The RandstadRail project: a case study in decision-making strategies under uncertainty

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INTERFACE

What constitutes a "successful" mega transport project?

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Introduction

There has been a flurry of book publications on mega projects in the last 10 years or so, not to mention the increasing volume of journal publications. Of particular note is the work of Allport (2011), Altshuler and Luberoff (2003), Flyvbjerg et al. (2003), Flyvbjerg (2014), Greiman (2013), Merrow (2011), and Priemus and van Wee (2013). Many of these publications have focused on or included mega transport projects (MTPs)[1] among the mega projects examined. This academic and professional interest in mega projects and MTPs in particular has followed a dramatic world-wide expansion of mega project studies and developments since the latter part of the twentieth century both in the developed and developing world.

The sheer size of MTPs results in daunting planning, appraising and management challenges with economic, social, environmental and territorial impacts that reach far beyond the project itself. It is hardly an overstatement to say that a MTP can make or break a place. But what constitutes a "successful" MTP? How to take account of the unique complexities of MTPs when defining what success is? And can there be a generic definition of "success" or should the definition be dependent on each specific context?

The contributions which follow look to provide insights into the answer to some of these questions from a variety of perspectives. They are based, among other things, on the story-telling of key stakeholders reporting on aspects of project developments that went far beyond "iron-triangle" delivery concerns of finishing projects on time, on cost, and within specifications that have dominated the narrative of much of the literature regarding mega projects (Dimitriou et al., 2013). The research undertaken was conducted on the basis of a systematic examination of decision-making in the planning, appraisal and delivery of 30 MTPs (see Table 1) derived from a 5-year research programme conducted by the OMEGA Centre at University College London (UCL) in association with nine other universities in 10 different countries. Undertaken between 2006 and 2011, the research was funded by the Volvo Research and Education Foundations (VREF) and involved interviews of some 300 project stakeholders in developed economies, including Australia, France, Greece, Japan, the Netherlands, Sweden, the UK, the USA, Germany, and Hong Kong.

The ensuing *Interface* text comprises selected contributions from researchers engaged in this OMEGA international investigation from seven of those countries, drawing from the experiences of one case study each. They seek to identify and highlight, from the evidence gathered, generic and context-specific conclusions regarding how and why MTPs are judged "successful", why in some instances formally declared judgements of "success" can be misplaced, and the shortcomings of relying to excess on project management criteria of finishing projects on time, within budget, and according to specification.

In its efforts to identify such lessons, the discussion looks to the potential value these findings can offer for future MTPs and the potential for the future employment of more holistic and long-

Table 1. OMEGA 2 case studies (projects discussed in this *Interface* are in bold).

Country	Mega transport project	Date finished	Final costs US$ (billions)[a]	Project type
UK	**Channel Tunnel Rail Link (CTRL), London and south-east**	**2007**	**9.6**	**High speed rail**
	Jubilee Line extension, London	1999	6.8	Metro rail (subway)
	M6 toll road, West Midlands	2003	1.7	Inter-urban toll motorway
France	Météor rail: Saint Lazare–Olympiades, Paris	1998	1.8	Metro rail (subway)
	Lignes à Grande Vitesse (LGV) Med: Valence–Marseilles	**2001**	**6.6**	**High speed rail**
	Millau Viaduct: Millau, south of France	2004	0.5	Road bridge (on motorway)
Greece	Rion–Antirion Bridge	2004	1.3	Road bridge
	Athens Metro: Sepolia–Dafni and Monastiraki–Ethniki Amyna, Athens	**2003**	**4.6**	**Metro rail (subway)**
	Attiki Odos, Athens, Greece	2004	5.4	Inter-urban toll motorway
Germany	Neubaustrecke: Cologne–Rhine/Main	2001	8.6	High speed rail
	Tiergarten Tunnel: Berlin, Germany	2006	9.0	Urban motorway and rail tunnel
	BAB20 motorway: Brandenburg to Schleswig-Holstein	2005	2.7	Motorway
Netherlands	HSL Zuid: Amsterdam Zuid to Schiphol Airport, Rotterdam (with connections to Antwerp, Brussels and Paris)	2009	9.8	High speed rail
	Randstadrail: The Hague to Rotterdam and Zoetermeer, the Netherlands	**2007**	**1.6**	**Light rail and bus**
	Beneluxlijn: extension of Rotterdam metro network	2002	1.0	Metro rail (subway)
Sweden	**Øresund Bridge/Tunnel Link: Malmö–Copenhagen**	**2000**	**4.1**	**Road and rail, bridge and tunnel**
	Södra Länken road tunnel: Stockholm	2004	1.3	Urban motorway tunnel
	Arlanda rail link: Stockholm Airport to Stockholm	1999	1.1	Airport express rail link
USA	Airtrain: JFK Airport: New York City	2003	2.2	Light rail airport link
	Alameda rail link: Los Angeles (port–downtown)	2002	2.8	Freight rail line
	Big Dig road and tunnel links: Boston	2007	15.5	Urban road tunnel and bridges
Australia	CityLink, Melbourne	2000	2.5	Urban toll motorway
	MetroRail, Perth	2007	1.7	Inter-urban rail line
	Cross City Tunnel, Sydney	**2005**	**1.1**	**Tolled urban road tunnel**
Hong Kong	Western Harbour Crossing: Hong Kong Island– Kowloon	1997	0.9	Tolled urban road tunnel
	Airport Express rail link: Hong Kong Central–Chek Lap Kok International Airport	1998	4.4	Airport express rail link
	KCRC West Rail link: Tsuen Wan–Yeung Long	2003	5.9	Urban rail line

(*Continued*)

Table 1 – *continued*

Country	Mega transport project	Date finished	Final costs US$ (billions)[a]	Project type
Japan	**Metropolitan Expressway: Nishishinjuku Junction–Kumanocho Junction, Tokyo**	**2007**	**5.5**	**Tolled urban road tunnel**
	Shinkansen high speed rail link: Kagoshima Chuo–Shin Yatsushiro	2004	7.5	High speed rail
	Toei Oedo Line: Tochomae–Hikarigaoka Tokyo	2000	11.4	Metro rail (subway)

Source: OMEGA Centre (2012).
[a] Adjusted to 2010 prices.

term perspectives. The discussion in particular looks at "project achievements" relative to:

- the original objectives set when the projects were first approved, and new project objectives that subsequently "emerged" during the course of their planning and implementation (referred to as "emergent objectives");
- the treatment of risk, uncertainty and complexity in MTP decision-making, with special attention paid to the impacts of changing contexts on such decision-making (i.e. the "power of context"), with particular focus given to the contexts of pivotal decisions in a project's history.

The former set of findings is seen as potentially very useful in identifying lessons of how MTPs can be further enhanced by the adoption of "emergent objectives", highlighting the importance of how these can lead to a recognition of the need to re-visit the framing of such projects. The second set of findings looks to identifying lessons of how the better treatment of risk, uncertainty, complexity in decision-making, and the impact of context on such decision-making (both within and outside the project) can considerably improve the performance, resilience, and outcomes of such projects.

Note

1. MTPs are here defined as land-based transport infrastructure investments in the form of bridges, tunnels, road and rail links or combinations of these, that entail a construction cost of over US$1 billion which are frequently perceived as critical to the "success" of major urban, metropolitan, regional, national developments and even transnational developments (OMEGA Centre, 2012).

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Leadership, risk and storylines: the case of the Sydney Cross City Tunnel

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Introduction

Storylines give mega projects life and spirit, and ultimately determine whether they are judged successful or not. In this paper the authors discuss the case study of the Cross City Tunnel in Sydney (see Figure 1), judged a "failure" by the majority of the key respondents interviewed by the authors. The interpretive analytical framework employed to explain what happened is introduced before an account is given of the decision-making process involved in the planning, appraisal and delivery of the tunnel.

Animating storylines

Hajer (1997) used the term "storyline" to describe the product of discursive explanation and justification of action. In the instance of the Sydney Cross City Tunnel Project, the storylines identified by the authors uncovered arguments that threaded together facts, assumptions, images, norms and values used by the decision-makers, to create their version of a coherent order of explanation and justification of this mega transport project (MTP). Some such storylines were simple statements, others were complex chains of reasoning. The use and value of such materials go beyond that of accountability to civil society, for they reveal the thinking of the institutional actors behind the development of such projects.

The timeline of the project's key decisions (see Figure 2) plus the storylines extracted from the interviews, animate the project. As Cicmil, Williams, Thomas, and Hodgson (2006, p. 680) observe, decision-making at the "virtuoso" level of (mega) project leadership is based on the awareness of the interpretation and judgement involved in such decision-making rather than any logical information processing and steps of analytical problem-solving. Described by Kahnemann (2012) as "system 1 thinking", the measure of "success" for this is "the coherence of the story it manages to create" (Kahnemann, 2012, p. 85).

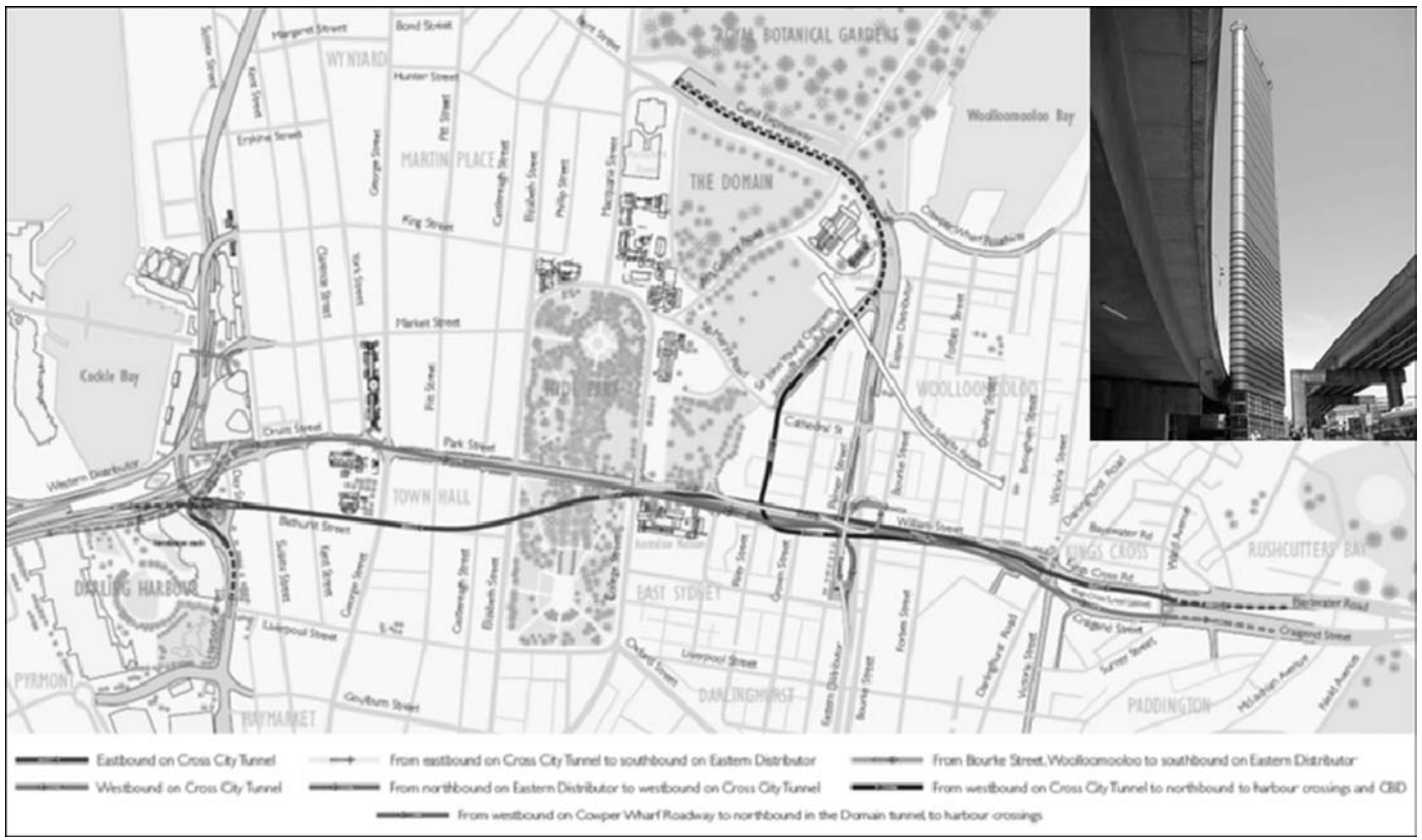

Figure 1. Map showing the horizontal alignments of Sydney's Cross City Tunnel. Source: Catalyst Communications (2003) Cross City Tunnel: Summary of Contracts, p. 2. Insert: a vent stack for the tunnel (Photo by S. Sturup).

