

## Decision-making on Mega-projects: Drifting on Political Discontinuity and Market Dynamics

Hugo Priemus<sup>1</sup>

Faculty of Technology, Policy and Management and OTB Research Institute for Housing, Urban and Mobility Studies, Delft University of Technology

---

Decision-making on mega-projects is beset by a multitude of problems. Cost overruns and disappointing achievements are already well documented. Some of these pitfalls appear in the initial stages of the decision-making: the absence of an appropriate problem analysis, the lack of alternatives, ambiguities about scope, no programme of functional requirements, flawed process architecture and the dissemination of contested information.

But all sorts of uncertainties arise in the long periods between the initiative and the start of operations. Very often, unforeseen developments are triggered by political discontinuity and market dynamics.

This paper helps to address this situation by providing an overview of the impact of market dynamics and political discontinuity (which are sometimes interrelated) on decision-making on mega-projects. We analyse these impacts and attempt to determine ways in which project managers could deal with them. The identification and allocation of risks among public and private players is a crucial variable.

The paper aims to contribute to theories of decision-making on mega-projects and puts forward practical recommendations for the relevant parties.

*Keywords:* mega-project; political discontinuity; market dynamics; decision-making

---

### 1. Introduction

The academic literature discusses many of the pitfalls that can occur on the long and winding path between the conceptualisation and the realisation of major infrastructure projects. The mega-projects referred to in this paper cover different kinds of infrastructure including roads, railways, dykes, airports, bridges, energy transport, electronic communication, drinking water, sewage and waste. It is not our intention to produce a list of all the pitfalls that can plague a mega-project but to focus on those that occur in the early stages of the decision-making and their relationship with political discontinuity and market dynamics.

---

<sup>1</sup> Jaffalaan 9, 2628BX, Delft, the Netherlands, T: +31(0)152783005, F: +31(0)152784422, E: [h.priemus@tudelft.nl](mailto:h.priemus@tudelft.nl)

These pitfalls, though problematic in their own right, are also central to other – already well-documented pitfalls – such as cost overruns and shortcomings in achievements (Flyvbjerg *et al.*, 2003).

The questions addressed in this paper are as follows:

1. What are the main pitfalls in the early stages of decision-making processes on mega-projects?
2. What is the potential impact of political discontinuity on mega-projects, which are invariably characterised by a long period of decision-making?
3. What is the potential impact of market dynamics on such mega-projects?

General infrastructure projects are required to meet certain criteria. The Dutch Scientific Council for Government Policy (WRR, 2008: 35) applies two types of criteria for infrastructures. Over the last two decades most infrastructures have undergone a significant change in regime, which has led to a stronger emphasis on service, lower prices and enhanced consumer choice as well as a greater concern for efficiency. These issues fall under Type I criteria. This regime change consists of five elements: liberalization, privatization, unbundling, corporatization and internationalization. It has addressed, in particular, Type I market failures, which are characterised by the absence of proper market forces. WRR (2008: 36) argues that, nowadays, a strategy is needed that can also address Type II market failures, which are characterised by ineffective realisation of long-term public values, such as innovation, safety, health and the environment. The WRR (2008: 36) also describes the kind of strategic policy that is needed to secure long-term investments in physical infrastructures under the new regime and to meet the challenges these infrastructures will have to meet in the future. It does not, however, offer clear solutions for the long timespan of decision-making or the sometimes fatal blow that political discontinuity and market dynamics in the decision-making process can inflict on mega-projects.

These issues will be addressed in this paper. But first, we shall discuss some general pitfalls in the early stages of decision-making on mega-projects. We shall follow WRR (2008) and apply both Type I and Type II criteria.

Sections 2-7 identify a number of pitfalls in decision-making on mega-projects: absence of a problem analysis, lack of project alternatives, ambiguities about the scope, no programme of functional requirements, flawed process architecture and the dissemination of contested information.

The core of the paper is formed by Sections 8 and 9 which deal with the impact of political discontinuity and market dynamics on decision-making on mega-projects respectively. Section 10 deals with the identification and allocation of risks among public and private players. Finally, Section 11 presents conclusions and recommendations.

The paper is based on the personal experience of the author as research coordinator for the Dutch Parliamentary Commission on Mega-projects (TCI, 2004), a literature review and interviews with people at the cutting edge.

