INTERNATIONAL CENTER FOR PUBLIC POLICY

International Center for Public Policy
Working Paper 14-09
January 2014

# Financing Infrastructure

**Luiz de Mello**
**Douglas Sutherland**

Georgia State University | Andrew Young School of Policy Studies

Georgia State University | Andrew Young School of Policy Studies

**International Center for Public Policy**
**Working Paper 14-09**

# Financing Infrastructure

**Luiz de Mello**
**Douglas Sutherland**

**January 2014**

International Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia 30303
United States of America

Phone: (404) 651-1144
Fax: (404) 651-4449
Email: hseraphin@gsu.edu
Internet: http://aysps.gsu.edu/isp/index.html

Georgia State University | ANDREW YOUNG SCHOOL OF POLICY STUDIES

# International Center for Public Policy
# Andrew Young School of Policy Studies

The Andrew Young School of Policy Studies was established at Georgia State University with the objective of promoting excellence in the design, implementation, and evaluation of public policy. In addition to two academic departments (economics and public administration), the Andrew Young School houses seven leading research centers and policy programs, including the International Center for Public Policy.

The mission of the International Center for Public Policy is to provide academic and professional training, applied research, and technical assistance in support of sound public policy and sustainable economic growth in developing and transitional economies.

The International Center for Public Policy at the Andrew Young School of Policy Studies is recognized worldwide for its efforts in support of economic and public policy reforms through technical assistance and training around the world. This reputation has been built serving a diverse client base, including the World Bank, the U.S. Agency for International Development (USAID), the United Nations Development Programme (UNDP), finance ministries, government organizations, legislative bodies and private sector institutions.

The success of the International Center for Public Policy reflects the breadth and depth of the in-house technical expertise that the International Center for Public Policy can draw upon. The Andrew Young School's faculty are leading experts in economics and public policy and have authored books, published in major academic and technical journals, and have extensive experience in designing and implementing technical assistance and training programs. Andrew Young School faculty have been active in policy reform in over 40 countries around the world. Our technical assistance strategy is not to merely provide technical prescriptions for policy reform, but to engage in a collaborative effort with the host government and donor agency to identify and analyze the issues at hand, arrive at policy solutions and implement reforms.

The International Center for Public Policy specializes in four broad policy areas:

- Fiscal policy, including tax reforms, public expenditure reviews, tax administration reform
- Fiscal decentralization, including fiscal decentralization reforms, design of intergovernmental transfer systems, urban government finance
- Budgeting and fiscal management, including local government budgeting, performance-based budgeting, capital budgeting, multi-year budgeting
- Economic analysis and revenue forecasting, including micro-simulation, time series forecasting,

For more information about our technical assistance activities and training programs, please visit our website at http://aysps.gsu.edu/isp/index.html or contact us by email at hseraphin@gsu.edu.

# *Financing Infrastructure**

**Luiz de Mello**
Deputy Chief of Staff of the Secretary-General
**Douglas Sutherland**
OECD

**Abstract**

The need for infrastructure building, replacement and updating is large worldwide and governments - particularly subnational governments - will need to mobilise budgetary resources while simultaneously restoring public finances to sound health and meeting other spending pressures. This paper considers the factors affecting investment in infrastructure (with an emphasis on fixed networks), the specific characteristics of the different financing modalities applicable to subnational governments and highlights the challenges that are specific to subnational governments. In order to rise to the challenge, subnational governments will need to enhance their capacity to raise own revenue, to make the most of intergovernmental grants and transfers, and to mobilise private-sector funds, including by tapping capital markets, where permitted. In order to exploit fully the various financing options, subnational governments in many countries will need to strengthen their technical capacity to design and implement investment projects, as well as manage increasingly complex, multi-year budgets, especially when there is private sector involvement.

Keywords: infrastructure Investment, decentralisation,
JEL codes: H40, H54

* This paper was prepared for the workshop on "Infrastructure and Decentralisation: A Memorial Conference in Honour of Dana Weist", organised by the International Centre for Public Policy, Andrew Young School, Georgia State University, and the World Bank, which took place in Atlanta, GA, on 25-27 September 2011. We are indebted to workshop participants, in particular Giorgio Brosio, Kent Eaton, Jonas Frank, Jorge Martinez-Vasquez, Paul Bernd Spahn, as well as Teresa Ter-Minassian, for helpful comments and discussions. The opinions and analyses presented in this paper are the authors' own and do not necessarily reflect those of the OECD or the Organisation's member countries.

## 1. Introduction

1. Global infrastructure investment needs are estimated by the OECD at about 2.5 percent of world GDP per year in the coming 20 years in the areas of electricity transmission and generation, surface transport (roads and rail), telecoms and water. Estimates could rise to some 3.5 percent of world GDP if additional energy-related investments (such as oil, gas and coal) are taken into account. In the developing world, rapid urbanisation requires increased public investment in water, sanitation, transport and urban amenities to meet the needs and demands of a growing urban population and to deliver on MDG commitments. Rising incomes in emerging-market economies create demands for addressing deficiencies in provision, upgrading existing infrastructure and improving access to the underserved population. The need to replace and update ageing infrastructure, and to maintain competitiveness in international markets in an increasingly tight budgetary environment poses challenges for governments in mature economies to provide and finance infrastructure. At the same time, technological change affects the nature of, and scope for, government provision of infrastructure services in developing, emerging-market and mature economies alike.

2. The huge resources required to meet infrastructure demands call for combined efforts by the government – including the central and subnational administrations, as well as the public enterprise sector – and private-sector partners. In particular, where infrastructure provision and financing are carried out in a decentralised manner, co-ordination rises in importance, particularly when resources are limited. Within the government, co-ordination of infrastructure provision amongst subnational jurisdictions, as well as with national priorities and line ministries, is required to ensure investment is well designed and not wasteful. At the interface with the private sector, governments of all levels need to consider the best arrangements to ensure value for money. In this context, the role of subnational governments needs to be set in a broader context of government intervention.

3. Governments intervene in infrastructure provision to address market failures that could lead to the under-provision of services, to take into account externalities or public-good features when they are predominant, or to limit the exercise of market power in the case of natural monopolies. This broader context includes decisions on the ownership structure (public or private) of infrastructure, the delivery modalities (pure government provision, public procurement, concessions, PPPs, etc.), the financing options for these different modalities (budget appropriations, user charges), and the regulatory regime for service delivery (market- and/or government-based regulation).

4. In this paper, we address general issues related to infrastructure investment but focus on fixed networks, such as water/sanitation, energy and transport. These networks are interesting, because they require investment that is lumpy and largely irreversible, and therefore costly, which calls for considerable financing for instalment and maintenance. They also account for the bulk of infrastructure development budgets around the world and also often generate a future stream of revenue that accrues to the provider. Moreover, fixed networks concern most of the infrastructure investment already under way around the world and the bulk of demand for future investment. Infrastructure investment in other sectors, including for the provision of social services, such as health care and education, is discussed in Papers [3] and [13].

5. This paper identifies a few general principles that should guide policymakers' choices for financing infrastructure investment in a decentralised setting. By raising efficiency, there are

substantial savings to be made from the choice of appropriate financing, given that the costs of infrastructure investment are substantial. In particular:

- The choice of financing instrument depends on the nature of the investment (size, revenue-generating capacity, potential for competition), the modality of service delivery (pure government provision, procurement, concession, PPP), the budgetary capacity of the jurisdiction (breadth and depth of own taxes, intergovernmental transfer arrangements, borrowing constraints), and the technical capacity of the jurisdiction to design and negotiate contracts with private-sector providers.
- Financing options should maximise the welfare of local residents. Perception of the role of government matters and affects the willingness to pay for services. If local residents believe that provision, especially that financed locally, does not generate benefits that can be internalised by the local community, they are unlikely to be willing to pay for the services associated with the infrastructure.
- Where subnational administrations remain important providers of infrastructure, better co-ordination mechanisms can help ensure that returns to scale are exploited and inter-jurisdictional spillovers are taken into account, including through decision-making frameworks that bring together subnational and central governments, as well as other stakeholders.
- On the financing side, subnational governments typically need to enhance their capacity to raise own revenue, to make the most of intergovernmental grants and transfers, and to mobilise private-sector funds, including by tapping capital markets, where permitted. They also need to strengthen their technical capacity to design and implement investment projects, as well as manage increasingly complex, multi-year budgets, especially when there is private-sector involvement.
- To meet the infrastructure investment challenge, making better use of user charges, while dealing with associated affordability and equity drawbacks, can help make sure existing infrastructure that can generate revenue streams is used efficiently and identify where more infrastructure investment is needed, as well as creating more options for private-sector involvement.

