

Koppenjan, J.F.M. (2015). Public–Private Partnerships for green infrastructures. Tensions and challenges. In: *Current Opinion in Environmental Sustainability*, 12 (February 2015), 30-35.

Public-Private Partnerships for Greening Infrastructures. Tensions and Challenges

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Recently, the OECD has suggested to seek private investment to realize and accelerate the realization of low-carbon, climate-resilient (LCCR) infrastructure. One of the options explored was the use of Design, Build, Finance, Maintain and/or Operate (DBFMO) contracts. Since experiences with these forms of Public Private Partnerships are diverse, making the realization of government's sustainability policies dependent upon these practices is not without risks. In this paper tensions between DBFMO contracts and LCCR-objectives are explored. Engaging in PPPs requires these tensions to be addressed.

Governments must ensure that success conditions are in place, like the presence of a sound LCCR policy, potentials for return on investments, and the skills to act as professional client and competent contract and stakeholder manager. Last not least it requires the greening of the predominantly economic oriented regulation framework of PPPs.

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Introduction

In February 2012 the OECD organized an expert meeting in Paris to discuss the potentials of private investments in low-carbon, climate-resilient (LCCR) infrastructure. The investments they envisioned are aimed at new and existing public infrastructures in for instance the field of transportation, energy, water management, public buildings or urban development, in order to increase their contribution to sustainability, more specifically to the reduction of the emissions of greenhouse gasses and to the adaptation to climate change. [1**] Investments in infrastructures were seen as a smart way to create a long-term and large scale lock-in in LCCR-friendly technologies, thus realizing a substantive improvement in the sustainable performance of urban and societal systems. One of the options explored were the potentials of public-private partnership (PPP) and more specifically the use of Design, Build, Finance, Maintain and/or Operate (DBFMO) contracts. DBFMO contracts were developed in the UK and have been copied in many developed countries. [2, 3] They give private consortia of banks, constructors and service suppliers a concession to invest in new or existing public infrastructure. Concession periods are 15 years or more, granting private parties operation monopolies in order to enable them to recover their investments. The contracts have an integral nature. They combining design, construction,

operation and/or maintenance. From a LCCR perspective this may be attractive, since it allows for a life cycle approach. DBFMO contracts give contractors incentives to invest in optimizations that improve the contribution of the infrastructure to LCCR objectives during the various phases of the life cycle of the project. For instance, since contractors bear the cost of the exploitation of a public building, they have an incentive to take the cost of energy use into account and therefore to design a sustainable building with a low energy consumption. [4, 5*]

The OECD suggests that by pursuing PPPs governments may entice private investment in LCCR-infrastructure when public funds fall short. However experiences with PPP are diverse. Besides successes, failures are reported. The performance of PPPs is contested. [6, 7, 8**] Linking ambitions to realize LCCR infrastructures to PPPs and more specifically by pursuing DBFMO contracts may introduce risks, which jeopardize rather than increase the likeliness of attaining LCCR objectives. In this paper the assumptions underlying the OECD ideas are investigated by exploring six potential tensions between PPPs and LCCR-objectives: notably tensions between

1. investments in infrastructure and LCCR-objectives;
2. preferences for proven technology and innovation;
3. long term contracts and flexibility;
4. economic regulation and sustainability considerations;
5. profitability and sustainability;
6. the government business partnership and stakeholder involvement.

Insights in the nature of these tensions also provide clues regarding the challenges policies and research need to address in order to meet the conditions under which for PPS and especially DBFMO contracts may contribute to the LCCR performance of infrastructures in urban and societal systems.