It presents empirical evidence and puts forward recommendations for both politicians and practitioners. The tone of the paper is somewhat normative; it does not aspire to launch new rules or regulations.

## **2. Pitfall no. 1: absence of a proper problem analysis**

A mega-project is – at best – a solution. This statement implies that there is at least one problem to which a mega-project is the most expedient response. A proper problem analysis is essential to determine whether a proposed project is effective, efficient and legitimate (Altshuler & Luberoft,

2003; Priemus, 2008). The first question that should be asked is: what is or what are the problem(s)? And then: what is the problem *now* and what is it likely to become in the short and the long term? And finally, who is affected by the problem? One player's problem might be another player's solution.

Problems relating to transport infrastructure often emerge in the form of locations that are insufficiently accessible at present or are expected to be so in the future. This may go hand in hand with an increased risk of economic stagnation caused by growing congestion (measured in lost vehicle hours). Sometimes there are additional health and safety problems as a result of emissions (air quality).

As all of this impinges on mobility, people tend to see the problem in terms that extend farther than just accessibility or stagnation. They point to the decline in residential and commercial appeal and the prospect of a deteriorating living climate, reduced quality of life and a decline or stagnation in business leading to job insecurity and uncertain economic growth. This implicit connection between mobility and the living and economic climate is usually difficult to substantiate and often bears witness to a long list of policy ambitions which cannot be supported by valid insights.

In practice, it is barely possible – and usually impossible – to establish a causal relationship between improved accessibility and an upturn in the regional economy (Rietveld, 1989; Vickerman, 1989; 2000; Banister & Berechman, 2000).

As problems are often perceived differently by different players, it is not only essential to conduct a problem analysis but also to reach the strongest possible consensus. A shared problem analysis enhances the possibility that the selected alternative will still be endorsed by everyone farther down the line and survive changes in government coalitions. If there is still a difference of opinion on the analysis, it is usually the authorised political body (parliament, regional or municipal council) that decides on the problems that will form the departure point.

In later stages other differences of opinion may arise around issues of contested information (Section 7). Decision-making on mega-projects is not usually linear. Sometimes a problem analysis has to be reformulated at a later date.

### **3. Pitfall no. 2: lack of project alternatives**

Once the problem analysis has been sorted out, it is time to think seriously about potential solutions. It is best to appraise alternatives in the initial stages. After all, everyone knows that more than one road leads to Rome.

Potential alternatives can be tested in the light of the problem analysis; so, certain matters need to be concretely and promptly specified (Findeisen & Quade, 1985):

- the values and criteria;
- the objectives of the public and private bodies who bear responsibility;
- the boundaries and constraints.

A cost-benefit analysis can be drawn up for each alternative. Conflicts can easily arise if the various parties have different ideas about these matters. Experience has shown that it makes sense to identify potential pitfalls at an early stage and to establish a workable consensus. Other pitfalls may, of course, arise along the way. Complexity is inherent in decision-making processes on mega-projects. It cannot be simplified away and is one of the reasons why these processes are seldom linear.

An investment project is not always the right answer to a problem. The Dutch Ministry of Transport, Public Works and Water Management (Ministerie van Verkeer en Waterstaat, 2004) differentiates three types of solutions for transport infrastructure: utilisation, pricing and building. First, action can be taken to make better use of the capacity of the existing infrastructure. Congestion might easily arise on certain routes during the rush hour. But can mobility in the opposite direction be augmented? Or mobility outside rush hours? That is the first question. The second is whether a price tag can be attached to the use of infrastructure in the form of a user charge, such as road pricing. Experience has shown that people curtail their use of infrastructure if it hits their pocket (Verhoef *et al.*, 2008). If the rates were differentiated in terms of time and place, pricing could lead to better utilisation of the existing infrastructure. If utilisation and pricing are not enough, then new infrastructure or expansions to the current infrastructure can be considered.

The 'building' solution embraces various alternatives: different routes, different modalities, different cross-sections (e.g. two-lane, four-lane, six-lane) and different types of spatial integration (for instance, to conserve nature or prevent urban pollution).

In real life we often witness situations in which alternatives are put forward at the last minute by, for example, those opposed to the government-favoured plan. It is a pity that alternatives are not systematically recognised at a very early stage.