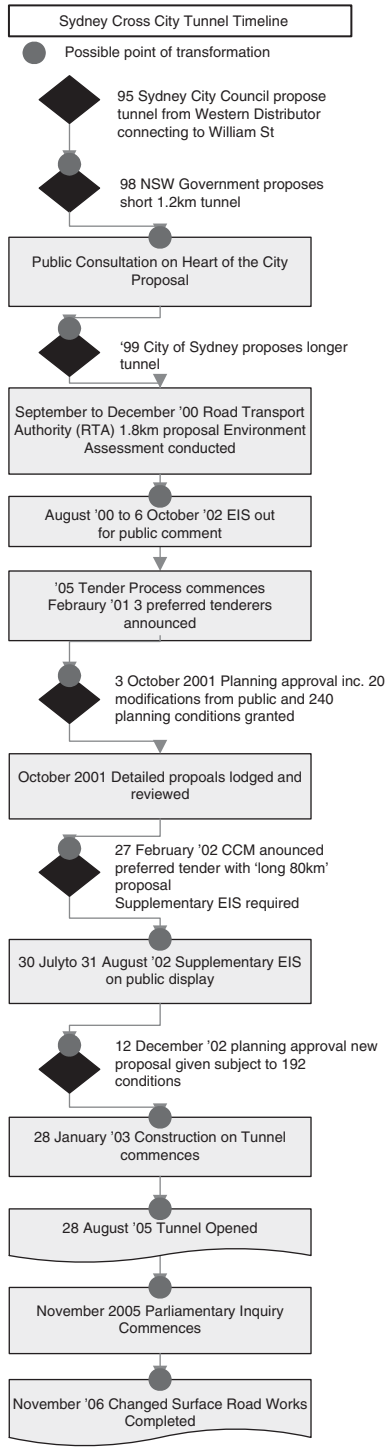

Figure 2. The timeline of major decisions for the Cross City Tunnel.

A coherent storyline here is the necessity for MTP "success" to become evident at two levels: firstly, as a public case within which project success can be described, and secondly, as a means to justify and strengthen the ability of individual project actors to drive the project forward by maintaining an internal integrity. When that coherence breaks down, it is contended, the "success" of the project evaporates. The case of the "failure" of Sydney's Cross City Tunnel demonstrates that the ultimate judgement of success (or failure) of the project, as seen by the majority of those interviewed, hinges on the capacity of the project leadership to maintain the coherence of the animating storyline.

Political leadership, design changes and risk

Initially designed by the Road Traffic Authority (RTA), the Cross City Tunnel was intended to bypass a well-known traffic bottleneck and ease traffic congestion in central Sydney. Led by Mayor Frank Sartor, the Sydney City Council was particularly attracted by the latter outcome because, apart from the congestion experienced by motorists, the surface streets were becoming hazardous for pedestrians (PPK Environment and Infrastructure Pty Ltd, 2000). To further the aim of environmental improvement in central Sydney, Mayor Sartor insisted on a longer tunnel which would allow the creation of a boulevard the length of William Street. Sydney City Council ran a campaign with a number of design experts to build a vision for the boulevard. This vision subsequently became included in the storyline for the tunnel. The project was thus adapted to include a number of changes – primarily to reduce space for traffic on surface streets once the tunnel was completed.

As these developments unfurled, there was a (deteriorating) change in the financial circumstances of the state of New South Wales, which led to the state government looking to reduce its expenditure. Being influenced by the rhetoric of the claimed "success" of public–private partnerships (PPPs), the state Treasury responded to these events by requiring that all new infrastructure projects be built at "no cost to government" (Infrastructure Implementation Group, 2005). For the Minister for Transport, Carl Scully, who had made his reputation on the delivery of mega road projects such as the M5 South West Motorway (a PPP), this was a direct challenge to take up the mantle of PPP once again – and one he took up with enthusiasm. The RTA advised that the Treasury directive meant that the project should only be pursued if the costs of RTA's management (a substantial amount) could be reclaimed from the private sector consortium (Joint Select Committee on the Cross City Tunnel, 2006). Such was the enthusiasm in Australia for investment in toll roads in the early 2000s that potential investors for Sydney's Cross City Tunnel were not hard to find. When a bid came in from Cross-City Motorway Pty Ltd (CCM) that provided a so-called "business consideration fee" to the government of AU$100 million (allowing the project to be delivered at no apparent cost to government), Minister Scully immediately championed the project.

The two objectives added to the simple "bypass" story (one environmental, the other financial) and undermined the coherence of the animating storyline as a whole. While these developments seemed to reinforce the case for a "bypass," the objective of "no cost to government" collided with the fact that more than half of the benefits of the road were to accrue to non-tunnel users: i.e. pedestrians using city streets. Given that the project finance was to be recovered entirely through tolls on motorists using the tunnel, this effectively meant a tax on those using the tunnel to pay for benefits accruing to the wider public. It also meant that the financial basis of the project required high traffic volumes (to justify the level of revenue generation claimed).

Estimates of traffic flows in the tunnel grew (coincidentally?) as project negotiations progressed. The final business case was based on a traffic flow of 90,000 vehicles per day (Joint Select Committee on the Cross City Tunnel, 2006). It is clear, however, even to the layman, that

90,000 vehicles per day (subject to morning and evening peak flows) simply could not be accommodated in a two lane tunnel with an 80-km/h speed limit and single direction peak load, no matter what the demand. Moreover, the predicted demand for the total number of individuals to move east–west across Sydney in 2006 was only 69,600 (PPK Environment and Infrastructure Pty Ltd, 2000). Since the private investors were now taking on all the risk, the realism of the traffic estimates was of little concern to the state government. The error in the traffic forecasts was compounded by lengthening the tunnel to site the eastern portal closer to the coast. Rather than increasing the number of motorists willing to enter the tunnel, this design revision meant that some potential users would have to turn back from their intended direction of movement in order to access the tunnel, thereby actually reducing the tunnel traffic. As one case study interviewee reported

> we would not have got a benefit cost ratio above one if we'd known that the upper capacity for motor vehicles for that project was only going to be in the order of 30 to 40,000 a day. And it won't climb terribly much above that, because there are bottlenecks on the eastern side where the networks are operating at capacity.

The contract to construct the tunnel and undertake surface street changes was signed in December 2002; construction commenced in January 2003. The tunnel was completed with few difficulties, on schedule, within 10% of assigned budget, and met required noise and air quality emission requirements. However, as soon as the tunnel was opened widespread criticism began. This included complaints that the tolls were excessive for short distance travel. Traffic was as a result, unsurprisingly lower than forecast. Travellers from the eastern suburbs to the harbour crossings were especially negatively affected by changes to Cowper Wharf Roadway which privileged vehicles entering the crossings from the tunnels and reduced access for vehicles using other routes.

The political risk that emerged as a result, namely having to deal with enraged motorists from the eastern suburbs who wanted to travel north, had not been foreseen. The problems for these motorists further increased when the surface road changes commenced. As agreed with the residents of the inner residential suburb of Woolomoloo, restrictions to motor vehicles using alternative routes to the harbour crossings began to be implemented. When this happened, to use a colloquialism, "all hell broke loose." The National Roads and Motoring Association (NRMA) and other motoring lobbyists subsequently began a concerted campaign, assisted by the news media, to discredit both the tunnel and the government, and to have the surface street changes reversed. The story promulgated by the campaign was that surface streets were being closed because the traffic numbers in the tunnel were low, and that the government had done a "dirty" deal with the private provider to funnel traffic into what was an unworkable, and unreasonably expensive tunnel. This story then became the story of the Cross City Tunnel. The original story – about saving the lives of pedestrians, improving urban amenity for all, and reducing the impact on residents – was lost.

Coincidentally, as these problems emerged, the long-serving premier of New South Wales retired, carrying with him Carl Scully, the champion of the Cross City Tunnel. The successor Premier instituted a parliamentary inquiry that rapidly concluded that the street closures should be reversed. Consequently, most of the benefits of the project to the wider community were abandoned. A tunnel costing AU$600 million had been constructed in which private investors in CCM subsidised the few tunnel users without advantage to the safety of the pedestrian users of city streets.

The original owner-operators of the tunnel were declared insolvent in 2006 (within 2 years of the project opening). For that reason, and because the MTP is not used by large numbers of motorists, Cross City Tunnel is widely regarded by the public and commentators as a failure. The

authors conclude that these failures were a product of both poor risk management and inadequate "due diligence" on the part of the private proponents of the project. It is most interesting that it is not considered a failure because it failed to reduce vehicle numbers in the city, nor because it failed to reduce the numbers of cars using residential streets as throughways. This finding is perhaps the most telling part of the whole project. The new storyline became so prevalent that the original one was forgotten.

Conclusions

The Sydney Cross City Tunnel project demonstrates one reason project failure can occur and why project success is often measured in only limited terms. When the coherence of the animating storyline breaks-down and the original story underlying its *raison d'être* is eventually abandoned, the broader socio-environmental ambitions of the project are threatened.

In the case presented here, the objectives to reduce pedestrian injuries, return residential streets to the residents, and improve amenity in the central city by creating a boulevard which the public could enjoy, were lost. These goals were replaced by a competing story, one applauding freedom of choice (for motorcar drivers), reduction of government control, and victory over "corporate greed". Once the competing story had achieved the short-term goals of preventing and reversing the surface street closures, however, this competing "success" story died out. It never became grounds for the long-term understanding of the success of the project. In these terms, we conclude that the basis for judging the "success" of the project was ultimately established through a set of background (or perhaps default) criteria. These criteria flow from (and are embedded in) the concept of PPP itself. They are: the need for the project as measured by the use of it, and the capacity of the project to capture value through tolls sufficient to sustain the business that built it.

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The case of the LGV (Lignes à Grande Vitesse) Méditerranée high speed railway line

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Introduction

The planning, appraisal and delivery of a mega transport project (MTP) with major development implications is inevitably concerned with establishing objectives for a wide spectrum of outcomes – ranging from the final costs of the project, completion times and service quality of project delivery, to urban development impacts and environmental protection concerns. In France, many such objectives are currently influenced by strategic planning directives provided by central government (and its National High Speed Master Plan and Public Inquiry File, in particular) or by local authorities (their Local Urban Planning Schemes). Despite the presence of this strategic guidance, MTP planners, promoters and other parties responsible for the implementation of such projects are well aware that there is a risk that some of these objectives will either not be attained or else only partially be achieved, given the uncertainties typically surrounding decision-making and the evolving rationality of actors as they confront changes (Sfez, 1994). The case-study of the LGV Méditerranée high speed railway line discussed here is particularly illustrative of this.

Stretching over a length of 250 km between Saint-Marcel-lès-Valence and Marseilles (see Figure 1) this MTP provides a high speed strategic rail connection linking northern France with the country's southern regions of Provence-Alpes-Côte d'Azur and Languedoc-Roussillon. More than in other cases, the route choice was confronted by a number of challenges due to the special nature of the rural and urban locations it planned to traverse. Feedback from project stakeholders interviewed by the authors indicates that the institutional contexts for the planning, and ultimately the construction of the project, progressively changed over its decision-making timeline as shown in Figure 2. The process changed from a relatively "closed decision-making process" – resting essentially in the hands of the state, local elected representatives and experts – to a more "open decision-making process" with the participation of non-governmental national and local associations and private citizens – an experience reported on elsewhere in this set of *Interface* contributions.

Central government requested SNCF (the French national railways authority) to undertake the initial route studies of the proposed rail link in 1989 which led to a "public interest statement" being signed in 1994. SNCF carried out the pilot project and remained the client up to 1997, the year that RFF (Réseau Ferré de France, the public corporation owning the railway network) took over this role. SNCF then became the project manager for the line's construction. LGV was financed by public funds (9.45% from state subsidies, 1.08% from local authority funding and 0.45% from EU funding) plus a loan from SNCF (amounting to 89% of total funding) (SNCF, RFF, 2007).

This contribution looks to provide insights into a number of key questions regarding the project; namely, whether this Train à Grande Vitesse (TGV) link may be considered a "success" overall, how well the risks and uncertainties accompanying key decisions taken at different

