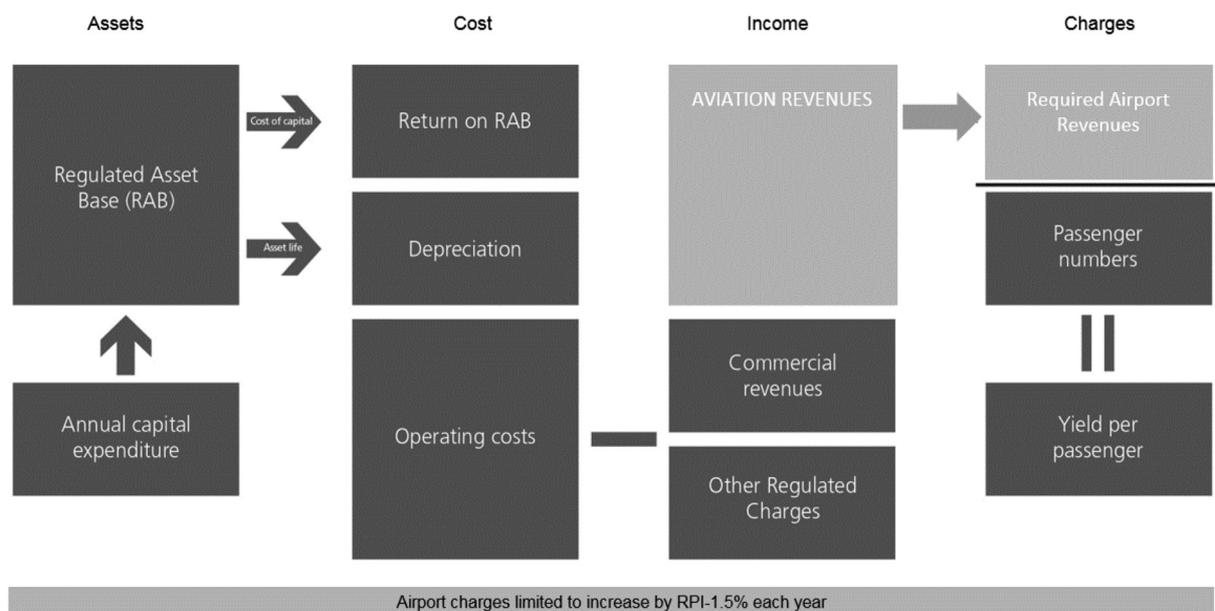


Fig. 1. Heathrow RAB building blocks. Source: www.heathrow.com/company/investor-centre/regulation/regulatory-accounts.

2. Front-end planning and opportunity recognition in infrastructure projects

This research aims to look at the early decision-making at the front-end and inception of airport expansion programmes. To this end we broadly draw upon literature on major projects performance combining it with insights from literature on organisational entrepreneurship and exploitation of opportunities.

Literature on major projects explores aspects of efficiency in the delivery focusing on the cost underestimation and benefit overestimation, which lead to failure in delivering the predicted outcomes. The determinants guiding the decisions are therefore based on the judgment of the realisation of benefit and cost in the future, subjected to the influence of optimism bias (Skaburskis & Teitz, 2010; Taleb, 2007; Flyvbjerg, 2005, 2014; Tversky and Kahneman, 1974). Moreover, this stream of literature has focused on the organisational structure for projects conceived under uncertainty (Lenfle, 2011; De Meyer et al., 2002) as well as organisational behaviour theory to explain what caused failure and losses in large infrastructure projects (Gil & Beckman, 2009; Cantarelli et al., 2010; Flyvbjerg, 2009; Hirschman, 1967; Samset & Williams, 2010).

Whilst literature on project performance is abundant, it provides very little insight on the front-end planning and decision making that leads to the development of the project case that results in projects being sanctioned. To this end, we draw on literature on entrepreneurial decision making (Shepherd et al., 2014) showing the heterogeneity of individuals associated with the decisions about exploiting opportunities. Opportunity recognition sits at the core of the entrepreneurship (McKelvie et al., 2011). In particular human capital, in the form of education, training, employment experience and skills, is the first factor driving decisions (Foo, 2011). Because entrepreneurs concentrate in collecting information that allows them to make decisions, the quality of their conclusion defines the achievement of innovations, and thus influences the long-run performance of the economy (Casson & Wadson, 2007). However, Heavey et al. (2009) proved that although comprehensiveness is considered one of the key characteristics for organisations to approach opportunities, it has demonstrated to be intangible since it is conditional on the managerial preferences regarding uncertainty, as well as the market environment enthusiasm.

In second place, according to Choi and Shepherd (2004), the environmental condition drives the exploitation of opportunities when entrepreneurs and managers perceive a deeper understanding of customer demand and have greater stakeholder support. The literature, expanding on how individuals are heterogeneous to the extent they exploit recognised opportunities, presents the importance of the business planning phase (Bryant, 2009). Chwolka and Raith (2012), show that the value of planning is driven by the possibility of evaluating alternative actions and being able to improve strategies. In the same context Gruber (2007), indicates that planning differs between highly and less dynamic environments, in the form of how entrepreneurs judge activities' value, thus proposing the importance of a business "adaptive planning toolkit" approach.

Exploitation of opportunities can also vary in respect to entrepreneurial endeavour source and timing of funding. According to Schwiendbacher (2007), two alternative financing strategies for capital-constrained entrepreneurs can be adopted. The more conservative is to wait until enough capital has been raised to undertake a new project, whereas on the other side the entrepreneur can use limited resources to complete some initial scope in advance to opening to larger outsource form of capital (Patzelt & Shepherd, 2011).

Entrepreneur's heterogeneity in the assessments of risk and the attitude toward retaining or devolving control in decisions, further shape the entrepreneurial decision-making process (Forlani & Mullins, 2000; Knight, 1921). According to Scherpereel (2008) governance approaches, in the substitution of control rights, take the form of firm, market and hybrid governance structures. Indeed, as showed by Alvarez and Parker (2009), entrepreneurs decide how to allocate ownership control rights considering different conditions of risk.

An additional aspect, presented in the literature, builds on managers' attitude to correct their views whilst undertaking decision based on new information, instead of relying on past experience. However, Parker (2006) suggests that whilst entrepreneurs exploit new information, they give greater weight to their principles when forming their expectations, more sensitively if young to the profession.

Ultimately the literature focuses on the characteristic of the decision maker related to her/his individuality, capacity to transformation, self-guided improvement and level of influence (Mullins, 1996). According to Mitchell et al. (2011), the inconsistency in the decision-making has to be explored within the managers' metacognitive experience in hostile environments, where they make more unpredictable strategic decisions, and in dynamic environments, where they make less unpredictable strategic decisions (Fig. 2).

In summary, from the literature reviewed appears that the determinants to the decision about exploiting opportunities can be grouped as follow:

- Institutional settings and regulation – Understand environment condition and stakeholder support
- Planning – Evaluating planning activities
- Risk – Understand condition of risk and uncertainty
- Control and funding - Evaluate attitude toward retaining or devolving managerial control and structuring the funding.

Whilst the existing literature presents cases of small to large enterprises, this analysis aims to explore the front-end determinants, and the extent of entrepreneurial decision-making for airport expansion projects, drawing on a model abstracted from Shepherd et al. (2014) literature review. We ask: What are the main determinants of decision-making at the front-end stages in the context of airports expansion projects?

3. Research design and methodology

The research design for this study is based on diversity sampling whereby we focused on hub airports as a class of airports that operate a business model of combining passengers from direct and transfer flights and freight movement, allowing long-haul aircraft to fly destinations that otherwise couldn't be served by "point to point" airports, relying on regional demand only. Moreover, we focused on a concentrated geographical area- specifically North-Western Europe- to capture a relatively consistent policy and market space. Within the selected business model (hub airport) and geographical focus (NW Europe), we wanted to capture airports across a range of scales, ownership structures and national regulatory frameworks. To this end, we chose to compare London Heathrow, Amsterdam Schiphol and Dublin airports. Comparing these three airports, the aim of the paper was to encompass several relevant issues, including countervailing power of the hub operator which different airport regulatory regimes have experienced (Polk & Bilotkach, 2013).