#### **4. Pitfall no. 3: ambiguities about the scope of the project**

It is difficult to decide on the 'optimal' scope of a project at an early stage. In most cases, the scope will not be limited to the line infrastructure but will extend to the development of a wider area. Nodes should be developed near and around stopping places or junctions, as the anticipated increase in the value of land around these nodes can finance unprofitable constituents and/or enhance the quality of the plan.

It can take a lot of brain-racking to spatially accommodate a mega-project. It is all about finding the best fit between the infrastructure and the city, the landscape and the natural environment. Hence, it involves questions relating to noise pollution, eyesores, conservation and harmful emissions (such as CO<sub>2</sub>, NO<sub>x</sub> and particulate matter).

One crucial question is whether a mega-project should be prepared and realised in one single process or whether it is more prudent to split it into manageable constituents and take the political decisions in phases. Admittedly, the latter might lead to incomplete, less-than-optimal pieces of infrastructure, but it usually makes for greater flexibility. It would also keep various options open and perhaps facilitate the decision-making at later stages (Miller & Lessard, 2008). Flexibility is a key factor in the efforts to cope with the effects of policy changes or market dynamics.

#### **5. Pitfall no. 4: no programme of functional requirements**

Engineers, in particular, tend to focus on the technical specifications of a mega-project. All too often, they are blinded by the 'technological sublime' (Trapenberg Frick, 2008): quality comes first, followed by timescale - with costs invariably bringing up the rear. If we are to avoid overspent budgets and overrun timescales, we need to be aware in advance of market dynamics and political discontinuity and we need to start by compiling a programme of functional requirements.

In practice, people do not always think first in terms of a programme of functional requirements. The criteria that the project needs to meet and the public values that need to be secured are

seldom clear. Traditionally, stakeholders have Type 1 values in their mind; but Type 2 values are becoming increasingly important. Only in later stages is concretisation addressed. It is unusual to spend time thinking of alternative solutions, let alone consciously generating and designing them. Different options are seldom tested against the programme and the social costs and benefits are seldom determined for each case. The options can be ranked, starting with the one with the highest score and ending with the one with the lowest score. The public authority takes a decision on the basis of this information. If it gives the go-ahead, construction can begin.

A process which uses a concrete programme of functional requirements as its starting point creates space for a tendering procedure in which candidates compete in terms of quality and innovation as well as price. Unfortunately, in practice this is still the exception rather than the rule.

## **6. Pitfall no. 5: flawed process architecture**

Normally, agreement is reached on the process architecture either beforehand or along the way. Particularly important is the question of which space can and will be presented to the public, the politically elected and empowered bodies (especially local authorities), and the potential private players, and when this will take place. When the project managers create this space they are not always prepared for strategic moves by parties who are – in principle – involved. They will, at all events, have to respect the official regulations and standards at EU, national, regional and municipal level.

The Design & Construct (D&C) model has been specifically developed to give competing contractors plenty of scope – ideally within the programme of functional requirements – to work out their own solutions and to come up with smarter alternatives for the execution of the project. Frequently, the parties must be selected on the basis of market forces. This calls for a level playing field which precludes the possibility of state support or inside knowledge. Market recruitment and political decision-making are a complex mix, which often creates difficulties. How can one prevent (overly) transparent public decision-making from damaging the market position of the government? And how does one stop parties who feel bypassed or unfairly treated from filing claims for damages? It is not a superfluous luxury to seek legal advice on the process architecture.

Most of the time, the actual process becomes dominated by concerns about costs. A lopsided emphasis on cost reduction stands in the way of quality and innovation and the realisation of Type II criteria in particular.

In Section 11 we present a basic process architecture in which we identify stages in the decision-making, leading to go/no-go decisions.

## **7. Pitfall no. 6: dissemination of contested information**

The process architecture and the interaction between the players are strewn with pitfalls. Misinformation – and sometimes even blatant lies – are apparently disseminated on a large scale (Wachs, 1989; 1990; Flyvbjerg *et al.*, 2003). Leijten & de Bruijn (2008) call this ‘contested information’, i.e. information that is explained in different ways by different players. Occasionally, some real battles erupt in which each side hires an experts to launch its views. Mega-projects often appear to create their own endogenous political and market dynamics and tensions.

Leijten and de Bruijn (2008) recommend that the players agree beforehand on how to deal with the information as it becomes available.