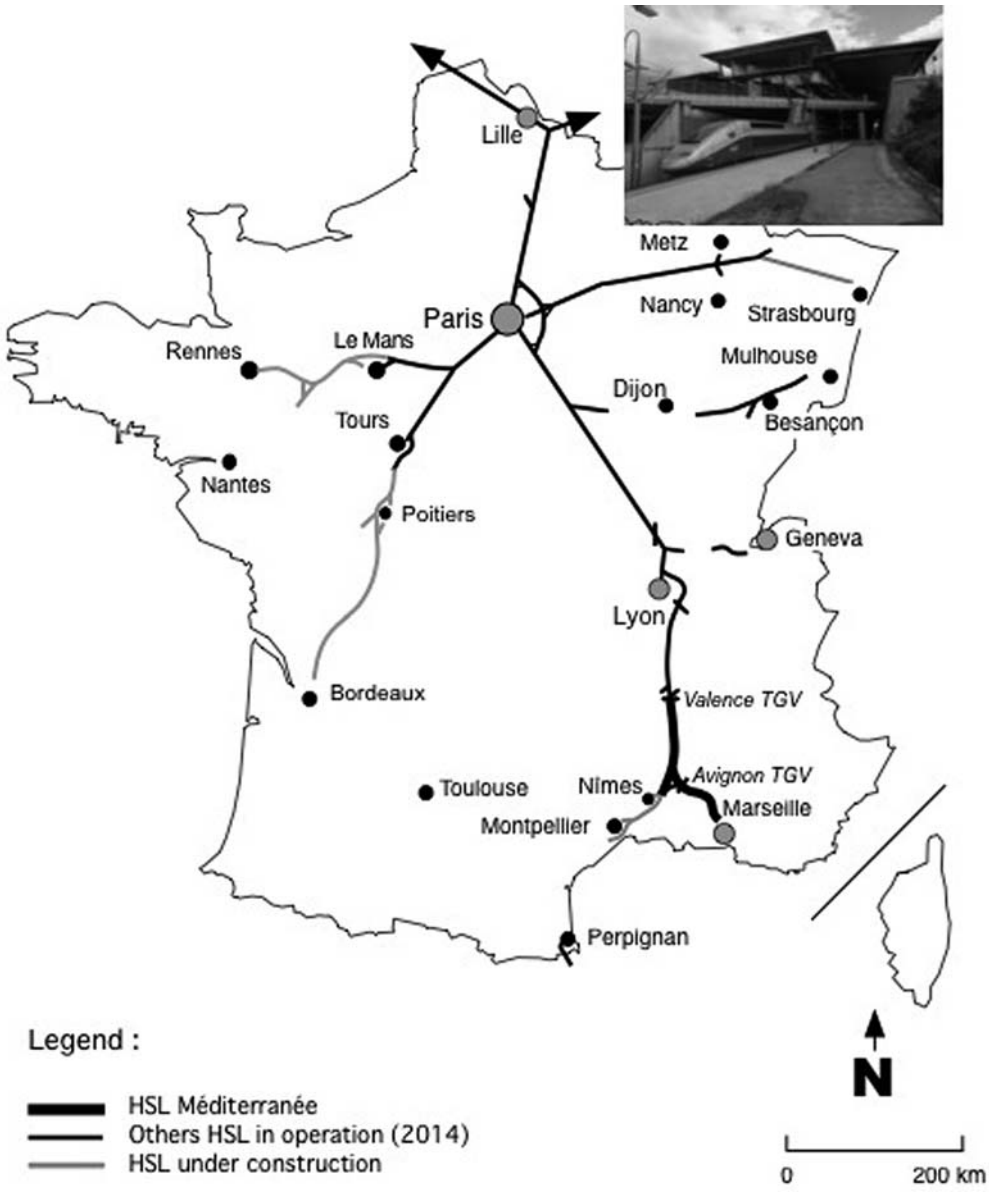

Figure 1. The LGV Méditerranée in the French high speed train network.

stages of the project's life cycle were handled, and what lessons can be drawn from this project's experiences for future projects?

Reflecting on the above, it may be useful to note that in 1991 the National High Speed Line Master Plan (Ministère de l'Equipement, du Logement et des Transports (MELT), 1992) assigned the LGV Méditerranée a high priority, linking as it did several French and European towns and cities, and freeing transport capacities on conventional rail routes for freight and regional passenger traffic. The first route proposed in 1990 to the east of the River Rhone, however, resulted in

Date	Event
31 January 1989	The French government asked SNCF to begin the route studies and analyse the conditions of building extensions of HSL south-east towards Marseille, Italy and Spain.
1990	Public opposition to the first route.
August 1990	The Minister of Transport asked a State Councillor (Querrien Mission) to study a final route with local elected representatives.
January 1991	The Minister of Transport confirmed the route layout by the Querrien Mission.
May 1992	Following continuing public oppositions, the Minister of Transport asked for a counter appraisal from an independent expert panel.
October 1992	Public inquiry.
15 December 1992	Government circular concerning the management of large-scale infrastructure projects. The state was obliged to make environmental protection commitments in compliance with requirements of the public inquiry file.
31 May 1994	Public Utility Statement.
5 May 1995	Public Utility Statement for a modification of the route layout near Tricastin nuclear plant.
2 February 1995	Law 95-101 introduced public debate and reinforces environmental protection.
10 June 2001	The line opened to traffic.

Figure 2. Timeline of key decisions: The LGV Méditerranée.

vigorous opposition from local residents and elected representatives as it crossed through Beaujolais vineyards and areas that were already highly urbanised.

The French government decided, as a result, to assign to a State Councillor a consultation mission (the Querrien Mission) with local elected representatives which, among other things, examined alternative routes. This mission proposed two different alternative routes to that originally proposed, with eight variants. Notwithstanding these efforts, the demands on (and objections to) the project by local residents and opposition movements grew, involving both elected representatives and non-governmental associations alike. In response, the Minister of Transport decided to commission a counter-appraisal from an expert panel in 1992 (SNCF, RFF, 2007). The panel refined the route and proposed that the state commit itself to environmental protection addressing concerns about noise levels, studies to protect the landscape, etc. The conclusions of the public inquiry obliged both central government and SNCF to move the route taken by the railway line away from the Tricastin nuclear plant. Addressing these issues, however, subsequently increased the cost of the project (SNCF, RFF, 2007).

In terms of meeting "iron-triangle" project management criteria (i.e. finishing the project on time, on cost, and to specification), the LGV Méditerranée high speed railway link was reasonably successful. The project's 1992 Public Inquiry File initially provided for an opening of the project in 1998 (see Figure 2). This date was subsequently delayed to 2001 by the Inter-Ministerial Economic and Social Investments Committee (CIES) in order to spread the financial load of the project on to the state budget over a longer period of time. The delay was also caused by unforeseen geological difficulties being encountered during the works (SNCF, RFF, 2007).

This revised deadline was met. The budget originally allocated was fairly well respected (with only a 3.1% increase of the real cost relative to the budget of the 1995 ministerial approval file). The costs of the stations, however, increased considerably (by a margin of 23.5%) (SNCF, RFF, 2007). Curiously, the scale of additional costs, which may be attributed to addressing environmental concerns, are not exactly known. Travel time reduction objectives were, however, generally achieved for trips from Paris to Valence, Avignon, Nîmes and Marseilles but not for Montpellier. This was attributed to delays in the construction of the high speed section between Nîmes and Montpellier (SNCF, RFF, 2007). The traffic forecasts made in 1995 (extracted from the Ministerial approval file) looked to a traffic level of 22.2 million passengers by 2004, whereas the actual traffic level observed that same year was 20.4 million passengers (SNCF, RFF, 2007). Given these developments, one may conclude that, from the point of view of traditional project management concerns, the LGV Méditerranée has proven to be a "success". This, the authors conclude, is largely because of the widely supported agreements resulting from consultations held with the elected representatives of small towns and various associations. It should, however, be emphasised that this conclusion has been arrived at in the absence of any real knowledge of the exact costs of addressing the environmental concerns of the project.

The handling of risks

It is clear from the above discussion that some of the key decision-making risks encountered by the state and SNCF were social and political ones. These materialised in objections to the first route by various associations, some mayors of small towns, and individual private citizens who were largely under the impression that this was to be the final proposed route. Objections also highlighted environmental risks previously insufficiently accounted for. Furthermore, the project's stakeholders faced a financial risk as shown by the budgetary implications of the new route developed between 1990 and 1992. These were due to rising costs associated with the introduction of measures to respond to the objections cited above, including: the need to build new civil engineering structures following revisions to the route, technical problems encountered during construction, insufficiently detailed studies, together with the additional commitments made by the state to environmental protection published by SNCF following the 1994 declaration of public utility.

The social, political and environmental risks were eventually addressed by an in-depth study of the route variants and their environmental impact responding to the opposition to the project (SNCF, RFF, 2007). In this experience, the consultations helped unlock the decision-making process procedures. Emphasising this point, one case study interviewee explained

> In these kinds of mega projects, I think we can get out (of such problems) only if we try to develop systemic thought; we need to forget our own interest and try to take the position of someone else. We need to be open-minded to see what's happened in the other points of the system. It means that the planner should be able to admit that his project is not necessarily the best one and accept to adapt proposals [accordingly].

Meetings with the local community organised by SNCF during the project's on-going studies were intended to better familiarise the local community with the project, while still not involving the public in decisions as to whether or not the project should be built or which variants should be carried out, as some were advocating (Ministère de l'Equipement, du Logement et des Transports (MELT), 1990). The difficult context surrounding the project led the state to take into consideration the environmental issues raised during consultations through a 1992 government circular concerning the management of large-scale infrastructure projects. This document required central government, henceforth, to make environmental protection commitments in

compliance with requirements of a public inquiry exercise. It was felt that an environmental review carried out in this manner, following the start of a project, should make it possible to cross-check whether these commitments had been respected. Commenting on this aspect, one case study interviewee added,

> It is true we made a lot of effort to have the route choice made sensitive to environmental concerns. This led people to better understand what we proposed and why. It showed that we were doing good job.

The financial risks of the project were reduced by conducting more detailed studies and by affirming the state's commitment to maintaining the project's internal rate of return to 8% for SNCF between the 1992 public inquiry and the Ministerial approval in 1995. The latter was achieved by delaying the construction of the Nimes–Montpellier section, which in turn resulted in reducing the SNCF investment cost and the amount of public subsidy.

Conclusions

In retrospect, the performance of the LGV Méditerranée – in terms of handling environmental, social and political risks – could have been improved by undertaking earlier consultation on the route. This could have assisted in assessing the potential impacts of the infrastructure on the urban and natural environments it served/traversed. This project experience made it clear to the state that there was a need to take measures to adapt its decision-making process to a society demanding involvement. The opposition to the LGV Méditerranée was so strong that both the state and project promoters came to understand that other (subsequent) large-scale infrastructure projects could well be exposed to the same types of risks which could see the "success" of projects endangered if lessons were not learned from the LGV Méditerranée experience.

To improve the handling of the social and political risk in subsequent MTPs in France, the state voted for a law on 2 February 1995, committing itself to a greater level of environmental protection. This introduced public debate concerning the building of major infrastructure projects from the outset of the decision-making process.

As a result of the developments outlined above, today's public sector agencies and private sector promoters involved in mega infrastructure developments in France tend to anticipate such tensions and seek to minimise them by breaking very large projects up into a large number of subsections, each covering a distance of only several dozen km. This has the effect of simplifying continuous consultation and is seen as a means of detecting early-on in the project lifecycle the various local social, political, technical and environmental risks that may and do arise. In so doing, public and private MTP promoters also make use of mitigating risk management methods intended to better handle these risks. These, it is contended, allow each major risk and its consequences to be treated in a more precise and localised manner. For example, the promoters might optimise locally the design of the project by respecting cost forecasts. Evidence over the last few years suggests, however, that it remains difficult to assess the real impacts of this approach, suggesting that the incorporation of these wider, non-iron-triangle project management concerns in the cost–benefit analysis of major projects is still in its early days.

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Dealing with context and uncertainty in the development of the Athens Metro Base Project

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Introduction

Based on findings from the Athens Metro Base (AMB) Project, and drawn in part from extensive interviews conducted by the authors with selected project stakeholders, this discussion focuses on how the context of the AMB Project and its uncertainties affected the attainment of its aspired objectives. It also analyses the most critical aspects of project context and uncertainties, and the way that decision-makers responded to these challenges. The paper concludes by offering a number of lessons especially alluding to how project performance can be effectively enhanced when dealing with contextual challenges and uncertainties of mega transport projects (MTPs).

Project's background and achievement of its objectives

The AMB Project – a 20-station, 17.6-km metro railway comprising lines 2 and 3 – traverses central Athens and connects with the pre-existing line 1 (see Figure 1). It is publicly funded, owned and managed by state enterprise Attiko Metro SA (AM SA). The project was initially conceived in the 1950s (Nathenas et al., 2007). Thereafter, a number of subsequent studies and plans were carried out over different periods during which the project became embedded in the planning agenda for Athens (see Figure 2).

In view of a greater accessibility to capital (in the form of European Union [EU] subsidies and European Investment Bank (EIB) lending) in the mid 1980s, and as a result of mounting political pressure to resolve the proliferating traffic congestion in Athens, the Ministry of Environment, Planning, and Public Works (MEPPW) included the AMB Project in the Athens city plan (Skayannis and Kaparos 2013; Kaparos et al., 2010). Preparations for the tender for this MTP ended in 1991 with the award of the turnkey project to Olympic Metro (OM) – a consortium led by

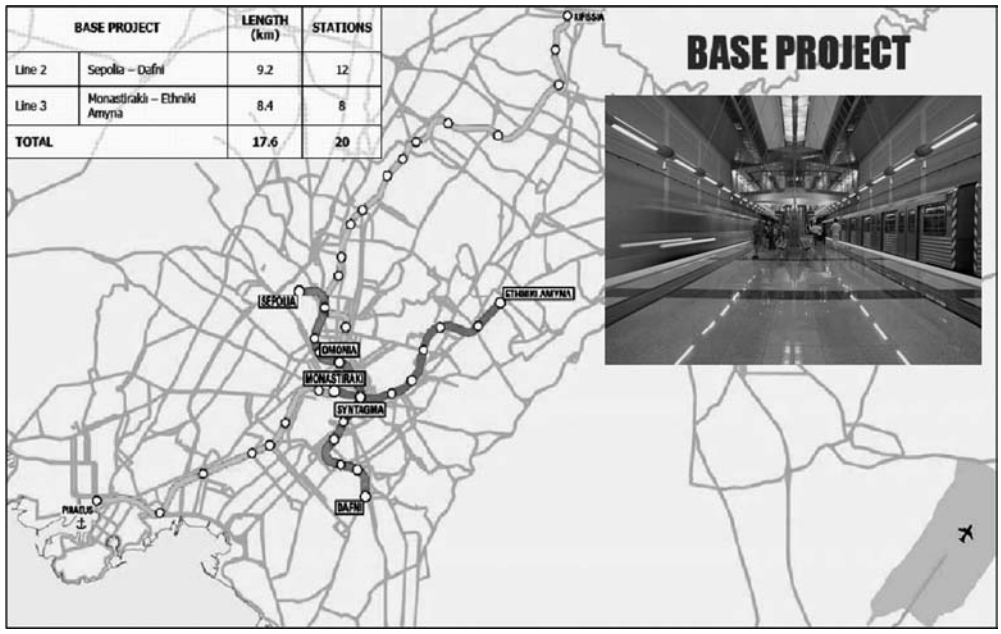

Figure 1. Map and photo of AMB Project. Source: Leoutsakos (2007), Photo source: http://ec.europa.eu/regional_policy, processed by the authors.