The first case analysed in this study is the Heathrow Airport Expansion Programme. In 2016 the British Government announced policy provision for the Heathrow Northwest Runway Scheme, and subsequently produced a draft Airports National Policy Statement (NPS), successfully designated in 2018 following a parliamentary vote. Heathrow's Preferred Masterplan has been prepared to accommodate up to 756,000 air traffic movements (ATMs) and 142 million passengers per annum (mppa) and a cargo capacity of approximately three (3) million tonnes per year, upon completion. To accommodate this growth the airport operational footprint needs to expand from the current circa 1200 ha to approximately 1800 ha and introduce a new Northwest runway. The second case study examines Amsterdam Airport Schiphol. Since 2015 Royal Schiphol Group, owner and operator of the airport (controlled by State of the Netherlands (69.8%), Municipality of Amsterdam (20.0%), Municipality of Rotterdam (2.2%) and Groupe ADP (8.0%)), has agreed to expand its aircraft and passenger handling capacity to both enable an additional 14mppa, and enhance the quality of the passenger journey. The third airport expansion project under analysis is Dublin Airport. The delivery of the proposed Capital Investment

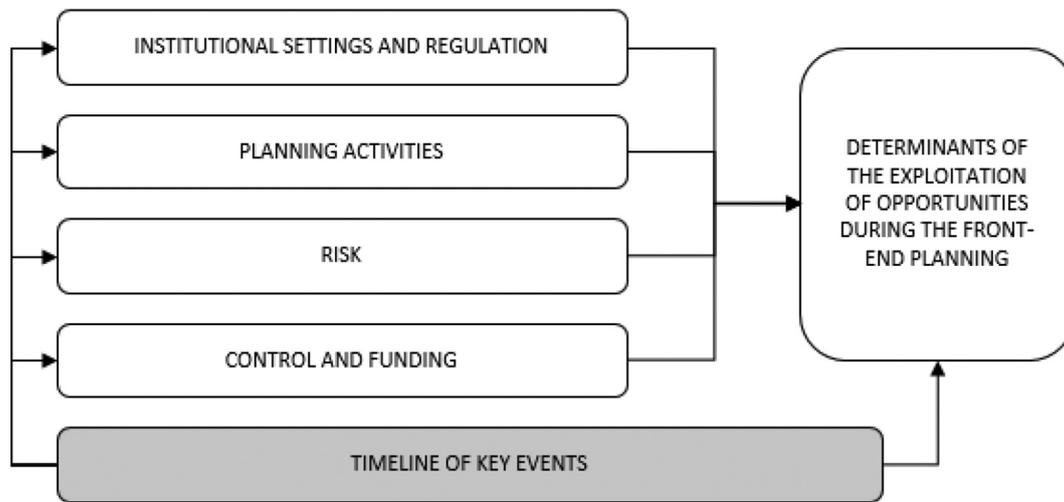


Fig. 2. Theoretical framework.

Programme CIP2020+ will enable Dublin Airport, owned and operate by *daa plc.*, to initially accommodate 40 mppa in a plan to grow up to 55 mppa.

As the goal of the paper is to compare the three case projects, a qualitative inductive methodology was chosen. Specifically, we selected the study method (Yin, 1994) with the aim of building theoretical insights based on replication logic (Yin, 1994). To this end, we analysed publicly available data such as planning documentation, newspapers articles, government reports, complemented by interview with individuals occupying key positions in the projects, to validate the findings through interviewee narratives. Using Eisenhardt and Bourgeois (1988) cross-case analysis techniques is suggested when limited data reduce the ability to process information (Tversky and Kahneman, 1974). This study structures the data by selecting categories and then looking for within-group similarities, influencing the decision-making process for airport expansion projects during the planning stage.

The categories of findings developed in this section are integrated and refined into a theoretical model by reducing data from multiple cases into concepts that can be used to explain a phenomenon (Strauss & Corbin, 1990) and produce new insights consistent with the empirical data (Orlikowski, 1993; Eisenhardt, 1989). The resultant theoretical model aims to generalise patterns across the selected cases (Eisenhardt, 1989).

3.1. Data collection

A mixed-data collection approach has allowed to capture thoroughly the case insights behind the decision-making process at planning stage. In line with Strauss and Corbin (1990) grounded theory methodology, gathering data from projects at different planning stages increases the extent of the cognitive angle through which the projects are evaluated.

The use of document analysis, in which documents are interpreted to connotate an assessment topic (Bowen, 2009), enabled an effective, cost-efficient, accessible, data collection that amplified the study data analysis. Since qualitative research method are based primarily on the systematic review of printed and electronically available documents (Bowen, 2009), those were initially found through searches on Google browser and various project stakeholders websites using “Heathrow Expansion Programme”, “Schiphol Airport Capital Programme” and “Dublin Airport Capital Investment Programme 2020 +” as the keyword.

The project context and situations to be observed as part of research were therefore derived from the publicly available documents, which subsequently allowed to suggest questions to be asked in the semi-structured interviews.

A summary of the documents which were collected during the Data Selection stage is shown in the Appendix A. According to Denzin and Lincoln (2000) and Jack and Raturi (2006), the diversity of data allows

comparisons and correlations from different sources with one another. The table below (Table 1) summarises the type of documental sources, the type of audience and the number of pages analysed.

A summary of data collected from public presentations and videos for the case is shown in Table 2.

Four semi-structured interviews were conducted between June and July 2019 with individuals directly involved in the three selected case studies to complement the narrative and enrich the case history. The interviews, providing exceptional background information and insights into areas not considered during the formal data collection from publicly available material are, summarised in Table 3.

The limited number of interviews and the restricted time spent with each individual has constrained the type of data to be collected.

Table 1
Data collected from publicly available documentation.

Data type	Quantity	Original data source	Intended data audience	Pages
Policy document	11	Government/Ministry website	Public	902
Regulatory document	9	Regulator website	Public	708
Corporate external document	4	Corporate website	Public	937

Table 2
Data collected from public presentations and videos.

Data type	Link	Original data source	Duration	Pages
Presentation slide-deck	See Appendix A	Corporate website	N.A.	230
Video	See Appendix A	Corporate website link to YouTube	10' 45"	N.A.

Table 3
Data collected from semi-structured interviews.

Data type	Quantity	Who	Audience/type	Duration
Semi-structured interview	3	Decision maker, consultant	Face-to-face interview	4 h 10'
Semi-structured interview	1	Decision maker	Skype interview	1 h 15'

3.2. Data analysis

The progress from data to objective conceptual intuitions was accomplished by reducing, sorting and coding the raw data, public documents and interviews through the lenses developed in the theoretical framework (Eisenhardt & Graebner, 2007). Colour coding was initially used to filter contents which were subsequently organised into categories related to central questions of the research. The first step involved the screening of data into the different projects' four lenses then grouped in an Excel table imported and stored within MAXQDA 2018 code matrix browser package (Van de Ven, 2007). This allowed visualising how codes have been assigned to which documents, by providing an overview of the number of document sections from each document which have been assigned to a specific code (Table 4). Documents were organised in columns and codes in rows, so that the matrix table would show a symbol representing the number of coded sections within a particular code. This resulted in cell colours going from red to amber and green whether the number of coded sections assigned to the code was high, medium or low.

For the interviews a thematic analysis, involving pattern recognition, was undertaken. Whereas for the publicly available document, a thorough evaluation aimed at establishing their significance and influence of the document to the research question, allowed to test the document adequacy to the considered framework.

To allow the structuring of the analysis, flexible associations between codes were assumed in the data framework (Van de Ven, 2007). This converted the static input into a theory model seeking to illustrate the determinants of an opportunity exploitation during the front-end phase of a project.

4. Findings

This section of the study presents the main findings resulting from the data collected from publicly available documents and semi-structured interviews and describes the three (3) case studies under the four (4) lenses illustrated in the theoretical framework. The *timeline of decision* section describes the decision-making process as a series of events, exploring the characteristic of the decision makers.

4.1. Heathrow Expansion Programme

The UK's aviation sector in the last decade has been challenged by capacity constraints impacting with an increased risk of flight delays, a restricted scope for competition (Tavalaee & Santalo, 2019), a decline in domestic connectivity (Littchild, 2018), and compelling the delivery of wider economic benefits (DfT, Airports National Policy Statement, 2018).

In this context the decision to expand Heathrow was supported by the recognition of its importance to the UK economy and its role as a hub airport (The Future of Air Transport Progress Report, December 2006, Department of Transport). However, the Government sponsoring the development of a third runway required to meet the stringent environmental limits set in the 2003 White Paper: *The Future of Air Transport*.

The sequence of events (Fig. 3) shows that the expansion decision for Heathrow was driven primarily by the Government, seeking to maintain the UK in its position as Europe's main aviation hub, and recognising the need for a new full-extension runway in the South East of UK. A shift in the airport organisation, in support of the expansion, has instead manifested following the 2009's CC investigation and reduction of BAA market

Table 4
Sample of the initial concepts emerged from case study analysis.

Emergent core category	Subcategory	Codes
Infrastructure delivery	Planning stage	<ul style="list-style-type: none"> • Regulatory settings • Planning process • Risk assessment • Level of control • Funding structure

power which has required Heathrow to strive for an increase in connectivity and further development as an aviation hub. Conversely, the decision-making process adopted by the Heathrow management to achieve a masterplan proposal, required to produce a solution pointing to the business ambition, and be aligned with the ANPS requirements. A strategy framework around eight strategic intents (passenger, operations, colleagues, construction, sustainability, security and safety, airlines, public support and financial affordability) was framed with the introduction of key performance indicators.