Tension 1. Investments in infrastructure versus the realization of LCCR-objectives

The first assumption underlying the proposed strategy of OECD is that (private) investments in infrastructure are a smart way to contribute to sustainable performance, since a long term lock-in in technologies and practices that contribute to sustainability are created. However this strategy is vulnerable in a couple of respects. First of all it assumes governments are capable of choosing the right projects. This is not straightforward. Table 1 presents a typology of infrastructure projects illustrating that 1) many PPPs contribute to the realization of infrastructures that are all but LCCR-friendly and 2) that LCCR, like sustainability, is a far from straightforward concept. Projects can be climate resilient (CR) but increase the emissions of greenhouse gasses (GHG) like CO₂, and the other way around. [1**, 9, 10]

Table 1. Examples of how infrastructure projects may contribute to LCCR policies

	<i>Projects with negative mitigation impacts (increase of GHG)</i>	<i>Projects with positive mitigation impacts (decrease of GHG)</i>
<i>Projects with negative adaptation impacts (CR)</i>	New highways, roads, bridges without e.g. appropriate drainage systems	Small hydropower (where competing with scarce water supplies; dense urban

		developments
<i>Projects with positive adaptation impacts(CR)</i>	Water desalination plants; air conditioning in (conventional) infrastructure	Waste to energy facilities; urban bus lanes with electric or LNG powered vehicles; multi modal transportation; retrofitting power plants; sustainable building; urban greenery

Source: [1**]

Research shows that the LCCR performance of for instance a public bus system is not strait forward, but depends on many variables like the choice of busses, the layout of the route, the number of stops, the driving style of the drivers. [11] Also investments in infrastructure may be costly, as a result of which investments in less sustainable, but also less expensive infrastructure or in measures that are not infrastructure based may be more ciost-effective. For instance, in the field of public transport infrastructure, the choice for rail infrastructure may be preferable from a sustainability point of view, may be less wise than an investments in rapid buss transport systems that need a far less expensive infrastructure. [12, 13] To avoid unaffordable infrastructure investments in dikes and levees, in Dutch water management policies a shift is made towards behavioral measures like evacuation preparation as an alternative.[8]

So the contribution of private investments to sustainability depends on whether governments know to select the right projects. Furthermore, policies should also be aimed at the use of projects in the next phases of their lifecycle (maintenance, operation, transfer and recycling), since the actual contribution of the infrastructure to LCCR objectives has to be realized in these phases.

Tension 2. Proven technology versus innovation

DBFMO contracts are expected to enhance innovation. However, in practice the risk adverse attitude of private parties often result in a choice for proven technology rather than for innovative solutions. As far as governments expect private involvement to automatically result in the adoption of innovative LCCR-friendly technologies, they are bound to be disappointed. [7, 8**]

As governments often do not know which technologies contribute to LCCR-objectives, they may ask the market to come up with proposals. DBMFO contracts normally have procurement procedure that forbid communications between governments and private parties that prepare bids, in order to maintain conditions of competition. Early private involvement require changes in procurement procedures of DBFMO projects, for instance by introducing the procedure of competitive dialogues. [14*] This allows bidding consortia to come up with innovative ideas, under competitive conditions. This way of doing things also requires different selection criteria during procurement. Currently governments mostly select private consortia that come up with the financially most attractive proposal. Competition in terms of sustainable performance requires that of LCCR performance criteria are used too.

Tension 3. Long term contracts versus the need for flexibility.

DBFMO-contracts are long-term contracts: they have concession periods of 15, 20 of even 30 years, sometimes even longer. In the short term, a lock-in may be realized of current LCCR technologies, but

communities may subsequently get stuck with these technologies while new developments or insights make these technologies outdated. Including LCCR performance rewards in the contract that create incentives for private consortia to keep investing in upgrading LCCR-technologies may increase flexibility. Granting the contract on the basis of performance instead of detailed reference designs allows private firms to keep looking for LCCR optimizations during the entire project life cycle. Likewise provisions for reviewing contracts in between and updating agreements in order to do justice to new technological findings and new insights may enhance flexibility. Contract design may also build upon 'real option' theory, which implies not simply choosing the cheapest proposal, but choosing bids that leave options open for future alternatives. [15] In public bus transport, for instance, this might involve additional investments in separate lanes, tunnels and viaducts that make it possible to upgrade the system to light rail in the future. [16]

Tension 4. Profitability versus sustainability

The absence of a positive business cases and the opportunity to recover investments is one of the main reasons why PPPs fail. [4, 5*] If LCCR requirements lead to higher costs that jeopardize the return on investments, these need to be compensated by either additional government contributions, or by redesigning the project in such a way that a positive cash flow is accomplished. One way to do so it by value capturing and scope management.

