Why are Mega-Projects so Difficult to Evaluate, Plan and Manage?

Statement before the California Senate Committee on Transportation and Housing
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"News that the Transbay Terminal is something like $300 million over budget should not come as a shock to anyone.

We always knew that the initial estimate was way under the real cost. Just like we never had a real cost for the Central Subway or the Bay Bridge or any other massive construction project. So get off it.

In the world of civic projects, the first budget is really just a down payment. If people knew the real cost from the start, nothing would ever be approved.

The idea is to get going. Start digging a hole and make it so big, there's no alternative to coming up with the money to fill it in."[1]

"We have met the enemy, and he is us."[2]

I appreciate the opportunity to appear before this Committee today as the topic of discussion is one with which I have considerable personal experience. My first job after college was in project management in the private sector for The Badger Company, a chemical engineering and design company, from 1965 through 1968. In 1978, after 5 years as a budget and policy specialist in the Office of the Secretary of Transportation at the US DOT and 5 years as a transportation economic and regulatory consultant, I took over management of the Northeast Corridor Improvement Project (NECIP) at the US Federal Railroad Administration.

NECIP is still the largest high-speed passenger rail project completed in the public sector in the U.S. and the largest project ever managed directly by the US DOT. The project involved new construction or upgrading of the 456 miles of tracks and 15 stations from Washington, DC to Boston, MA via New York City. In 2013 dollars, it would be roughly equivalent to the Central Valley section of the CA HSR project. After managing NECIP, I managed Amtrak budget planning, administration of Federal financial assistance to freight and passenger railroads, and the development of freight and passenger policy for the Federal Railroad Administration.

I then joined the World Bank as the Railways Adviser where I was involved in reviewing the financial, economic and policy aspects of railway lending to developing countries worldwide. This included familiarity with freight and passenger rail activities in Europe and Asia in order to advise developing countries of the applicability of rail lessons and techniques from developed countries. After retiring from the World Bank, I have been an international railway consultant, continuing to work on issues of railway structure, financing and development.

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[1] Brown, W.L., *San Francisco Chronicle*, July 28, 2013
[2] Pogo

The question of why mega-projects are so hard to evaluate, plan and manage is not at all new: it is not confined to railways, or to transport, nor is the U.S. the only country to confront the problem. I gave a lecture on the subject of NECIP as a mega-project at North Carolina State University in 1982.[3] A well-known study by Pickrell,[4] books by Altschuler and Luberoff,[5] Flyvbjerg and others,[6] and Priemus and others,[7] have all covered the same subject with roughly the same conclusions: so called "mega-projects" strongly tend to cost more, take longer than planned and deliver less than promised. Why? What can be done about it?

Even in the private sector, large projects are hard. They often involve large acquisitions of property, procurements of services, new technology and years of effort. All of these expose the project to uncertainties and risks, both in cost and timing. The private sector can control this problem by a number of well proven tools, for example by using effective contract bargaining to manage costs. More important, private sector projects generally have clear and relatively simple objectives – primarily to maximize the financial rate of return from the project. They have a beginning and an end and, during the project, most decisions are fully under the control of the owner or owner's agents. Time frames are usually short enough for a single management team to complete a project. Because private companies carrying out a project have their own "skin in the game," they have strong incentives to hire the best people, give them enough authority and assign clear responsibility so performance can be measured. They also give managers adequate resources so that they can make sure that managers are held responsible. Private projects can be very large but they are not, by my definition, mega-projects.

What are mega-projects and why are they so hard to evaluate and manage?

So, how do mega-projects differ from merely large, private projects, and why are they such a challenge for public officials? In my experience, mega-projects have a number of distinguishing characteristics:

- First of all, mega-projects tend to be even larger than the largest private projects, multiplying all of the managerial problems mentioned above.
- Mega-projects tend to be so large (billions of dollars) that the public sector must take a role in finding the financing and in assuming at least some of the risks of the project. This requires that mega-projects develop an appropriate form of partnership between public and private sectors. Finding the right balance of authority, risk and responsibility can be extremely difficult, especially when the public side has limited experience with, and understanding of, such partnerships. In addition, partnerships can lead to unclear authority and responsibility and erode accountability.

