# Editorial

Corrado lo Storto

School of Engineering,
University of Naples Federico II, DIEG,
Piazzale V. Tecchio n. 80, 80125 Napoli, Italy
E-mail: corrado.lostorto@unina.it

Infrastructure includes highly heterogeneous assets whose main task is to provide public services and/or public goods to industry and households. The most common infrastructure assets are (Rietveld and Bruinsma, 1996; Grimsey and Lewis, 2002): highways and roads, rails, bridges and tunnels, parking facilities, mass-transit and airport facilities, seaports, education buildings, electricity, gas and water supply facilities and distribution systems, waste treatment facilities, broadcast and wireless towers, telecommunication, cable networks, satellite networks, courthouses, hospitals, schools, correction facilities, stadiums, and subsidised houses.

Both scholars and policy-makers recognise that infrastructure investment is an important lever to stimulate economic development and growth. Indeed, infrastructure projects boost employment by creating new jobs and a highly dispersed construction and manufacturing economic activity, generating a considerable multiplier effect in a country economy. Further, infrastructure investments may help to gain business productivity (i.e., saving costs and/or increasing production amount) and remove barriers that hamper or impede development (Ahmed and Donovan, 1992). Public investment in infrastructure assets represents an important part of the European Union convergent strategy.

Recent literature reports that planning, development and management of complex and large scale infrastructure projects often are seriously flawed, failing to address the challenge they face (Esty, 2004). Investment costs exceed the initial budget, construction time and performance miss the target, and financial returns or even financial sustainability are disappointing (Flyvbjerg et al., 2003; Miller and Lessard, 2000). That is partially due to the intrinsic complex nature of this kind of projects. Indeed, as both literature and experience suggest, they are inherently risky because of long planning horizons and interface complexity, they are often unique and technology required is not standard, the project scope remains not enough defined for a long time, decision-making and planning are multi-actor processes with several conflicting goals and interests.

Developing infrastructure projects is a resource-intensive task. Traditionally, governments have funded infrastructure through general taxes or the municipal bond market. Funding sources may include grants from the national government, grants from local governments, borrowings, leasing, equity. Over the last decades, serious cuts to public expenditure and the search for a greater efficiency and long-term financial sustainability, have induced local and national governments in both developed and developing economies to move towards a dramatic liberalisation and opening-up of infrastructure sectors with the introduction of new regulatory regimes in the markets.

However, project weakness and failure also depend on the quality of the technical and economical feasibility analysis, inappropriate risk assessment and sharing among all

actors involved in the development and management of the infrastructure, and inadequate financing model design. Projects are often considered in isolation and interdependencies and network relations between different projects tend to be underestimated. Approaches, methodologies, and tools commonly adopted for the analysis and evaluation of projects may not be successful with complex and large scale projects and cost overruns and/or benefit shortfalls for the majority of this category of projects is the rule. In particular, they do not take into account critical issues of project analysis and evaluation which may have tremendous significance for project performance:

a the flexibility (or inflexibility) of the technology involved with these large scale projects

b uncertainties related to the possible variations and random errors in the values of the parameters and their estimates

c uncertainties related to alternatives not taken into account

d the predictability faulty judgments or cognitive biases due to heuristics and rules of thumb adopted to simplify decision-making.

This special issue collects a selection of papers that focus on different aspects related to the analysis and evaluation of complex and large scale infrastructure projects.

Energy and utilities infrastructure assets provide people with essential services. Effective investment in these industries is important for delivering energy and water services at an acceptable level of quality and cost, while market regulation is necessary to make the sector attractive to the private investors. However, despite a great effort of governments to establish new regulatory regimes and liberalise the sector over the last decade, in many cases the operating efficiency and quality of infrastructure assets remain still below standards. Two papers of this special issue focus on the assessment of infrastructure assets efficiency in the energy and water service industries. Seema Saxena and Tripta Thakur in their paper measured technical efficiency of electricity distribution companies in India after the implementation of EA 2003. They use data envelopment analysis (DEA) to assess the operating performance of Indian power distribution sector. Their sample includes only companies that distribute energy, both private or government owned, and was selected to cover all Indian regions. The scholars found important scale inefficiencies that ask for a major restructuring and downsizing of companies operations in many states of India. In the second paper, Corrado lo Storto conducted a benchmarking study of the Italian water service industry. He also adopted DEA as a technique for measuring efficiency of operations. The unit of analysis in his study is the optimal territorial area (ATO), a circumscribed geographical area where the provision of integrated water services is considered efficient. Findings suggest that there might be an optimal ATO size that is conducive to higher efficiency scores. Large scale operations and ATO size are associated to higher inefficiency rates. Finally, agglomeration economies seem to be an important factor for the provision of efficient water integrated services.