Experiences in the Netherlands and elsewhere [14*, 17, 18] show that there is a great variety of options for capturing value. E.g. by linking-up of water infrastructure investments with nature development additional funds may become available for project development.. In urban planning the construction of urban transportation systems may be combined with the building of new neighborhoods or real estate. This requires new planning and management paradigms that leave room for integral planning and scope management, as well as new management and planning skills. For governments pursuing LCCR policies, this way of working also implies the building of new alliances with new partners in other then the familiar sectors.

Tension 5. Economic regulation versus safeguarding sustainability

Market conditions and competition, essential for viable private involvement, are generally underdeveloped in infrastructure construction and infrastructure-based service delivery. As a result private parties develop market power and may engage in rent seeking and opportunistic behavior. In order to ensure the proper realization and functioning of new or existing public infrastructure by PPP arrangements, regulation is necessary. [19] Regulation is realized by contracts and contract management. Contracts include mechanisms such as price regulation, service quality standards and coverage targets, to incentivize private consortia to construct and operate the infrastructure effectively. [20] The proper design and use of DBFMO contracts require a government that can act as a professional client and capable contract manager. Regulation of DBFMO contracts during their lifecycle also presupposes an adequate legislative framework and oversight. A capable regulator is needed that monitors the behavior of private companies. In western democracies audit offices and PPP expertise centers are part of the regulatory landscape. [21*]

Current regulations have an economic orientation. Likewise, regulatory agencies and PPP units are focused on economic regulation, making sure competition is present and fair and governments pay

market prices. Pursuing PPP for LCCR-infrastructure requires a greening of the regulatory framework. Regulation should include efforts and provisions to safeguard sustainability, more specifically LCCR objectives. [22*] Contracts should include requirements regarding the reduction of the use of fossil resources and the reduction of GHG gasses and measures aimed at the adaptation to climate change. However, this implies that governments themselves are committed to LCCR objectives, and have the expertise to make judgments regarding LCCR performance. LCCR standards and indicators have to be available. All this presupposes a transition in regulatory contexts that in many countries and sectors is not yet underway. [23]

Tension 6: the government-business interface versus stakeholder involvement

Political risks are an important reason for private investors to refrain from investments in public projects. They perceive resistance of residents, users, pressure groups and local governments against infrastructure projects as serious political risks. [4, 5, 7] For instance, in recent years targets of the Dutch government with regard to wind energy by building inland wind farms have not been realized, due to the resistance of local governments and residents. [24] Government and private parties are often preoccupied with realizing their joined ambition, while neglecting their dependencies on third parties. DBFMO contracts fail to meet expectations due to a lack of stakeholder analysis and stakeholders management. In the case of wind energy participation and co-ownership are seen as prerequisite for transforming initial resistance into support. Adequate stakeholder management should be part of the repertoire of strategies of governments to reduce the perceived risks for private parties to invest in LCCR infrastructure. [21*, 22**] Since stakeholders are not necessarily committed to LCCR policies, stakeholder management should be aimed at aligning private, public and stakeholders interests with each other and with LCCR objectives. Private investments in LCCR infrastructure requires stakeholder participation, perhaps even to an extent that PPPs turn into Public Private Community Partnerships (PPCPs).

Conclusions

Striving for private investment to realize and accelerate LCCR infrastructure when public budgets fall short is an attractive strategy at first sight. In this contribution we examined the potential tensions between PPPs and LCCR-objectives. Table 2 summaries this exploration.