Siemens and Alstom (Ametro.gr, 2013). The project was completed in 2003 at a total cost of €2.7 billion (AM SA, 2007) after a delay of about 5 years and budget overruns of approximately €1 billion (Kaparos et al., 2010).

These cost overruns and delays were mainly due to route realignment amendments for archaeological heritage protection reasons. Since the delivery of the AMB Project, the metro network has more than tripled in length, while more stations and extensions are currently being constructed. According to the official announcements of MEPPW (Minenv.gr, 2010), the original main objectives of the project were to modernise and enhance the overall public transport network in Athens and reduce traffic congestion, pollution and travel times in/across the city. The project was also intended to act as a catalyst for urban renewal (especially around stations) and to increase employment opportunities. Additional major project objectives included later were the integration of public transport modes and the contribution to a balanced polycentric development of the metropolitan region (Laliotis, 2000).

Did the project achieve its objectives?

Completing projects within schedule and on budget, along with the realisation of the scope and quality requirements, constitute major traditional objectives and success criteria of projects of any scale. Against these important measures, the authors' review of the AMB Project suggests that of its claim to "success" it can only be credited with delivering a high quality infrastructure and associated services (Skayannis and Kaparos, 2010). Research and related interviews conducted by the authors have revealed that these achievements represent "the most praised" attributes of the project and one of the main reasons for which the project overall is regarded as "successful" by project promoters and the public at large.

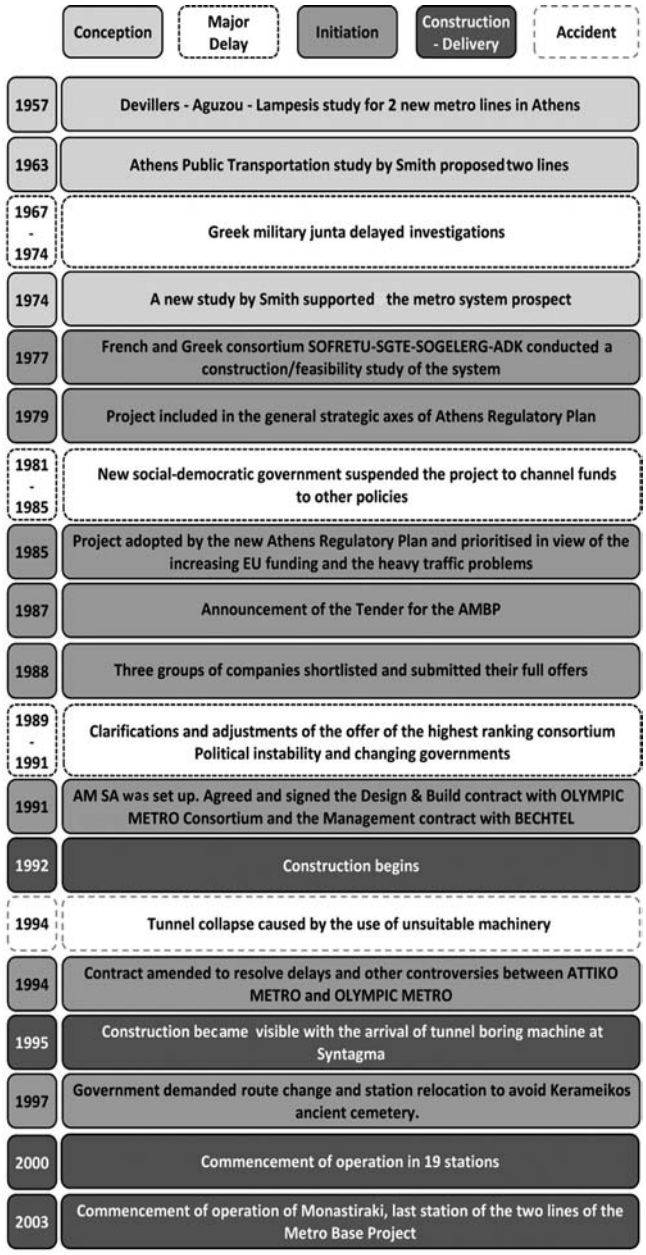

Figure 2. AMB Project timeline. Source: Kaparos et al. (2010).

The newly completed metro modernised and enhanced the overall public transport system of Athens. Its ridership between 2003 and 2008 increased by 30% (Oasa.gr, 2013) and it had a very positive initial impact on reducing traffic congestion, as well as reducing air pollution and travel times (Bouris et al., 2009; TRANSECON, 2003). These impacts, it was reported, however, gradually faded (mostly after 2008) because of renewed increase in car ownership (Oasa.gr, 2013; EC 2009; Tzanavara, 2009). Urban renewal near new metro stations only

materialised, furthermore, in very few places and on a limited scale. There is a general sense, backed by responses from interviewees and project stakeholders, that the AMB Project also failed to contribute to broader aims of restructuring the city towards the goal of a balanced polycentric city. Integration of the metro project with the overall Athens city transport network was also deemed insufficient – evidenced by the fact that no park-and-idre facilities were provided at key stations, and linkages with other public transport systems remained weak (ORSA, 2009).

How did the treatment of context affect the achievement of objectives?

Institutional organisational context

In retrospect, the different organisations responsible for city planning and transport in the Athens metropolitan area lacked an institutional and organisational capacity, as well as a cooperation mentality and a strategic approach to cope with the new challenges they faced (Skayannis and Kaparos, 2010). Despite steps made to overcome some of these deficiencies (see EC, 2009), the inadequate integration of the metro within the overall transport system of Athens, and the lack of urban regeneration efforts around the stations indicate that the project failed to cope with the problematic institutional contexts of the MTP. This was confirmed by many interview respondents. The authors' research findings suggest that improved co-operation between transport organisations would have both increased public transport ridership to serve a wider area and (thereby) enhanced poly-centricity. Despite these inadequacies, the pre-existing inadequate urban transportation context contributed to a significant public acceptance of the AMB Project without any serious opposition from civic society. It also ensured (subject to ticketing prices) an adequate demand for the new services provided.

Context of centralised and more politicised decision-making

There was much evidence from case study interview responses to suggest that decisions were all too often confined to minimising political risk (in a short-term, vote-seeking perspective). AM SA, owned by MEPPW and operating on a market-led basis, was originally seen as a suitable institutional mechanism to deal with this problem. Unfortunately, however, short-term decisions taken by politicians in efforts to incorporate client-based motives dominated these decisions, overruling in many critical instances techno-rationalist arguments that looked to broader and longer-term outcomes. Confirming these circumstances, case study interview respondents highlighted a number of detrimental outcomes of the project. These included: the failure to proceed with the needed expropriations for parking facilities and other developments at the stations, the over-staffing of services, the staffing of services with poorly skilled people (GIPA, 2010), and a reluctance to merge city transport organisations. In the words of one interviewee, when referring to the fact that AM SA did not proceed with any meaningful development around the stations, the party in question claimed

> The political pressures and the direction of the board [of AM SA] was "absolutely not" in line with what was needed. We used the least amount of land in order to prevent complaints from the people about taking their property away from them [instead of developing the areas around the stations].

The context of public participation

Contrasting with the above, a positive outcome of the AMB Project was the very effective public consultation it engaged in, that led to design changes to the metro stations, making them more accessible to the disabled (Galis, 2006). These developments arose because, as the project

progressed, disability organisations increasingly claimed participation in the decision-making and design processes. This brought about marked changes in the stance of society vis-à-vis disabled people, and represented a very positive response to the pre-existing context of poor and ineffective public participation.

How the treatment of uncertainties and complexities affected the achievement of objectives

Prior to the AMB Project, the Greek state had no experience in the implementation of transportation projects of this size and complexity or in dealing with large consortia of contractors, international consultants, foreign banks and the EU. An early government decision that proved wise in this respect was to establish close co-operation with an experienced international project management consultant, Bechtel S.A. (Skayannis and Kaparos, 2010). During the entire construction period, Bechtel provided professional personnel to AM SA and offered invaluable assistance in a range of activities, including managing the interface with OM and the construction consortium. This proved critical during disputes and negotiations with OM and in reporting to both the EIB (the project's lender) and the EU (which subsidised the project).

Engineering-related uncertainties and complexities

A major criticism of AMB Project appraisal presented by case study interviewees was the poor treatment of engineering uncertainties and complexities that arose from the alleged inadequate geological risk appraisal. Had a more detailed appraisal of soil conditions been undertaken, it was argued, a number of incidents (including a tunnel and a road collapse) that caused delays and cost overruns to the project would have been avoided.

Archaeology-related uncertainties and complexities

The vast subterranean archaeological riches along parts of the route of the project were such that, whatever engineering proposals were made, there would inevitably have been unforeseeable challenges by virtue of the unique circumstances of the city's history. Interviewee sources suggest that the archaeological investigations undertaken in relation to the AMB Project imposed an overhead of 20% onto the project's total cost. In the major case of Kerameikos, the cemetery of classical Athens, the realignments of the route entailed serious disputes and negotiations, and a delay of about 2 years plus a cost of approximately €70 billion, including penalties paid to the contractors. From a more positive perspective, the construction of the project became associated with one of the biggest archaeological excavation programmes ever undertaken in Greece (and overseas) and transformed some metro stations into spectacular archaeological galleries.

Lessons and conclusions

What the AMB Project reveals is that the quality of a MTP and its services may themselves generate a new set of important factors that can alter judgements about a project's success, attractiveness and public acceptance. The transformational impact of the AMB Project on the city and its inhabitants, plus its awakening of the heritage of the city/country through its archaeological findings, brought important new project criteria of "success" to the public eye, which were previously underestimated by planners and engineers, and even politicians. The serious attention that was paid, furthermore, to the image of the project and the user-experience of the system reinforced the perception of success for the AMB Project and its attractiveness; as one case study interviewee put it,

the metro provides its users with very high standards and people behave accordingly [in line with these high quality services].

The history of the project and its developments also importantly highlight the uncertainties and complexities of dealing with intangibles, in this case in the form of priceless subterranean archaeological artefacts that have been disturbed/discovered by the project and the subsequent (almost impossible) decisions that have to be made as to how much delay to allow in addressing these archaeological challenges. This experience also reveals that in some instances pre-project (transport and travel) circumstances can be so dire that almost any post-project transformational outcomes are unlikely to be questioned if/when it delivered the badly needed transportation improvements.

The authors conclude that establishing a state-owned, special-purpose company to construct, implement, manage and operate the AMB Project was essential. A company of this kind needs to have strong leadership and strong human capital assets. It also needs to be disentangled from individual political agendas in order to make and implement techno-rationalist decisions, especially at the tactical and operational level. Learning from this project, the authors conclude that central government needs to concentrate on its highly strategic functions in infrastructure development and commit to strategic needs without too much interference.

The authors also conclude that the planning and appraisal of the AMB Project cannot be regarded as an outcome of a comprehensive and pluralistic decision-making processes. The implementation of a heavy, high-cost metro network such as the AMB Project needs, at least reactively, to trigger a city-wide reorganisation of transport in an attempt to move towards both less fragmented urban transport governance and some essential land-use reforms. The findings of the case study reveal that had this taken place, the metro could have had a higher ridership and made a more critical contribution to the sustainable development of Athens. Perhaps most importantly of all, the AMB Project reveals that the whole process of constructing and operating a MTP such as the AMB Project should be seen as a "learning process" for future projects. This will help capitalise on the new "know-how" acquired in planning and early problem solving, and on taking proactive action to mitigate against project risks, uncertainties and complexities.

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What constitutes a "successful" mega transport project? Lessons from the Metropolitan Expressway in Tokyo

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Introduction

This contribution reports on the findings of a case study of the tolled Metropolitan Expressway in Tokyo – from Nishishinjuku Junction to Kumanocho Junction (otherwise referred to as the MEC2 Shinjuku Route). The underlying argument is that while mega transport projects (MTPs) are characterised above all by their large scale and high costs, judgements about their "success" (or failure) should not be based only on the scale of their costs and delivery performance but also on their multi-dimensional effects on the built and natural physical environments, and the economic and social environments they traverse and serve. According to the responses of the interviews conducted by the authors, stakeholders regarded social consensus, economic efficiency, improvements to the urban and natural environments and successful project management delivery to jointly determine the "success" of the project. In this paper, we highlight the treatment of risk and uncertainty in the project's decision-making in relation to changing perceptions about the project objectives (Muromachi et al., 2012).

