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Meeting Infrastructure Needs in Australia

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MEETING INFRASTRUCTURE NEEDS IN AUSTRALIA

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by Claude Giorno

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ABSTRACT/RÉSUMÉ

Meeting infrastructure needs in Australia

Adequate and well-functioning infrastructure is a key ingredient to growth and well-being. The benefits to activity of efficient spending in energy, water, transport and communication sectors go well beyond their contribution to capital accumulation. Good infrastructure facilitates trade, bolsters market integration and competition, fosters the dissemination of ideas and innovations and enhances access to resources and public services. These benefits are particularly important for Australia because of its size, the geographical dispersion of its population and production centres, and its remoteness from other markets. Nevertheless, Australia has an important infrastructure deficit. This is in part due to underinvestment in the 1980s and 1990s, while the rebound in capital spending at the beginning of the 2000s has been insufficient to deal with capacity shortages exacerbated by the strong demand generated by the mining boom, expected population growth, technological progress and environmental concerns. To ease these shortages, the authorities have put bolstering infrastructure to the top of their economic policy agenda. This entails greater government expenditure in this area, but also structural reforms to optimise public and private investment choices and the use of existing facilities with better regulation. This chapter reviews the state of Australia's infrastructure and the government's action programme.

This paper relates to the *2010 Economic Survey of Australia*.

Keywords: Infrastructure; productivity; network industry

Jel classification: D23; H41; L33; H54; H43; L97; L98

Répondre aux besoins d'infrastructures en Australie

Des infrastructures adéquates et fonctionnant bien sont essentielles pour la croissance et le bien-être. Des dépenses bien gérées dans les secteurs de l'énergie, de l'eau, des transports et des communications influencent positivement l'activité au delà de leur contribution à l'accumulation du capital. Elles facilitent les échanges, renforcent l'intégration des marchés et la concurrence, permettent la diffusion des idées et des innovations et améliorent l'accès aux ressources et aux services publics. Ces bénéfices sont particulièrement importants dans le cas de l'Australie en raison de sa taille, de la dispersion géographique de sa population et de ses centres de productions ainsi que leur éloignement des autres marchés. Le pays est pourtant confronté à un déficit d'infrastructures. Celui-ci est du en partie à un sous-investissement au cours des décennies 1980 et 1990. Le rebond des dépenses en capital au début des années 2000 a été insuffisant pour faire face au manque de capacités exacerbé par la hausse de la demande générée par le boom des produits miniers, la progression attendue de la population, les progrès technologiques et les préoccupations environnementales. Pour réduire ces tensions, les pouvoirs publics ont placé le renforcement des infrastructures en haut de leur agenda de politique économique. Ceci implique un accroissement des dépenses publiques dans ce domaine, mais aussi des réformes structurelles visant à optimiser les choix d'investissements publics et privés et l'utilisation des équipements existants grâce à une meilleure régulation. Ce chapitre passe en revue la situation du secteur des infrastructures en Australie et le programme d'action du gouvernement.

Ce document se rapporte à l'*Étude économique de l'OCDE de l'Australie*.

Mots clés : Infrastructure ; productivité ; industrie de réseau

Jel classification JEL : D23; H41; L33; H54; H43; L97; L98

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MEETING INFRASTRUCTURE NEEDS IN AUSTRALIA

by Claude Giorno¹

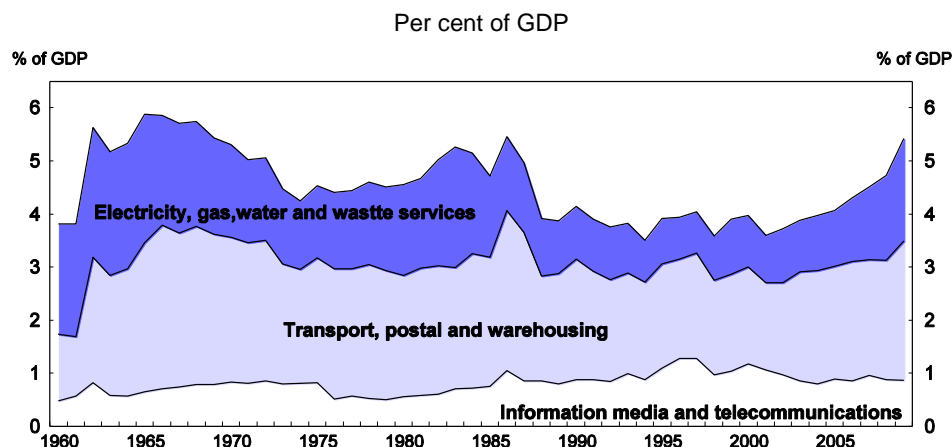
Increasing infrastructure capacities has become a national priority

The goals of infrastructure policy have shifted in recent years to capacity-building from an earlier focus on management efficiency. Expanding capital investment and improving use of the current stock of infrastructure are national priorities (Rudd, 2010). There are substantial needs in many areas:

- Growth in mineral exports predominantly to China has put substantial strain on key port infrastructure and exposed gaps in rail infrastructure. The demand for freight is expected to double between 2000 and 2020 and needs to be addressed (BTRE, 2006).
- Rapid growth and population ageing over the coming decades call for a reappraisal of urban infrastructure requirements. In 2006, over three-quarters of the population was living in cities of over 100 000 people, which produced roughly 80% of GDP (IA, 2010a). While this concentration is a source of scale economies, it also gives rise to problems of congestion. In the large metropolitan areas, congestion costs estimated at some AUD 13 billion (1½ per cent of GDP) for 2010 could exceed AUD 20 billion in constant price by 2020 with unchanged policies (BTRE, 2007).
- Water supplies to large cities are insufficient given the prices currently charged, leading to chronic restrictions. These difficulties are only partially attributable to climate change (OECD, 2008). A high proportion of the electricity infrastructure was installed in the 1960s and now needs replacement. There is also a substantial population and industry shift towards regions where mining industry is expanding and new infrastructure is required. Capital investment in water, energy and transport industries, which was low in the 1980s and 1990s, has nonetheless increased since 2000 (Figure 1).
- Environmental concerns about scaling back greenhouse emissions demand substantial capital investment in energy and rural water management (OECD, 2008).
- Broadband Internet services have limited distribution, high prices and slow connection speeds in relation to the best-performing OECD countries (Figure 2).