Following the T5 public inquiry, resulting in the lengthiest planning application ever held in the UK (Heathrow Terminal 5 Inquiry: Briefing note, Department for Transport, January 2005), and in line with the Government decision to streamline the decision-making process for major infrastructure projects (Planning Act 2008), a different planning process was formally suggested by the airport planning advisors. As a result, because of Heathrow's nature as Nationally Significant Infrastructure Projects (NSIPs), under the Planning Act 2008, a plan aligned with the ANPS's planning framework for a new runway would have to be submitted to the Planning Inspectorate (PINS) for the Development Consent Order (DCO).

In September 2016 a comprehensive risk analysis on the development of the Heathrow Expansion project was presented in the report by the All-Party Parliamentary Group on Heathrow and the Wider Economy. According to the Parliamentary Group Report of significant importance, for the success of the application, is the respect of the requirements in the field of carbon obligations. In fact, carbon impacts from expansion, originated by the increase in air travel, airport operations, airside ground movements and construction of new infrastructures, need to be delivered within the UK's carbon commitments. As a result, also shown in the timeline of event leading to the expansion decision, both environmental policies and the political environment represent the key main risk to the approval of the scheme. The interviews with key managers, involved in the structuring of the Heathrow Expansion Programme, revealed that Heathrow's ambition has always been to grow with the programme and control "hands-on" the development of Expansion, so to minimise impacts on operations. The decision to internalise a delivery structure, was justified by the lesson learned from the disrupted opening of Terminal 5, which presented major criticalities when it opened causing reputational damage as a result (Zerjav et al., 2018).

February 2020 marks an important milestone for Heathrow Expansion plans with the programme plans being put on hold on the basis of its non-compliance with the UK 2050 Net-zero carbon pledge. Following the Covid-19 disruption, announcements have been made questioning the viability of the expansion project in the result of the pandemic and the effects it is likely to cause for the aviation sector globally.¹

Even in business-as-usual conditions, the scale of Heathrow Expansion's capital expenditure and the timeline of the project extending beyond a single five-year regulatory period, would require the commitment of an important proportion of the investment under a prediction of the return on capital. The shareholders interest in contributing to the financing of the scheme with self-funded equity would be complementary to a large debt financing raised on the market (Table 5).

4.2. Schiphol Capital Programme

The Netherlands aviation sector relies on the ability of its only hub airport to build an extensive flight connections network (Schiphol Action Plan, Ministry of Infrastructure and the Environment and Ministry of Economic Affairs). In this context, Amsterdam Schiphol Airport, due to capacity constraints and challenged by the competition with the Asian market and the rise of the Gulf States in the international aviation, has planned to increase its capacity of additional 14 mppa by 2023. The sequence of events (Fig. 4) shows that the expansion decision for Schiphol Airport was strongly

¹ Heathrow's third runway project now 'impossible', says IAG chief- Financial Times, 7 May 2020, Accessed on 20 May at <https://www.ft.com/content/2921cb8b-e557-4307-8f59-f05038fa7b9>.

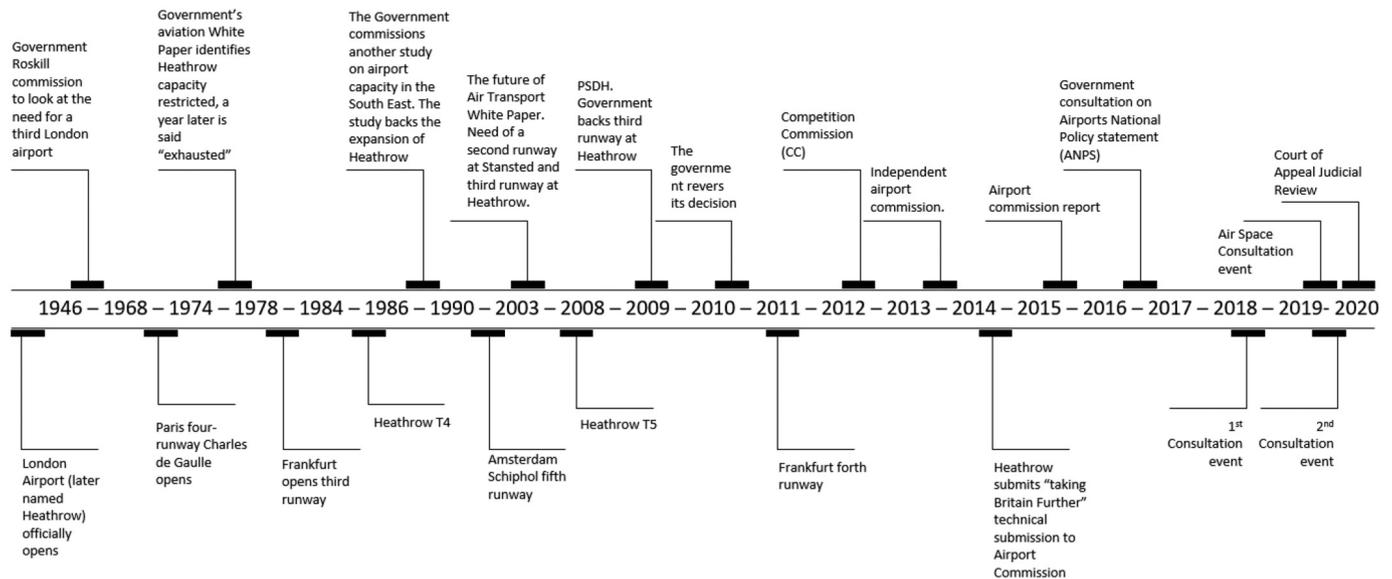


Fig. 3. Timeline of decisions.

influenced by the Government's view which, although being a major shareholder, guaranteed a “ring-fenced autonomy” to the airport in particular during the negotiation with the airlines (interview 14/07/2019). On the other side the national carrier's bargain power and political influence in the negotiation has always been stronger than other airlines, although legally with equal rights, due to the uncompleted process of privatisation in which the government has maintained influence for key decisions (Wassenbergh, 2000). The instrument currently governing the organisation and use of Amsterdam Schiphol Airport, and defining standards for noise, air quality, odour and safety, is the Aviation Act (Wet luchtvaart) in force since February 2003. Nevertheless, as mentioned in the previous section, the goal of the Alders Agreement (2008) was to balance the development of aviation with the reduction of noise levels, and increase the quality of the surrounding environment, offering possibilities for using the space around the airfield.

According to the report Airport Capacity: The Dutch Approach (Ministry of Infrastructure and the Environment, 29 February 2016), in 2009 the implementation of the “package deal” required all parties on the Alders table to be responsible for the implementation of the Alders agreement. This was based on a new assignment commissioned by the Minister of Infrastructure and accepted by the parliament. At the time of writing, the Dutch Ministry of Infrastructure and Water Management is working on its Aviation White Paper (or “Luchtvaartnota” 2020–2050). This is anticipated to be issued in the second half of 2019 and will set out the government's perspective on the development of the Dutch aviation industry. It will also seek to address the challenge of how to find equilibrium between the society's need for aviation, sustainability, healthy living environment, safety, and a robust economy over the coming decades. Schiphol Group, as being reported in both the Socio-economic Accountability and Financial Statement of the 2017 Annual Report, faces risks related to the fluctuations in demand for

Table 5
Summary of Heathrow Expansion Programme findings.

Institutional & regulatory settings	Planning	Control and funding	Risk
<p>Ownership</p> <ul style="list-style-type: none"> Topco Limited Ferrovial S.A. (Spain) (25.00%) Qatar Holding LLC (Qatar) (20.00%) Caisse de Dépôt et Placement du Québec (Canada) (12.62%) Government of Singapore Investment Corporation (Singapore) (11.20%) Alinda Capital Partners (US) (11.18%) China Investment Corporation (China) (10.00%) Universities Superannuation Scheme (UK) (10.00%) 	<ul style="list-style-type: none"> Adding Capacity at Heathrow Airport consultation 2007 Airports National Policy Statement (ANPS) June 2018 Heathrow Consultation 1 Airspace Future Operations Consultation (Jan 2019). Airport Expansion Consultation (June 2019). Development Consent Order (DCO) 	<p>Control</p> <ul style="list-style-type: none"> Heathrow Airport Ltd. (HAL) Programme Client Partner: Arup, CH2M (Jacobs), MACE and Turner & Townsend. <p>Funding</p> <ul style="list-style-type: none"> £14bn capital expenditure Access to debt market and shareholders' equity contribution 	<p>Planning and construction risks</p> <ul style="list-style-type: none"> Environmental & Carbon Policy risk Land acquisition risk Formal planning risk Construction riskCommercial and financial risks Commercial risk Financial and governance risk Pricing riskOther government risks
<p>Regulation</p> <ul style="list-style-type: none"> The Department for Transport (DfT). The Civil Aviation Authority (CAA). The Competition and Markets Authority (CMA). 			<ul style="list-style-type: none"> Regulatory risk Risk of subsidy for UK regional connections Risk that expected long haul routes will not materialize Risk that economic benefits will not materialize State Aid risk Carbon risk