The risk of misinformation can be contained by deciding together at an early stage on how information is to be treated. The parties can agree in advance on the sources of information that will be accepted as authoritative. In the event of conflicting information, they can decide which independent expert or institute is to be consulted. Are there any underlying uncertainties? Is it possible to pursue a no-regrets policy which takes these uncertainties into account? Is it clearly understood who bears the risks of underestimations or overestimations? Can these risks still be allocated, if necessary? Does awareness of individual responsibility for risks result in revised estimates for investment costs, management costs and transport performance?

## 8. Political discontinuity

The literature on decision-making on mega-projects almost invariably describes the length of the process as a complicating factor. According to Hertogh *et al.* (2008: 39):

“Major projects take many years to implement, usually much longer than the lifetime of governments, and clarity of purpose and business case justification are vital if they are not to be hampered by changes in government occasioned either by a change of coalition party or key individuals. Equally, it is helpful to seek as much ‘cross-party support’ as possible to ensure that it is widely understood that the project is of national importance and not a bone of political contention”.

This certainly makes sense, but a lot more can be said about the issue of political discontinuity. In markets we use the term ‘dynamics’ because market changes usually occur gradually. Policy changes tend to be more abrupt, depending on the results of elections and new coalitions at national, regional and local level. In addition, the relationship between national, regional and local policy may be inconsistent. The implications of the terms ‘discontinuity’ and ‘inconsistency’ are not necessarily negative. Indeed, some discontinuities may have a positive impact and reduce inconsistencies. Even so, the frequent changes that occur in the political composition of the respective government may complicate the decision-making on mega-projects. As the entire process, from proposal to handover, takes decades rather than years, every mega-project will be confronted with government elections and – more often than not – shifts in the balance of political power at national, regional and local level. Some mega-projects are so emotionally charged and so bound up with differences in political ideologies that they are used as part of the stakes during elections and the formation of coalitions. This happens not only at national level (parliament, cabinet), but also at regional and local level and – most crucially – around the political consensus or dissensus between different tiers of governments (national and local).

In Europe mega-projects often cross national borders and thus involve international negotiations and treaties, and sometimes, international conflicts. In some cases the European Commission also participates in the decision-making, especially if subsidies are involved or specific EU themes such as the Trans European Networks. Lack of political continuity and public consensus, possibly stemming from diametrically opposed backgrounds, can exert an adverse influence on the decision-making. When this happens the parties are assailed by tensions which have spilled over from other domains. Fortunately, this can also work in the other direction: if government units collaborate well in other spheres and if they share similar views, there may be more consensus.

Though the decision-makers on mega-projects have very few weapons to wield against political discontinuity and inconsistency, there are still lessons to be learned in this domain. After all, one can hardly object to the workings of democracy even though the results may not be to one’s liking. Sometimes, attempts can be made to depoliticise parts of the decision-making; for example, when empirical or technical data are being collected. Independent researchers and consultants could play a useful role here. It is also advisable to consistently pass on useful and relevant information to the public and private players, the professional world at large and the

general public, including the press. This raw information may generate some opposition, but it is better to amend or even call off a mega-project for valid reasons than to go ahead with it on the basis of loosely founded insights.

In the investigatory stage it is advisable – but not always easy – to keep a step ahead of the collection and dissemination of information. It is better not to spring surprises on political bodies or the public, but to mention in good time the strategic choices which will present themselves in the near future and to state the case for and against them. It is also advisable to share the dilemmas with political bodies and the public and to invite them to consider and put forward arguments. In the long run political continuity and consistency will be enhanced by prompt and relevant insight into facts, prognoses, scenarios and circumstances. Evidence-based policies are a godsend for decision-making on mega-projects (regardless of the nature of the final decision) and for democracy (TCI, 2004).

Sometimes, new standards and ground rules are mindful of what insurers used to call ‘Acts of God’, given that there is no way of insuring against them. Often, national governments and professional sectors are unaware that the European Commission has moved the goalposts.

Standard-setting authorities should desist from formulating absolute standards, observe reasonably long transition periods and, in certain incontestable cases, compensate anyone damaged by new standards, particularly if they were unable to prepare for them.

The importance of communicating information on new standards cannot be underestimated. The parties involved must be informed in good time of any likely changes and should be provided with information and training programmes to bring them up to speed once the changes come into effect. This has scarcely happened at all in the recent past: usually the standards are made absolute far too soon (despite uncertainties about safety and environmental problems). There is seldom a transition period and there is no information or training. Project managers need to be alert to unexpected changes to standards and rules; they also need eyes in the back of their head.