6. The paper is structured as follows. Section 2 describes long-term global trends in investment and discusses estimates of future infrastructure investment needs. Section 3 presents a general framework for government interventions that highlights the specific characteristics of subnational governments. Section 4 discusses financing options for subnational governments ranging from budgetary sources (general revenue, intergovernmental grants and transfers, user charges, debt issuance) and private-sector co-financing. Section 5 concludes.

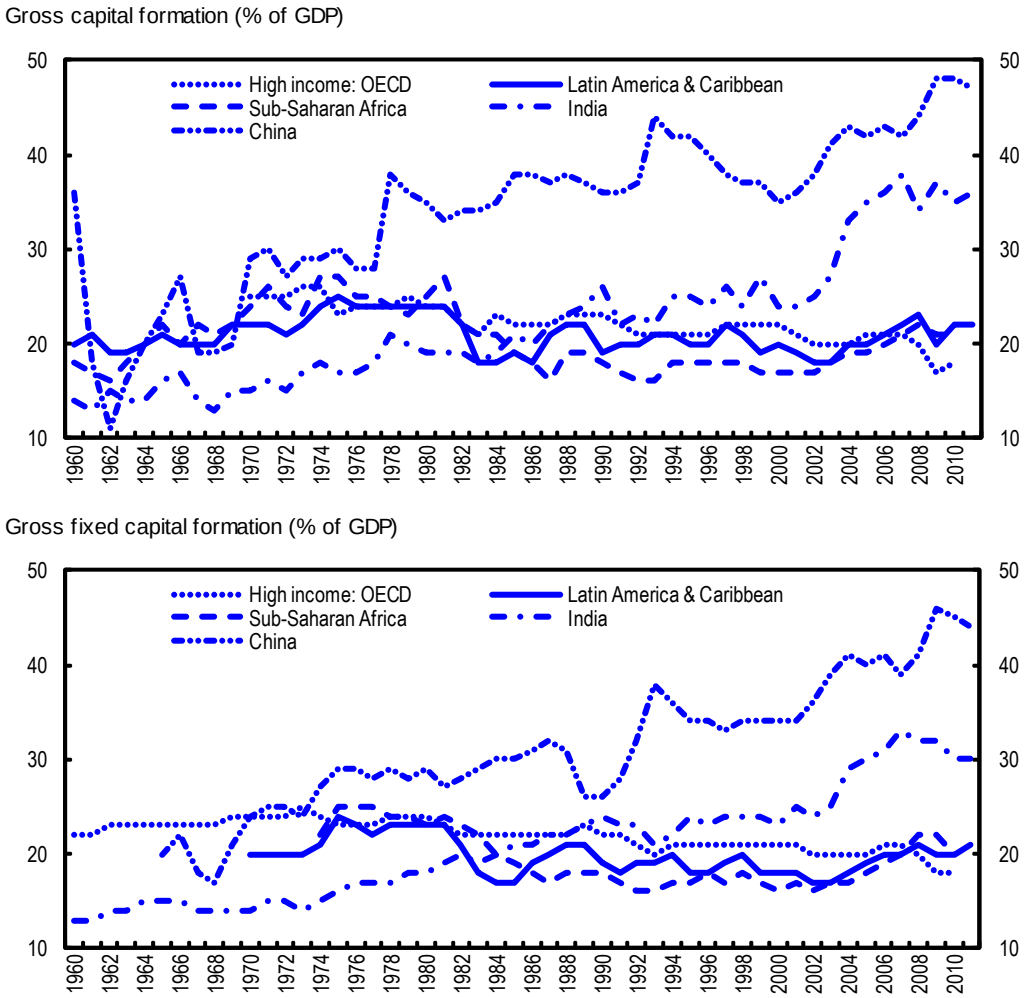
## 2. Trends in infrastructure spending and future needs

### *General trends and near-term outlook*

7. As noted in Paper [3], there is a dearth of internationally comparable data and long time-series of government spending on infrastructure development, let alone associated recurrent outlays, such as operations and maintenance. Also, national accounts data on gross fixed capital formation do not usually distinguish between infrastructure and non-infrastructure investment. To the extent that both series move together, trends in infrastructure spending could be gauged,

although rather imperfectly, by those in overall gross fixed capital formation, which vary a great deal across countries (Figure 1). Investment patterns also differ across countries: typically, investment accounts for a larger share of GDP in fast-growing economies, such as China and India, than in the high-income OECD economies.

**Figure 1. Investment trends: International comparisons, 1960-2011**




*Source*: World Bank (*World Development Indicators*).

8. Notwithstanding regional differences in infrastructure spending, there has been an increase in government investment, reflecting to a large extent counter-cyclical fiscal support in OECD countries and several emerging-market economies (OECD, 2011; World Bank, 2012). Stimulus packages accounted for 4 percent of GDP or more in some OECD countries (Australia, Canada, Korea, United States), with a strong focus on public investment, including labour-intensive infrastructure in sectors such as transport and urban utilities and on subnational levels of administration for the implementation of investment programmes. About three-quarters of the investment package announced by Korea and Spain was to be delivered by the subnational jurisdictions (OECD, 2011a). This crisis-driven expansion in investment is nevertheless losing impetus as support packages are unwound in some countries and as a result of ongoing fiscal consolidation in several OECD countries (OECD, 2012a).

9. Also, there are numerous factors, some of them structural, others stemming from the crisis, which will likely bear down on investment in the coming years. On the demand side, uncertainty about the near-term outlook for the global economy and the poor state of the public finances in many countries will likely constrain investment in the near term. On the supply side, despite historically low interest rates around the world, there is a dearth of financing due to ongoing bank deleveraging and financial sector impairment. At the same time, in some cases strict regulations governing the extent to which institutional investors are able to invest in infrastructure and other long-term projects.

10. The composition of infrastructure investment between the government and the private sector has also changed over time. Efforts to leverage private-sector financing for investment and privatisation, motivated by the potential for enhancing the efficiency of government-owned enterprises through private ownership or management, has led to a decline in the government share of infrastructure investment in many countries (Chan et al., 2009; de Mello, 2012). A large share of infrastructure is already in private hands, especially in telecoms and to lesser extent power generation and railways. At the same time, technological change, not least in the ICT area, as well as regulatory reform to foster competition in otherwise uncompetitive markets, have altered the scope for government provision and facilitated the involvement of the private sector.

### *Investment across government layers*

11. It is very difficult to compare trends in the composition of infrastructure investment across the different layers of administration, as discussed in Paper [2]. In the OECD area, over two-thirds of government investment, including infrastructure, are carried out at the subnational level. Internationally comparable data are very difficult to come by, even for very crude measures of infrastructure decentralisation and the associated financial flows across levels of administration, including capital transfers. Also, institutional settings vary a great deal across countries, involving different degrees of subnational participation in the design and financing of investment projects. As a result, conventional decentralisation indicators, such as the share of subnational capital expenditure in total public investment, can be misleading to the extent that subnational autonomy is not taken into consideration.

12. Notwithstanding these caveats, the information available from the International Monetary Fund's Government Finance Statistics on the acquisition of fixed assets at different levels of administration, which is computed on an accrual, rather than cash, basis, can be used as a metric for subnational infrastructure investment. On the basis of the indicators presented in Appendix Table 1 for OECD countries, middle-tier and local governments account for the lion's share of government investment, at least as far as the ratio of acquisition of fixed assets to GDP is concerned. Of course, there are limitations to GFS data, including the fact that most countries do not report investment spending for the different layers of administration in a systematic manner and that in some cases investment is carried out through extra-budgetary funds that are not consolidated in the fiscal accounts.