The project's features

Located 8 km or so from the centre of Tokyo, the MEC2 Shinjuku Route is the northern part of the western section of the MEC2 Route which runs mostly underground through six densely inhabited wards of Tokyo (17,700 individuals per km2) (Metropolitan Expressway Co., Ltd, 2008) (see Figure 1). The history of the project's development is outlined in Figure 2. According to a traffic count undertaken in 2008 (Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism, 2014), it carries on average 36,000 vehicles per weekday, including passenger cars and trucks. The design standards of the MEC2 Shinjuku Route categorise it as an urban expressway running in a metropolitan area comprising two lanes in each direction, with a design speed of 60 km/h, providing three entry/exit points and six ventilation stations. The upgrading of the 6th Circular Highway ("the Yamate Dori") is a major associated development. By widening the road from 22 m to 40 m width, the underground tunnel of the MEC2 Shinjuku Route could be accommodated under the road.

The timeline of the project and responses received from stakeholders indicate that the project, especially its objectives in relation to the environment, changed as it proceeded. When the Special Committee for the Study of Tokyo City Planning Expressway proposed the plan for Metropolitan Expressway extensions (including the C2 Route) in 1968, the priority was to provide traffic congestion relief to the overall existing Metropolitan Expressway network, especially the Inner Circular Route, and the circular highways. According to the documents of the city planning decision and environmental impact assessment for the project, prepared by the Tokyo Metropolitan Government in 1990, the project objectives for the MEC2 Shinjuku Route were widened to address three major areas of concern. The first was to ensure the efficient use of

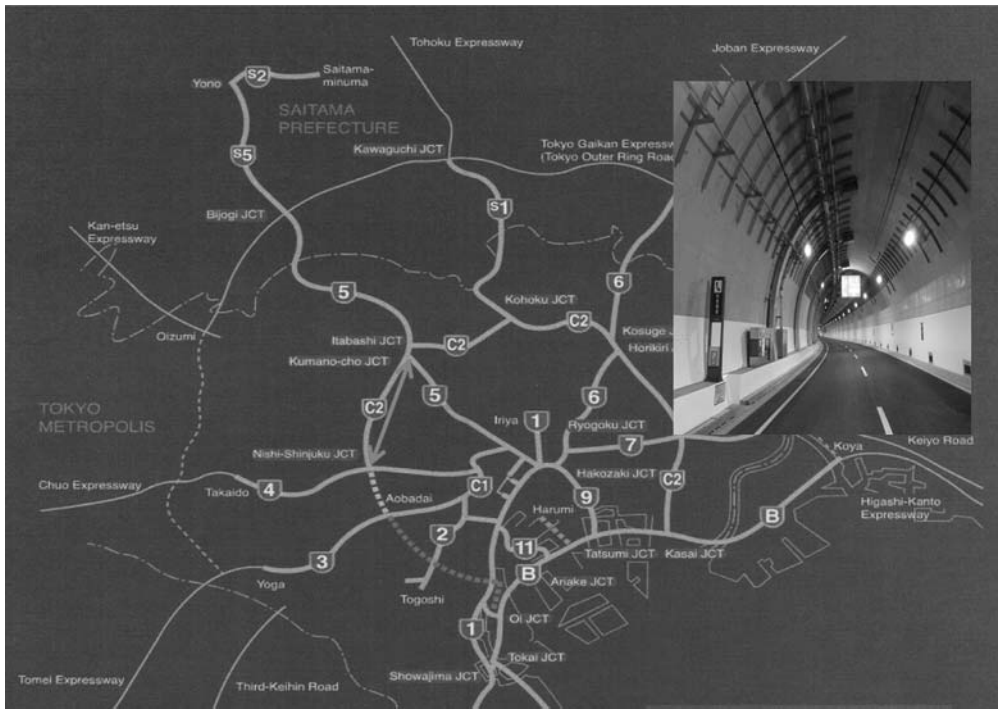

Figure 1. The Metropolitan Expressway C2 Shinjuku Route.

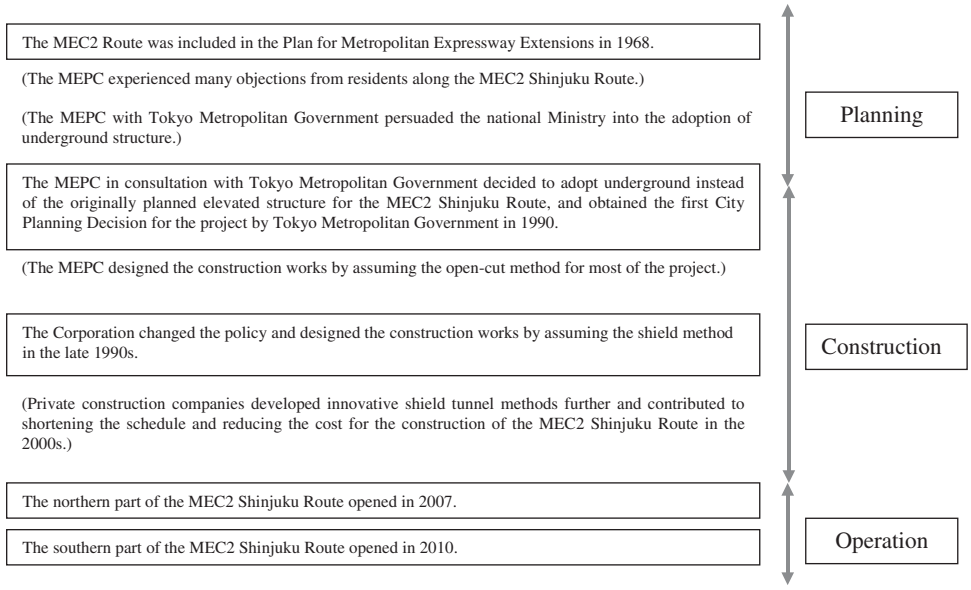

Figure 2. The history of the project's development.

the Metropolitan Expressway network by diverting the congested traffic on the Inner Circular Route to the MEC Shinjuku Route and by promoting the efficient use of radial routes. The second priority was to introduce congestion mitigation initiatives, particularly along the circular and radial highways. The third and final priority was to reinforce the functions of sub-centres such as Ikebukuro, Shinjuku and Shibuya, to stimulate economic activity and to contribute to local developments.

The MEC2 Shinjuku Route was implemented by the Tokyo Metropolitan Government and the Metropolitan Expressway Co., Ltd (formerly the Metropolitan Expressway Public Corporation (MEPC)). When the MEC2 Route was included in the plan for the Metropolitan Expressway extensions in 1968, the MEPC was confronted by many objections regarding environmental concerns from residents living along the western and southern sections of the route during the late 1960s. While both the Tokyo Metropolitan Government and MEPC regarded congestion as one of the most serious problems at that time, the residents living along the Route as well as the general public did not share this view but were more concerned about the environmental damage (such as air and noise pollution) caused by the project (Niitani, 1980a, 1980b).

Political influences and emergent objectives

Against this background, Ryokichi Minobe, an environmental policy advocate, was elected Governor of Tokyo in 1967, and following his appointment, stopped most of the planning and construction of major roads within the Tokyo metropolitan area during his governorship until 1979. In 1990, when the MEPC decided to adopt a plan to put large sections of the MEC2 Shinjuku Route underground, instead of as originally planned as an elevated structure, the environmental concerns of the residents along the Route were considerably mitigated and the need to "solve" traffic congestion problems became more recognised by the general public. Documents published by the Metropolitan Expressway Co., Ltd in 2007 (Metropolitan

Expressway Co., Ltd, 2007) acknowledged the positive effects of the MEC2 Shinjuku Route on the regional road network and surrounding built and natural environments due to traffic congestion mitigation, in effect introducing the improvement of the environment as an "emergent" project objective.

Over and above this "emergent" objective, the MEC2 Shinjuku Route project also acknowledged other "original" project objectives, including traffic congestion mitigation on the Inner Circular Route and circular highways. However, the initiatives that reinforced the economic activities in the sub-centres had not yet been clearly evaluated.

Perceptions of success

Upon reflection, one may conclude that the ultimate changed perception of the "success" of the project had much to do with the project sponsor's treatment of risks. The key priority proved removing the risks associated with the project's opposition. The Tokyo Metropolitan Government and the MEPC faced two sets of risks: a persistent opposition from the residents living along the Route if the original elevated structure was adopted, and the risk of incurring considerably higher costs if the underground structure was adopted instead. Both parties eventually chose to confront the second option. It was not without implications; one of the following amendments to the city planning decision that arose as a response to the public opposition detrimentally affected the connection between the Route and a planned future radial expressway. One can only conclude that both the Tokyo Metropolitan Government and the MEPC gave the highest priority to minimising the risk that public opposition from the residents might spawn along the Route.

Project risks

Once the decision to build the structure underground was taken, a new set of risks followed. Firstly, both agencies subsequently needed to persuade the then national Ministry of Construction (currently the Ministry of Land, Infrastructure, Transport and Tourism) to change the project designs from an elevated to an underground structure at considerably higher costs. While the Ministry of Construction was concerned about the change, because it might induce the adoptions of underground structure in other parts of Japan, and increase considerably the unit cost of constructing expressways nationwide, both the Tokyo Metropolitan Government and the MEPC were ultimately successful in obtaining its approval. They achieved this by emphasising the special characteristics of the densely inhabited locations that the project needed to traverse.

A second set of risks was related to the technology with which the project would be realised. The MEPC designed the construction works by assuming the open-cut method for most of the project in the early 1990s, when the underground structure was chosen. However, it proved extremely difficult to implement this method under the 6th Circular Highway because of space constraints, interruptions in surface traffic and damage to the local environment. The MEPC changed its design of the construction works in the late 1990s by employing the shield method, which involves less space constraints and interruptions in surface traffic (Metropolitan Expressway Co., Ltd, 2007). The implication was that it also had to adopt other innovative technologies such as low-concentration de-nitration equipment for capturing air pollutants, improved ventilation systems for stations and other safety and environmental measures for the underground expressway. These methods, however, were so undeveloped at that time, that the MEPC was obliged to invest a significant amount of time and resources into research and development, until private construction companies developed more innovative technologies in

the 2000s. It should be noted, that in the end the adoption of the shield method contributed significantly to shortening the project schedule and reducing costs because the construction works were able to be conducted more flexibly. Most importantly, the MEPC could avoid much of the works required to sustain the railway crossings and utilities that would have been required by the open-cut method.

Conclusions

The preceding discussion reveals that both the planning and implementing bodies of the MEC2 Shinjuku Route project paid considerable attention to traditional project management concerns, especially aspects regarding the management of internal project risks and uncertainties. However, the agencies simultaneously paid considerable attention to reducing the risks and uncertainties of the project emanating from the concerns of the residents living along the MEC2 Shinjuku Route. This developed into a chief priority, which was embraced even if it subsequently meant having to manage the risks and uncertainties of the national Ministry opposing the project revisions on the grounds of cost or with the need to choose different construction technologies. The planning and implementing bodies of the MEC2 Shinjuku Route project might well have perceived the risks and uncertainties from the concerns of the residents as much higher than those of the national Ministry and construction technologies from the beginning, because the former was external but the latter were more or less internal to the bodies. It was also noted that more innovative technologies might often be developed when they were needed. In the end, these were not only managed successfully, but led to improved performance in schedule and costs.

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The RandstadRail project: a case study in decision-making strategies under uncertainty

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Introduction

Decision-making for mega transport projects (MTPs) typically takes place within highly uncertain contexts (Salet, Bertolini, & Giezen, 2012). It can frequently take well over a decade for the stakeholders concerned to agree project goals and ambitions, let alone the practical details of a project. The authors identified two essential strategies in dealing with such decision-making processes from their case studies (Giezen, 2012). The first is a strategy that treats the decision-making process as "closed" to other stakeholders as possible in order to reduce the amount of conflicting views that might delay decisions. The second is a strategy that seeks to deliberately open up the decision-making process to a large number of stakeholders in order to bring conflicting views into the process so as to ensure conflicts are minimised later. Quite clearly, both strategies have negative and positive implications for the "success" of a project. This paper presents the RandstadRail project as an illustration of the use and implications of the dialectic between these two strategies.

RandstadRail – the basics

RandstadRail is an inter-regional rail project that links the cities of Rotterdam and The Hague in the Netherlands (see Figure 1). It is a combination of a tram, metro and bus service with the main part of the project completed in 2010. This was preceded by a very long and complex decision-making process that started at the end of the1980s (see Figure 2).

The project was designed to provide an attractive form of public transport that is of high quality and high frequency, providing an alternative mode of transport to the motorcar directly connecting the most important housing, employment and service locations in the region with competitive travelling times. It is part of the development of the Zuidvleugel metropolitan area in the south-western part of the Randstad region within the province of Zuid-Holland. The Zuidvleugel has approximately 3.5 million inhabitants residing within it and is among the most densely populated regions in Europe. Its main cities include Rotterdam (with one of the largest international ports in the world) and The Hague (the political capital of the Netherlands). As may be noted from Figure 1, RandstadRail consists of four lines. Three are rail-based systems and the fourth is a bus service with a dedicated lane. The lines in The Hague region are tram lines, while the link from Rotterdam to The Hague is a metro connection.