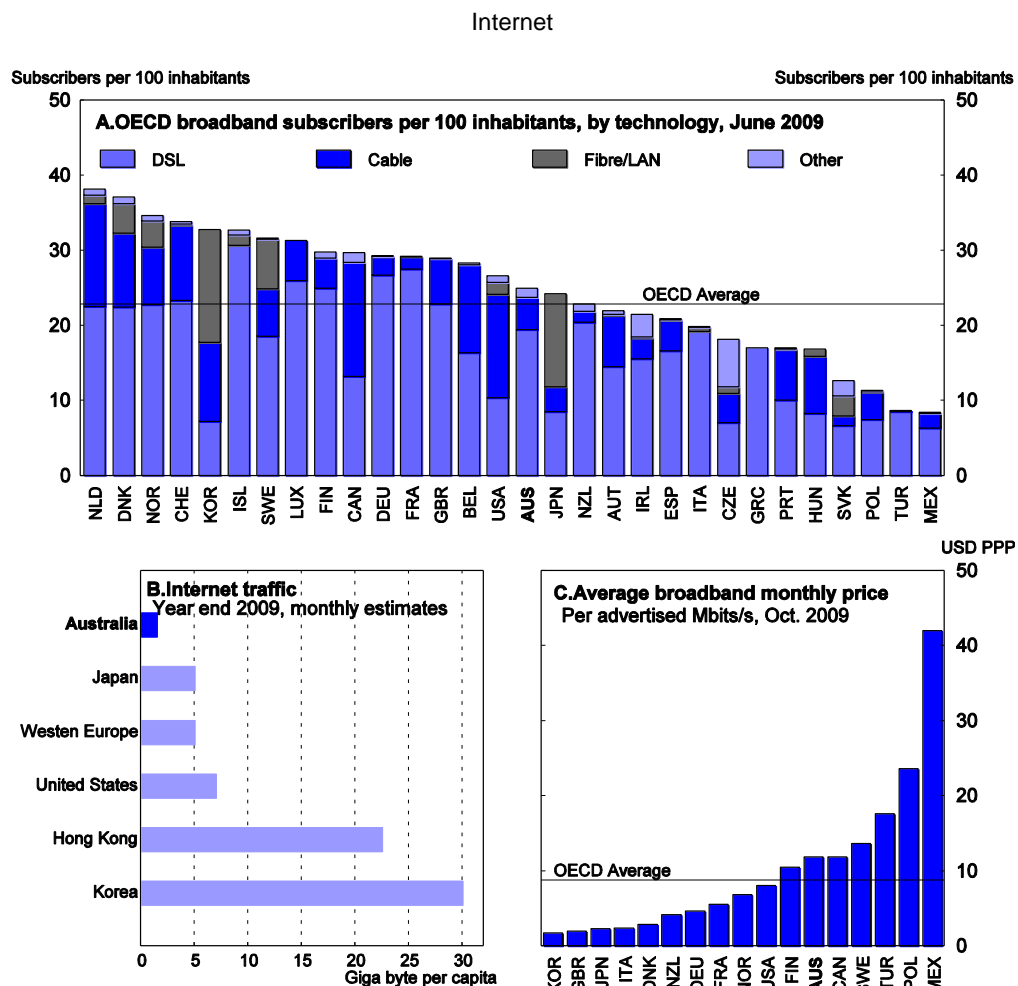
1. This paper is based on the Economic Survey of Australia published in November 2010 under the authority of the Economics and Development Review Committee (EDRC). Claude Giorno is a senior economist in the Economics Department of the OECD. The author would like to thank several OECD colleagues for valuable comments on earlier drafts, notably Bob Ford, Piritta Sorsa, Nick Taylor and Jeremy West. He would like to thank also Olivier Besson, Deirdre Claassen, Ane-Kathrine Christensen and Josette Rabesona, for valuable research, statistical and editorial assistance.

Figure 1. Infrastructure investment development



Source: Australian Bureau of Statistics, Australian National Accounts: Gross Fixed Capital Formation by industry and by sector (cat. No. 5204.0), Table No. 52, 53 and 54.

Figure 2. Broadband access and uses



Source: OECD, STI Broadband statistics and Minnesota Internet Traffic Studies.

As in many other OECD countries, capacity problems reflect management difficulties in the infrastructure sector in dealing with market failures. The delivery of these services depends on natural

monopolies, entails substantial, mostly irreversible capital investment, and involves a high level of risk-taking. Moreover, the development of infrastructure networks is often associated with positive or negative externalities that can lead to socially non-optimal levels of capital investment. Public policy in Australia to deal with these issues has taken a variety of forms over time and across sectors (Box 1). However, the capacity problems encountered in recent years reflect persistent gaps in policies. The authorities have started to fill these gaps with increased capital spending and new reforms in two main areas: *(i)* improving co-ordination and planning of infrastructure projects at the national level with better information about the supply and demand for services; and *(ii)* regulatory reform to optimise the use of existing infrastructure and investment decisions.

Box 1. Policies in the infrastructure sector have taken various forms over time and across industries

Until the mid-1980s, the bulk of infrastructure investment was made by the public sector, mostly by monopolies controlled by the states or the federal government (Figure 3, upper left and right). For example, between 1981 and 1990, the share of private investment reached only 20%. Poor management of these monopolies led to reforms in the mid-80s culminating in the adoption of the National Competition Policy in 1995 to enhance efficiency. Vertically integrated, publicly controlled sectors such as telecommunications, rail transport and energy were restructured and/or opened up to competition. Privatisation of some entities brought gains in efficiency and quality of services. This policy continued until recently, enabling Australia to adopt regulatory measures that on average are less restrictive than those of the other OECD countries, although there are disparities between industries¹ (Figure 3, lower left). These reforms resulted in efforts to optimise capital investment outlays, which had probably been excessive in previous decades, and led to a drop in investment in the 1980s and early 90s, especially within the public sector (PC, 2009a).

These transformations changed the structure of infrastructure markets. Since the early 2000s, half of the sector's capital investment has been undertaken by private companies. The private share is lower, however, in the energy and water sectors (35%) and in transport (45%). In telecommunications all capital investment has become private following the total privatisation of the historical operator, Telstra, in 2006 (Figure 3, lower right). The states are the main public-sector players with spending on infrastructure acting primarily through public enterprises under their control, but also directly via budget expenditures, as in the transport sector. The federal government has an important role in regulation, and in fostering and co-ordinating capital investment in all these areas. The influence and the form of these public interventions vary from one industry to another.

In telecommunications, the government has mainly a regulatory role. Mobile telephony is subject to relatively few restrictions, while fixed-line services and especially the broadband Internet sector are subject to tighter regulatory control. The supply is dominated by DSL technology, which uses the copper telecommunication local access network owned by Telstra after its privatisation. Telstra's competitors have access rights to the network which are guaranteed by an independent regulator. Even so, there are recurrent conflicts between the firms operating in this market, in which competition has not worked satisfactorily for the delivery of broadband services. The federal authorities have embarked on reforms in this area.

In the case of energy (electricity and gas), a structural separation was introduced between network activities involving a natural monopoly (transmission and distribution) and those open to competition (gas production, electricity generation and energy marketing). This gave rise to the creation of companies controlled by the states which play a large role. In Victoria and South Australia the industries have, however, virtually been wholly privatised and substantial privatisations of particular assets have occurred in most other states. Even where governments retain ownership of energy assets, the assets are held and managed as commercial enterprises and new private sector energy infrastructure has been built. All Companies operating in the sector have regulated non-discriminatory network access. A national wholesale electricity market the National Electricity Market was created in 1998 to cover all but Western Australia and the Northern Territory, which are too remote. Nevertheless, within the National Electricity Market the transmission distances are such that the investments in interconnection infrastructure have not been sufficient to remove all capacity constraints and, the trade within the market is frequently segmented into regions. Transmission network capacity limitations are also an obstacle to the development of renewable energy production. The picture is also similar in the wholesale electricity market established in Western Australia and in wholesale gas markets that exist in several regions.

The urban water management chain from storage to distribution and sewage disposal is operated by public monopolies controlled by the states. The states are also heavily involved in rural water management. This sector is marked by overexploitation of water resources, which poses environmental problems, especially in the Murray-Darling Basin. Australia is one of the very few OECD countries that have developed markets in this industry, although they are compartmentalised. The lack of co-ordination of state actions in the industry has prompted the federal government to intervene more directly since 2007 to lay the foundations for a more efficient and sustainable use of water.

Management of transport networks involves a multiplicity of government responsibilities, shared between the federal government (for roads and interstate railways), the states (for roads, intrastate railways and most ports) and local governments (for roads). Regulatory measures for road, rail and maritime transport differ from state to state. The multiplicity of parties involved complicates co-ordination between the modes of transport and affects the efficiency of the freight system. Access to rail transport and port infrastructure is non-discriminatory. The private sector manages some ports and toll roads directly, and certain mining companies have developed their own rail networks.