### *Future demand and needs*

13. Current spending levels may not be sufficient to meet future demand for infrastructure development and upgrading. A combination of low levels of investment and poor infrastructure in most developing and emerging-market economies begs the question of how much countries

should invest in infrastructure. However, the economic literature is rather limited in this area, reflecting to a large extent data limitations, even in the OECD area. The estimations reported by the OECD suggest that investments to the tune of 2.5 percent of world GDP are needed to improve the world's infrastructure, especially in sectors such as roads, rail, telecoms, electricity (transmission and distribution) and water (OECD, 2007). If electricity generation and other energy-related investments in oil, gas and coal are taken into account, based on estimates by International Energy Agency (IEA, 2010 and 2011), worldwide infrastructure investment needs could rise to 3.5 percent of world GDP per year through to 2030. Given that subnational governments, especially cities and local jurisdictions, account for lion's share of government investment in mature economies, it is likely that they will remain at the forefront of service delivery in this area in the years to come (OECD, 2012b).

14. At the same time, competing demands associated not least with population ageing will likely intensify and create additional claims on already stretched government budgets. To illustrate, government spending on health and long-term care alone is likely to increase from the current level of close to 7 percent of GDP in OECD countries to about 10-13 percent of GDP by 2050, and outlays on old-age pensions are set to rise by 3-4 percentage points (OECD, 2007). Governments will find it increasingly difficult to finance future infrastructure investment from traditional sources. This is because the tax base may come under pressure through an ageing workforce, and medium-term fiscal consolidation needs associated with high levels of government indebtedness will constrain the ability of governments to finance investment through debt issuance.

## 3. The scope for subnational provision of infrastructure

15. Against a background of significant demand for infrastructure investment projected over the coming decades, often with the lion's share of responsibility falling to subnational governments, rethinking how best to meet this challenge becomes increasingly important as pressure mounts on both subnational and central government budgets. To address the infrastructure challenge policymakers will need to reassess infrastructure priorities if funding cannot be guaranteed, whether the government remains best suited to take responsibility for provision and whether there are more effective ways to harness the private sector in the provision of infrastructure.

### *General framework for government intervention*[1]

#### *Addressing market failures*

16. Subnational provision of infrastructure needs to be set in a broader context of government intervention to address market failures that could result in the under-provision of infrastructure, when externalities or public-good features are predominant, or to limit the exercise of market power in the case of natural monopolies. The resulting decisions about ownership, delivery modality and regulation are important factors affecting the supply and demand of infrastructure (Figure 2). At the same time, and as discussed in Paper [4], the assignment of functions across the different layers of government depends on the institutional underpinnings of intergovernmental

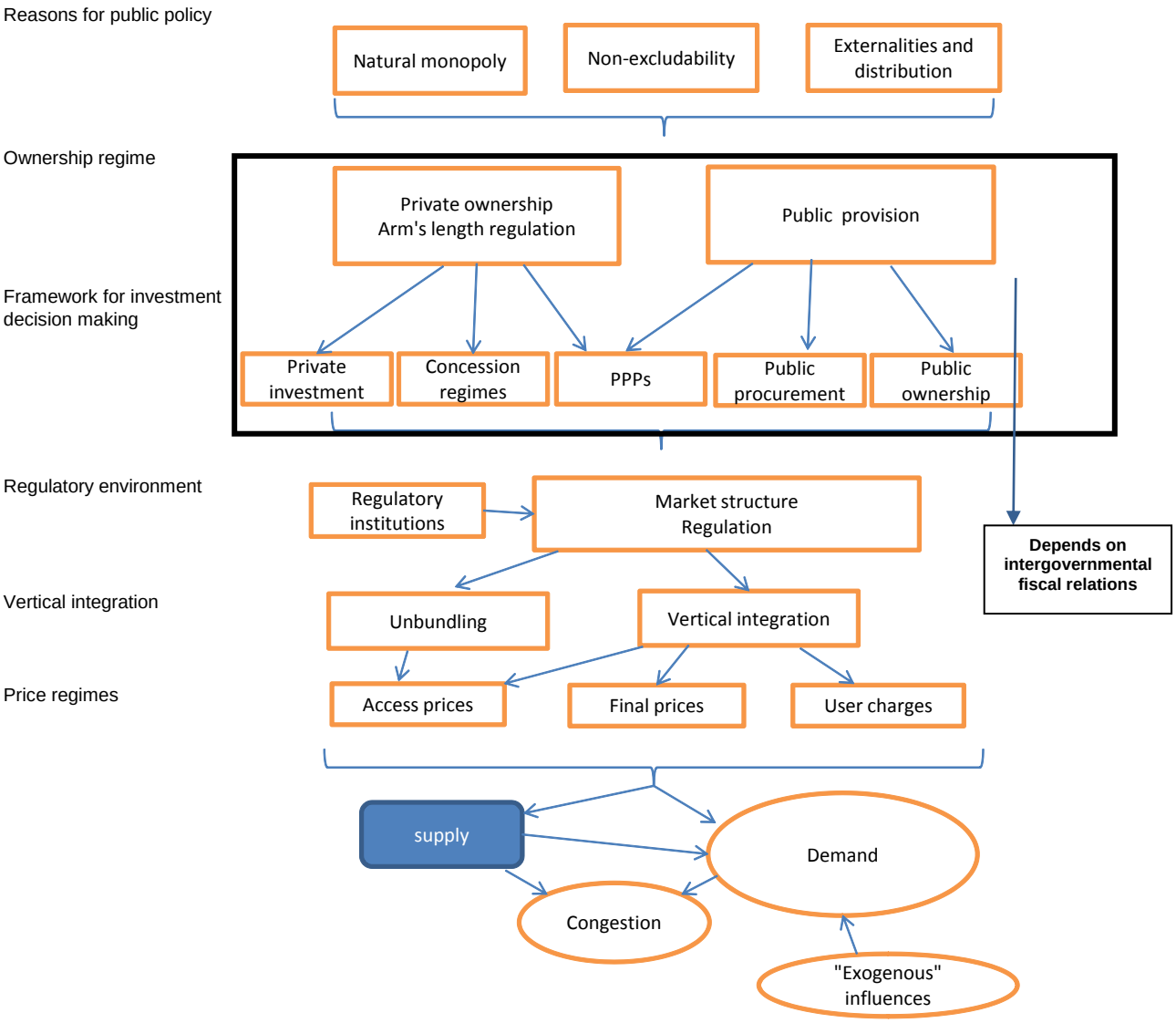
1. This section draws on Sutherland et al. (2011).

fiscal relations, which are specific to different countries and set the parameters for subnational government involvement in infrastructure provision and financing.

17. In general terms, the structure of infrastructure supply depends on the nature of the market failure to be addressed. In particular, in the case of externalities or public-good effects, the private sector would not provide the service, and decentralised government intervention would result in under-provision of the service relative to the social optimum. Under-provision arises because the costs of delivery would be borne by local residents whereas the benefits could accrue at least in part to neighbouring jurisdictions. In the case of natural monopolies, the private sector would usually be willing to provide the service, although normally at a level that is below, and a price that is above, the social optimum. Dealing with either type of market failure calls for direct government provision and/or some type of arm's length regulation for private-sector involvement, as well as intergovernmental fiscal arrangements (discussed below) to align the costs and benefits of provision to local taxpayers in the case of decentralised delivery. Due to the often extremely large fixed costs and the irreversibility of investment, investment decisions are also particularly sensitive to the regulatory environment.

18. When the government is involved in infrastructure provision, investment decision-making should use the standard criterion of setting the level of provision that equates the marginal social benefit to the marginal social cost, which is related to the marginal costs of public funds and production costs. However, due to the characteristics of networks, the marginal benefits of additional investments are often low and declining, but not always, particularly in well-developed networks.

**Figure 2. Factors affecting investment in infrastructure**
General framework and scope for subnational intervention




*Source:* Based on Sutherland *et al.* (2012).

### *Selecting appropriate delivery modes*

19. There are a number of different delivery modes involving the public or private sector to differing degrees. These include public ownership and procurement, which has often characterised the water supply and road networks; concessions and public-private partnerships (PPPs), which are increasingly involving the private sector in the delivery of infrastructure; and fully privately-owned companies, which has often been the case in the energy sector.