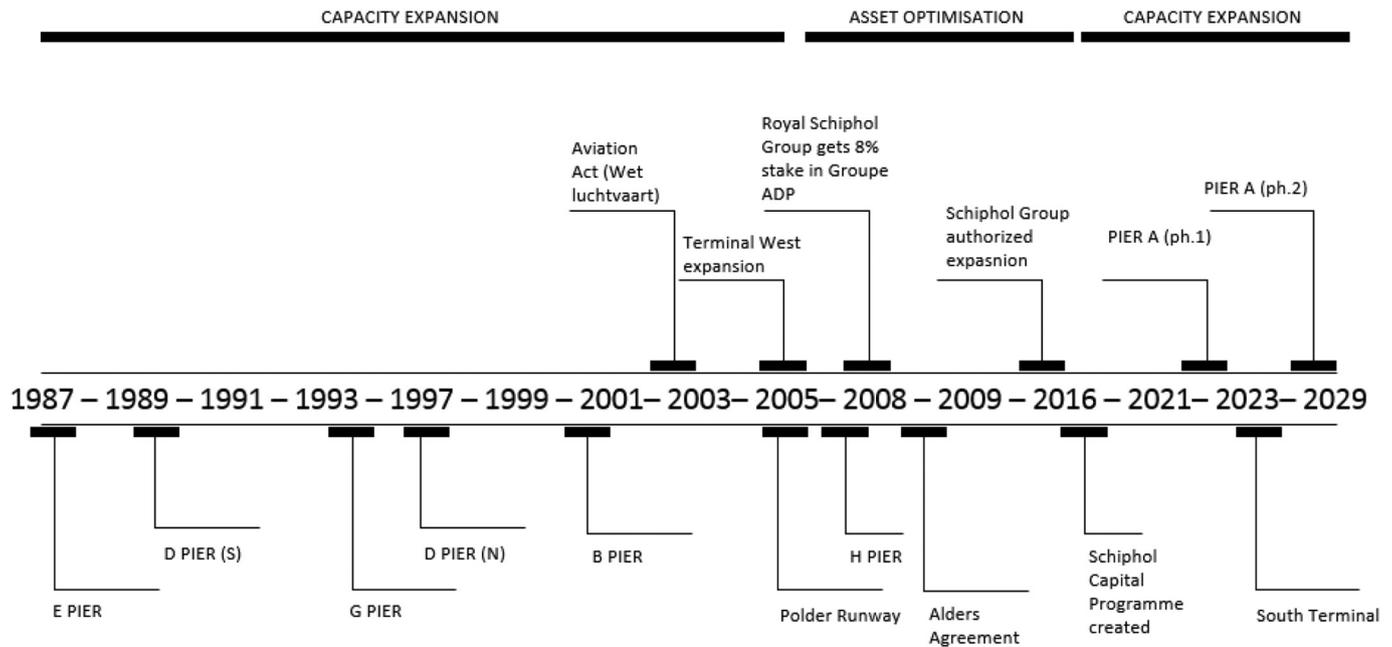


Fig. 4. Timeline of decisions.

air transport, the development of capacity, changes in consumer behaviours, competition in the real estate and infrastructure delivery market, changes in IT infrastructure, information security and operation of the airport (Jacquillat & Odoni, 2018).

4.2.1. Timeline of key decisions

In merit of the delivery of major projects, the Capital Programme unit faces risk related to the scale of projects to be delivered, different from any airport project being carried out by the in-house project management team. Besides, constructing within an operational environment characterised by old infrastructures, requires extensive knowledge especially when re-configuring utilities and road networks. In 2016 Schiphol's advisors suggested the creation of the Capital Programme unit for the delivery of the new pier and terminal, by structuring a business case around capital and operational expenditures, depreciation of assets and return of investment.

In the same year, following the appointment of a new Programme Director of the Capital Programme, the first task was to establish the programme governance structure, and the roles of the client team and consultants. The integration of the Capital Programme team with the external consultant was then possible following the award of the role of Project and Construction Manager (PM/CM), logistic and system integrator, and design teams. The requirement to appoint a PM/CM role became necessary for the Capital Programme team to devolve the responsibilities of managing the project to a supplier with extensive international delivery experience and the ability to manage construction within an operating airport. The Capital Programme unit, therefore, was responsible to manage the interfaces between projects at different stages (Table 6).

4.3. Dublin Airport Capital Investment Programme 2020 +

Dublin Airport, which in 2018 has handled 31.5 mppa, has grown importance in a European context becoming the 11th largest airport in the European Union, and assuming a hub role by providing access to transatlantic routes, given its strategic geographical location and its capability to offer customs and immigration pre-clearance for passengers travelling to North America. In this context the decision to expand the airport, by undertaking a major capital investment programme has at its heart a capacity plan to grow the airport capacity to 40 mppa. Dublin Airport, subjected to a price-cap regulation by the Commission for Aviation Regulation (CAR), is

operated by *daa plc*, a state-owned enterprise operating on a commercial agreement.

The sequence of events (Fig. 6) shows that CIP2020 + is driven by Dublin Airport's aspiration to respond to passenger growth and future demand, but also to enhance the quality of service and passenger experience. Strong support was manifested also by the airlines which according to a press release from Stephen Kavanagh, Chief Executive of AerLingus, will enable Dublin to expand as hub airport which is served by multiple airline alliances and will provide economy of scale in routes, aircraft, staff and passengers. On the other hand, the overall development is framed within the direction given in the National Aviation Policy (2015), and the need to determine the maximum level of airport charges and also to undertake an independent assessment of the project cost. For the majority of the proposed development, with the exception of asset rehabilitation projects, CIP2020 + will require Statutory Planning Permission. However, third party objections and environmental issues will require to be in line with the objectives of the relevant policy documents. In this context, Dublin Airport being a development which is considered a "Strategic Infrastructure" under the National Planning Framework 2018–2027 (Fig. 5), can benefit of the expedited planning applications route approved by the AnBord Pleanála and called *Strategic Infrastructure Development Plan*.

As highlighted in the timeline of the decision leading to the CIP2020 +, and confirmed by one interviewee, CAR's approval on the Maximum Level of Airport Charges at Dublin Airport, is currently the main factor undermining the feasibility of the expansion programme under the airport charges and service quality regulations (Directive 2009/12/EC on airport charges of The European Parliament and of The Council, 11th March 2009). A second key risk, reported by the public-private Construction Sector Group (CSG), is related to the impact of "excessive cost inflation" in the construction sector (ProjectIreland2040 BUILD, Construction Sector Performance and Prospects 2019). Thirdly, the commercial sustainability is a substantial risk to the scheme, as it relies on passenger growth and the consolidation of airlines in the hub configuration.

4.3.1. Timeline of decisions

In this scenario, Brexit uncertainty on demand over the course of the next Regulatory Determination, added to the rising of oil prices, could impact the viability of some airline's business models and their possible collapse. Finally, as Dublin Airport will strive to secure funding ahead of starting new projects, any deferral in remuneration profile will also surge

Table 6
Summary of Amsterdam Schiphol Airport findings.

Institutional & regulatory settings	Planning	Control and funding	Risk
<p>Ownership</p> <ul style="list-style-type: none"> Dutch government (69.77%) Municipality of Amsterdam (20.03%) Municipality of Rotterdam (2.20%) Groupe AdP (8.00%) <p>Regulation</p> <ul style="list-style-type: none"> Aviation Act (2017): dual-till regulatory approach with separation of aeronautical activities from concession & commercial activities. 	<ul style="list-style-type: none"> Alders Agreement (2008) Schiphol Action Agenda (2016) Schiphol Group expansion approval (March 2016) Coalition Agreement (2017) Aviation White Paper or “Luchtvaartnota” 2020–2050 (2019) 	<p>Control</p> <ul style="list-style-type: none"> Royal Schiphol Group Capital Programme project group PM/CM partner which is the client representative managing the project on behalf of SNBV (Schiphol Nederland B.V.) <p>Funding</p> <ul style="list-style-type: none"> EUR 350 million European Investment Bank (EIB) loan facility EUR 100 million KfW IPEX-Bank loan facility Long term credit rating_ Standard & Poor's: A+ stable outlook; Moody's: A1 stable outlook Short term credit rating_ Standard & Poor's: A-1 	<ul style="list-style-type: none"> High competition for developments in the real estate Risk of fluctuations in demand for air transport Changes in consumer behaviour risk Changes in environmental policies Changes in IT infrastructure and information security Compliance risks

pressure on its liquidity, a key metric considered by rating agencies when factoring the risk of default.