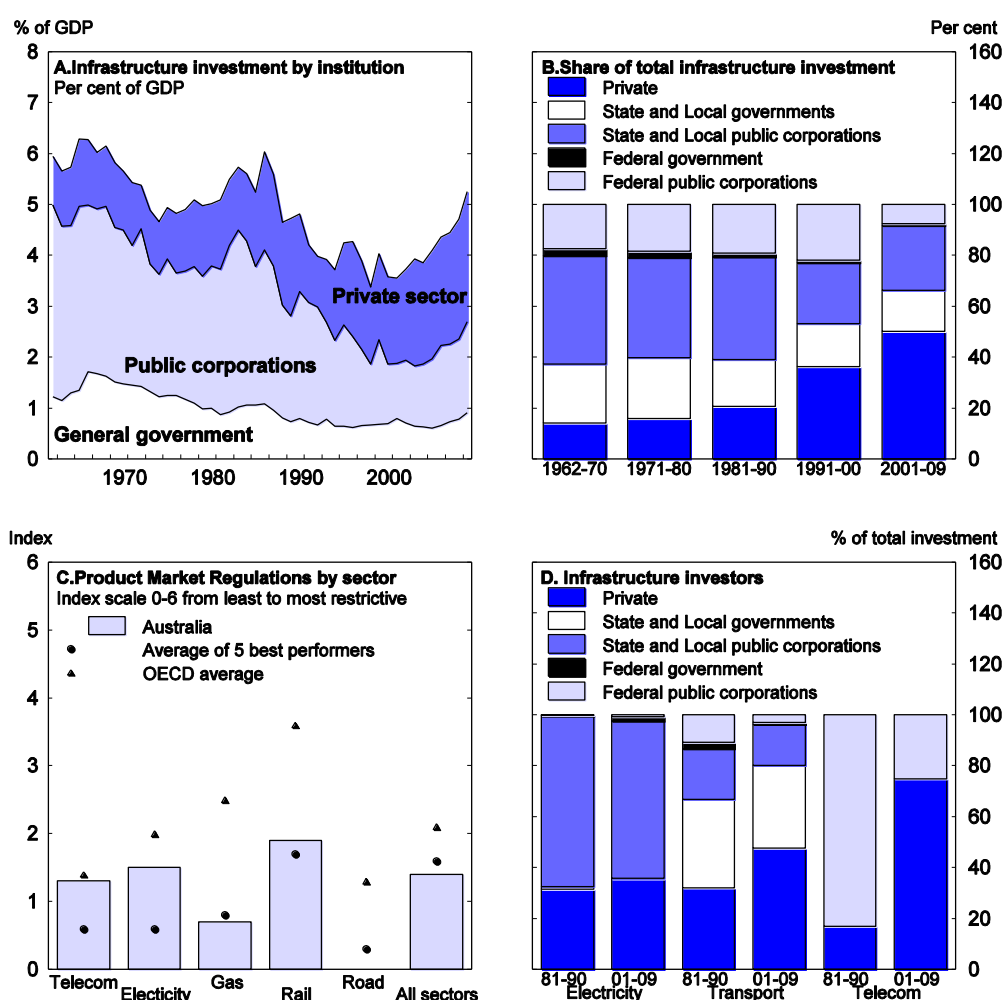
1. In 2008, regulatory provisions imposed comparatively few restrictions in land transport, gas and, to a lesser extent, electricity. Restrictiveness was above the OECD average in respect of telecommunications and postal services.

Despite progress, the management of public infrastructure provision needs more attention

Information gaps and weak coordination within government have contributed to the deficits

Current estimates of unmet infrastructure needs vary and tend to be unreliable, as they are based on cumulative costs of multiple capital investment projects proposed in each sector, instead of detailed needs assessments, and do not consider making better use of the existing stock of equipment². It is also difficult to assess how the significant increase in public and private investment in infrastructure in recent years meets current and foreseeable needs (Figure 3). The infrastructure deficit stems in part from the inevitable time lag for investment between the increased demand triggered by the take-off of Asian economies and the rise of environmental concerns. More specific information is needed to assess the precise needs of various infrastructure services and to identify potential obstacles to a greater supply.

Figure 3. Infrastructure investments by sector



Source: Australian Bureau of Statistics, Australian National Accounts: Gross Fixed Capital Formation by industry and by sector (Cat. No. 5204.0), Table No. 52, 53 and 54 and OECD.

2. According to some estimates, infrastructure requirements range between AUD 445 billion and AUD 770 billion (Henry, 2010).

Weak co-ordination between public infrastructure development and fiscal management has contributed to capacity problems. Before the crisis, the cyclical situation of the economy did not justify spurring already strong demand through increased public spending to eliminate bottlenecks in the freight sector, for example, even though the fiscal situation was comfortable. From one standpoint, then, the crisis provided an opportunity to increase these outlays. Nevertheless, the resources allocated to this in the 2009/10 budget were limited because of the lack of capital investment projects that were ready to be undertaken quickly (Henry, 2010). Moreover, it is likely that in the coming years the need for fiscal consolidation will constrain the growth of public infrastructure investment.

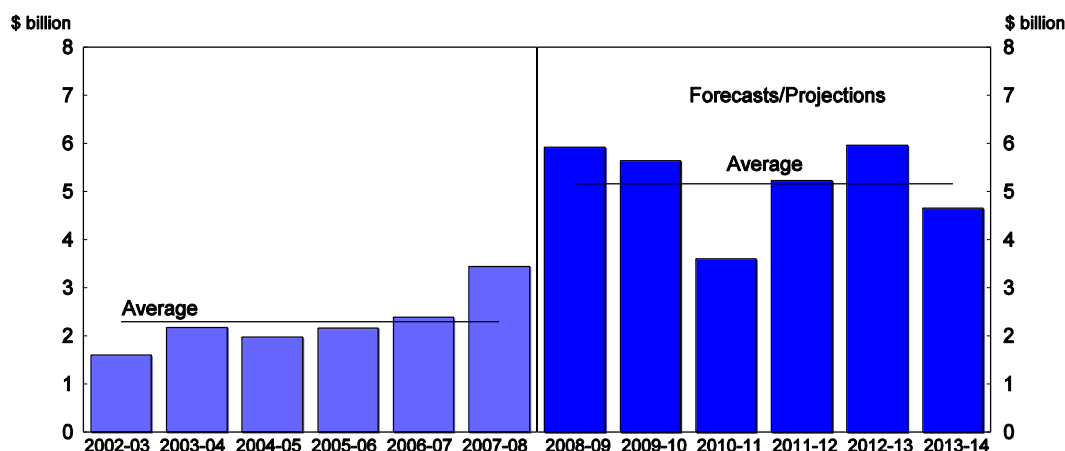
The lack of co-ordination between the various levels of government, and between jurisdictions at the same level, has been another source of inefficiency. Infrastructure spending decisions are frequently taken with no regard for national priorities. This is the case, for example, with freight, where the transport chain is governed by multiple authorities (Box 1). Efforts have been made in the past to co-ordinate road and rail investment thanks to federal government involvement. But the plan in question Auslink, (renamed the Nation Building Program following a change of government in 2007) did not include port infrastructure, whose lack of connections to the land transport chain reduced its benefits. The problem of inter-governmental co-ordination also takes the form of cost transfers: for example, the application of the Auslink Program for roads between 2005 and 2009 prompted the local authorities to use federal subsidies to scale back their own capital investment (ANAO, 2010).