20. An important motivation for greater private sector involvement in infrastructure provision arises from harnessing their financial and technical expertise for investment and their managerial

abilities in managing large construction projects and in some cases subsequent operation of the infrastructure.

21. At one extreme, the private sector will provide and operate the infrastructure themselves, particularly when it is a natural monopoly and user fees are feasible. In this case, the state needs to provide an appropriate regulatory environment (see below). When entry is possible, new infrastructure can be wholly owned and provided by the private sector, such as in the case of electricity generation. When entry is difficult – for example, planning requirements impose important obstacles or infrastructure already exists – the private sector may be involved through franchises or concessions, largely to operate existing infrastructure, and public-private partnerships (PPPs), to construct and operate new assets.

22. Franchises or concessions and PPPs occupy a middle ground between public and private provision. In part, this is due to the public good nature of the services, for which the sub-central government is directly accountable to the population, as well as distributional concerns. In this context, the public sector may wish to remain involved in decisions regarding investment, management of infrastructure assets and provision of services.

23. At the other end of the spectrum, the public sector will involve the private sector through traditional procurement while retaining ownership of, and managerial responsibility for, the infrastructure asset. This type of arrangement arises when the sub-central government finds it easier to specify the infrastructure asset than the service it wants to provide, which may also be difficult to monitor. In this light, building the local road network may be something easier to specify ex ante rather than designing a contact based on local road network availability or usage.

### *Setting appropriate regulation*

24. The regulatory framework needs to focus on the desired market structure (reflecting the degree to which competition is possible), access regimes and pricing, which play important roles in determining infrastructure supply and use. In particular, the regulator often needs to set user costs, access prices or final prices, depending on whether the network provider is vertically integrated and competition is feasible. Under certain conditions, setting the price equal to the marginal social cost would be welfare maximising and when the networks are characterised by constant returns to scale this form of pricing would also cover investment costs. Alternatively, the regulator may adopt an alternative pricing structure to cover investment costs. Given the importance of pricing to investment decisions, the credibility and consistency of the regulatory framework are important determinants of infrastructure investment.

25. Infrastructure in the network sectors is also often a congestible public good with congestion-raising production costs and reducing individuals' utility. When pricing is introduced, the optimal toll—determined by the difference between the marginal social cost (reflecting congestion costs and wear and tear of the infrastructure) and private costs—will reduce demand and, by enhancing the efficient use of existing infrastructure, will damp the need for investment in additional capacity. Efficient investment decisions would then equate marginal costs to the marginal benefits of infrastructure capacity and quality, which the revenues from the congestion toll would indicate when additional investment is warranted.

***Decentralisation and government provision of infrastructure: insights from the literature***

26. Although subnational jurisdictions account for the bulk of government investment, the public finance literature is surprisingly limited on the possible effects of fiscal decentralisation on infrastructure provision. The Oatesian and Musgravean traditions of fiscal federalism place limited emphasis on the composition of public investment across the different layers of administration. The basic argument is that, as noted above, public investment is best carried out and financed by higher levels of administration because of externality/network effects, which discourage subnational provision and result in a sub-optimal supply of public investment. Economies of scale in production and service delivery are common in fixed networks and also discourage subnational provision, especially by small jurisdictions (de Mello and Lago-Peñas, 2011). Horizontal tax competition, which is likely to arise from the decentralisation of revenue sources to lower levels of administration, could result in sub-optimal investment under certain conditions (Hulten and Schwab, 1997).

27. The empirical literature provides some, albeit limited, validation to the under-provision hypothesis. The cross-country analysis reported by de Mello (2012) suggests that decentralisation, measured by the share of subnational revenue in total revenue, encourages aggregate investment (gross fixed capital formation), although it is associated with lower investment at the subnational level (acquisition of fixed assets). In the case of Latin America, greater decentralisation is associated not only with lower subnational government investment but also with economy-wide gross fixed capital formation.

28. By contrast, another strand of literature shows that decentralisation could result in over-provision of infrastructure at the subnational level. One argument is that competition among same-level jurisdictions could affect the composition of expenditure, leading subnational governments to over-invest in public goods that would make their jurisdictions attractive to private investment (Keen and Marchand, 1997). Decentralisation could therefore be associated with higher levels of subnational spending on infrastructure projects, a result that is validated by the cross-country evidence reported by Estache and Sinha (1995), which suggests that more decentralised countries, especially in the developing world, tend to spend more (total and subnational) on infrastructure projects. More recent evidence reported by Kappeler and Välilä (2008) for European countries also shows that decentralisation tilts the composition of public investment towards more productive projects, notably infrastructure, a finding that the authors attribute to increased fiscal competition brought about by decentralisation.

29. Overprovision does not imply that the benefits of infrastructure are shared equally. Bardhan and Mookherjee (2006) find that decentralisation of infrastructure does indeed increase the supply of services at the local level, given that local policymakers are more responsive to local needs than central government officials, but it also leads to overprovision of services to local elites to the detriment of other social groups. As for financing, they find that user charges improves local welfare more than intergovernmental transfers, regardless of the degree of local capture. Evidence for Spain (Esteller and Solé, 2005), Bolivia and Colombia (Faguet, 2004), and Indonesia (Chowdhury *et al.*, 2007) also suggest that decentralisation makes investment decisions more responsive to local preferences and needs, which in turn improves the composition of the capital stock among the subnational jurisdictions.

30. The empirical literature, although limited, provides some evidence on the links between decentralised provision and the quality of infrastructure. For example, Humplick and Estache (1995) estimate the effect of decentralisation on the performance of several infrastructure projects,

including roads, electricity, and water. Using different measures of decentralisation in each sector, the authors find that at least one performance indicator improved in each sector as a result of decentralisation, although the correlation between decentralisation and performance remains fairly weak in general. However, in some cases, the decentralised provision of infrastructure was subsequently reversed, such as the responsibility for road investment in Bolivia.

31. All in all, there are theoretical arguments and empirical evidence suggesting a link between decentralised provision, on the one hand, and the level and quality of infrastructure, on the other. The cross-country empirical literature nevertheless does not provide conclusive evidence, suggesting that there is much scope for future research in this area and that country-specific circumstances and characteristics need to be taken into account.

## 4. Financing options for subnational governments

32. To each delivery mode identified in Figure 2 corresponds different financing options, which need to be tailored to the needs and capacity of subnational governments, the scope and modalities for private-sector involvement, and the institutional settings for intergovernmental fiscal relations. By and large, and as discussed in Paper [4], financial options can be of two types: *i*) budget appropriations (general revenue, debt, intergovernmental grants and transfers, user charges), and *ii*) private-sector co-financing (concessions, PPPs). Of course, these options are not mutually exclusive; for example, to the extent that public funding is required for projects involving private-sector co-financing, a claim is placed on budget appropriations

33. The choice of financing options is not without consequences for the delivery of infrastructure services. They depend on the budgetary and administrative capacity of the subnational jurisdictions, the institutional framework for intergovernmental fiscal relations, the mechanisms for oversight of government operations, and the incentives for risk management and private sector involvement (Table 1). These issues will be discussed in greater detail below.

34. The way public infrastructure is financed can also affect its benefits. Funding infrastructure spending by taxes could promote growth if the marginal productivity gains arising from the tax-financed investment exceed the adverse impact of higher taxes. Debt financing could also be desirable to the extent that the investments it finances create a future stream of earnings to the government that meets debt service requirements. In the case of PPPs, efficiency gains can be generated if market risk is shared appropriately between the government and the private-sector partner.