Dublin Airport, as presented in the Capital Investment Programme from 2020 (Redacted), is planning to procure projects both on a standalone basis and grouped into packages through framework agreements with consultants and contractors, which will include works from both the “Capacity” and the “Core” projects. During a Market Engagement Process (April 2019), Dublin Airport has manifested the desire to procure the works adopting different routes. In order to facilitate the procurement of those process, the Airport will secure Project Management Office (PMO), a Management Contractor to deliver design

and surveys, undertake utility diversions, enabling works, demolitions, and a Principal Design & Building (D&B) Contractor to deliver a New Pier 5 and associated stands.

Financially, according to one interviewee, although Dublin Airport has declared that the required level of investment can be accommodated with the price cap from 2015 to 2019, the pressure will reside with the CAR's Draft Determination on the Maximum Level of Airport Charges, which could determine the withdrawal of some CIP2020 + projects. If funding requirements can be sourced by the operating cash-flows, dependent on the price cap and the passenger levels, new debt can be raised, with a credit rating not lower than BBB + , as the funding structure is also linked to projects

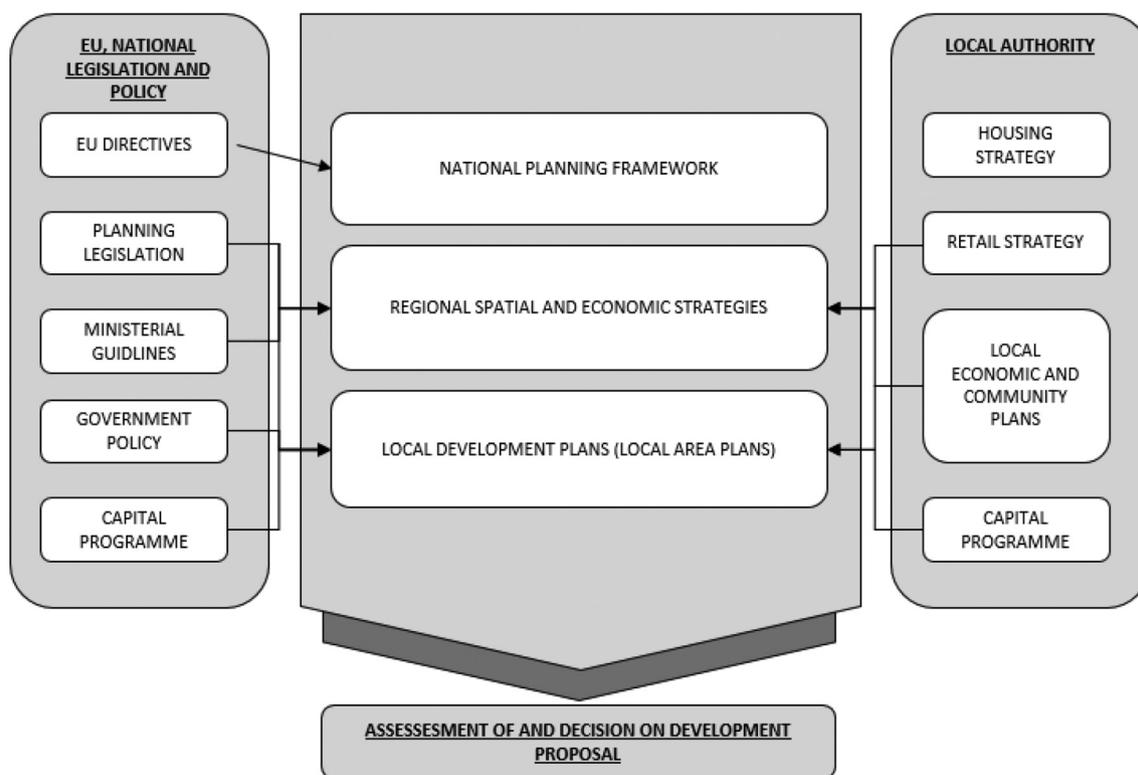


Fig. 5. Irish Planning System overview.
Source: Project Ireland 2040, National Planning Framework.

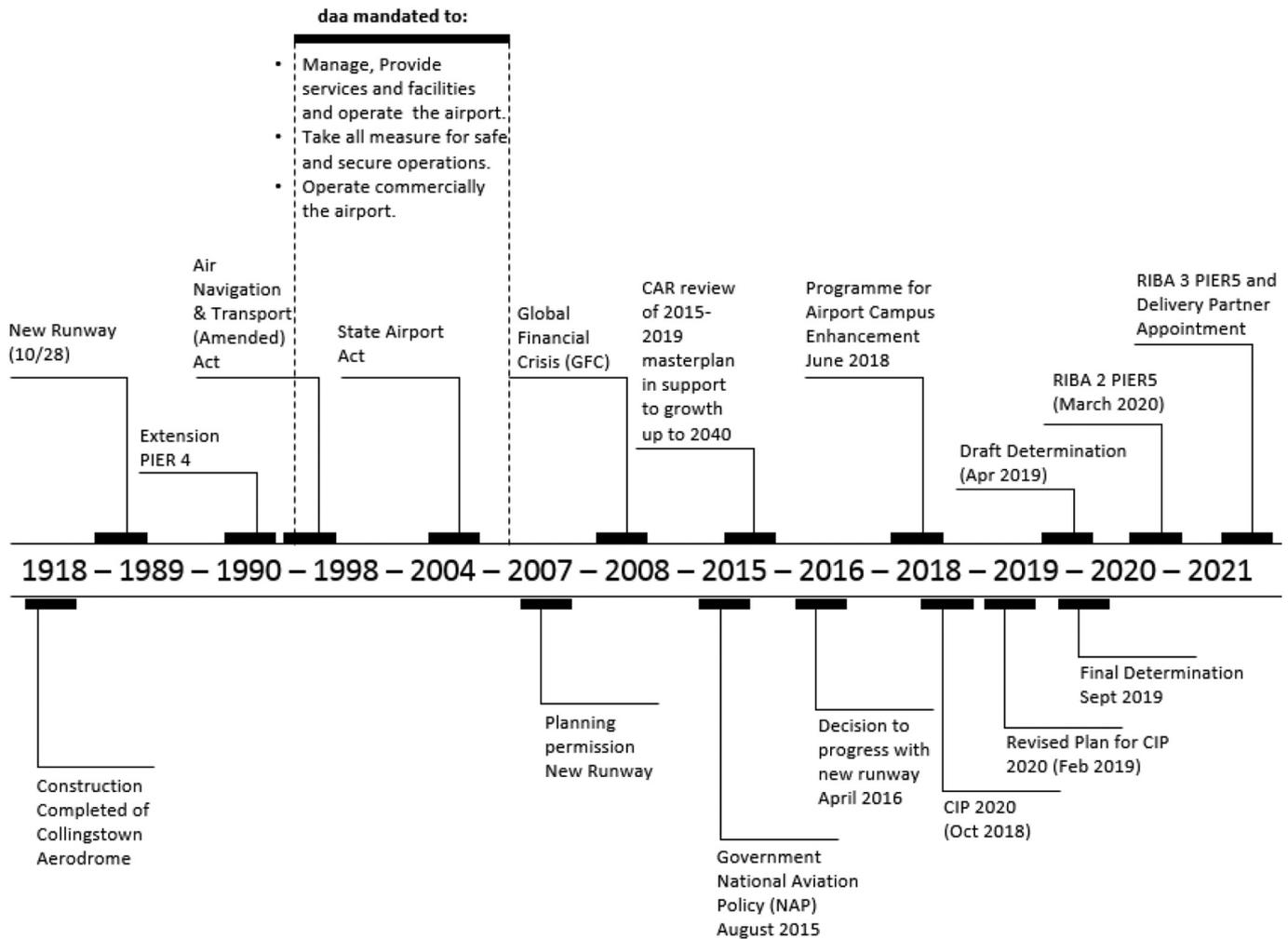


Fig. 6. Timeline of decisions.

such as the North Runway, approved during the 2014 Determination (PACE) (Table 7).

4.4. Implications of Covid-19 crisis on Heathrow, Dublin and Schiphol expansion programmes

At the time of writing the article, the three airports have taken different approaches to their expansion plans. Whilst it is clear that the Covid-19 crisis has cast a shadow of doubt on the aviation projects, different governments and airport operators have dealt with it differently. For example, Heathrow Expansion has been stopped in a court case by environmental activists suggesting that the project should not proceed on the basis of not complying with the Paris 2015 agreement and the UK 2050 Net-zero emissions pledge² suggesting that proceeding with the expansion project would be illegal. Covid-19 crisis has created a further blow to the viability of the expansion plans suggesting, at the time of writing the article, that the entire expansion programme might be abandoned.³ Whilst at the time of writing the article Schiphol and Dublin Airports have not made their deliberations public, all of them have faced unprecedented drops in passenger numbers

² Heathrow braced for court ruling on third runway, The Financial Times, 27 February 2020, Accessed on 20 May 2020 at <https://www.ft.com/content/3cbe3f5c-58b6-11ea-abe5-8e03987b7b20>.