[3] Thompson, L.S., "The Northeast Corridor Improvement Project," NC State University, Henry M. Shaw Lecture in Civil Engineering, November 10, 1982

[4] Pickrell, D., "Urban Rail Transit Projects. Forecast versus Actual Ridership and Costs," Washington, DC, U.S. Department of Transportation, 1989

[5] Altshuler, Alan and Devid Luberoff, "Mega-Projects: The Changing Politics of Urban Public Investment," Brookings Institution Press, Washington, DC, 2003

[6] Flyvbjerg, Bent, Nils Bruzelius and Werner Rothengatter, "Megaprojects and Risk: An Anatomy of Ambition," Cambridge University Press, 2003 and 2006.

[7] Priemus, Hugo (editor), Bent Flyvbjerg, and Bert van Wee, "Decision-Making on Mega-Projects: Cost-Benefit Analysis, Planning and Innovation," Edward Elgar publisher, Cheltenham, UK, 2008

- Most mega-projects in the U.S. have been too large for local and state governments to finance the entire public share. Traditionally, the federal government filled the gap, which created perverse incentives (why look a gift horse in the mouth), added costs (Davis-Bacon or added administrative costs) and made it harder for local and state officials to influence projects when the federal financing role was dominant.
- A large expenditure of public money immediately attracts proponents and opponents whose interests may have little to do with the ostensible purposes of the project. This can be exaggerated by the fact that at least some of the parties (for example construction engineering and contracting, and/or labor) derive immediate benefits from the project itself but have less interest in the long-term performance of the system they build. Pressures based on short-term self-interest can, and sometimes do, harm the long-term outcome of a project.
- Mega-project justification is never based solely on commercial (market) objectives such as customer revenues and operating costs. Instead, mega-projects inevitably entail putative public benefits and costs, such as reduced traffic congestion or emissions and improved safety, that a private investor or operator cannot or will not realize. They may also involve aesthetic or image goals (making a world-class statement, pursuing the "technological sublime") that only have perceived public value. These public benefits can only be realized through public involvement, but they are not easy to define in the same dollar terms as investment costs and user revenues. In some cases those who perceive the benefits are not required to pay for them.
- Mega-projects are also large enough to have impacts that extend well beyond the boundaries of the project, including land condemnation, noise, urban development, access for disadvantaged, job creation, etc. As a result, the public at large, and their elected representatives at all levels, subject the project to intense review and often impose constraints (such as environmental reviews) that tend to delay the project and add costs that would not otherwise be encountered. Expenditure of public money also entails requirements, such as minority business promotion, small business set-asides, buy America (or buy California), or others, that add costs and time to schedules but that are rarely explicitly reflected in budgets or plans.
- Mega-projects tend to originate as "Big Ideas" or "Visions," often promoted by public figures whose commitment to the idea is not fully matched by a detailed understanding of the potential costs and difficulties of the project. As a result, the optimistically expansive scope of the project can become de-linked from a realistic schedule or budget, with promotion based on promised scope rather than realistic budget. Putting the two back together later can be essentially impossible until the project actually commences and the gaps between promises and resources become unmistakable. It is also not uncommon for the original promoters to disown the project when it becomes clear that the initial promises can't be met: the fault obviously must be with the execution, not the idea. When this happens, project planners and managers are under attack from all sides.
- Because of the very heavy public involvement, mega-projects rapidly become politicized, with both proponents and opponents couching their arguments in simplified and exaggerated "sound bite" form, making responsible discussion difficult if not impossible. When mega-projects become partisan political issues, policy and funding support become unstable, which is highly destructive for management of projects that need committed goals and reliable, predictable stable funding.