**Table 1. Characteristics of financing modalities: A summary**

| | Budget appropriations | | | | Private-sector co-financing (procurement, concessions, PPPs) |
|---|---|---|---|---|---|
| | **General revenue** | **Debt** | **Intergovernmental grants and transfers** | **User charges** | |
| Subnational budgetary and administrative capacity | Conditional on the revenue mobilisation capacity of subnational governments | Conditional on the rules governing subnational financial management and borrowing | Constrained by subnational administrative capacity (conditional and matching grants may be cumbersome) | Constrained by willingness/ability to pay | Constrained by subnational administrative capacity |
| Intergovernmental fiscal relations | Depends on the assignment of tax bases to subnational governments and their policymaking autonomy | Subnational borrowing is often subject to administrative and/or prudential controls imposed by the centre | Depends on the design of grants and transfer system | Often under the purview of subnational governments | Subnational governments often have their own legal framework for partnerships |
| Scope for private-sector involvement | No scope | No or limited scope | In principle no scope, unless specified by recipient jurisdiction | Depends on ownership structure of project | Scope depends on ownership structure and risk-sharing between government and private-sector partner |
| Oversight | Local legislature; local capture problems | Local legislature, central or middle-tier government and markets; local capture problems | Local and higher-level legislature; local capture problem | Local legislature and market; could reduce risk of local capture | Local and higher-level legislature; market oversight is strengthened if project is carried out by listed public enterprise |
| Incentives for risk management and potential for enhancing competition | Depends on oversight mechanisms and accountability of local policymakers | Low, depends on oversight mechanisms, including markets, and accountability of local policymakers; specific-purpose bonds could provide stronger incentives | Low to medium, depends on the design of grants, incentive to inflate costs of projects; matching grants could provide stronger incentives | Medium to high, could provide stronger incentives due to greater transparency and inter-jurisdictional comparability | Medium to high, depends on capacity to ensure appropriate risk sharing between government and private-sector partner |

*Source:* Authors' elaboration.

### ***Budgetary appropriations: general revenue, debt, intergovernmental grants and transfers, user charges***

35. The sunk costs associated with public investment are often too high to be fully financed by subnational budgets, whose revenue mobilisation and borrowing capacity is lower than that of higher levels of administration. Higher levels of administration therefore participate in the financing of subnational provision through transfers and grants, even when investments are carried out entirely by subnational jurisdictions. The scope for user charges depends more broadly on the pricing regime for infrastructure projects and on the willingness/ability to pay of local residents as well as the capacity to collect fees for infrastructure use.

#### *General revenue*

36. Subnational governments tend to have lower revenue mobilisation capacity than the central government, which limits their ability to finance costly investments in fixed networks out of their general budgets. On the basis of conventional public finance principles, the tax bases that can efficiently be assigned to subnational governments, such as property, are narrower than those that are typically assigned to the central government, such as personal and corporate income. Arrangements differ considerably across countries, and in many cases, the central and the subnational governments also share the revenue of some taxes, including those on income and consumption, which may enhance subnational revenue.

37. Subnational governments also often rely on the earmarking of the revenue from own or shared taxes to finance public investment. Revenue earmarking ensures that funds are allocated to activities – including operations and maintenance – that might otherwise be undersupplied once investments come to fruition. However, revenue earmarking complicates expenditure management and discourages efforts to improve the cost-effectiveness of government expenditures, because policymakers are unable to reallocate scarce budgetary resources to cost-effective activities. This practice is widespread in Latin America, and much less prevalent in OECD countries, although provisions vary considerably across (de Mello, 2012). For example, in OECD countries, motor vehicle taxes or fuel duties are sometimes earmarked for road investment.

38. Financing of investment projects through revenue earmarking is subject to the same oversight procedures as the general budget, which is carried out by subnational legislatures (and in some cases by the central government). Some countries also condition the creation of expenditure mandates to the availability of financing, which encourages a discussion during the budget process on the costs and benefits of investments and the trade-offs at may exist among different interventions.

39. A final potential source of government funding comes from improvement levies. In this case, the government can levy a charge on those benefiting from infrastructure provision to defray investment costs. In OECD countries, (local) governments frequently charge improvement levies to real estate developers to cover the expenses of extending infrastructure to the new developments. More contentiously and thereby less frequent, existing inhabitants or businesses can face an additional levy for improvements of or new additions to infrastructure.

*Debt*

40. Debt financing is often used in the case of costly investment projects, often with long maturities, that cannot be financed by the general budget and which generate future benefits to the population and yield a stream of revenue that can be used to service the debt. However, when subnational governments can borrow directly from capital markets, particularly when they have limited revenue raising capacity, such borrowing may be perceived as implicitly guaranteed by central government. As a result, subnational governments can take on too much borrowing, thereby forcing the central government to bail them out. Against the backdrop of a possible breakdown in fiscal responsibility, subnational governments, especially in developing countries and emerging-market economies, often face restrictions on borrowing in the form of outright bans (such as on foreign borrowing, for example), administrative restrictions (such as central government approval) and/or prudential regulations (such as limits based on debt service capacity and debt ceilings). Arrangements vary considerably across countries. For example, borrowing is allowed in most European countries subject to a golden rule; that is, long-term borrowing is allowed to finance capital expenditure only. More flexible arrangements involve prudential requirements based on debt service parameters (de Mello, 2010), whereas in Latin America subnational borrowing is severely constrained (Martinez-Vazquez, 2010).

41. Governments often set up financial institutions, such as investment banks, to provide dedicated financing for investment, in particular infrastructure development projects. The logic of setting up such banks is that the private financial sector may be unable (due to financial shallowness) or unwilling (due to some market failure) to provide long-term financing for large infrastructure development projects. In addition to well known governance challenges associated with the management of public financial institutions, risks include the possibility that an active government involvement in long-term investment financing may actually inhibit the development of private-sector financing, rather than overcoming obstacles to infrastructure development.

42. Decisions on whether or not to finance infrastructure projects through the issuance of debt, were permitted, are guided by the usual financial parameters, although borrowing costs tend to be higher for subnational governments than the central government (de Mello, 2001). In this case, on-lending by higher levels of administration would provide less onerous financing for subnational provision. Debt financing also depends on the depth of national capital markets and the tax regime for investment in subnational securities (in some countries, including the United States, investment in local government bonds is exempted from income tax).

43. In the case of debt financing, oversight is often extended to subnational legislatures and other agencies responsible for ensuring compliance with administrative and/or prudential regulations on subnational borrowing. In some cases, market mechanisms may also exert pressures for enhanced fiscal discipline at the subnational level.

*Intergovernmental grants and transfers*

44. There is considerable variation across countries on the types of grants from higher levels of administration used to finance infrastructure projects. Intergovernmental grants and transfers can help overcome subnational government revenue shortfalls, allowing them to take on major infrastructure projects. However, in the absence of co-ordination mechanisms, investment decisions may fail to take into account the consequences for other subnational jurisdictions possibly leading to under-provision. Similarly local investment decisions can be

at variance with national priorities. In response to these problems, central governments can attempt to influence infrastructure provision by making grants conditional.

45. Block grants allow the recipient jurisdiction greater managerial autonomy than do conditional or matching grants, which require financial counterparts and/or impose constraints on the use of funds by the recipient jurisdiction. In many respects, co-financing by different levels of government is similar to conditional or matching grants. Conditionality is often introduced in intergovernmental transfer systems to deal with externalities in subnational provision, although in practice the design of conditional grants is complicated by the fact that externalities are not directly observable. These grants may also be complex to administer. In turn, matching grants are used in some cases to ensure financing for recurrent spending associated with operations and maintenance once infrastructure projects come on stream.

46. While recognising that different grants serve different purposes, there is a trend towards increased flexibility in the grant system around the world. For example, conditional and matching grants are hardly used at all in Latin America, where revenue earmarking is more widespread, as discussed above, and are being replaced by block grants in most European countries. Experience within the OECD also demonstrates that sectoral or functional earmarking can be relaxed without risking under-provision of infrastructure, particularly when local residents hold subnational governments accountable for infrastructure investment. Heightened demands for local self-governance are also resulting in the replacement of conditional grants by block grants. However, this is not always the case and in reaction to failures at the subnational level, further conditioning by central governments is a possible response.

47. As in the case of the creation of dedicated financial institutions (discussed above), governments often establish development funds to channel -- essentially subsidised loans and/or grants -- to finance infrastructure development in lagging regions. Resources often come from the budgetary sources, including through the earmarking of specific revenues, but the existence of such mechanisms poses challenges because funds are seldom disbursed in a transparent, contestable manner. It is also difficult to assess the cost-effectiveness of these dedicated support mechanisms and the role they play in regional development.

48. While the management of intergovernmental grants and transfers is subject to conventional budgetary oversight, the wedge that they drive between the costs and benefits of subnational delivery is known to create perverse incentives for decentralised fiscal policymaking. This is especially of "common pool" problems, which encourage the recipient jurisdiction to overspend due to an underestimation of provision costs (de Mello, 2000).