³ Financial Times, 2020. Heathrow's third runway project now 'impossible', says IAG chief, Financial Times, 7 May 2020, Accessed on 20 May at <https://www.ft.com/content/2921cb8b-e557-4307-8f59-ff05038fa7b9>.

and it is expected that the expansion programmes might go through a significant overhaul in both of those cases. A key implication of the pandemic is that the full range of knock-on effects on the economy, society, behaviours of individuals and businesses is uncertain and continually evolving. In this way, airport operators are doing their best to work with this uncertainty by integrating it in their planning of capital investment projects as well as operations.

5. Discussion: navigating the tensions in the front-end planning of airport expansions

What happens during the front-end phase of a megaproject, according to Samset (2008), is essential for the project's success. Although the literature illustrates that the focus should be on the justification of the project benefits, arguing that most of the time the options are proceeded by the solution (Priemus, 2008), this study demonstrates that stakeholder's influence in the decision-making is key to recognise the determinants in the implementation of the project.

Findings suggest that the decision to exploit the opportunity of airport expansion projects can be implemented by analysing categories which unfold the timeline of key events if investigated across the following for dimension:

- Institutional settings and regulation – Understand environment condition and stakeholder support
- Planning – Evaluate the route for the consent application for the expansion project
- Risk – Understand condition of risk and uncertainty

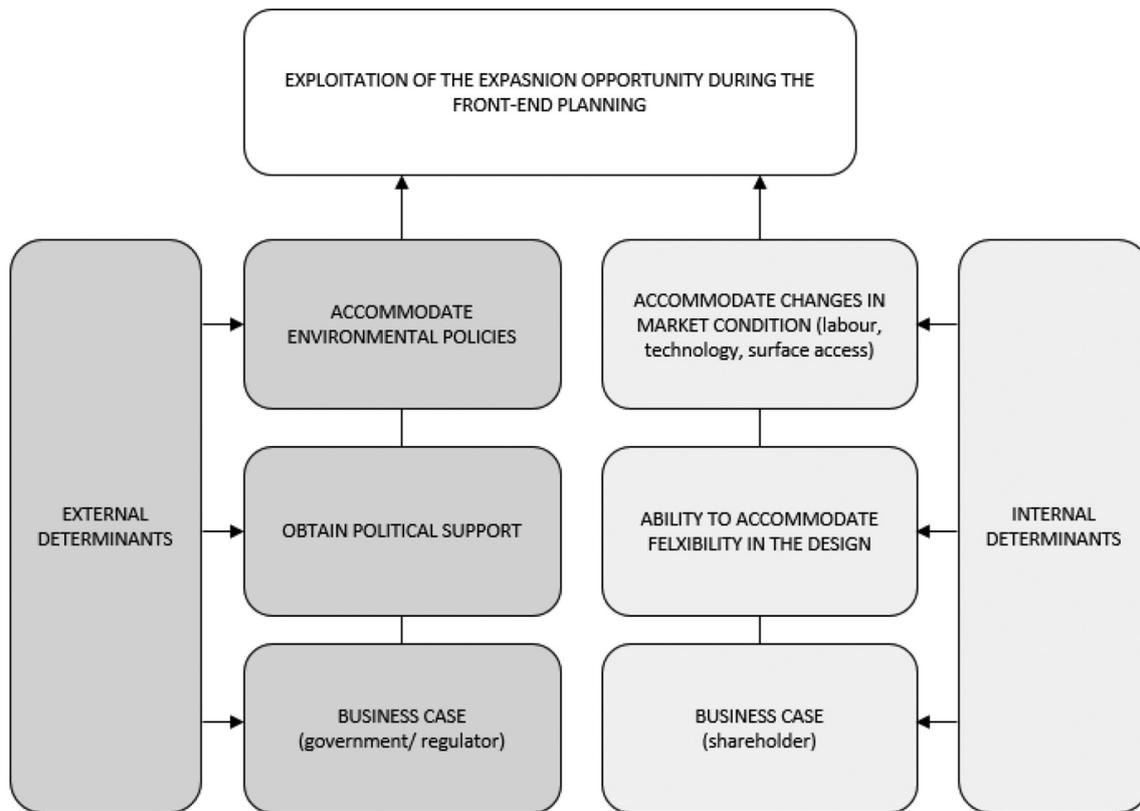


Fig. 7. Revised framework.

Table 7
Summary of Dublin Airport findings.

Institutional & regulatory settings	Planning	Control and funding	Risk
Ownership <i>daa plc.</i> (State-owned company, headquartered at Dublin Airport)	<ul style="list-style-type: none"> National Planning Framework 2018–2027 The Fingal Development Plan 2017–2023 Regulation (EU) No 598/2014 National Aviation Policy for Ireland 2015 	<ul style="list-style-type: none"> Control Project Management Office (PMO) Management Contractor Principal Design & Building (D&B) Contractor 	<ul style="list-style-type: none"> Commission for Aviation Regulation (CAR) approval Construction cost inflation Commercial sustainability Oil prices BREXIT (relationship Ireland-UK)
Regulation The independent Commission for Aviation Regulation (CAR)	<ul style="list-style-type: none"> Dublin Airport Local Area Plan 2006–2015 Dublin Airport Central Masterplan Greater Dublin Area Transport Strategy 2016–2035 	<ul style="list-style-type: none"> Funding 20 Capacity projects (€1.1bn) 85 Core projects (€477m) 15 commercial projects (€105m). Operating cash-flows dependent on the price cap and the passenger levels New debt raised with credit rating not less than BBB + 	

- Control and funding - Evaluate attitude toward retaining or devolving managerial control.

Differences and similarities across the case studies will build on the linkage existing between the selected four categories. In fact, the understanding of the context and regulatory environment, together with the analysis of risk, evolve in the determination of the most appropriate planning process and the creation of a defined regime of control and funding structure.

The complexity in understanding the factors driving the decision to expand existing airports is therefore reduced by looking into the correspondences among projects. Table 8 summarises the results of the three (3) case studies and clusters the results as evidence of similarity.

However, the data suggests that among the four categories, the determinants of the front-end planning need to be determined where the interplay

between the results shows differences. For this reason, the result of the “Control and Funding” category has been excluded as they present similar results across the three (3) projects. In fact, airport organisation demonstrated to aim in preserving the leadership role, and fulfil legal requirements toward the airport shareholders, whilst devolving, to supplier with international experience in delivering facilities in operating environment, the responsibilities of managing the projects.

Based on the selected coding structure, where data are broken-down from text (open coding) into a succession of concepts developed into building blocks (Böhm, 2004), this research refine and differentiate concepts in an axial-coding analysis where the relationship between categories develops in cause and effect relationships (interplay). The proposed interplays have been patterned in a deductive procedure, using the available data material (Table 9).

When analysing the shareholder commitment, in the context of the economic regulations, the political support and availability of clear environmental policies, and the response to demand, regulatory and market risk, the study demonstrates that the tensions between opposing poles are the factors to be investigate at the front-end of the planning process.

5.1. Balance between market forces and government initiatives

The first balance among tensions emerging from the case studies highlights the importance of understanding the relationship between market forces and government initiatives when pursuing the opportunity to expand. If megaprojects are conceived as the result of politically expressed needs, in dialogue between various stakeholders, the study demonstrates that in market liberalized country, where private ownership has enabled capacity constraints (Wojciech, 2009), airport organisations, although subjected to economic regulation, strive to achieve increase in connectivity by prioritising return of investment, whereas publicly owned airport organisations strive to maximise the wider national economic welfare.

In fact, Schiphol Capital Programme, differently from Heathrow Expansion (Section 4), reinforces the Government's manifesto to protect the competitive strength of the Netherlands, the airport's ambition to provide excellence in the quality of experience and the aim of the national carrier to strengthen and expand its extensive network from the national hub.

Similarly, Dublin Airport Capital Investment Programme 2020 + , supported by both the volume of passenger being processed in the last five years and the incumbent airlines, aims to improve the airport service quality. The finding that the alignment of interests between the different parties is a key determinant of front-end planning of hub airport expansions has an important implication for markets and institutional settings which are yet to undergo a significant programme of airport expansions. China is a prime example of such a market at the forefront of infrastructure delivery and upgrades. Whilst the airports and airlines will reflect a different ownership structure than the one we observed in the focal geographical area of this study, the different actors (central government vs local authorities, public vs private involvement) will have different interests that will need aligning in a similar way to what we observed in our case sample (Yang, et al., 2008). In the last few years the ownership of most airports in China has been transferred from the Central Government to local authorities. The ability for the most profitable airports to raise the funds from the private capital market usually comes from interested airlines based at the airport or other state-owned enterprises. According to Qin's (2010) review of Chinese airport business models the problem that local authorities are facing is to avoid the over-development of airports. As demonstrated by the case of Zhuhai airport in Southern China which was designed to cater for 10 million passengers a year and currently receive less than 1 million passengers per annum, local authorities should cautiously plan their large

Table 8
Summary of evidence for airport expansion projects.