The federal authorities have taken steps to bolster their intervention in the infrastructure sector

To tackle these difficulties, the federal government has recently taken a more active role in infrastructure development. A federal ministry was established to handle the issues involved. The Building Australia Fund was set up to finance infrastructure projects, endowed with a portion of the pre-crisis budget surpluses. These financing arrangements are to be replaced as from 2012/13 by a new permanent arrangement the Regional Infrastructure Fund funded by the new federal tax on mining industry profits (Chapter 2). In addition, the newly established Infrastructure Australia (IA) was asked to advise the government on infrastructure policy.

One of IA's first tasks was to conduct an audit and compile a list of priority needs to steer public and private investment. The audit spotlighted requirements in seven sectors: broadband Internet, ports, the rail freight network, urban transport, the energy market, water supply and infrastructure for Indigenous communities (IA, 2008). In these sectors, nine priority projects and an additional list of 28 other projects, accounting for aggregate investment in excess of AUD 60 billion, were identified (IA, 2009). In the short term, this planning effort led to the funding of seven of the nine priority projects selected as part of the 2009/10 Budget thanks to the resources of the Building Australia Fund. The 2010/11 budget has also increased railway investment, so that federal transport expenditures, either actual or projected, which amount to 0.3-0.4% of GDP a year between 2008/09 and 2013/14 represent, in real terms, more than twice those of the six previous years (Figure 4). In the longer term, it should be useful for the formulation of future fiscal stabilisation policies to maintain a list of projects that have been scrupulously evaluated and could be launched rapidly (Henry, 2010). Moreover, in June 2010 Infrastructure Australia updated the list of projects likely to meet the country's most pressing needs (IA, 2010b).

Figure 4. Commonwealth spending on road and rail infrastructure



Source: Treasury.

The role of the federal government in the sector has been expanded. This has led to investments in ports and urban transport, which had previously been reserved exclusively for the states. Infrastructure Australia has also recommended a closer integration of ports into the freight transport chain for expanding the country's export capacities. The pivotal role of cities in the workings of the economy also legitimises federal intervention to guarantee the efficiency of infrastructure in major city centres, especially given the sharp population growth.

Co-ordination between the various levels of government and long-term planning efforts have been strengthened in the ports and urban transport sectors. Implementation of these long-term strategies is essential in view of the long lead time for capital investment projects in transport. This is also important to clarify the outlook for the supply of freight services and facilitate the planning of private-sector investment, especially in the mining industry. A national ports strategy is thus being devised by the Council of Australian Governments (COAG) to eliminate obstacles to development. This was facilitated by improved management of the land surrounding the port areas near large cities. More broadly, the strategy should be incorporated into a national freight strategy that Infrastructure Australia is going to propose to COAG at end-2010 to improve co-ordination of investment choices between the various modes of transport (IA, 2010b). In addition, an agreement was reached within COAG at the end of 2009 to tie federal funding of urban infrastructure to better town planning for state capitals. In Australia, the infrastructure of large cities is not co-ordinated by a special authority as in many other big cities in the world (Henry, 2010). Under the signed agreement, the states will have to formulate town planning schemes for their capitals by January 2012 on the basis of common criteria for better identifying and tackling the challenges and infrastructure needs made necessary by population and economic growth.

The new federal policies are welcome, but there is room for further reforms

Future audits to assess the country's requirements should be fine-tuned. By relying primarily on submissions of investment projects by the states or the private sector, the first audit by IA was unable to analysing demand and evaluating imbalances in the various markets. Recently however, IA seems to have geared its work more towards assessing demand, as in the areas of ports and water (IA, 2010c). It would seem useful to get a clearer picture of the current level of the supply of infrastructure services in relation to needs, using indicators that are updated regularly (BCA, 2009). Such indicators could show, for instance, how freight handling capacity for ports and land transport compare with desirable levels; they could also gauge the extent and frequency of city water restrictions and the degree of congestion of urban road transport in relation to acceptable maximum thresholds. This results-oriented approach, which would entail the creation of a customised database, would supplement ad hoc evaluations of various infrastructure

projects. It would provide systematic information on supply and demand imbalances and assess the underlying trends. This would clarify the policy makers' strategy, and provide a better accounting of the progress made.

It would also be advisable to upgrade the mechanisms for selecting public infrastructure projects. Greater federal government involvement in this sector, alongside the states, is beneficial from a co-ordination standpoint, but needs to be well managed to avoid diluting responsibilities and affect the quality of expenditures (Ergas and Robson, 2009). Prior earmarking of public resources for infrastructure financing is superficially attractive for sustaining infrastructure growth, but it is inadvisable because it will hinder incentives for strict project selection.

Infrastructure Australia has pledged to follow an objective and stringent investment selection process. It is based on a published methodology using cost/benefit analyses. Recently, some results of project cost/benefit analyses carried out by IA have been released, although not all have been disclosed (IA, 2010b). A cost-benefit analysis was not undertaken before the government announced the National Broadband Network policy. However an implementation study was conducted after the announcement of the policy which undertook detailed financial analysis, including revenue and cost modelling. This study estimated the cost of the NBN at a maximum of AUD 43 billion of which taxpayers are expected to contribute approximately AUD 26 billion. Additional efforts for rigour and transparency would, however, be welcome. Such efforts could be geared towards three objectives:

- (i) *Enhancing transparency.* Systematic publication of cost/benefit analyses for the projects evaluated would be useful. The technical quality of these evaluations should be verifiable, and the assumptions underlying investment choices should be clearly identifiable. From this standpoint, the recent transparency efforts made by IA go in the right direction, but they should be pursued and stepped up, because the information disseminated to date has been too limited.
- (ii) *Making more frequent use of audits.* Independent evaluations could be made mandatory for capital investment projects exceeding a certain amount. Regular audits after the fact would also provide useful lessons.
- (iii) *Bolstering the technical quality of cost/benefit analyses.* Such analyses make use of complex techniques which are important to fine-tune and disseminate more widely. In this area, for example, the Productivity Commission could play a useful role as a reference centre to help agencies involved in the analyses to shore up their work.

Regulatory incentives for investment, capacity utilisation and competition should be reviewed

Continued regulatory reform in the infrastructure sector is also needed. Increases in public investment should not serve as a substitute for such reforms. The options for government funding are in any event limited, and the private sector should become more and more decisive in the supply of services. On the other hand, investment flows are relatively modest in relation to stocks of existing infrastructure, the usage of which could be improved. Against this backdrop, there should be no underestimation of the role of regulation, and especially of efficient pricing systems, in improving infrastructure services. Adequate signals enable a better fit between demand and available capacities and let investors identify the economy's real needs, thus fostering efficient resource allocation. The regulatory reforms of the 1990s to expand the influence of markets in the infrastructure sector have generated gains estimated at 2½ per cent of GDP, and a continuation of these reforms should secure substantial added benefits, which might amount to as much as 2% of GDP (Productivity Commission, 2005; BCA, 2007; Productivity Commission, 2008).