*User charges*

49. When infrastructure is not financed from taxation (either wholly or in part) user charges represent the other principal source of funding. In OECD countries, user charges are most commonly levied for transport services, water supply and wastewater treatment, and waste. User charges can account for a substantial source of subnational government revenue, although considerable heterogeneity exists across countries partly depending on whether the public or private sector provides these services. When the public sector is the provider, revenue to all levels of government from user charges are around 2.5 percent of GDP on average for the OECD. In federal countries the subnational government share is around three-quarters while in unitary countries this drops to around one half.

50. User charges are attractive as they can provide more than simply a source of revenue. By putting a price on service provision, user charges can influence demand, which is particularly useful for congestible public goods. As discussed above, the price signal needed to address congestion will reveal where new infrastructure is needed and provide funding. However, the use of road and congestion pricing varies enormously across countries despite substantial costs associated with congestion. Within Europe, estimated costs of congestion of around 2 percent of GDP are not uncommon, but relatively few countries have explicit congestion charging schemes (Kozluk, 2010).[2]

51. Another attraction is that pricing can help internalise environmental and other externalities. The externalities can be significant for some types of infrastructure typically provided by subnational governments, such as water supply and wastewater. In practice, pricing infrastructure and associated services often fails to cover operating costs, yet alone capital and external costs. In the water sector, charging for wastewater treatment has increasingly been levied separately as costs have risen due to tightening environmental standards. But for water supply, while tariffs account for the lion's share of operating costs, full-cost recovery remains rare. Differences in water price levels are considerable, with price levels lower and the gap to full-cost recovery often larger in countries where water is scarce (OECD, 2010b).

52. Regardless of the financing arrangements for investment projects, attention is typically placed on the capital expenditure per se, and the recurrent costs of operations and maintenance are often neglected.[3] This is often related to politicians preferring supporting new, highly visible projects at the expense of the upkeep of existing infrastructure assets (Romp and De Haan, 2007).

53. A major drawback with user charges centers on their interaction with affordability and the distribution of income. This is because user charges, especially for essential services, can account for noticeable shares of household disposable income, creating a financial burden that can fall disproportionately on the poor, as discussed in Paper [7]. As a result, pricing mechanisms may introduce some cross-subsidisation, as in the case of increasing block tariffs for water supply, or in other cases, revenues from user charges can be used (at least in part) to finance (preferably means tested) transfers to poorer households that would facilitate access to services while addressing equity considerations.

54. A second complication arises in whether or not local governments possess the administrative capacity to implement user charges. Investments in collection, monitoring and pricing technology can represent a sizeable financial burden which, combined with difficulties in setting prices effectively, may limit the potential gains from introducing user charges. However, to some extent, technological change has transformed the landscape in recent years in areas such as transport, allowing subnational governments to introduce quite complex pricing mechanisms in both OECD countries and emerging-market economies. In this light, some of the barriers to implementing user charges may be falling, but they will still represent an important obstacle in many cases.

---

2. The costs of congestions arise due to a number of factors. Businesses costs rise due to the extra time needed for travel and the greater unreliability of travel time. Individuals are not productive in traffic jams and with the prospect of spending considerable time commuting they may limit their geographical area of job search. The combination of these factors is likely to lower welfare and reduce long-term growth.

3. For example, Peru attempted to decentralise much of its road network to provincial and municipal governments but failed to provide financing for the associated recurrent expenditures, which resulted in a widespread deterioration of the network and ultimately recentralisation. In Brazil, federal assistance is now provided to those states that have accepted to take on responsibility for maintaining federal roads in their jurisdictions.

### *Private-sector involvement*

*Financing modalities: Concessions, PPPs*

55. No single model of private-sector involvement in infrastructure investment has emerged across countries. However, over time OECD countries have generally moved away from investment by public enterprises and towards public procurement, concessions and more recently PPPs. This is also the case beyond the OECD area, including many countries in Latin America. One factor influencing the particular choice of procurement versus concessions and PPPs is whether the infrastructure assets raise revenue. When it is possible to raise revenue, a wider range of financing options are available, which would otherwise be largely limited to traditional public procurement.

56. In the different models involving the private sector, tendering introduces competition either for the public procurement contract or *ex-ante* for the market (Demsetz, 1968). In this context, the subnational government's capacity to manage the tendering process effectively determines whether potential benefits are harnessed. For example, the upfront contracting costs for PPPs are typically substantially greater than traditional procurement, making PPPs less attractive for subnational governments with limited experience and lacking the technical skills to negotiate effectively with the private sector. In this context, enhancing subnational governments' capacity to negotiate complex deals and select the most efficient bidder acquires some importance (World Bank, 2012).

57. With different models of private-sector involvement available, subnational governments need to guard against choices that may be convenient in the short term but may turn out to be costly later on. For example, interest in PPPs can arise to overcome budgetary constraints, which may be imposed by fiscal rules, or in an attempt to disguise pressure on the public finances. A proper and transparent assessment of the expected long-term impact on public finances and accounting for associated contingent liabilities for the different possible models would help ensure that the most appropriate choice is made (OECD, 2008).

58. Additional consequences of short-termism may also arise for other reasons. Due to the electoral cycle, the relatively short period officials may be in office -- when measured in comparison with the life of an investment project -- can introduce uncertainty about the subnational government's commitment to the project in the future. In other cases, dependence on transfer arrangements, which underpin subnational government involvement, may also raise concern about project sustainability. In such cases, the increased uncertainty would induce the private sector to demand a higher rate of return on their investment, which could make the investment unattractive.

59. In contrast to public procurement, concessions and PPPs involve private-sector co-financing, with the choice between them largely determined by the risk characteristics of the project. There are many overlapping issues as contracts for concessions and PPPs are unavoidably incomplete and long-term in nature, requiring on-going monitoring and control during the life of the project (Araújo and Sutherland, 2010; also discussed in Paper [9]). First, contract design needs to ensure an appropriate and effective transfer of risks and responsibilities to the private sector. A second area of overlap is mitigating investment hold-up throughout the life of the contract. Third, lengthier contractual relationships require scope for flexibility, as output specifications and service standards can become obsolete during the life of the contract. Finally, since governments are effectively the provider of last resort for often very visible public goods, mechanisms to minimize the potential for opportunistic behaviour from both parties and costly renegotiation need to be considered, notwithstanding the need for flexibility.

60. Concessions require the private sector to bear significant demand risk. The concessionaire operates and finances the maintenance of the asset but is generally not involved in its construction though may be responsible for maintenance, as discussed in Paper [8]. Usually the underlying infrastructure asset remains public property. For the private sector, user charges constitute the bulk of revenues and many concession contracts do not envisage any payment from the government and sometimes involve a payment to the government for the concession. This implies that the level of demand risk transferred to the private sector is relatively large.

61. A PPP contract, by transferring both construction and the operation of the infrastructure asset, including its maintenance, implies greater and sometimes longer private-sector participation compared to traditional procurement or a concession. Due to the infrastructure being new, the private sector may be reluctant to bear the demand risk without some co-financing or guarantees from government (Andres and Guasch, 2008).

62. PPPs potentially bring a number of advantages. Requiring outside financing entails greater project scrutiny and a better evaluation of the potential risks as well as better monitoring of the private contractor. Second, PPPs, by bundling the construction and the operation phases, create incentives for the private contractor to internalise operational and maintenance costs during the construction phase (Hart, 2003). The private partner will seek to identify the design and construction options that can potentially minimise the costs of construction and provide better service quality throughout the life of the project.[4]

63. But PPPs are not always easy to get right. The OECD Principles for Private Sector Participation in Infrastructure adopted in 2007 offer a checklist of policy issues to consider when setting up PPPs, including an assessment of the relative long-term costs and benefits and availability of finance, taking into account the pricing of risks transferred to the private operators and prudent fiscal treatment of risks remaining in the public domain; the an enabling policy framework for investment; and the capacities at all levels of government to implement projects. The experience of OECD countries shows that PPPs can obscure real spending and make government actions un-transparent, using off-budget financing, which makes can be potentially risky for fiscal management and sustainability.