The hybrid "solution" that RandstadRail represents is one that is clearly a compromise, in that it employs the strengths of the existing transportation networks of Rotterdam (i.e. its metro system) and The Hague (the tram service). What is particularly interesting about this project is exactly this compromise. The RandstadRail makes for a well-integrated addition to the existing transport systems, adding value to the overall network of the Zuidvleugel in the form of a full regional integration of two previously separated urban transportation networks at only a fraction of the cost of a fully new regional light rail system (Giezen, 2013). On the basis of extensive interviews, the authors conclude that the decision-makers involved in making the MTP "happen" seem to have

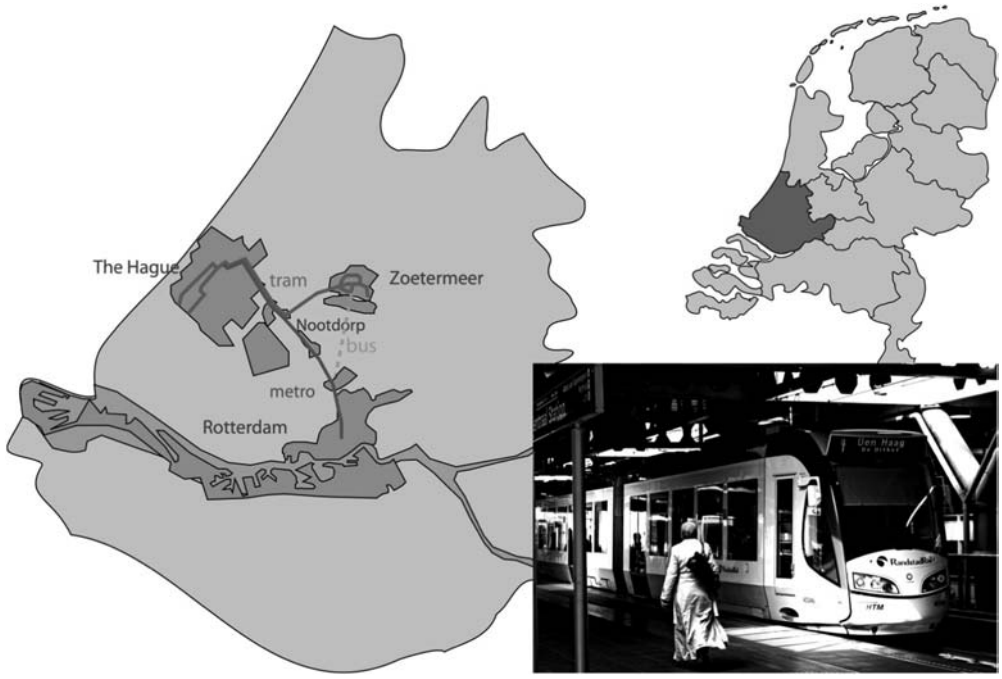

Figure 1. Route RandstadRail.

overcome temptations of incurring large cost overruns that frequently arise from technological uncertainties of innovation (Frick, 2008). This is despite the fact that the first plans were designed to support a completely new transport system. In this regard, a Rotterdam civil servant remarked:

> What I often see is the development of a blind drive [by politicians and policy makers] to want the project to be built, further spurred by a strong infrastructure lobby, to push the project through [the decision-making process]. And often you see this leading to a project tripling in cost and creating less added-value.

These earlier plans could, however, not be financed, and in order to break the decade-long deadlock that followed, they had to be changed.

The remaining part of this contribution looks into the decision-making process that brought about this change, highlighting the crucial moments and strategic decisions that enabled it to materialise, and especially the role of open and closed decision-making in the process. The contribution ends with a reflection on wider implications for the planning and decision-making of MTPs more generally.

Opening and closing the decision-making process

According to those interviewed, the first transport plans connecting Rotterdam and The Hague emerged at the end of the 1980s. It was, however, not until 1995 that a formal proposal was published and approved (RET, HTM, ZWN & NS, 1995) (see Figure 2). Project stakeholders retrospectively reflected on the fact that the earlier deadlock could be attributed to the closed nature of negotiations between civil servants in Rotterdam and The Hague and their transport companies. The authors speculate that a more inclusive decision-making approach would have led to a more speedy decision. Put simply, the Rotterdam stakeholders in this initial phase felt that anything less than a metro would not be acceptable, while stakeholders in the capital felt that a tram was more

Date	Decision/event
1989	First plans surfaced for a regional public transport network linking The Hague with Rotterdam.
1995	The public transport companies RET, HTM, ZWN (now Connexxion), and NS took the initiative by publishing the report *RandstadRail, de file voorbij.*
1995	Introductions of the Stadsregio Rotterdam (SRR) and Stadsgewest Haaglanden (SGH, The Hague Region).
November 1996	Exploration study. SRR, SGH, and the Province of Zuid Holland suggest a light rail system that would cost between 3–6 billion NLG (€1.3– €2.7 billion). The national state asked for solutions requiring less investment.
December 1999	Additional advice by the RandstadRail Steering Group (State, PZH, SRR and SGH) to achieve higher quality of transport by suggesting linking the lines to the urban rail networks and making the line between Rotterdam and Zoetermeer a high-quality bus line. The foreseen investment was €0.84 billion.
December 2001	Administrative agreement between the state and the regions about the financial aspects pending the subsidy application.
December 2002	Approval of the application by the Minister of Transport. This enabled the regions to continue with the preparations for construction.
June 2003	Start of construction in Rotterdam.
September 2005	Concession for transport and maintena nce of the infrastructure in the region Haaglanden and the RandstadRail lines 3 and 4 was given to HTM.
February 2006	Concession for transport and maintenance of the Hofplein line section (the Erasmus line) was given to the RET.
November 2006	Derailments of line 4.
October 2007	Lines 3 and 4 were fully operational between de Uithof and Zoetermeer Oosterheem. This meant that RandstadRail The Hague was now fully operational.
August 2010	The Rotterdam section of RandstadRail became fully operational.

Figure 2. Project timeline.

suitable in the belief that a metro "would not fit into the urban fabric of The Hague". Because the "success" of the project was defined in relation to the respective positions of each set of stakeholders, the two groups did not agree, and deadlock ensued.

In 1995, in an attempt to break this deadlock, the two public transport companies of Rotterdam (RET) and The Hague (HTM), together with the regional bus company (ZWN), respectively published a tentative proposal to develop a regional transport network for the area. They, however, did not succeed in getting it approved by the local authorities involved, thereby requiring negotiations to re-commence. In the meantime two new regional bodies were assigned responsibility for public transportation for the Rotterdam region and The Hague region, including the different municipalities within their borders as well as the two major cities. The creation of these new agencies introduced a new dynamic into the decision-making process. Both agencies were particularly interested in arriving at what mutually could be considered a "successful" regional transport plan, principally because achieving this was to a large degree their *raison d'être*. With this new constellation of agencies, a formal plan for a fully new regional transport system was eventually proposed in 1996.

The Ministry of Transport, however, considered the associated investments to be too expensive and sent the parties back to the drawing board, so to speak. This led to a new deadlock, as it seemed again that a choice would have to be made between either a metro- or a tram-based system. Not until 1999 did a new plan emerge, which innovatively integrated both the existing tram and the proposed metro systems in a fully fledged regional system. Several parties interviewed by the authors indicated that the breakthrough primarily occurred because of the threat of a "window of

opportunity" closing as a result of the Ministry warning the municipalities and regional agencies that failure to arrive at an agreed solution would lead to the withdrawal of any national funding. The new plan was finally approved in 2002.

After the decision in 2002 to fund the project, both regional bodies received capital lump sums from the Ministry of Transport to finance their share of the construction costs. This meant that any cost overruns that might be generated would fall on the regional and/or municipal budgets. This proved a very effective disincentive to overrun costs and helped keep the budget within contained limits. Another cost-reducing aspect of the project was that the proposed infrastructure development primarily entailed the retrofitting of existing heavy rail lines or the upgrading of existing tram lines. Given this retrofitting/upgrading approach it was not necessary to go through extensive planning procedures involving environmental impact assessments and public consultations. While such procedures do not themselves necessarily automatically impact the budget significantly, mitigation measures would likely have had to be taken in order to attain the necessary permits, which can drive up costs (Giezen, 2012; Shane, Molenaar, Anderson, & Schexnayder, 2009).

While the RandstadRail project did not incur cost overruns, the project did have some time overruns because of serious accidents during the operational test phase of the project. These were attributed to the very short time period allowed for testing due to strong political pressures to finish the project by a given deadline. A consultant interviewee argued that

> The discussion about the specifications remained closed for so long that when parts were put to tender there was too little time to develop the dilemmas [concerning safety and material costs] on account that everything was done under enormous time pressure. This is the reason for the problems [derailments and delays] later.

The engineers demanded more time for testing but the politicians needed to show results before an election.

Conclusions

Overall, the RandstadRail case study illustrates both advantages and disadvantages of open and closed decision-making processes in the development of MTPs. The case shows that key conditions making one or the other approach more appropriate include the degree of alignment between the different interests, the balance of power among actors, and the measure of uncertainty with regard to the technologies employed and their impacts. These conditions may vary between projects but – in the case of the Randstadrail – also over time within the same project. In the case of this project, newcomer stakeholders such as the regional authorities proved capable of reopening the negotiations between the municipalities and the transport departments of the cities of Rotterdam and The Hague. The Ministry of Transport effectively forced the parties into "redefining" their project and therefore in essence the very basis upon which the project's success would be defined. Closing the project to public consultation and environmental assessment procedures in later phases contributed to maintaining it within budget and schedule. This was, however, only possible because of the nature of the project. Given that there was no new infrastructure involved there were no new major negative impacts (other accounts in this *Interface* show very different outcomes). Reinforcing this point, in the last phase the closure of the process instead yielded premature outcomes, as it did not take account of existing uncertainties concerning the performance of the technology.

What the findings of the RandstadRail case study seem to suggest are two things. Firstly, there is a crucial difference between employing a "closed-system" decision-making process in times of uncertainty as opposed to in more predictable times. Secondly, there is (therefore) no simple answer as to when to employ "open" or "closed" systems decision-making. The authors conclude

that on some occasions (especially during uncertain times) one needs to employ open systems, and at other times one needs to close them. Similarly, while a MTP might profit from keeping certain actors out of the decision-making process in less complex institutional contexts, this can create more risky outcomes by denying the uncertainties of decision-making in more complex contexts. It follows that a correct assessment and understanding of these contextual circumstances is key.

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Constructive conflicts in the case of the Öresund Link

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Introduction

The Öresund Link between Sweden and Denmark inaugurated in the year 2000 was one of the largest transport infrastructure projects in either of the countries and has widely been regarded as "successful" in contributing to an increased integration between the two regions. The project, however, has not been without its critics. During its entire planning and decision-making process it proved highly controversial both in the public realm and at the highest political levels. Much of the dispute concerned environmental issues. Drawing on the work conducted by the authors (Pettersson, Sundberg, Khan, & Holmberg, 2010a, 2010b), this paper advances the argument that the Öresund Link may be viewed as a product of "constructive conflict" among project stakeholders and concerned parties that ultimately led to the adoption of new "emerging project objectives" with much better environmental outcomes than would otherwise have been the case.

The concept of "constructive conflict" has recently been advanced by Cuppen (2012) as a basis for designing stakeholder dialogue in order to facilitate the articulation of a diversity of perspectives and confrontation of claims and ideas. It aims to increase knowledge as a basis for decision-making by encouraging different perspectives and an open dialogue among involved parties. The planning process for the Öresund Link took place before the introduction of some of the most important planning reforms improving environmental assessment and stakeholder participation in Sweden, and the research undertaken by the authors revealed that it was far from perfect. Nevertheless, its outcome has generally been received positively, and responses of stakeholders show that the project's planning process contained important elements of "constructive conflict".

Features of the project

The Öresund Link is a combined four-lane motorway and two-track railway that crosses the Öresund strait and connects the two cities of Copenhagen in Denmark and Malmö in Sweden (see Figure 1). The link consists of a bridge, an artificial island and an undersea tunnel with a total length of 7845 m. Plans for a fixed link have existed for more than 100 years but in reality the planning process for the project started in the 1980s. The final decision to go ahead, however, was made in 1994, building commenced in 1995, and the Öresund Link opened in July 2000 (see Figure 2). The project was completed ahead of schedule, but had some cost overruns, mainly associated with the provision of land-based access infrastructure (Flyvbjerg, Rothengatter, & Bruzelius, 2003).

The environmental debate

The debate on the environmental impacts of the Öresund Link centred around two issues: firstly, the effects on water flow through the Öresund strait and marine life in the Baltic Sea, and secondly, the environmental effects of increasing road transport and associated emissions.