Many distortions affecting the pricing of public infrastructure could be eliminated or improved

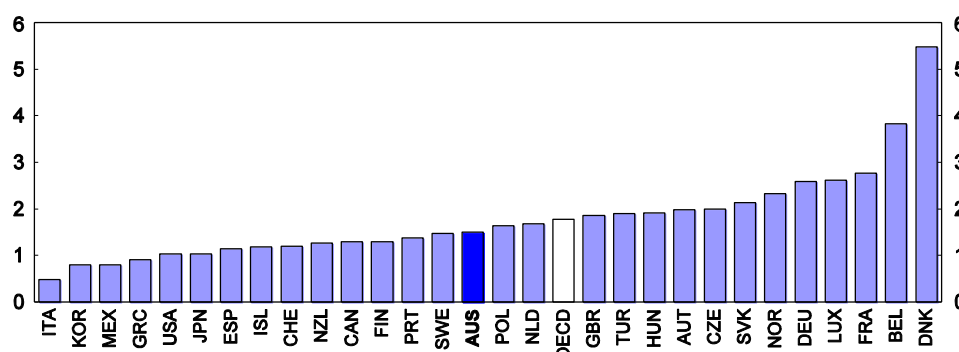
The authorities should pursue reforms of public infrastructure usage pricing to ensure that long-term costs are recovered in full. This applies in particular to water pricing, in rural and urban areas. The over-

allocation of water resources in some areas of Australia has led to an effective under-pricing of water and a deterioration of the environment. These demand-stimulating price distortions have also induced pressures to renovate unviable infrastructure (PC, 2008a). Efforts have been made in recent years to rectify this under-pricing, *inter alia* by improving how water-rights markets work in rural areas. However, the segmentation of those markets that is caused by the existence of natural barriers is exacerbated by state regulations that, among other things, limit trade in water between urban and rural areas. The subsidies that states grant regularly to water companies also show that pricing adjustments are needed. A better job must also be done to factor in environmental costs (OECD, 2008).

Water pricing also poses difficulties in urban areas. Prices in this sector are low by international standards (Figure 5) and are affected by distortions. The states intervene frequently in the financing of infrastructure (IA, 2008; Marsden Jacob, 2006). Recently, most large cities have increased their investment to put an end to the quantitative restrictions that had been put in place in response to excess demand. Nevertheless, as a rule these investment decisions have shown little transparency. The construction of numerous desalination plants responded to a need to diversify supply and thus avoid the consequences of droughts. However, options that were attractive from a cost standpoint, such as those involving trade between rural and urban areas, could not be taken up. Regulatory barriers also limit increased use of water recycling. Dismantling these barriers, as well as reforming the current arrangements for management by public monopolies, ought to be considered. This sector bears many similarities to the electricity and telecommunications industries, which are also dependent on natural transmission monopolies. Introducing competition to industry segments upstream and downstream from the transmission chain (bulk water supply, marketing services and sewage treatment) could have beneficial effects that would attract private capital and spur innovation. Analyses in this area would be desirable (IA, 2010c; BCA, 2009; PC, 2008a). The Productivity Commission is currently examining opportunities for efficiency gains in the structural, institutional and regulatory arrangements relating to the urban water sector.

Figure 5. Cost of water for urban consumers

US dollars per cubic metre, June 2009^{1, 2}



1. User cost (based on 2009 purchasing power parities) assuming consumption of 15 cubic metres per month per user; including value added tax but *excluding wastewater treatment*. Unweighted average of the city data available for each country. The OECD aggregate is an unweighted average excluding Ireland.

2. For Belgium, Denmark, France and Sweden include wastewater treatment cost (*i.e.*, combined billing).

Source: Preliminary estimates from Global Water Intelligence.

The pricing of road infrastructure also suffers distortions which are reflected in capital investment decisions. Road use charges in Australia involve fixed registration fees and an excise tax on fuel. Such payments are independent of the type of vehicle and the road infrastructure used. As a result, there are cross-subsidies between the different types of vehicles and the various infrastructures. Between 32% and 100% of road maintenance costs are attributable to heavy vehicles, whereas the wear and tear caused by passenger cars is negligible (PC, 2006a). This situation may in turn imply an inefficient allocation of capital investment in the freight sector between rail and road, when both modes of transport are in

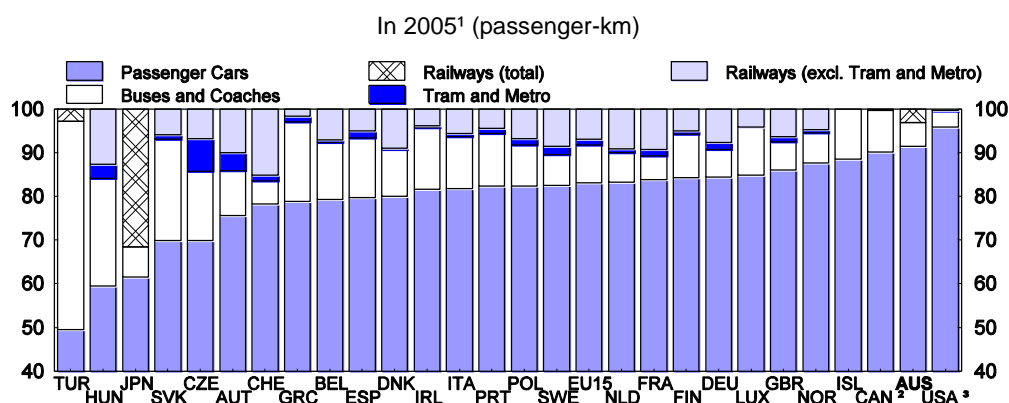
competition, if it results in a cost advantage for heavy goods vehicles over long distances (Sims, 2010). Neither, for that matter, is there any linkage between road fee revenues and the expenditures of the agencies in charge of managing this infrastructure. Spending decisions are taken by the states and local governments as part of their annual budget processes. Funding is provided via general transfers that the agencies get as a result of equalisation mechanisms and resources specifically allocated by the federal government (AFTS, 2010). The incentives for efficient choices in road infrastructure are thus reduced. Local governments are sometimes also prompted to protect the value of their assets by restricting access to roads. But the resultant reduction in management fees may be more than offset by the higher costs of freight companies, which may be compelled, for example, to adopt longer itineraries.

COAG is looking into the introduction of a new road freight pricing system to address these issues. It would harness new technologies to factor in the location and intensity of network utilisation (amount transported and distance travelled). The feasibility study for the system planned for end-2011 should be brought forward to accelerate the reform. In parallel, thought should be given to overhauling the framework for managing and financing road infrastructure. In line with the approach used for other services, such as electricity and water, the authorities could transfer the management of road transport to public enterprises (Sims, 2010; AFTS, 2010). This would make the supply of these services more market-driven than under the current budget-management approach. It would also enhance the consistency of decision-making with regard to expenditure and revenue, and spur more efficient use of infrastructure. To maximise the benefits of such an approach, efforts should continue to give public enterprises clear objectives, make them responsible for their results and ensure that they have sufficient managerial independence from the government, in respect of capital spending. This would require better identification and greater transparency of public funding of the services, and avoiding pricing distortions that impair investment choices (PC, 2008a and b).

Better demand management can reduce congestion

Regulatory reforms should be complemented by better management of transport demand to ease congestion problems in the large metropolitan areas. As mentioned earlier, these problems impose a growing cost on society, in terms of well-being and productivity alike. Congestion problems generate delays and uncertainty over transport times for individuals and businesses, additional costs for the fleet of automobiles and the environments. At present, users have no incentive to consider the costs of using urban networks at peak times.

Congestion charges would facilitate a better use of road infrastructure. They should vary according to time of day or location. This approach has been used successfully for access to downtown London, Oslo and Stockholm. More boldly, the Netherlands has been considering a generalised system of per-kilometre tolls on its road network, using GPS technology and charging additional fees for using congested areas and during peak times (OECD, 2010a). The introduction, at the beginning of 2009, of one-way tolls in the Sydney Harbour Bridge and Tunnel that vary by time of day seems to have increased off-peak traffic and reduced rush-hour traffic. The purpose of charging such variable fees is not to increase tax revenue but to correct market failures and ensure that users consider congestion costs when making decisions. The resources collected may, however, be a useful source of revenue for developing public transport that provides alternative travel options. Public transport would appear to play a more limited role in Australia than in the other OECD countries (Figure 6). Moreover, the growing use of public transport in urban areas is posing saturation problems justifying additional capacity (BCA, 2009; IA, 2009 and 2010b).