*Supply-side considerations*

64. In most countries, bank loans have traditionally been the most important private source of financing for infrastructure investment. However, deleveraging by banks after the crisis and new banking regulations are taking their toll on the ability of banks to provide credit for infrastructure development. The OECD estimates that the global volume of new project finance, about USD 65 billion, was one-third lower in the first quarter of 2012 than in the previous year. In European countries, the fall in the number of announced deals was felt in both large transport infrastructure projects and also in the education sector, where deals are typically much smaller. To some extent, the fall in new project financing may be a temporary response to the ongoing crisis, but how much and how fast project financing recovers remains an open question.

65. Institutional investors, such as pension funds, insurance companies and mutual funds, are another important source of private-sector financing for infrastructure. These investors

4. By combining private sector innovation and financing as well as the sharing of risks in innovative ways PPPs can represent value for money for the public sector and a fair deal for the private sector. The OECD estimates that there are about USD 0.8 trillion worth of projects in operation under PPP arrangements in OECD countries.

currently hold over USD 70 trillion in assets under management in OECD countries alone and, if emerging-market economies are taken into account, including their Sovereign Wealth Funds (with over USD 4 trillion in assets), the potential pool of financing for infrastructure investment is considerably larger (OECD, 2010a). Pension funds alone have assets under management to the tune of USD 29 trillion and annual inflows of about USD 850 billion in OECD countries. However, the OECD estimates that less than 1 percent of the pension funds' investment portfolios is allocated directly to infrastructure projects.

66. Given their volume of assets under management, and the relatively low share of their investments in infrastructure, institutional investors are the main potential sources of financing for long-term infrastructure investment. However, there are limitations to the ability of institutional investors to redirect their asset portfolios to infrastructure projects, including not least regulatory restrictions on portfolio allocation and risk management considerations related to the tenor and currency composition of investment portfolios. Policy reforms to improve the regulatory framework for institutional investors, for instance by removing investment regulatory barriers and helping investors address long-term risks, would contribute to facilitating investment by institutional investors.[5]

67. Of course, not all countries have access to private-sector funds and capital markets to raise the necessary financing for infrastructure. In that case, foreign assistance constitutes an obvious instrument. However, the OECD estimates that the share of Oversees Development Finance (ODF) in total infrastructure investment is rather modest (OECD, 2011b) and, in a challenging budgetary environment in many donor countries, it is likely that ODF will come under pressure, stressing the need to harness private sources of finance even in countries that currently rely heavily on foreign assistance. Setting up an appropriate framework for private sector involvement, including capacity building, is therefore critical in those countries, and recent OECD estimates suggest that about one-fifth of ODF for infrastructure in Africa is allocated to setting up and/or improving these framework conditions.

### *Horizontal arrangements: dealing with scale effects in subnational provision*

68. Although the disincentives for provision arising from scale effects and inter-jurisdictional externalities are conventionally dealt with through conditionality in the intergovernmental grants and transfer systems, there are alternative, more horizontal mechanisms to deal with these challenges. This is the case of the inter-municipal consortia that are currently in place in many countries and allow neighbouring local governments to set up – most often on a voluntary basis – single- or multiple-purpose agencies and/or local enterprises to provide local services to residents of different jurisdictions.[6]

69. Such horizontal arrangements are widespread in Europe, especially for the provision of transport, urban waste management, water supply, fire fighting and hospital administration by local governments, and arrangements vary considerably across countries (Hulst and van Montfort, 2007). Norway also has an interesting experience with joint ownership of power plants, which allows neighbouring jurisdictions to cut costs in providing energy services. In Latin America, the Brazilian experience with inter-municipal consortia in the area of hospital administration is rather rare in the region. These horizontal arrangements are important tools

5. It is in this context that the OECD launched in 2007 the OECD Principles for Private Sector Participation in Infrastructure.

6. The empirical evidence reported by de Mello and Lago-Peñas (2012) for Brazil and Spain suggest that the presence of economies of scale in service delivery provides incentives for subnational governments to provide services jointly.

for local governments to improve the cost-effectiveness of provision while satisfying demands for local autonomy.

70. It is true that such benefits could also potentially arise from the consolidation of local governments into larger units through mergers and amalgamations, for example, but international experience shows that in many cases there is considerable political and public opinion resistance to consolidation (Martinez-Vazquez and Gomez-Reino, 2008). In addition, the benefits of proximity between the government and the citizenry, which has much scope for making the government more responsive to local preferences and needs and for strengthening social control over government operations, would also likely be lost through consolidations. Weighing the benefits and costs of alternative governance arrangements is of course an empirical question, but institutional arrangements change only slowly and the structure of local governments, while far from immutable, are not often amenable to experimentation.[7]

## 5. Conclusions

71. The need for infrastructure building, replacement and updating is large worldwide. In the areas of electricity, telecoms and water alone, investment requirements are estimated by the OECD at about 2.5 percent of world GDP per year through to 2030. To foot the bill, governments will need to mobilise budgetary resources while at the same time delivering medium-term fiscal consolidation to restore the sustainability of public finances in many OECD countries. Demands associated with health and long-term care in ageing OECD societies and for enhanced social protection in many developing and emerging-market economies will also put an increasingly heavy burden on government budgets.

72. Middle-tier and local administrations will bear the brunt of the pressures associated with growing demands for infrastructure. Subnational governments already carry out, and sometimes finance, the bulk of government investment – about two-thirds on average in the OECD area – a ratio that is unlikely to change in the years to come. To better prepare subnational governments for the challenge ahead, this paper provided a general discussion on the factors affecting investment in infrastructure (with emphasis on fixed networks) that could serve as a framework for subnational intervention. The specific characteristics of the different financing modalities applicable to subnational governments were presented to highlight the challenges that are specific to subnational governments.

73. The central argument presented above is that, on the financing side, subnational governments will need to enhance their capacity to raise own revenue, to make the most of intergovernmental grants and transfers, and to mobilise private-sector funds, including by tapping capital markets, where permitted. In order to exploit fully the various financing options, subnational governments in many countries will need to strengthen their technical capacity to design and implement investment projects, as well as manage increasingly complex, multi-year budgets, especially when there is private sector involvement.

74. Making better use of user charges while addressing associated affordability and equity challenges can help ensure existing infrastructure is used efficiently and identify where more infrastructure investment is needed. User charges also generally offer more options for private-sector involvement; in particular, different types of concessions, franchise arrangements and public-private partnerships for revenue generating infrastructure services are amenable to private-sector co-financing. However, these forms of financing are not

7. For some recent empirical evidence on the benefits and costs of consolidation, see Steiner (2003) for Germany, Sorensen (2006) and Dafflon and Ruegg (2001) for Switzerland.

always suitable and the authorities need to assess the high upfront transaction costs that are typically incurred, and how risk is best allocated between the government and the private sector.

75. Where subnational administrations are important providers of infrastructure, better co-ordination mechanisms can help ensure that returns to scale are exploited and inter-jurisdictional spillovers are taken into account. In this context, decision-making frameworks that bring together subnational and central governments as well as other stakeholders could help increase the efficiency of investment.

76. Finally, in some cases, governments may need to rethink the boundaries of the state. Advances in technology, contracting and regulation allow infrastructure, such as telecoms and much of energy, which was often provided by government, to migrate to the private sector. Setting the appropriate regulatory framework will be important for encouraging investment in these cases.

## Bibliography

Andres, L. and J.L. Guasch (2008), "Negotiating and Renegotiating PPPs and Concessions", in G. Schwartz, A. Corbacho and K. Funke (eds.), *Public Investment and Public-Private Partnership: Addressing Infrastructure Challenges and Managing Fiscal Risks*, International Monetary Fund, Washington, D.C.

Araújo, S. and D. Sutherland (2010). "Public-private Partnerships and Investment in Infrastructure", *OECD Economics Department Working Papers*, No. 803, OECD, Paris.

Bardhan, P. and D. Mookherjee (2006), "Decentralisation and Accountability in Infrastructure Delivery in Developing Countries", *Economic Journal*, Vol. 116, pp. 101-17.