The idea of building a fixed link between Sweden and Denmark began to take concrete shape in the 1980s. Strong business interests promoted it as one important part of a broader infrastructure network connecting Scandinavia with the continent, with a view especially to linking the country to the German market. Within the Social Democratic Parties, which were in power both in Sweden and Denmark at the time, there was a great deal of discussion, with arguments both in favour and against a fixed link. The environmental issue at this early stage was almost entirely about the long-term effects of building new transport infrastructure and the risk of locking society into a system of ever-increasing motor vehicle transport (Hedegaard Sörensen, 1993; Falkemark, 1999). The first design proposal was for a highway crossing only for road transport. Once this overwhelming dominant concern for motor vehicle movement became publicly known there was opposition from various environmental non-governmental organisations (NGOs) who demanded that a rail

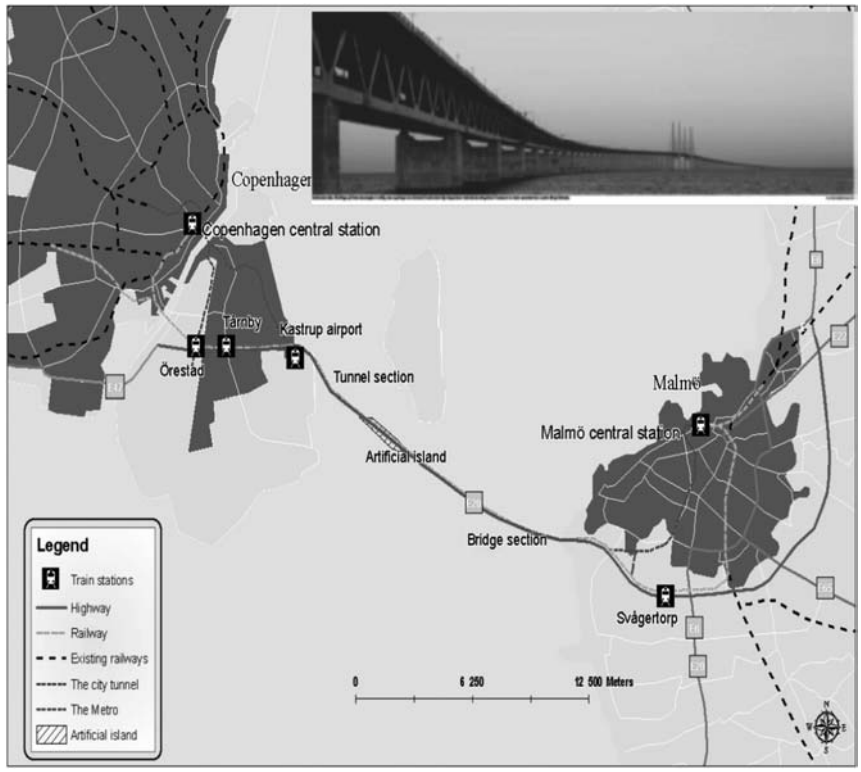

Figure 1. The main components of the Öresund Link and connecting infrastructure.

Year	Decision/event
1985	The first government report on the Öresund Link was prepared, recommending a railway tunnel in the northern part of the sound and a bridge for car traffic between Malmö and Copenhagen.
1987	A government report presented and compared different alternatives, and recommended the solution with a combined road and railway link.
1989	A government report singled out two alternatives; a railway tunnel and combined road and railway link. The latter was recommended.
1990	The Danish and Swedish social democratic governments voted in favour of the combined road and railway link between Copenhagen and Malmö.
1991	On 23 March the Swedish and Danish governments signed an agreement to build a fixed link between Malmö and Copenhagen.
1991	The Swedish government decided on an environmental impact assessment (EIA) procedure.
1992-1993	The EIA was scrutinized by various authorities and courts. The 'zero impact solution' became a requirement for approval.
1994	Court verdict decided that the zero impact solution was possible. The government granted permission to the project.
1995	Construction of the coast-to-coast section of the link commenced with dredging.
2000	The link was inaugurated.

Figure 2. Timeline of main events in the planning of the Öresund Link.

connection also be included. Alternative proposals were subsequently prepared by government which included only road, a mixed crossing and a tunnel only for rail transport (Hedegaard Sörensen, 1993). The debate that followed became highly public and led at the end of the 1980s to a change in perspective among politicians and planners, and the adoption of a combined road and rail link as the chosen alternative.

In 1991 the project entered into a formal planning process with the signing of a contract between the Swedish and Danish governments obligating both parties to build a fixed link, consisting of a combined motorway and a rail track. In Sweden, it was decided that an "environmental assessment process" would be undertaken before a final decision could be made. The fact that the agreement was written before the environmental assessment had been carried out was criticised by many as being undemocratic (Falkemark, 1999). On the Danish side, the environmental assessment was hurried through before the agreement, which was equally criticised.

During this time, project opponents made a strategic decision to focus on the design of the link instead of opposing it entirely, as the following quote from an NGO representative illustrates,

> when the decision [to build the Øresund Link] was taken … we said – let's not put more work into this … We felt that we had to concentrate on something else because this is a completely hopeless case from our perspective, we can't affect it much. It's like fighting windmills.

The project opponents employed a variety of means to further their arguments including the writing of articles in the press, mounting mass demonstrations in public and publishing reports criticising the formal planning process. The main environmental issue at this point had become the effects on marine environment in the Baltic Sea. The fixed link was to be built across the narrow Öresund strait which is the only inflow of oxygen-rich salt water from the North Sea to the sensitive, brackish Baltic Sea. There were worries that the Link would have a harmful blocking effect on the water flows. This led in 1992–1993 to the project promoters introducing a requirement in the environmental assessment that the fixed link be designed in such a way that a "zero impact solution" was achieved by measures such as extensive dredging.

A retrospective analysis

While in retrospect there was a strong focus on the effects on marine life, the issue of system-wide aspects on traffic flows and emissions that had been important earlier played a much smaller role in the environmental approval process. Stakeholder interviews suggest that to some extent this can be explained by the inclusion of a rail connection, which meant that the requirements of the environmental movement were to a large degree met. There is also evidence that the effects of increasing motor vehicle traffic were deliberately underestimated by adopting low traffic volume increase scenarios and by not considering long-term traffic-inducing structural effects on urban developments (Falkemark, 1999). Furthermore, the logic of the environmental assessment process meant that local and tangible impacts on the marine environment were in effect favoured over concerns about increasing traffic volumes. Interviews suggest that the support of this focus by the environmental lobbyists was tactical on the basis that opposing the predicted traffic growth would be a "lost cause". Ultimately, the question of whether a "zero impact solution" was attainable became the one defining issue which was finally resolved by a court verdict in 1994 in favour of the project. The extent of the controversy is well illustrated by the fact that the Environment Minister (Olof Johansson) resigned from his post in protest to the decision of his own government to build the fixed link. At the same time, the Prime Minister (Carl Bildt) commented that the environmental permit process had resulted in "the greenest bridge that can be built" (Falkemark, 1999, p. 109).

In hindsight it can be concluded that the Öresund Link has successfully avoided negative effects on water flows and marine life in the Baltic Sea, but mitigating the negative effects of regional road traffic volumes and related emissions has been less successful. In this respect it is also worth

highlighting that the project incorporated a built-in conflict between goals of increased regional integration and the environmental goals of reduced emission levels (Pettersson, 2014). This begs the question as to whether this project and mega transport projects in general can be consistent with goals of sustainability, as some researchers such as Höyer (2000) argue that any significant increase in mobility levels is inconsistent with sustainable development. In this regard, apart from the 19,000 vehicles crossing the link every day cited for 2010, (Øresundsbro Konsortiet, 2011), the wider impacts of the new motorways connecting to the link are not known in any detail. Arguably, the long-term impacts of the project on land use developments and mobility patterns are more important than the level of traffic across the link. Notwithstanding this, the enduring and somewhat unexpected effect of the Öresund Link is that it has contributed to a boost in rail traffic both across the sound and regionally. The funding model to finance the link has in practice meant that a subsidy to rail and public transport has been provided by revenues from road transport (Lyck, 2002; Pettersson, 2014).

Lessons and conclusions

There are two main lessons that can be drawn from the account above. Firstly, this case study clearly shows that situations of initial conflict can lead to better project outcomes than would otherwise have been the case if "constructive dialogue" is employed. Secondly, the controversial nature of the project, and the fact that there was always a great deal of public attention, obliged project proponents to reflect on, and reconsider, fundamental aspects of the project and their perspectives. This led to a much more careful and detailed assessment and monitoring of initial proposals than was normal practice at the time. It should be emphasised, however, that although the conflict led to improvements in the project design it also generated highly polarised positions between proponents and opponents, and led to the questioning of the democratic legitimacy of the process and accusations of manipulation of decisions. To many of the individuals involved the experience was largely frustrating and even traumatising.

What may be further concluded is that the "constructive conflict" that occurred was accidental rather than by design. This is, it should be emphasised, an important difference from the ideal model of constructive conflict as a deliberate strategy as advocated by Cuppen (2011). In the case of the project under discussion, the constructive nature of the conflict can be largely attributed to the persistence of project opponents and the high media attention it attracted. An important question for further research is thus how deliberate efforts to include diverging opinions and perspectives can and should be organised without decision-making becoming too top-down in its management and thereby stifling autonomous initiatives.

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Perspectives on "success" from the UK Channel Tunnel Rail Link Project

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Introduction

This contribution presents a selection of key findings from a case study of the UK Channel Tunnel Rail Link (CTRL) (OMEGA Centre, 2012). The discussion focuses on the treatment of the original objectives that were set for this mega transport project (MTP) and those that subsequently "emerged" during its planning and appraisal. It also examines the treatment of risk, uncertainty and complexity, and the power of context in the decision-making process for the project. The case study entailed an extensive review of related public domain material and numerous confidential documents, plus interviews with some 30 key project stakeholders.

CTRL (High Speed 1, HS1) connects the Channel Tunnel and London St Pancras International. There are three intermediate stations at Ashford, Ebbsfleet and Stratford (see Figure 1). The project opened in November 2007 with all four stations positioned as major hubs for urban development and regeneration, with varying degrees of success.

The original project objectives from the 1974 British Rail (BR) proposal were simply to increase rail capacity and reduce journey times between London and the Channel Tunnel, and to connect London to the economy of the European Union by establishing good rail links with Paris, Brussels and beyond. The aim of using CTRL as a catalyst for urban regeneration and spatial restructuring in east London and north Kent only emerged during the project's later planning and appraisal processes, not before (OMEGA Centre, 2008).

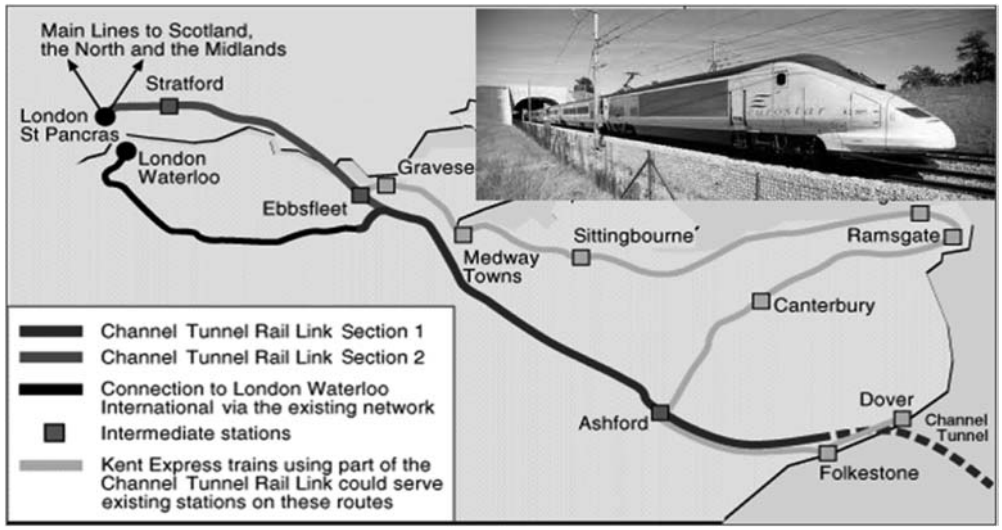

Figure 1. Map of CTRL sections 1 and 2, Source: Department for Transport (http://www.dft.gov.uk) - "The Channel Tunnel Rail Link".

At royal assent by the UK government in December 1996 the project's estimated construction cost was £3 billion In 1998, the target construction cost agreed between London and Continental Railways (awarded the franchise for its construction) and the UK Department of Transport was £5.233 billion The final cost for the project once completed in 2007 was £5.8 billion (at 2009 prices); i.e.,10% above the cost agreed in 1998 and 57% above the cost estimated at royal assent in 1996 (OMEGA Centre, 2008).

CTRL's achievements relative to objectives

Having reviewed the timeline of key decisions for the CTRL (see Figure 2) and examined the project's achievements, it is readily apparent that the original objectives it was expected to fulfil were fundamentally altered during the planning and appraisal stages. These changes were so significant that arguably the project was no longer the same as originally conceived – notably if one considers the urban regeneration and subregional restructuring aims it was latterly additionally expected to address.

The changes highlight the very important issue of "fuzzy project boundaries" associated with many MTPs. This in turn raises the question as to which judgements of project success and failure ultimately pertain. While costs escalated significantly over time, in retrospect this arguably had much to do with the broadening of the scope of the project. Seen in these terms, it is hard to argue that CTRL should be judged a "failure" on grounds of its cost escalation alone,[1] especially given the dramatic impact that the project has since had (and is expected to further have) on developments at Stratford, King's Cross and (emerging) Ebbsfleet. As one interviewee explained:

> The fact that it is so heavily used, the fact that it has supported regeneration all along its entire length is a real plus … Property values have gone up along its length, so to that extent it works quite well … I think without a doubt, it's a very successful project. Unfortunately, though it cost too much.