Uncertainty and risk are typical of investment in infrastructure assets that is capital-intensive and irreversible in nature. Several volatile factors may influence decision-making and performance of infrastructure investment. The third paper by P. Taneja, W.E. Walker, H. Ligteringen and M. van Schuylenburg addresses these issues. Scholars present a methodological framework – the real options-based adaptive port

planning – that supports the planner to first identify critical uncertainties in the system and then, to examine, evaluate, and incorporate flexible options for handling these uncertainties. They apply the framework to two cases in the port sector, and find that in the face of uncertainty, a flexible option approach enhances the value of a project.

Advanced communication systems are a complementary investment to other infrastructure such as energy and water utilities, education buildings, roads and railways, seaports, etc., as they contribute to economic and social development by making public and private investment that depends on high-speed communication more efficient (OECD, 2009). Costs and benefits have to be therefore accurately assessed. The paper by Husam Othman and Moncer Hariga presents a formal approach used to select the best capacity expansion alternatives for value added services projects at a leading local telecommunication operator in the UAE to improve the decision making. In their approach, after generating cash inflows and outflows for every candidate project, NPV is calculated and sensitivity and risk analysis are performed on feasible alternatives. Finally, projects are ranked according to a set of different criteria.

Transport infrastructure networks, as telecommunication, are a key factor in sustaining both developed and developing countries competitiveness, providing direct and indirect benefits to communities. According to ESCAP (2006) data, in most developing and transition countries, demand for freight and passenger transport – in particular by road – has grown 1.5 to 2 times faster than GDP, while some statistics report that public investment in transport accounts for 2 to 2.5% of GDP, and even to 4% in those countries where the effort to modernise infrastructure is greater (Mackie and Smith, 2006; International Transport Forum, 2011; The World Bank, 2005). Elisabetta Venezia in her paper investigates whether transport investment has an impact on employment and GDP. The outcome of the empirical study she conducted shows that there is an association between investment and economic growth in terms of employment and GDP. She finds that the nature of investment remains a strategic factor to have desired effects, and that technology investment has a major impact on growth in the short term.

## References

Ahmed, R. and Donovan, C. (1992) *Issues of Infrastructural Development: A Synthesis of the Literature*, International Food Policy Research Institute, Washington, DC.

ESCAP (2006) 'Statistical abstract of transport 2005', available at http://www.unescap.org/ttdw/statabs/index2.asp (accessed on 29 October 2010).

Esty, B.C. (2004) 'Why study large projects? An introduction to research on project finance', *European Financial Management*, Vol. 10, No. 2, pp.213–224.

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

Grimsey, L. and Lewis, M.K. (2002) 'Evaluating the risks of public-private partnerships for infrastructure projects', *International Journal of Project Management*, Vol. 20, No. 2, pp.107–118.

International Transport Forum (2011) 'Trends in transport infrastructure investment 1995–2009', Report, available at http://www.internationaltransportforum.org/statistics/StatBrief/2011-07.pdf (accessed on 29 November 2011).

Mackie, P.J. and Smith, N. (2006) *Road Transport Infrastructure: Business Trends and Prospects in Infrastructure to 2030*, Vol. 2, pp.463–495, OECD, Paris.

Miller, R. and Lessard, D.R. (2000) *The Strategic Management of Large Engineering Projects*, MIT Press, Cambridge MA.

OECD (2009) 'The role of communication infrastructure investment in economic recovery', Report of the Directorate for Science, Technology and Industry, DSTI/ICCP/CISP(2009)1/FINAL, JT03264896.

Rietveld, P. and Bruinsma, F. (1996) *Is Transport Infrastructure Effective?*, Springer, Berlin.

The World Bank (2005) 'Transport sector overview', available at http://www.worldbank.org/transport/whytsimp.htm (accessed on 3 March 2006).