Table 2. Tensions between DBFMO contracts and LCCR requirements

	<i>Characteristics of DBFMO contracts</i>	<i>Requirements from LCCR perspective</i>	<i>Research and policy challenges</i>
<i>Tension 1</i>	Infrastructure focused	Ensuring LCCR performance	<ul style="list-style-type: none"> • Development and selection of high potential, LCCR friendly alternatives • Ensuring LCCR performance during the life cycle of the project
<i>Tension 2</i>	Proven technology	Innovative technology	<ul style="list-style-type: none"> • Optimize life cycle approach • Steer on innovative competitive dialogues

<i>Tension 3</i>	Long term contracts	Application of new technologies and practices	<ul style="list-style-type: none"> • Reel options • Provisions in contract for adaptations • Functional specification
<i>Tension 4</i>	Return on investment	Costs of sustainability	<ul style="list-style-type: none"> • Addressing affordability • Ensuring positive business cases • Value capturing and scope management
<i>Tension 5</i>	Economic regulation	Sustainability considerations	<ul style="list-style-type: none"> • Development and institutionalization of LCCR indicators • Greening of regulation and management
<i>Tension 6</i>	Government-business interface	Stakeholder involvement and ownership	<ul style="list-style-type: none"> • Stakeholder management and public-private-society partnerships

PPP is not without risks and may be a dangerous ally, jeopardizing the success and reputation of LCCR infrastructure. Engaging in PPPs and more specifically in DBFMO-projects requires these tensions to be addressed. In some situations it may be sensible to refrain from PPPs or DBFMO-contracts. Pursuing LCCR infrastructures by DBFMO contracts imposes high demands on governments as policy makers, clients, regulators and stakeholder managers, as the inventory of policy and research challenges illustrates. Last not least it requires the incorporation of sustainability considerations in the predominantly economic oriented regulation framework of PPPs.

References

1. **Corfee-Morlot, J. *et al.*, "Towards a Green Investment Policy Framework: The Case of Low-Carbon, Climate-Resilient Infrastructure", *OECD Environment Working Papers*, No. 48, OECD Publishing, 2012. <http://dx.doi.org/10.1787/5k8zth7s6s6d-en>
In this working paper the OECD philosophy regarding private investments in LCCR infrastructure is presented. It includes an overview of what is considered LCCR infrastructure. Also, this paper shows that private investments include more than PPP and DBFMO-contracts.
2. Bennet, E., P. Grohmann, *Joint Venture Public Partnerships for Urban Environmental Services. Report on UNDP/PPPUE's Project Development Facility 1995-1999*, New York: UNDP & Yale University; 2000.
3. Hodge, G., C. Greve (eds.), *The Challenge of Public Private Partnerships. Learning from International Experience*, Cheltenham: Edward Elgar; 2005.
4. Akintoye, A., M. Beck (eds.), *Public Private Partnerships: Managing Risks and Opportunities*, London: Blackwell Publishers; 2003
5. *Hodge, G.A., C. Greve, A.E. Boardmann (eds.), *International Handbook of Public Private Partnerships*, Cheltenham UK: Edward Elgar Publishing; 2010
This handbook gives an encompassing and state of the art overview of experiences with PPP and DBFMO contracts worldwide.