Institutional settings and regulation	Planning	Risk	Control and funding
<i>Heathrow Expansion Project</i> • Private ownership • Economic regulation	• National Policy Statements • Development Consent Order	• Carbon commitments • Business case viability • Regulation approval	• Internalised structure • Privately funded
<i>Schiphol Capital Projects</i> • Public ownership • Economic regulation	• Alders Agreement	• Capacity growth • Construction market • Carbon commitments	• Internalised structure • Privately funded
<i>Dublin Airport Capital Investment Programme</i> • Public ownership • Economic regulation	• National Planning Framework • The Fingal Development Plan	• Construction market • Regulation approval	• Internalised structure • Privately funded
<i>Results</i> • Shareholder commitment • Economic regulation	• Political support • Environmental Policies	• Growth materialization • Climate change regulation • Market condition	• Project interface management • Reliance on private capital

Table 9
Summary of evidence linking determinants for airport expansion projects.

Resulting determinant	Balance
Interplay 1 Shareholder commitment Economic regulation	Balance 1: Different ownership models define the balance between markets vs. policy initiative in the exploitation of the opportunity to expand.
Interplay 2 Political support Environmental policies	Balance 2: Capacity of an organisation to adapt to different planning condition and to steer the political approval.
Interplay 3 Growth materialization Climate change regulation Market condition	Balance 3: Capacity to plan for flexibility and accommodate the risk of change in demand growth, climate change regulation and market condition (labour, technology, surface access).

capital investment considering a balance with the national economic development as a whole.

5.2. Balance between organisational planning and political legitimacy

The second balance investigates the capacity of an organisation to enforce the different planning conditions and being able to steer the political approval. In the case of the Heathrow Expansion, being a Nationally Significant Infrastructure Project, the application to the Planning Inspectorate for the Development Consent Order, requires for its process a strong engagement with residents and stakeholders and involves during the preparation, periods of public consultation with local authorities, neighbouring communities, statutory bodies, airlines, and the Heathrow Community Engagement Board (HCEB). Nevertheless, because the DCO is based on the NPS, if the NPS conditions change in due course due to political reason or misalignment with environmental policies, the application could be turned down as well as the Government's Airports National Policy Statement (NPS) itself.

Schiphol Capital Programme, on the other hand, being subjected to the 2003 Aviation Act and the Alders Agreement (2008), needs to balance its growth only against the adaptation to the environmental constraints, which restrict the airport to an ATM cap, since the political support is guaranteed by its ownership structure.

In analogy, Dublin Airport Capital Investment Programme 2020 + , although requiring a Statutory Planning Permission can be implemented as Strategic Infrastructure Development under the speeded-up planning applications presented in the National Planning Framework 2018–2027. This

however involves strict control by the regulator which aims to strengthen the competitiveness, by reducing the maximum level of airport charges and striving for costs efficiency.

5.3. Balancing responses to growth, climate change and market risks

The third key interplay focuses on the balance that airport organisations need to accommodate and respond to the risk of change in demand growth, climate change regulation and market condition (labour, technology, surface access). Heathrow Expansion Programme, according to the data gathered in Section 4, is primarily affected by the carbon and environmental risk. In fact, the legitimacy of the scheme is threatened by the late issuing of revised national environmental policies, and stability of the political environment. Conversely, Schiphol Capital Programme is subjected predominantly to risk related to the competitive national infrastructure market which undermines the availability of labour skills and construction component resources. Dublin Airport Capital Investment Programme 2020+, as well as being exposed to traffic demand risk in a Brexit scenario, is subjected to uncertainty in the scope definition and budget planning due to the on-going determination of the maximum level of airport charges.

Whilst there was general acknowledgement of the importance of the Net Zero agenda, we didn't observe any significant difference between the three airports concerning their approach to carbon emissions. One of the possible reasons for this is that plans that set and govern emission targets are established beyond the national and international (EU) level and therefore are expected to be adopted by all organisations, including those that we analysed in this study. In this way, carbon emission targets are set in policies that drive, shape and constrain project decisions in airport owner and operator organisations, but we observed that this happens in a consistent way across the three projects. However, as illustrated by Vaishnav et al. (2016), capping emissions at 2020 levels might place a larger offset of carbon dioxide burden on fast-growing but historically underserved developing regions of the world. Indeed, there are a number of challenges that must be overcome for addressing the carbon issue within the transport policy of the 21st century as explored by Nocera et al. (2018). Decision making for climate policy should apply evaluation methods requiring estimates of what will happen under different alternatives when public resources are invested. In fact, by deploying uncertainty assessment, a final unitary price can be established.

The above-listed balances between tensions emerging from opposing determinants represent the key contributions to knowledge, as it offers an answer with a different outline to the one structured in the theoretical framework. Nonetheless they provide a response to the research question objective to find similarities among the determinants of airport expansion during the front-end planning stage.

In fact, evidence from the data collected shows that a dual stream of determinants, outward and inward looking the airport organisation, need to be in place in order to realise the exploitation of the expansion opportunity (Fig. 7). From one side the rigorousness of the business case, supported by the economic regulation, will allow the obtainment of political support and the respect of the environmental policies, hence determining the backbone of negotiation with external stakeholders. On the other side, a strong business case in support of connectivity and competition, will support the capacity to plan for flexibility, accommodate changes in technologies, as well as the mode to operate and access the airport, which are the key determinant of the front-end planning of airport expansions projects in the view of the organisation's stakeholders.

6. Conclusions and implications

This paper set out to revisit the key factors in decision-making regarding airport expansion investments. Findings suggest that the project front-end decision-making in airport expansions is about identification of opportunities for exploitation working with a variety of stakeholders toward a planning solution that is viable and acceptable for stakeholders involved. The three specific tensions that arise from the analysis create an intricate and

fragile playground of navigating the different stakeholder interests toward achieving favourable project outcomes. Findings suggest that the decision-making journey is often decades long and is prone to risk of suspension or failure as we have seen in the case of Heathrow Expansion recently. Whilst the findings provide a useful summary of key considerations in front-end planning and inception of major airport infrastructure expansion programmes, the key question is how these can inform decision makers' choices regarding airport expansion plans in the aftermath of the Covid-19 crisis. This is the goal of the final section of this article.

The global aviation market is facing a disruption and long-lasting transformation the results of which are yet to be revealed and can include the demise of the hub-and-spoke model and low-cost massive air travel that many airports have been relying on prior to the pandemic. It is clear that airports will be challenged to make strategic choices that will involve transformation and restructuring to maintain profitability and availability of services. The landscape including the investment, political, and stakeholder support climate will have changed and so will priorities of the key actors and stakeholders who inhabit this space. Currently, a number of scenarios are being considered for the future of the market, which includes significant redesign of the passenger journey systems including check-in, boarding and queuing so as to comply with physical distancing recommendations. Similar interventions will be needed by airline companies who are expected to find themselves under significant financial pressures to maintain their margins, a pressure which they are likely to pass onto passengers in the form of ticket fees. New public health measures implemented on border control can mean a significant disruption for passenger experience, providing opportunities for replacing passenger travel with cargo flights (Harrell 2020).

Based on our findings we suggest that we should understand airports as platforms that need to align interests of a diverse range of actors including for example, airlines, passengers, infrastructure operators, cargo operators and investors. In this way the front-end decision making on airport expansion projects in light of a global pandemic is caught in a crossfire between the different forces which drive, constrain, influence or sometimes even dictate the decisions. At the same time airports need to deploy solutions quickly as they are directly exposed to global disruptive events such as the global pandemic, which is currently unfolding.

As it becomes clear that the long-term slowdown of the aviation industry is imminent, airports around the world look very likely to put a stop on any business development and expansion plans in the near future. Alongside business restructuring and operational processes to implement health regulation and improved facilities to support emergency responses, an important part of the adaptation process that airports will need to undergo in the during and post the global pandemic will involve a reconsideration of expansion projects, which were on the agendas of many hub airports in the past decade. Whilst high-scale expansion schemes are predicated on the future growth of passenger numbers, which look very unlikely at the moment, they also leverage the wide-reaching support from the public, investor, government and stakeholder communities, all of which have an important say in the decision to sanction an expansion project.