Figure 6. Modal split of passenger transport on land

1. Or latest year available.
2. Intercity passenger services only for rail and includes light trucks in cars.
3. Private cars include vans and recreational vehicles.

Source: DG Transport and Environment, OECD Environmental Data Compendium, 2006/2007.

Efforts should also be pursued in the electricity and water sectors to make better use of available facilities. Greater responsiveness of consumption of these infrastructure services to pricing would avoid construction of costly production capacities to meet peak demand. In these areas, technology can provide invaluable assistance. In the case of electricity, the use of smart meters would allow users to better adapt consumption to rate differences during the day, which would help stabilise wholesale electricity prices (AEMO, 2010). The authorities should continue to promote the installation of such meters wherever they would be economically worthwhile. This should be accompanied by the elimination of the electricity rate caps in effect in most states for households and SMEs. Likewise, there should be greater recourse to pricing mechanisms to manage the pressures of demand for water in urban areas (ABARE, 2008). Here too, the use of smart meters may play a useful role. In addition, consumers exempt from these pricing signals, such as renters (whose water bills are generally paid by their landlords) and pensioners (who are granted special deductions on their water and electricity bills) should be included. It is important to avoid having social objectives, which some of these measures address but which are better pursued through the tax-transfer system, interfere with the workings of the markets.

The regulatory framework for private investment is another thorny area for reform

Some have suggested that regulations in Australia have focused more on enhancing the efficiency of the use of existing facilities rather than on spurring private investment in the industry (Emerson, 2009). Since the mid-1990s, Australia has adopted bold regulations to facilitate third-party access to infrastructure, which cannot be duplicated in an economically profitable manner (Box 2). They provide for arbitration by the regulatory authority, and set the terms and pricing for the access. As they were devised at a time when most infrastructure was managed by public enterprises, they do not always strike a suitable balance between incentives to investment by the private firms dominating these markets, and the need to avoid barriers to competition stemming from the existence of natural monopolies.

Box 2. Australian regulations on third-party access to infrastructure services

In Australia regulation provides for third-party access to infrastructure under certain conditions. The National Access Regime (NAR), Part IIIA of the Trade Practices Act, provides four broad avenues for access:

- Voluntary offers of access from infrastructure owners on terms that must be validated by the Australian Consumer and Competition Commission (ACCC).
- A state government (alone or with other governments) can implement a mandatory access regime for an industry or asset and seek certification from the Commonwealth Minister that the access regime is effective.
- For the new government owned infrastructure, the terms and conditions for access can be determined pursuant to an ACCC approved, competitive tender processes for the construction and operation of the facility.
- If none of the above three avenues have been taken, access-seekers have legal recourse to compel infrastructure owners to negotiate conditions and prices for using their facilities. They may apply for a recommendation of the National Competition Council (NCC) and, ultimately a decision by a responsible Minister, that the services provided by particular infrastructure should be “declared”. This decision is based on several criteria including that:
 - The requested access to infrastructure would have to strengthen competition in at least one market other than that of the infrastructure services in question.
 - It would not be economically feasible to duplicate this infrastructure, which must also be substantial on a national level.
 - The right of access should not be detrimental to the public interest, and there must be no exemption in the legislation with regard to the services in question.

Once a service is declared, the infrastructure owner must negotiate with access seekers the terms and conditions for access to the service. If no agreement can be reached, the parties can refer the matter to the ACCC for arbitration.

Special national regimes exist for telecommunications and banking payment systems which replicate the main provisions of negotiation/arbitrage of the general access model described above. These industries stand apart from other infrastructure sectors because of the extent of the powers invested in the regulators, the ACCC and the Payment Systems Board: the regulators themselves determine which services to regulate on the basis of the “long term interests of end users” (telecommunications) and efficiency, competitiveness and the risk to the financial system (payments systems) and, once services are declared or designated, their powers extend well beyond the arbitration of disputes.

The effectiveness of this regulation raises questions inherent in the complexity of the problem. One function of the National Access Regime (NAR) is to avoid having monopolistic control over infrastructure services thwart competition in markets reliant on those services. However, this obligation entails a non-voluntary transaction, in which the cost to the supplier may exceed the gain to the applicant. A vertically integrated firm’s refusal to grant access may in fact be justified on efficiency grounds rather than a desire to protect a rent or exclude a competitor (Ergas, 2009). The practical difficulties of implementing an obligation to grant third-party access to an infrastructure network should not be underestimated. It is difficult for regulators to set adequate conditions and access prices in relation to costs, especially in respect of sectors undergoing rapid and complex technological change, such as telecommunications. Third-party access to an infrastructure network of a vertically integrated company also entails the institution of controls previously managed in-house to check the quality of network use. This raises transaction costs and impairs efficiency when conflicts arise, as happens frequently because of the divergent interests of the parties. Often, the owner of the infrastructure also adopts a discriminatory attitude *vis-à-vis* its competitors. This non-co-operative dynamic tends to increase regulatory intervention, which is a source of additional cost. In all, regulatory failure cannot be ruled out, and this can be costlier than the market failings that need correcting. In particular, such regulation can thwart capital investment if private businesses deem that the

risk of having to share their new infrastructure with competitors at a price set by the regulatory authority is excessive.

The slowness of NAR implementation procedures is a source of uncertainty and costs for the parties involved. In part this reflects the complexity of the issues raised by this regulation. For example, applications for access to certain rail freight segments owned by big private mining companies in the Pilbara region of Western Australia were submitted between 2004 and 2007 and have yet to be resolved. In each case, the initial decisions triggered appeals, leading to comprehensive re-examinations of the arguments of the parties involved by the Australian Competition Tribunal. Application of the NAR constitutes an intrusion into ownership rights that demands extreme prudence and minute review by multiple independent bodies. However, the length of these procedures stems also from needless duplication of assessments and the legal options seized upon by companies prepared to expend the necessary resources to delay the application of these decisions (NCC, 2009).

The few empirical evaluations available suggest that the NAR's impact on infrastructure operation and development varies by industry, and even by particular circumstances within a given industry. Some arguments favour limited regulatory influence on investment delays. Since 1995, only 7 facilities have been declared under the NAR (some of these decisions are currently subject to appeal) and only two of those instances have led to arbitration by the ACCC to set access conditions and prices (NCC, 2009). Regulatory intervention has been more frequent in telecommunications, however, and a consensus exists to acknowledge the regulatory and organisational deficiencies of the broadband Internet sector (Ergas, 2008; Conroy, 2009a; ACCC, 2009). The NAR seems to have had beneficial effects in energy, although the workings of that particular market could be improved further (IA, 2008; Henry, 2010). Fagan (2007) reaches a mixed assessment of the regulatory impact on rail freight transport: a comparison with the situation in the United States shows that the gains obtained from additional competition would be more than offset by the costs of regulatory co-ordination. Rules for third-party access to various segments of the railway network do not sufficiently factor in specific circumstances, and the competition from other modes of transport (PC, 2006a). According to NCC (2008), co-ordination costs for some parts of the network (such as coal freight along the country's east coast) are not related to the NAR, but to the piecemeal organisation of the industry, which is regulated by the states and consists of a great many individual firms.

Measures to rationalise the NAR have been passed by the Australian Parliament. They aim at reducing the amount of time needed to implement the NAR by imposing deadlines for decision-making and by setting limits on the content of merit reviews conducted by competition courts to avoid duplication. These provisions also allow for minimum 20-year exemptions from NAR application with new infrastructure (Bowen, 2009). These amendments are expected to reduce some of the uncertainty that discourages private investment. However, the 20-year exemption period seems arbitrary. It should probably vary from one industry to another, if not from project to project. But it may be too long, by passing the entire life cycle of a technology in a fast-moving sector, or yielding excessive monopoly rents or unduly restricting access.