6. Reside, Jr., *Global Determinants of Stress and Risks in Public-Private Partnerships (PPP) in Infrastructure*, Tokyo: Asian Development Bank Institute; 2008
7. Koppenjan, J.F.M., Public Private Partnerships and Mega-Projects, in: H. Priemus, B. Flyvbjerg, & B. van Wee, (eds) *Decision-making on mega-projects: cost-benefit analysis, planning and innovation*, Cheltenham: Edward Elgar; 2008: 189-214.
8. **Koppenjan, J.F.M., Public-Private Partnerships and LCCR investments. Paper written in the context of the expert meeting on Mobilizing Private Investments in Low-Carbon, Climate Resilient Infrastructures, 6 February 2012, OECD Headquarters, Paris; 2012.
This paper gives an overview of forms of and experiences with PPP and the potentials and limitations in applying PPP to enhance and accelerate the realization of LCCR-infrastructure.
9. Moser, S.C., Adaptation, mitigation, and their disharmonious discontents: an essay. *Climatic Change*, 2012, Vol. 111, No. 2., pp. 165-175
10. Viguié, V., and S. Hallegatte *Trade-offs and synergies in urban climate policies*, Nature Climate Change DOI:10.1038/nclimate1434; 2012
11. Chester, M., and A. Horvath, Environmental assessment of passenger transportation should include infrastructure and supply chains, *Environmental Research Letters*, 2009, 4(2), 024008.
12. OECD/ITF, *GHG Reduction Strategies in the Transport Sector*, Paris: OECD Publishing, 68;2009
13. Sakamoto, et al , *Financing Sustainable Infrastructure. Sustainable Transport: A source book for Policy-makers in Developing Countries*. Module if. Deutsche gesellschaft für Technische Zusammenarbeit (GZT) GmbH. ; 2011
14. *Lenferink, S. and L.E.M. Hoesen , The interplay between public procuring authority and private competitors: Experiences with competitive dialogue, in: Management and Innovation for a Sustainable Built Environment, 20 – 23 June 2011, Amsterdam, The Netherlands, ISBN: 9789052693958; 2011
This paper discusses experiences with early involvement of private parties and citizens in procurement practices to accomplish innovation while upholding conditions of competition.
15. Wijnia, Y.C. and P.M. Herder: Options for real options - Dealing with uncertainty in investment decisions for electricity networks, pp. 3682-3688. In: *Proceedings of the IEEE 2005 International Conference on Systems, Man and Cybernetics*, Oct. 10-12, 2005. At: Waikoloa, Hawaii, USA. [s.l.]: IEEE, Eds.: Mark Johnson. International Proceedings (refereed) ISBN: 0-7803-9298-X.; 2005.
16. Van Gestel J.F.M. Koppenjan, I. Schrijver, A. van de Ven & W.W. Veeneman, Managing Public Values in Public-Private Networks: A Comparative Study of Innovative Public Infrastructure Projects, *Public Money and Management*, 2008, 28(3): 139-145.
17. Koppenjan, J.F.M., The Formation of Public-Private Partnerships: Lessons from Nine Transport Infrastructure Projects in the Netherlands, *Public Administration*, 2005, 83, (1): 135-157.
18. Mu, R., W.M. de Jong, J.F.M. Koppenjan, The rise and fall of Public-Private Partnerships in China: a path-dependent approach, *Journal of Transport Geography*, 2011, 19: 794-806
19. ten Heuvelhof, E., M. de Jong, M. Kars & H. Stout, *Strategic behaviour in network industries: A Multi-disciplinary approach*, Cheltenham: Edward Elgar; 2009.
20. Jensen, M. & W. Meckling, *Theory of the Firm: Managerial behavior, Agency costs and capital structure*, Journal of Financial Economics, 1976 3: 305-360.

21. *Koppenjan, J.F.M. and B. Enserink, Public Private Partnerships in *Urban Infrastructures: Reconciling Private Sector Participation and Sustainability*: in *Public Administration Review*, 2009, maart/april: 284-296.
This article presents a review on practices of private sector participation in urban sustainable infrastructure worldwide, presenting best and bad practices.
22. **Johnstone, N, and L. Wood, *Private Firms and Public Water. Realising Social and Environmental Objectives in Development Countries*. Cheltenham: Edward Elgar Publishing Limited; 2001.
This book gives an in depth analysis of how social and environmental objectives can be done justice in practices of involving private firms in public infrastructure based on theoretical considerations and empirical findings in various countries and sectors. It also emphasizes the importance of making the connection with local, informal practices and communities and issues of affordability.
23. Koppenjan, J.F.M, N. Frantzeskaki, D. Loorbach & N. Ryan, (eds.) Governing Systems Transitions towards Sustainability: theoretical and Empirical Explorations, Special Issue, *Int. J. Sustainable Development*, 2012, 15 (1/2): 1-186.
24. Wolsink, M., Wind power implementation: The nature of public attitudes: Equity and fairness instead of 'backyard motives' *Renewable and Sustainable Energy Reviews*, 2007, Volume 11, Issue 6, pp 1188-1207