Chan, C., D. Forwood, H. Roper and C. Sayers (2009), "Public Infrastructure Financing: An International Perspective", *Productivity Commission Staff Working Paper*, Canberra.

Chowdhury, S., F. Yamauchi and R. Dewina (2007), "Governance Decentralisation and Infrastructure Provision in Indonesia", JBIC Institute Working Paper, No. 25, Japan Bank for International Cooperation, Tokyo.

de Mello, L. (2000), "Fiscal Decentralisation and Intergovernmental Fiscal Relations: A Cross-Country Analysis", *World Development*, Vol. 28, pp. 365-80.

de Mello, L. (2001), "Fiscal Decentralisation and Borrowing Costs: The Case of Local Governments", *Public Finance Review*, Vol. 29, pp. 108-38.

de Mello, L. (2010), "Europe" in *The State of Local Government Finances: Are we Ready to Face the Demand?*, Second Global Report on Decentralisation and Local Democracy, United Cities and Local Governments, Barcelona, pp. 149-88.

de Mello, L (2012). "Fiscal Decentralisation and Public Investment: The Experience of Latin America", in G. Brosio and J.P. Jiménez (Eds.), *Decentralisation and Reform: Improving Intergovernmental Relations* (Cheltenham: Edward Elgar), 2012 (in print).

de Mello, L. and S. Lago-Peñas (2012), "Local Government Cooperation for Joint Provision: The Experiences of Brazil and Spain with Inter-Municipal Consortia", *Working Paper*, No. 1218, Andrew Young School of Policy Studies, Georgia State University, Atlanta, GA.

Demsetz, H. (1968), "Why Regulate Utilities", *Journal of Law and Economics*, Vol. 11, pp. 55-65.

Estache, A. and S. Sinha (1995), "Does Decentralization Increase Spending on Infrastructure?", *Policy Research Working Paper*, No. 1457, World Bank, Washington, D.C.

Faguet, J.-P. (2004), "The Effects of Decentralisation on Public Investment: Evidence and Four Lessons from Bolivia and Colombia", *Working Paper*, No. 62, Crisis States Research Centre, LSE, London.

Guasch, J.L., J.-J. Laffont, and S. Straub (2008), "Renegotiation of Concession Contracts in Latin America: Evidence from the Water and Transport Sectors", *International Journal of Industrial Organization*, Vol. 26, pp. 421-42.

Gutman, J. (1999), "Decentralizing Roads: Matching Accountability, Resources, and Technical Expertise", in Burki, S.J., G. Perry and W. Dillinger, *Beyond the Center: Decentralizing the State, Latin American and Caribbean Studies*, Viewpoints No. 19636, World Bank, Washington, D.C., pp. 87-105.

Hart, O. (2003), "Incomplete Contracts and Public Ownership: Remarks and an Application to Public-Private Partnerships," *Economic Journal*, Vol. 119, pp. 69-76.

Hulten, C.R. and R.M. Schwab (1997), "A Fiscal Federalism Approach to Infrastructure Policy", *Regional Science and Urban Economics*, Vol. 27, pp. 139–59.

Humplick, F. and A. Estache (1995), "Does Decentralization Improve Infrastructure Performance?" in A. Estache, Ed., *Decentralizing Infrastructure: Advantages and Limitations*, World Bank Discussion Paper Series, No. 290, World Bank, Washington, D.C.

Humplick, F. and A. Moini-Araghi (1996), "Decentralized Structures for Providing Roads: A Cross-Country Comparison", *Policy Research Working Paper*, No. 1658, World Bank, Washington, D.C.

International Energy Agency (IEA) (2010), *World Energy Outlook*, IEA, Paris.

International Energy Agency (IEA) (2011), "Energy for All: Financing Access for the Poor", *World Energy Outlook*, IEA, Paris.

Kappeler, A. and T. Välilä (2008), "Fiscal Federalism and the Composition of Public Investment in Europe", *European journal of Political Economy*, Vol. 24, pp. 562–70.

Keen, M. and M. Marchand (1997), "Fiscal Competition and the Pattern of Public Spending", *Journal of Public Economics*, Vol. 66, pp. 33–53.

Kessing, S.G., K.A. Konrad and C. Kotsogiannis (2007), "Foreign Direct Investment and the Dark Side of Decentralisation", *Economic Policy*, Vol. 22, 5–70.

Kozluk, T. (2010), "How the Transport System Can Contribute to Better Economic and Environmental Outcomes in the Netherlands", *OECD Economics Department Working Paper*, No. 804, OECD, Paris.

Lucioni, L. (2009), "La Provisión de Infraestructura en América Latina: Tendencias, Inversiones y Financiamiento", *Macroeconomía del Desarrollo*, No. 72, CEPAL, Santiago.

Martinez-Vazquez, J. (2010), "Latin America" in *The State of Local Government Finances: Are we Ready to Face the Demand?*, Second Global Report on Decentralisation and Local Democracy, United Cities and Local Governments, Barcelona, pp. 189-230.

OECD (2007), *Infrastructure to 2030: Mapping Policy for Electricity, Water and Transport*, OECD, Paris.

OECD (2008), *Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money*, OECD, Paris.

OECD, (2010a), "Pension Funds Investment in Infrastructure: A Survey", in *International Futures Programme, Project on Strategic Transport Infrastructure to 2030*, OECD, Paris.

OECD (2010b), *Managing Water for All, An OECD Perspective on Pricing and Financing*, OECD Publishing.

OECD (2011a), OECD *Regional Outlook*, OECD, Paris.

OECD (2011b), *Mapping Support for Africa's Infrastructure Investment*, OECD, Paris.

OECD (2012a), *Mobilising Investments for Urban Sustainability, Job Creation and Resilient Growth*, Issues Paper for the OECD Roundtable for Mayors and Ministers, Chicago.

OECD (2012a), *OECD Economic Outlook*, OECD, Paris.

Romp, W. and J. De Haan (2007), "Public Capital and Economic Growth: A Critical Survey", *Perpektiven der Wirtschaftspolitik*, Vol. 8, No. S1, pp. 6-52.

Sutherland, D., S. Araújo, B. Égert and T. Kozluk (2011), "Public Policies and Investment in Network Infrastructure", *OECD Economic Studies*, Vol. 2011, pp. 161-83.

World Bank (2012), Investing to Invest, World Bank, Washington, D.C.

**Appendix Table 2.Public investment across levels of government: OECD countries**

Acquisition of fixed capital in percent of GDP, accrual basis, averages since 1995

| | General Government | | Different layers of government | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Central | | Middle-tier | | Local | |
| | **Investment** | **Total outlays** | **Investment** | **Total outlays** | **Investment** | **Total outlays** | **Investment** | **Total outlays** |
| Chile | 1.4 | 20.5 | 1.2 | 20.5 | .. | .. | 0.2 | 2.6 |
| Italy | 0.6 | 47.8 | -0.2 | 39.0 | .. | .. | 0.8 | 15.0 |
| Japan | 1.1 | 37.8 | .. | .. | .. | .. | .. | .. |
| Spain | 1.9 | 38.6 | 0.4 | 27.3 | 0.8 | 13.6 | 0.7 | 6.1 |
| France | 0.7 | 52.6 | 0.1 | 45.5 | .. | .. | 0.6 | 10.4 |
| Mexico[1] | .. | .. | 0.5 | 15.9 | .. | 7.0 | .. | 1.4 |
| United Kingdom | 0.5 | 42.0 | 0.0 | 38.9 | .. | .. | 0.5 | 12.1 |
| Australia | 0.6 | 34.5 | 0.1 | 25.3 | 0.4 | 13.9 | 0.2 | 2.3 |
| Germany | -0.1 | 46.5 | 0.0 | 30.9 | 0.0 | 13.1 | -0.1 | 7.2 |
| Switzerland[1] | 2.2 | 37.4 | 0.1 | 20.1 | 1.1 | 14.6 | 1.0 | 9.6 |
| United States | 1.2 | 36.3 | 0.1 | 21.0 | .. | .. | .. | .. |
| Canada[1] | 2.3 | 40.7 | 0.3 | 18.7 | 1.0 | 21.4 | 1.0 | 7.4 |

1. Cash basis.

*Source*: International Monetary Fund (*Government Finance Statistics*).