Application of the NAR combined with sufficiently high access prices to encourage new capital investment might be another option to consider (PC, 2008b). Economic regulation of natural monopoly infrastructure seeks to replicate the outcome of a competitive market. In doing so, it seeks to balance the need to efficiently attract investment funds to network businesses by providing a fair market return with preventing monopolies from charging inflated prices to the detriment of business and end consumers. A key component of the permitted rate of return for equity is an assessment of the nature and extent of the risk of such businesses. Until recently, these industries have been generally regarded as mature industries with low investment risks and, consequently, the permitted returns for existing and incremental capital investments have been relatively conservative. However, Australia is now confronting the need for large investment by businesses that are structurally separate from the businesses that determine the pattern

and extent of the use of the new infrastructure, which makes it difficult to quantify and control some types of risk. For regulators, this raises several related questions concerning whether some forms of coordination between the separate businesses can be improved, whether higher returns are required to encourage new investments and, if so, how much higher (Helm, 2010).³ To the extent that improved coordination cannot eliminate the additional risks of new investments in structurally separated industries when compared with mature industries, the cost of capital might need to be higher.

The issues of coordination and identifying a fair rate of return for new investments in structurally separated regulated industries are exacerbated by the recent global financial and economic crisis. As in many other OECD countries, Australian regulatory system uses publicly quoted financial market data to calculate the fair return benchmarks for regulated businesses. Even if Australia financial sector has weathered this crisis well, these financial turbulences caused thinner trading on local equity and debt markets that are small by comparison with European, North American and Japanese equity and debt markets. This made the regulator's task of finding a fair rate more challenging. Counterproductive court and tribunal disputes have indeed significantly increased in number and value between infrastructure investors, consumer representatives and regulators on these issues.⁴

The search for improvements in how to apply the current methodology for establishing a fair rate of return and the consideration of alternative methods for identifying such a rate appear to be an important issue that regulators in Australia have already started considering. This question, together with those raised by the past implementation of the NAR in the various industries, should be given priority to address potentially damaging uncertainty and impediment to new investments. A detailed assessment of NAR new challenges and past implementation, to draw conclusions from the experience to date, would thus be useful to fine-tune regulatory provisions and help incorporate the specifics of each industry. This would facilitate the review of the regulatory framework scheduled for 2012.

Restructuring of the telecommunications sector should maintain competition between technologies

A far-reaching reform project has been undertaken to fill the gaps in the broadband Internet sector. Regulatory support for investment and innovation in this area is vital to respond to rapidly shifting technology and demand. Internet services that are faster and more widespread, using fixed and wireless technologies, could yield substantial benefits, especially in terms of productivity, as was the case with the dissemination of ICTs in the 1990s (OECD, 2010b).

The organisation of the telecommunications sector with a strong hold by the historical operator does not promote competition or the development of broadband networks. Telstra, which was privatised gradually between 1997 and 2006, is highly vertically integrated. It owns and controls access to the copper telecommunications network, and is active in the competitive retail services. There were 157 disputes

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3. As note by Helm (2010), the coordination problem is considerable: the development of new infrastructure assets needs to be coordinated with the building of new transmission and distribution networks, and these in turn need to be coordinated with expansions of the customer bases. If each stage is conducted through separate and independent companies, then there will be a sequence of transaction costs. Hold up becomes a serious problem: not only in terms of extra costs but also in incentives.
 4. A substantial divide about whether Australian infrastructure regulatory model delivers adequate returns to justify new investment has opened up between, on the one hand, virtually the whole of the infrastructure investment sector both publicly and privately owned and, on the other hand, regulators. Almost every major economic regulatory decision in recent times has been challenged in Courts and Tribunals on this basis. Examples of concluded dispute decision in the Australian competition tribunal involving 5 electricity companies can be found at: <http://www.austlii.edu.au/au/cases/cth/ACompT/2009/8.html>; similar decisions have involved Telstra and further disputes have recently commenced for a gas network.

between 1997 and mid-2009 on conditions for access to the telecommunications network, virtually all of which involved Telstra, compared to three conflicts in other infrastructure sectors under the NAR (Conroy, 2009b). This strategy of the historical operator is impeding its rivals' ability to build a customer base in the DSL Internet services niche which occupies a dominant share of the market in Australia. Telstra also owns the country's largest cable and mobile networks. Its strong presence in all service platforms therefore limits competition using different technologies: the company's incentive to develop new services is diminished by the potential loss of value of its assets and its income from existing networks. For example, Telstra did not respond favourably to the government's 2007 invitation to build a fibre optic network on the basis of a private/public partnership (OECD, 2008). Moreover, the other private operators do not have a large enough customer base to make wide-scale capital investment in such infrastructure economically feasible.

There are two main components to the authorities' plan to remedy these difficulties (Box 3):

- Revise the framework for competition in telecommunications, and especially the infrastructure access regime.
- Overhaul the market structure to ensure the development of a National Broadband Network (NBN) to replace the copper telecommunications network.

Box 3. Proposals to reform telecommunications and improve the supply of Internet services

The biggest regulatory change of the reform project is to replace the current infrastructure access regime, based on a negotiation/arbitrage model, with a system that sets in advance the conditions and price of access, as in European countries. Uniform conditions would be set for all applicants for three-to-five years. The current regime is heavy to administer and easy to manipulate, as regulatory decisions are required for each individual request for access. This has triggered many disputes. The dominant operator uses these legal procedures, along with the options that infrastructure owners can exercise to make voluntary offers of access, as stalling tactics to limit competition. As a result, the proposed reform would eliminate possibilities for voluntary access offers. It also seeks to do away with examinations of the merits of conditions for access, bolsters the ACCC's powers to prevent anticompetitive conduct and encourages faster intervention (Conroy, 2009b).

More fundamentally, the proposed reform seeks to change the structure of the market to deploy a national broadband network. The authorities have planned to construct a fibre optic network, the National Broadband Network (NBN), managed by a public company, NBN Co., to raise the quality of Internet services and connection speeds (up to 1000 Mb per second) for most of the population. The total cost of this projects is expected to reach AUD 43 billion, with public investment expected to total AUD 26 billion over eight years, and the balance funded by private debt raised by NBN Co. NBN Co. will be exclusively a wholesale broadband access service provider and will not take part in the marketing of consumer Internet services, which will be carried out by private firms.

To enable the development of this network, the government prompted Telstra to accept a financial agreement involving structural separation between the management of its copper network and its other commercial activities.¹ A financial heads of agreement in the amount of AUD 11 billion (0.8% of GDP) was signed in June 2010, allowing NBN Co. to access the conduits and ducts of Telstra's historical network, and to avoid unnecessary duplication of infrastructure to install its equipment. The agreement also provides for the gradual transfer to NBN of users of Telstra's copper and cable networks, which will then be decommissioned. Lastly, a public company, USO Co., is going to be created to finance certain universal service obligations and the costs of redeploying Telstra staff induced by these changes. To be applicable, the final agreement, which is being negotiated, must also be approved by Telstra shareholders and the government, probably during the first half of 2011. The ACCC will also review competition aspects of the agreement.