- Put another way, mega-projects always require a generally agreed set of goals or objectives along with a stable source of funding that predictably covers the size and life span of the project. Starting mega-projects without agreed objectives and predictable funding creates risks for the future, but putting in place long-term funding is a challenge, possibly an impossible one in today's political climate.
- Since mega-projects function in a highly litigious environment (especially true in California), much of the open public discussion -- and a lot of the available "expert" opinion – is carefully tailored to protect legal (or political) positions rather than to highlight uncertainties and risks.
- Mega-project promoters and managers are sometimes able to dominate discussion because of the sheer scale of the "expertise" they can deploy. At the same time, the proponents' (and opponents') experts may have a hard time being truly impartial: as in the legal arena, it can be very difficult to distinguish between a paid expert's arguments versus his or her professional opinions. The polite term is "optimism bias" or, (a new term) "pessimism bias."
- Under the best of circumstances, it can be hard for experts to communicate effectively to decision-makers in a promotional or oppositional arena. "Vision" (positive and negative) confers a degree of commitment and certainty ("optimism bias") in public argument that no real expert should ever express. Real project management experts think in terms of **un**certainties, not certainties, and they spend more time on what they **know** can go wrong than on what they **hope** will go right. Experience time and again shows that **all** forecasts, be they of demand, revenue, operating costs, capital costs, schedules, benefits, etc., and no matter how expertly prepared, are at best approximations subject to a range of errors. While the error range is itself based on some factors that are potentially knowable and correctable (data weaknesses, engineering mistakes, shortage of experience in the problem at hand, etc), it will also be driven by factors that are unknown and unpredictable (population changes, economic growth, weather, etc) and that are in any case beyond the control of the project's planners and managers. The error range is greatest at the outset of a mega-project, and then gradually narrows with time and experience.
- The problem of communication of uncertainty is important. Mega-projects are often presented as if the outcome is relatively clear and reasonable – we expect this much usage, at a given cost and schedule, with definable benefits – over the life of a 30 to 50 year effort. In fact, at the outset of a project, essentially everything is a forecast subject to uncertain outcomes and very little is really known. Then, as experience happens, information evolves to accommodate reality, both in terms of costs and benefits and in terms of the most effective and achievable scope. The project that is actually **built** is often quite different from (typically less than) the one confidently described at inception. The question is whether the political or public policy process can accommodate a definition of the project, not as a certainty, but as a **process that will need to include change and adaptation** as the project proceeds. If not, effective project management can be impossible because adverse changes are inevitably attacked as errors or mistakes when in fact they are normal and unavoidable.
- PPPs are often negotiated in circumstances in which neither party understands the needs and objectives of the other. Rigidity in public procurement also tends to squeeze out the good faith flexibility that true partnerships must be based on. The net result is that the "partners" become adversaries, especially when unexpected events happen, such as inflation higher than forecast.

This all boils down into a fairly simple formulation. Mega-projects are so large and extensive that they inevitably harm interests beyond the boundaries of the project in question and they create benefits for interests that are not fully and directly committed to the long-term success of the project. They always involve a mixture of potential private (market) benefits including user charges and operating costs that the private sector is best suited to realize along with public benefits and costs (reduced pollution or emissions, noise, safety) that only government(s) can define and achieve. Perhaps more important, mega-projects can create the opportunity for benefits to go to one group (investors or contractors) while risks are borne by others (the public). All of this plays out in a political and legal arena in which very few of the participants are either wholly driven by the public interest in having a project in which the total economic benefits exceed the total economic costs or have an incentive to present their position in a fully detailed and unbiased way.

What can public officials do to improve the evaluation and management of mega-projects?

Realistically, public officials are always going to be at a disadvantage in evaluating and shaping proposed mega-projects. This is partly because of the spirit in which many mega-projects are formed and presented and partly because most of the apparent information and expertise is controlled by proponents (or opponents). Many of the benefits are immediate and large, while the full impact of a mega-project (good and bad) will not be felt until well beyond the professional (or political) lifetime of the current participants; this creates a very strong bias toward getting started. With this said, I think there are a number of principles that could be considered.

- The best time to influence a mega-project is at the very beginning. Once funds flow and beneficiaries are identified (and lobbies formed), change of direction is much harder. Early and thorough investigation always pays off.
- Most mega-projects are based on a combination of financial (market) and economic (public) analysis. To the extent that the private sector is expected to play a role as operator or financier, then the private sector should be asked to comment on and commit to that role as soon as possible. Whatever else its strengths and weaknesses may be, the private sector can do an excellent job of financial and risk analysis: a lack of interest from the private sector (where interest is defined as being willing to invest and take risks rather than sell products or services) is a useful signal that better project definition would be a good idea. Conversely, government is usually asked to take a role in mega-project finance and risk based on alleged public benefits; but, those benefits are not always clearly stated and evaluated so that public officials can decide whether the benefits are worth the risks. Since the real job of public officials is to define and protect the public interest, all mega-projects should start with a clear and detailed listing of expected public benefits and risks along with the best possible measure that can be attached to those values. This is not to say that public benefits and risks are not real and significant – just to say that they ought to be subjected to explicit description and evaluation, and that those who demand benefits ought to be on the list to pay.
- California is uniquely privileged to have a superb public university system including individual and institutional expertise in virtually every economic, engineering and policy field. Public officials should make full use of this deep resource. In addition, the legislature

has the Legislative Analyst's Office, which has the capability to investigate and report on virtually any question of interest to the legislature.