## 9. Market dynamics

Mega-projects figure in different decision-making phases in some markets and affect many other markets in the process. In some markets empirical facts have only limited validity. Generally speaking, prognoses and estimates – implicit and explicit – are based on assumptions about trends in supply and demand, and hence the price developments in relevant markets. A whole host of factors comes into play, such as the availability of engineers and other experts for the preparation phase; the supply of tradesmen, building materials, installations and raw materials for the execution phase; developments in energy prices; the overall economic situation; the capital market (including trends in long-term interest rates); inflation and the land market (important in the programming phase and the preparation and execution phase). Sometimes these market conditions are taken as read, but it is no exception for a mega-project to create its own endogenous market dynamics. These uncertainties can be ‘put into cold storage’ until a later date, but there is no guarantee that crucial factors will follow the anticipated pattern. Moreover, deviations can have a profound impact on the final cost-benefit analysis. Mobility patterns can change within the course of a single decade as a result of, say, competition from other modes of transport than those envisioned in the project. Inland shipping, for example, is competing strongly with rail and road for the transport of goods to and from major ports like Rotterdam and Antwerp. And one can safely assume that the advent of budget airlines such as Easy Jet is undermining the demand for high-speed rail transport in Europe.

It is, of course, easy to spot the impact of market dynamics with the benefit of hindsight. The challenge presented by decision-making on mega-projects is to identify market dynamics ex-ante

and to be prepared for a mega-project to make an endogenous impact on the markets. The information on possible future developments often appears to be contested.

The best way to deal with unforeseen changes in the market is to apply scenario techniques and conduct sensitivity analyses. Changes in policy are often intertwined with changing markets. The introduction of a user charge on rail and/or road infrastructure can have an immediate and profound impact on the mobility market. It is impossible to fully protect a project against the impact of changing markets. Mega-project management will always entail uncertainties and risks.

## 10. Identification and allocation of risks

Often, the preparation and realisation of a mega-project is a risky business. Politicians are increasingly displaying a preference for public-private partnerships. Private players are being recruited in entrepreneurship, creativity and risk-awareness – areas where they are, quite simply, superior to public sector organisations. Time and again the question arises as to how the various tasks and activities – and more importantly – the risks are to be divided between the public and private players beforehand. This presupposes that each party already has a valid idea of the nature and extent of the risks, but this is rarely borne out in practice.

It may be possible to ascertain on a case-by-case basis whether some risks can be insured. Insurance companies have built up extensive experience in the identification and quantification of risks. Any risks that a promoter decides to bear himself must be included in the budget.

It is vitally important to identify and quantify potential uncertainties and risks in the contractual relations between the parties so that they can be allocated as efficiently as possible. Each player will try to determine the nature and extent of the risks and incorporate them in his price. If such issues are not settled on time, there may be huge surprises in store. For example, in the public tender for the five-part substructure of the Dutch HSL-South there were price differences of approximately 40% between the externally verified budget of the Ministry of Transport and the bids from the private consortia. Causes: collusion between the building firms, an overheated building market (too many mega-projects under construction in the same period) and serious underestimation of the overlap risks on the part of the Ministry of Transport (TCI, 2004).

Overlap risks can be reduced by interface management. They tend to be underestimated (not to say neglected) by governments and are sometimes overestimated by market players (whether or not on the basis of strategic considerations).

Contracted alliances with shared benefits and risks are gaining in popularity. It is important to identify the risks in different stages of the project, to determine the risk probability and to calculate the potential damage. This makes it possible to allocate prices to each risk, to determine how each risk can best be allocated and to find out whether it is feasible and advisable to pay insurance companies to cover the risks. We have observed that risk analysis entered decision-making on mega-projects only very recently. It seems that we are still at the beginning of a learning curve.

## 11. Conclusions and recommendations

Table 1 summarises the main pitfalls in the early stages of decision-making processes on mega-projects. These pitfalls may prove fatal as a result of complicating factors, such as the complexity of the mega-project; the multi-player and multi-level nature of the decision-making process and the many (often unexpected) changes that occur in the long period between the start and finish of the project; political discontinuity; changing standards and rules, and market dynamics.