Our findings also imply that the transport planning and forecast models are an important component that feeds into the decision-making process on airport expansions, whilst uncertainties and extraordinary variables and adverse situations (such as global pandemic) do not feature prominently in the scenario planning. An implication is that airport operators should implement decision-making models that take into account the uncertainty through flexible designs that allow adaptations and adjustments to accommodate the various ramifications of the uncertainties unfolding and affecting the project adversely. Such flexibility in the planning and front-end decision making can also account for the need to change behaviours and deploy solutions to react to fast-paced changes in the external environment.

In this paper we aimed to provide insights for airport operators and transport planners when reconsidering future scenarios for their expansion and capital investment projects. In particular, we emphasise the decision-making journey leading to front-end airport expansion decisions as a dynamic process involving multiple knowledge domains, actors and

stakeholders. We suggest that whilst a long-term drop in passenger numbers is likely due to a shift in the market demand and supply as well as regulatory landscape, a new consensus between the important actors and stakeholders defining air travel will be necessary. The findings of this study unpack the important tensions and interests of the different driving forces and we suggest that addressing those will help policy makers, transport planners, investors, and airport operators negotiate a new landscape toward justifying or repurposing the major investment projects in airport infrastructure, in particular large-scale airport expansions.

Whilst our findings are based on three project cases, they have conceptual and theoretical validity (Flyvbjerg, 2013) and inform our knowledge on project front-end decision making in the context of transportation planning through an empirical study of airport expansion programmes. The case selection was guided by the research question which led to the purposive sample of the three projects within a concentrated geography and with the comparable business model. Focusing on the differences between the three cases helps map a conceptual landscape of diverse issues that can be expected in a similarly structured sample in different geographical and institutional contexts. In such a way, the study is a milestone for further

work that should continue unpacking the issues we identified using different research designs and methodologies.

Whilst the point of this study was to take into consideration a host of factors that inform the decision making in the planning of airport expansions, it is clear that carbon emissions are a particularly prominent issue that warrants more empirical treatment. To this end, we suggest further studies should focus specifically on the carbon emissions problem and how it informs airport planning and project decision making. Similarly, future studies should focus on different empirical contexts, such as different institutional settings- in particular it would be interesting to compare features of front-end decision-making in airport expansions in emerging and high growth markets to the ones we observed in the Western European setting.

CRediT authorship contribution statement

Pierpaolo Avanzi: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Vedran Zerjav:** Supervision, Conceptualization, Methodology, Writing - original draft, Writing - review & editing.

Appendix A. Data sources

Table 10
Data collected from publicly available documentation

Data type	Quantity	Original data source	Audience	Year	Pages
Policy document	1	White Paper on Air transport (The Future of Aviation), <i>DfT</i>	UK public	2003	178
Policy document	1	The Future of Air Transport Progress Report, <i>DfT</i>	UK public	2006	80
Policy document	1	Adding Capacity At Heathrow Airport, <i>DfT</i>	UK public	2007	8
Corporate external document	1	Project for the Sustainable Development of Heathrow (PSDH). <i>HAL</i>	UK public	2009	9
Regulatory document	1	BAA airports market investigation. A report on the supply of airport services by BAA in the UK. <i>Competition Commission report</i>	UK public	2009	297
Policy document	1	Britain's Transport Infrastructure. Adding Capacity at Heathrow: Decisions Following Consultation, <i>DfT</i>	UK public	2009	28
Policy document	1	Airports Commission: Final Report	UK public	2015	344
Regulatory document	1	The recovery of costs associated with obtaining planning permission for a new northwest runway at Heathrow Airport: final proposals. <i>CAA</i>	UK public	2016	46
Policy document	1	Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England, <i>DfT</i>	UK public	2018	91
Regulatory document	1	Alders Agreement. <i>Alders table</i>	Netherlands Public	2008	13
Policy document	1	White Paper on Dutch Aviation (Aviation Policy Document). <i>Ministry of Transport, Public Works and Water Management and the Ministry of Housing, Spatial Planning and the Environment</i>	Netherlands Public	2009	18
Policy document	1	Schiphol Action Programme. <i>Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs</i>	Netherlands Public	2016	56
Policy document	1	Confidence in the Future, coalition agreement. Parliament Parties VVD, CDA, D66 and ChristenUnie (2017)	Netherlands Public	2017	60
	1	Royal Schiphol Group. 2018 Annual Report. <i>Royal Schiphol Group</i>	Netherlands Public	2019	255
Policy document	1	Directive 2009/12/EC of the European Parliament And of the Council on Airport Charges. <i>Official Journal of the European Union</i>	Ireland Public	11th March 2009	6
Corporate external document	1	Programme Of Airport Campus Enhancement (PACE). <i>Dublin Airport</i>	Ireland Public	October 2017	195
Regulatory document	1	Fingal Development Plan 2017–2023. Dublin Airport Local Area Plan	Ireland Public	June 2018	32
Policy document	1	Build. Construction Sector Performance and Prospects 2019. <i>Project Ireland 2040. Investment Projects and Programmes Office (IPPO)</i>	Ireland Public	2019	33
Corporate external document	1	Regulatory Proposition for Determination 2020 + (Redacted). <i>Dublin Airport</i>	Ireland Public	6th February 2019	190
Corporate external document	1	Capital Investment Programme 2020 + . <i>Dublin Airport</i>	Ireland Public	6th February 2019	543
Regulatory document	1	Dublin Airport Cost of Capital for 2019b Determination. Draft report. <i>Swiss Economics SE AG (Swiss Economics) for the Commission of Aviation Regulation (CAR)</i>	Ireland Public	12th March 2019	79
Regulatory document	1	Dublin Airport's Price Cap Proposal. <i>CAR Dublin Airport Price Determination 2020–2024</i>	Ireland Public	2nd May 2019	3
Regulatory	1	Dublin Airport Operating Expenditure: Bottom-up Efficiency Assessment. <i>Commission for Aviation Regulation</i> ,	Ireland	3rd May	182

(continued on next page)

Table 10 (continued)

Data type	Quantity	Original data source	Audience	Year	Pages
document	1	DRAFT REPORT	Public	2019	3
Regulatory document		Draft Determination On Dublin Airport Charges For 2020–2024. <i>CAR Dublin Airport Price Determination 2020–2024</i>	Ireland	9th May	
Regulatory document	1	Dublin Airport - Process for setting capex allowances for the regulatory determination period. <i>Steer for the Commission for Aviation Regulation (CAR)</i>	Public	2019	53
Regulatory document		Dublin Airport - Process for setting capex allowances for the regulatory determination period. <i>Steer for the Commission for Aviation Regulation (CAR)</i>	Ireland	June 2019	

Table 11

Data collected from public presentations and videos.

Data type	Link	Original data source	Date	Duration	Pages
Presentation slide-deck	file:///C:/Users/pierpaolo.avanzi/Downloads/airport-capacity-the-dutch-approach%20(3).pdf	Airport Capacity: The Dutch Approach <i>Ministry of Infrastructure and the Environment</i>	29 February 2016	N.A.	20
Presentation slide-deck	N.A.	About our plans. The Capital Programme <i>Royal Schiphol Group Capital Programme document</i>	7 December 2016	N.A.	27
Presentation slide-deck	http://netlipse.eu/media/92117/9b_arjan-bieshaar-lex-pepping-developments-schiphol-airport.pdf	Schiphol Airport Developments Schiphol Interface Management Lelystad Airport. <i>Royal Schiphol Group Capital Programme document</i>	20th November 2017	N.A.	36
Presentation slide-deck	https://www.wko.at/service/aussenwirtschaft/2019_04_29_Webinar_DAA_all.pdf	Webinar Dublin Airport. <i>WKO (Austria)</i>	29th April 2019	N.A.	40
Presentation slide-deck	https://www.aviationreg.ie/_fileupload/2019/Draft%20Determination/2020-2024%20Draft%20CIP%20Airfield%20Modelling.pdf	High-level performance review of airside capacity projects. Prepared in support of CIP2020 Evaluation process. <i>Egis Company</i>	2019	N.A.	44
Presentation slide-deck	https://www.aviationreg.ie/_fileupload/2019/Draft%20Determination/2020-2024%20Draft%20CIP%20Terminal%20Modelling.pdf	High-level performance review of terminal building capacity projects. Prepared in support of CIP2020 Evaluation process. <i>Egis Company</i>	2019	N.A.	63
Video	https://www.youtube.com/watch?v=_At_8ZfqSLo&t=16s	Heathrow Expansion Programme <i>Heathrow Airport</i>	18th June 2019	3:56"	N.A.
Video	https://www.youtube.com/watch?v=6Xvj_5JG1Oc	Schiphol Capital Programme. <i>Stadsarchief Amsterdam</i>	14th September 2016	4:30"	N.A.
Video	https://www.youtube.com/watch?time_continue=2&v=z3lN3ejP0xs	Dublin Airport North Runway <i>Dublin Airport</i>	22nd May 2018	2:19"	N.A.

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