CTRL's treatment of risk, uncertainty, complexity and context in decision-making

The following discussion provides an overview of the CTRL's "achievements" relative to the treatment of the risks, uncertainties and complexities encountered in decision-making during the

Date	Event
1971	British Rail (BR) and SNCF worked on a combined scheme for Channel Tunnel and respective rails links between London and Paris.
1974	BR published route proposal for CTRL and public consultation undertaken.
1986	UK and France signed Channel Tunnel Treaty.
1987	Channel Tunnel Act ruled out public funding for international services.
1987	BR began the search for additional rail capa city to cope with Channel Tunnel trains. Kings Cross Station selected by BR as a second London terminal (after Waterloo).
1998	British Rail chose the London Regeneration Consortium to become the developers of the 135 acres of derelict railway lands at King's Cross.
1989	BR invited tenders for joint venture partner for development of CTRL. Eurorail selected.
1989	A series of pressure groups emerged which put forward a number of alternative routes. Newham lobbied for east London alignment.
1990	Arup published an alternative route proposal which proposed entering London from the east via Stratford. BR's joint venture with Eurorail was disbanded as high cost of CTRL could not be funded commercially and government refused subsidy.
1991	Evaluation of route options: BR reported to the government that its proposed route into London (via south-east London) was superior in economic terms, whilst the Arup eastern route was the best alternative for an alignment through east London. Arup challenged BR conclusions.
1991	Arup's route was heavily promoted by Cabinet member Michael Heseltine as the key spine for Thames Gateway development to further sustain London's growth and economic needs and regeneration. Government announced preference for eastern route and construction to be a joint venture under a private finance initiative.
1992	Union Railways (URL) was formed to pursue the project – a BR agency company comprising public and private sector staff. Arup was one of six consultancies involved.
1994	Channel Tunnel opened. Public consultation on preferred route for CTRL. Channel Tunnel Rail Link Bill in parliament.
1994	Government announced that an intermediate station would be located at Ebbsfleet.
1995	Thames Gateway Planning Framework published, which envisaged major new housing and economic development in east London and extending into north Kent (including Ebbsfleet).
1996	CTRL Bill gained royal assent. Environmental impact study. LCR (London and Continental Railways) appointed as concessionaire. Decision to include station at Stratford, with LCR given development rights at Stratford.
1997/1998	Royal assent granted to CTRL Bill. LCR were unable to raise sufficient finance. John Prescott organized financial restructuring. CTRL now to be constructed in two stages instead of the original one.
1998 October	Construction of stage one began.
2001 July	Construction of stage two began.
2003 September	Stage one opened.
2004	Outline planning consent obtained for Stratford City Development.
2007 November	Stage two opened.
2009	Impact study.
2010	Concession sold to Canadian pension plan.

Figure 2. CTRL timeline. Source: OMEGA Centre, 2008.

planning, appraisal and delivery of the project, with particular reference made to the impact of changing contexts on such decisions.

The power of context

Literature on the influence of changing contexts on decision-making in project planning is extensive and varied (see Friend & Jessop, 1969; Hall, 1980). The CTRL case study highlights how decision-making for the project repeatedly responded to changing contextual influences exerted through a variety of stakeholders and champions. This saw original project objectives supplanted

by "new" initiatives and by government's willingness, despite initial pledges to the contrary, to accept considerable financial risk when the project encountered funding difficulties in 1997–1998 and needed "bailing-out". These changing contextual influences served to produce a situation in which the project simply had to respond in a somewhat organic and evolutionary manner, reflective of ecologically based urban development models of the kind presented by Batty (2008) among others. OMEGA's interview responses indicated that the changing premises, scope and nature of decision-making for the CTRL was characterised by a necessarily "adaptive process" adopted by its key stakeholders to better cope with the changing risks, uncertainties, complexities and contextual influences it encountered throughout its development.

Political influence

The authors suggest that political influence/support for the CTRL represents the most critical contextual factor in all aspects of the project's development. This observation regarding "the power of context" was captured by one interviewee who explained

> Eventually the project happened because of three [contextual] things - . . . "regeneration" was the one which tipped the balance. Not because the regeneration benefits are necessarily real but because they had political support, because people all along the route said: let's get this thing built, we don't want this thing planned forever, we want it built!

Political support is seen as a clear prerequisite to the successful launch of the project and the sustained efforts by the UK government to ensure the project was implemented. In this regard case study interviewees repeatedly made reference to the leadership offered by the MPs Michael Heseltine (from the Conservative governments of 1989–1997) and John Prescott (from the Labour governments of 1997–2011): two Deputy Prime Ministers from administrations with opposite political affiliations but with common goals for the project. The nature of political influence on CTRL may be exemplified by one interviewee's claim that:

> Whether the buzz words of the politicians are regeneration or globalisation, or world competitiveness, any project that's on-going picks up what it can to enhance its credentials.

Patronage in the form of a political champion was thus seen as a key commercial asset for MTP project sponsors, planners and delivery agents. Champions were found in the CTRL case study to fulfil a number of important roles, as a focus for clarifying, setting and adjusting project objectives, establishing project credibility and mandates for project teams, and offering opportunities for consensus-building and project networking.

CTRL as an agent of change

The positioning of CTRL as a key agent of change in relation to urban regeneration, subregional growth and restructuring was alluded to by many interviewees. Some also suggested that the relationship between the project and these wider initiatives had not been fully exploited in terms of coherent land-use transport plans, strategies and investment programmes. That said, many interviewees did note the project's substantial impact in encouraging investment in the regeneration of Kings Cross and St Pancras, as well as Stratford and east London. In this connection, such parties pointed to the need to acknowledge that the full benefits of the project in terms of regeneration and growth will likely only materialise in the longer term.

Stakeholder engagement, trust and transparency

The case study indicated that there is a clear need for MTP decision-makers to work more closely and build greater trust with key stakeholders, reinforcing the work of Currall and Inkpen (2008).

This is best achieved it was concluded by keeping such stakeholders fully informed throughout project developments so as to identify/anticipate potential issues going forward that could otherwise jeopardise planning and delivery.

The later positioning of CTRL as a means to promote a broader agenda associated with regional restructuring, urban growth and regeneration required considerable faith and strong advocacy skills amongst key political decision-makers and project promoters. Most importantly, it also required the development (over time) of consensus-building skills, especially at the project conception and planning stages – i.e. before the project gathered sufficient political "momentum" to have a life of its own. Consensus-building, the authors conclude, requires both the establishment of "trust" and strong lobbying skills, and benefits immensely from transparency in transactions and decision-making.

Lesson learning/sharing

The research findings suggest that there is little evidence of systematic institutional learning on the part of the CTRL project promoters and other stakeholders of the kind reported by Snowy Mountain Engineering Corporation (SMEC) (2001), despite the apparent abundance of relevant knowledge and experience amongst various international consultants and responsible organisations in earlier fast train projects. Numerous interviewees reaffirmed the point that lesson-learning and sharing systems about fast train programmes had up until then not been established in the UK in any formal sense. This conclusion is substantiated by recent experiences of the HS2 project which appears to have failed to adequately take on board many of the lessons of the CTRL project and other overseas high-speed rail projects. That said, case study respondents did indicate that such learning is often extensively disseminated in an informal manner as personnel move from project to project.

Conclusions

The OMEGA Centre's study of the CTRL project highlights significant new lessons and perspectives for decision-makers concerning what constitutes a "successful" mega transport project. Most importantly, the authors conclude that MTP planners, appraisers and delivery agents need to take into account the organic nature of MTP decision-making and the likelihood that new project objectives will emerge over the course of its planning and appraisal periods, and that this is legitimate up to the implementation stage. These "emergent objectives", it is contended, should not only be seen as opportunities to shape the project to better suit prevailing contexts, but also be employed as opportunities to redefine project boundaries so as to maximise the role of the project as an "agent of change" in the longer run especially.

Note

1. It is common for a MTP's success to be narrowly defined as its ability to deliver on time, within budget and according to specifications (see Flyvbjerg, Bruzelius, & Rothengatter, 2003; Hertogh, Baker, Staal-Ong, & Westerveld, 2008).

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Some concluding remarks

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Past and current notions of "success"

Most of the contributions to this collection of papers highlight the critical importance of viewing the development of mega transport projects (MTPs) from conception to delivery as an organic process. This is on account of the changing economic climates, policies and regulations that can arise over the duration of project preparations plus changes in stakeholder involvement and leadership that can impact project expectations and priorities.

As earlier indicated, current notions of "success" for most MTPs have been presented by much of the mega project literature as largely being about delivering projects "on time, on budget and to prescribed specifications". These criteria have also frequently been employed by the media, politicians and opposition groups to promote and/or criticise such projects, as in the case of the Big Dig project in Boston, USA (Brecher & Nobbe, 2010) and the recent High Speed 2 rail project in the UK (FT, 2013). Of late, there has, as a result, been such a crescendo of negative press in many parts of the world regarding mega projects that this cacophony has led to some governments (as in the UK) to introduce measures that seek to counter the alleged "optimism bias" in MTP project appraisals, seen to be the main underlying source of such miscalculations (HM Treasury, 2003).

Notwithstanding these developments and trends, several findings of the OMEGA international research programme (as reflected in the case study contributions provided here) strongly suggest that these "iron triangle" considerations are in fact all too frequently (and ultimately) not the overriding determinants of project "success." The insights reveal that these concerns have not always prevailed, sometimes for very understandable pragmatic reasons (other times not), reflecting the need if not imperative to adapt projects to new realties. Notwithstanding any skulduggery that may or may not have taken place, and depending on one's perspective and interests, this broader understanding can in retrospect shed a more sympathetic light on mega project achievements and offer a more realistic appreciation of the challenges they encounter and are required to overcome.

The earlier case study contributions reveal, for example, that in judging a MTP's "success", it is most significant to differentiate between the objectives set at the outset of the project from those that "emerged" over time – particularly for projects with long gestation periods and those that are conceived, appraised and/or delivered in turbulent times. Overall, findings from the OMEGA case studies show that of the 30 projects reviewed only one third achieved more than 75% of their original project objectives, whereas for those 13 projects where "emergent objectives" were identified, the success rate was much higher, with more than three-quarters achieving 100% of their "emergent objectives", thereby totally transforming judgements of "project success". In some instances it was noted that the amendments to the original project objectives were so great that one could legitimately argue that "the project" had fundamentally changed its nature, scope and even *raison d'être*.

MTPs as static engineering artefacts or organic phenomena

The insights of the case studies outlined point to another overall conclusion of the OMEGA research programme, namely that MTPs should not be seen as static engineering artefacts but organic phenomena that alter over time and space as they impact on (and are impacted by) the territories, economies and societies they traverse and serve. Taken in these wider geographical, temporal and sectoral terms, particularly over long gestation periods of 30 plus years, it is rational not to judge project outcomes against the first set of objectives or the first set of costs when the contexts, if not the very functions and even boundaries of such projects, may have altered dramatically. Societal, political and environmental visions, values and priorities can also alter over time, as do the compositions and influences of project stakeholders and the nature of the subsequent decisions they take in efforts to accommodate changes. Different project stakeholder values, priorities and expectations, in different cultural contexts, therefore translate over time (and location) into a myriad set of different perceptions of "success". And, while at the time of ribbon-cutting, delivery project costs, timing and adherence to specifications clearly matter a great deal, subsequent judgements of the value of mega projects can alter (positively and negatively) as new technologies emerge, societal values change and new policies are introduced and fade away. This finding reinforces earlier conclusions of Friend and Jessop (1969) and subsequently Hall (1980) who explain why in certain circumstances "failed" mega projects of the past have been reclassified as "successes", and vice versa.

What is important to appreciate, furthermore, is that different infrastructure sectors can have very different expectant mega project lifespans. In the transportation sector, for example, the lifespan of such projects prior to any major retrofits is within a 100-year period, typically 50 years or so. In instances where much longer time frames are advocated, as in the case of the nuclear industry, mention is made of time frames of several thousand years for dealing with its waste. Here one can reasonably argue that it is impossible to judge whether the "success" of such projects can be sustained, given our current inability to reliably predict futures beyond 30 years

(at best), much less 100 years; let alone for a period substantially much longer than this. This reality should perhaps oblige politicians, engineers and society at large to become more sanguine regarding expectations about project outcomes and more accepting that these may not transpire as predicted but need adaptation and retrofitting as new technologies emerge and as we learn, for example, more about climate change and the energy implications of our current behaviour.

Treatment of MTP risk uncertainty and complexity and power of context on decision-making

As regards the overall question of how well the treatment of risk uncertainty and complexity was dealt with in MTP planning, appraisal and delivery, the various case study contributions repeatedly highlighted the fact that "the success" of a project ultimately depended not only on how well risk uncertainty and complexity was dealt with *within* the decision-making process of the project itself, but also on the impact of contextual forces at play on this decision-making (i.e. "the power of context"). As obvious as this observation may appear, the failure to initially adopt an open-systems approach to project decision-making for many of the MTPs reviewed (up until time of implementation at least) has contributed, it is suspected, to subsequent project delays and costly adaptations downstream.

The case for adopting a more "open-systems approach" to MTP planning and development alluded to in several of the case studies has particular resonance in cases where MTPs are promoted or become "agents of change" – effectively reshaping the physical and socio-economic contexts of the economies, societies and communities they traverse, serve and link (OMEGA Centre, 2012). The French, Swedish and Japanese cases discussed in this *Interface* also led to instances of the introduction of new standards for participation and environmental assessment. Consequently, in this respect, the projects can also be seen to act as agents of change in institutional developments and governance. Such an approach could incorporate the treatment of risk, uncertainty, complexity plus the power of context as important parameters of a policy-led multi-criteria analysis (PLMCA) for the appraisal of major urban projects (OMEGA Centre, 2013). Reflecting an "open-systems" perspective, an approach of this kind has the potential to act as both a "risk-register" and an "opportunity register" of what traditional cost-benefit analysis (CBA) and related appraisal techniques may fail to recognise as significant.

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