Many lessons to prevent or reduce flaws can be learned from past experience (Table 1): strengthen the knowledge base of the project; stimulate learning processes during the decision-making process; adopt a risk analysis followed by an optimal allocation of risks among public and private players and, finally, organise ongoing monitoring by accountants.

Upon closer examination, it appears that a number of frequently cited pitfalls are bound up with a lack of political continuity and consistency and market dynamics. Many of the notorious interim rises in the costs of mega-projects are the result of fresh insight by political bodies who change the scope of the project along the way to make it fit more neatly into the spatial planning and to protect the environment against noise and air pollution, blots on the landscape and other negative effects. Missed deadlines and deteriorations in cost-benefit ratios are often the result of changing political views or of a perceived need for political compromises.

**Table 1. Systematic specification of lessons learned**

Pitfalls		Complicating factor	Lessons
1.	Absence of a proper problem analysis	Complexity; Long timespan between start and finish; Changes relating to political discontinuity, changing standards and market dynamics; Multi-player and multi-level decision-making	Strengthen the knowledge base of the project
2.	Lack of project alternatives		Keep learning
3.	Ambiguities about the scope of the project		Increase flexibility
4.	No programme of functional requirements		Formulate such a programme
5.	Flawed process architecture		Identify and allocate risks
6.	Dissemination of contested information		Organise ongoing monitoring

**Table 2. Stages of a project and go/no-go decisions**

Phase	Go/no-go decision at the end of the phase
Programme phase	Start preparation and elaboration; Provide budget for preparation and elaboration; From now on apply rules for information to public authorities
Preparation phase	Decide to build; Start the execution of the project; Provide budget for realisation (public + private)
Execution phase	Decide to operate; Start the operation of the project; Make documentation available on preparation and realisation of the project
Operation phase	Decide to stop or to restructure operation

Derived from TCI (2004).

In practice the decision-making is usually pretty chaotic with steps being retraced and decisions being reconsidered. It is absolutely crucial to design a process architecture in an early stage. This may be redesigned in later stages, but always approved by the parties. Division into phases can help point the way (TCI, 2004, see Table 2), each phase ending with a go/no-go decision. The problem analysis delivers a document which enables the competent authority to decide whether the next phase, the *programme phase*, can begin, paving the way for a programme of functional

requirements and an initial estimate of costs based on a reference class. If this leads to a 'go' decision, the *preparation phase*, which leads to an execution decision (go/no-go), can begin. A 'go' decision is linked to fundamental commitments: public and private funding is made available and the project is fleshed out in minute detail. The *execution phase* is followed by the operation decision and the *operation phase*.

It is not inconceivable that parts of a phase may have to be repeated; for example, the programme of functional requirements may need some adjustments to keep pace with later insights. The phasing must always make clear the stage which the infrastructure project has reached. It is also essential to identify alternatives in an early stage, to keep open as many options as possible so that there is enough flexibility to tackle unexpected developments, new insights and changed circumstances (Miller & Lessard, 2008). This is much easier in the preparation phase than in the execution phase, where financial claims can be expected when changes are proposed.

Not only is it important that the various components and details of the mega-project be closely studied and managed during the preparation phase, the mega-project itself and the process architecture must be continually monitored at system level. A risk analysis will make it possible to make early identification of the components and interfaces that require special attention in each stage (design, structural development, plan review, implementation, building inspection). An internal inspection is particularly important where strategic activities are concerned (high risk of damage, risk of major damage). The four-eye principle requires that vitally important operations be performed by at least two different people to minimise the risk of mistakes or tunnel vision. It is equally important that one single person take ultimate responsibility for the entire process during each stage. In particular, this person must closely monitor the cohesion and synergy of the process and the interfaces between the components.

There are many references on project management and risk management within the context of industrial processes. Lessons may possibly be learned from this sector, but we are not sure, for instance, how far experience of the petrochemical industry can be transplanted to traffic infrastructure.

According to the Dutch Scientific Council for Government Policy (WRR, 2008), mega-projects must meet both Type I (proper market functioning) and Type II criteria (realisation of long-term public values, such as safety, health, resilience and sustainability).

We have learned from Flyvbjerg *et al.* (2003) that many players have strong reasons *not* to follow the recommendations formulated in this final section. It often pays off to underestimate market dynamics and political discontinuity by underestimating costs and overestimating benefits. It is in the interest of the taxpayer to follow our suggestions for improvement. It is a challenge for national and local government to urge managers to identify alternatives in an early stage, to adopt a clear phasing procedure and to keep the options open in the interests of flexibility.

After seventy years with no lessons learned (Flyvbjerg *et al.*, 2003) it is time to get down to some serious work.

## References

- Altshuler, A. and Luberoff, D. (2003) *Mega-projects. The Changing Politics of Urban Public Investment*, Washington DC (The Brookings Institution).
- Banister, D., and Berechman J. (2000). *Transport Investment and Economic Development*, London University College London Press.
- Findeisen, W. and Quade, E.S. (1985). The Methodology of Systems Analysis: an introduction and overview. in Miser, H.J. and Quade, E.S. (eds.). *Handbook of Systems Analysis. Overview of Uses, Procedures, Applications and Practice*. Chichester, New York, John Wiley & Sons.

Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003). *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge, Cambridge University Press.

Hertogh, M., S. Baker, P.L. Staal-Ong and E. Westerveld, 2008, *Managing Large Infrastructure Projects. Research on Best Practices and Lessons Learnt in Large Infrastructure Projects in Europe*, Utrecht (AT Osborne BV).

Leijten, M. and De Bruijn, H. (2008). Mega-projects and Contested Information. in: Priemus, H., Flyvbjerg, B. and van Wee, B. (eds.). *Decision-making on Mega-projects. Cost-benefit analysis, planning and innovation*. Cheltenham (UK), Northampton (MA), Edward Elgar.

Miller, R. and Lessard, D. (2008). Evolving Strategy: Risk Management and the Shaping of Mega-projects. in: Priemus, H., Flyvbjerg, B. and van Wee, B. (eds.). *Decision-making on Mega-projects. Cost-benefit analysis, planning and innovation*. Cheltenham (UK), Northampton (MA), Edward Elgar.

Ministerie van Verkeer en Waterstaat (2004). *Nota Mobiliteit* [Mobility Memorandum], The Hague (Ministerie van Verkeer en Waterstaat).

Priemus, H. (2008). How to improve the early stages of decision-making on mega-projects. in: Priemus, H., Flyvbjerg, B. and van Wee, B. (eds.). *Decision-making on Mega-projects. Cost-benefit analysis, planning and innovation*. Cheltenham (UK), Northampton (MA), Edward Elgar.

Rietveld, P. (1989). Infrastructure and Regional Development: a survey of multiregional economic models. *The Annals of Regional Science*, Vol. 23, No. 4, pp. 255-274.

Tijdelijke Commissie Infrastructuur-projecten (TCI) (2004). *Grote projecten uitvergroot. Een infrastructuur voor besluitvorming* [Large projects under the magnifying glass. An infrastructure for decision-making]. Tweede Kamer 2004-2005, 29.283 nos 5-6, The Hague (Sdu Uitgevers).

Trapenberg Frick, Karen (2008). The Cost of the Technological Sublime: daring ingenuity and the new San Francisco-Oakland Bay Bridge. in: Priemus, H., Flyvbjerg, B. and van Wee, B. (eds.). *Decision-making on Mega-projects. Cost-benefit analysis, planning and innovation*. Cheltenham (UK), Northampton (MA), Edward Elgar.

Verhoef, E., Bliemer, M., Steg, L. and van Wee, B. (eds.) (2008). *Pricing in Road Transport. A Multi-Disciplinary Perspective*. Cheltenham UK, Northampton MA, Edward Elgar.

Vickerman, R. (1989). Measuring Changes in Regional Competitiveness: the effect of international infrastructure investments. *The Annals of Regional Science*, Vol. 23, No. 4, pp. 275-286.

Vickerman, R. (2000). Evaluation Methodologies for Transport Projects in the United Kingdom. *Transport Policy*, Vol. 7, No. 1, pp. 7-16.

Wachs, W. (1989). When Planners lie with Numbers. *Journal of the American Planning Association*, Vol. 55, No. 4, pp. 476-479.

Wachs, M. (1990). Ethics and Advocacy in Forecasting for Public Policy. *Business and Professional Ethics Journal*, Vol. 9, No. 1-2, pp. 141-157.

Wetenschappelijke Raad voor het Regeringsbeleid (WRR) (2008). *Infrastructures. Time to invest*. Amsterdam, Amsterdam University Press.