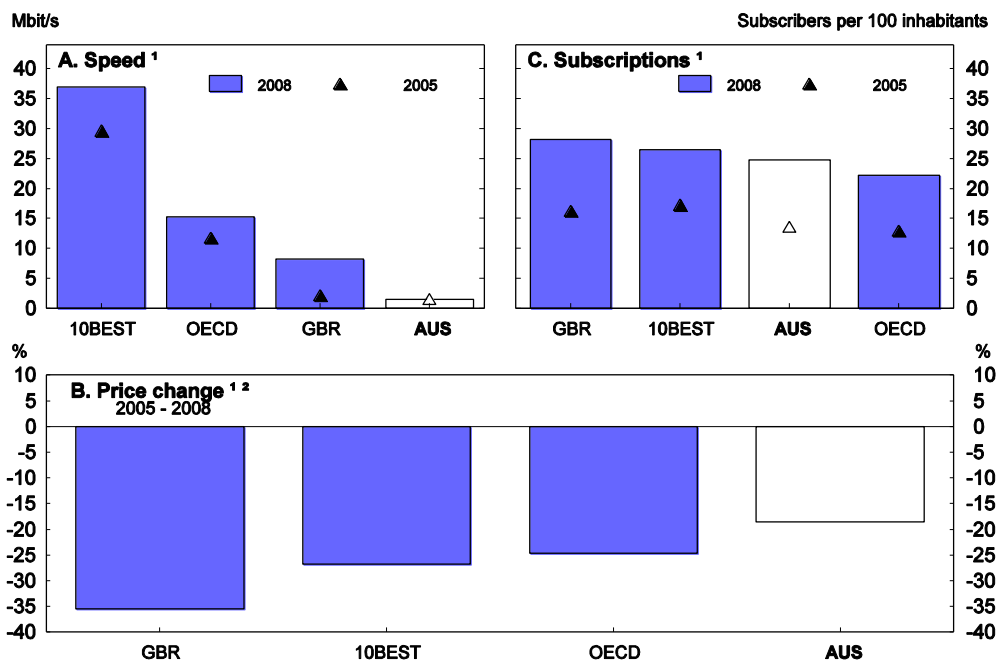
1. Had this voluntary structural separation been refused, the draft legislation would have forced a functional separation on Telstra, similar to the one imposed in the United Kingdom. The company would then have had to divest its holdings in Foxtel, the main supplier of pay TV. Moreover, its outlook for supplying mobile Internet services would have been limited by a ban on acquiring spectrum band usage rights, which are necessary for the future development of this technology.

The first component of this major reform can be expected to improve competition in the telecommunications market during the transitional period prior to the launch of the NBN. In particular,

simplifying the access regime ought to reduce possibilities for discrimination between private telecommunications operators. It would be prudent, however, to maintain the possibility of a number of independent bodies conducting a scrupulous review of the access pricing and conditions set by the ACCC. This would be compatible with faster application of the regulations, if these parameters are set in advance. Calling the dominant operator's vertical integration into question is also welcome, as it will stimulate competition in the DSL Internet sector, and it can be expected to yield substantial benefits, as shown by British Telecom's functional-separation experience (Ofcom, 2009; ERG, 2007; OECD, 2009a) (Figure 7).

Figure 7. Evolution of broadband subscription

Representative DSL broadband subscription over time, 2005-2008



1. The ten best countries are the countries offering highest speed for a representative broadband subscription in 2008. They are: Japan, Korea, Finland, New Zealand, Sweden, Italy, Netherlands, France, Portugal and Luxembourg.
2. The price change between 2005 Q4 and 2008 Q4 of the price per kbit/s of the representative DSL broadband subscription.

Source: OECD, OECD Broadband statistics, STI.

The NBN development project has sparked intense debate on the need for government intervention. It has the potential to significantly improve Internet services within a relatively short time frame. Management of the new network by a public enterprise not involved in commercial activities ensures that private operators accessing the NBN will each get fair treatment on the basis of uniform nationwide pricing. Lastly, the government's programme will avoid the risk of a geographic digital divide insofar as it will cover the entire population. Public involvement could be important where private firms are not prepared to invest if they were compelled to make the networks available to their competitors. What is more, if private capital were deployed, it would probably be done gradually and limited, at least at first, to the most densely populated areas.

Concerns have however been raised about potential limits to "local access" competition from building the NBN and its adverse impact on the effectiveness of the broadband sector. The heads of agreement signed with Telstra eliminate competition between the new fibre optic network and the existing technological platforms, the copper network and the country's main cable network. This implies a *de facto* restoration of a public monopoly over the supply of access to wholesale Internet services. Multiple empirical studies have stressed the value of competition between technological platforms for the

dissemination of broadband services (Cava-Ferreruela and Alabau-Muños, 2006; Picot and Wernick, 2007; Lee and Lee, 2010). Moreover, such a monopolistic incumbent could forestall the development of, as yet unknown, superior technological alternatives.

The government decision to limit competition for NBN has been justified by the size of the country and its relatively low population density. This makes it difficult for more than one competing fixed telecommunications network to exist. Even in the country's most densely populated and wealthiest urban areas, demand is probably too low to ensure the economic viability of the three networks currently operating: those of Telstra (copper and cable) and the cable network of Optus Australia's second largest telecommunications operator⁵. Should the protocol agreement with Telstra not be implemented, an intensification of competition between fixed network platforms would probably limit the NBN take-up rate, while growing demand for mobile Internet services could also exert heightened competition. Nevertheless, these arguments seem contradicted by the conclusions of the NBN implementation report of May 2010, which confirm the choice of technology, the estimated cost of building the NBN and the programme's financial viability, even without an agreement with Telstra (McKinsey and KPMG, 2010). This study notes that the need to keep access prices low compared to those of the copper network would limit profit margins to between 4 and 7%. However, the authorities point out that this new infrastructure could also result in substantial spillover benefits not quantified by the study (Conroy, 2009c). Recent research suggests that the use of the new network can bring large savings (0.5% and 1.5% of GDP) to the cost of public services over a 10-year period in four areas (health care, education, transport and electricity), which on its own would warrant the construction (OECD, 2009b).

In sum, while the financial return from the NBN project remains uncertain, there are potentially large benefits from development of the new network. Given this uncertainty, government intervention, which would seem necessary for developing this infrastructure, ought to take a prudent approach. At the same time, it should not trigger a weakening of competition in wholesale broadband services to protect the viability of the government project. An alternative to this picking-the-winner strategy would be to let the market guide choices between the various Internet service options on the basis of prices that reflect costs, factoring in externalities that ought first to be evaluated. To that end, it would be desirable to maintain competition between technologies and, within each technology, between Internet service providers. This would be consistent with the planned vertical separation of Telstra and with other aspects of the reform that seek to promote competition. To develop fibre optic networks more gradually than under the government programme would also allow a better assessment of the new network's costs and potential benefits and the potential positive externalities. From this standpoint, development of an NBN pilot project in Tasmania is a welcome initiative which may provide useful lessons.

Continued regulatory harmonisation between the states can bring large benefits

The overall pro-competitive functioning of the policy framework for infrastructure is hampered by state to state differences in regulation. Implementation of a simpler and more consistent regulatory approach at the national level is one of the priorities of the COAG reform. An acceleration of reforms in this area is desirable, as noted by Infrastructure Australia, which advocates the principle "One economy, one set of rules" (IA, 2008). Application of this principle led to the establishment of nationwide rules for public/private partnerships (PPPs) at the end of 2008. PPPs, which are often predicated on complex contracts, may yield substantial benefits if designed thoughtfully and transparently (OECD, 2009c). They promote better risk management and bolster synergy between the construction, operation and maintenance

5. According to Optus, Telstra and Optus were compelled to reduce the value of their cable investments by AUD 2.4 billion. Telstra's cable network covers 2.5 million homes and the Optus network 1.4 million. It should be noted, however, that competitive pressures bore down on these two competing operators in the same technology.

of infrastructure, and enhance incentives for efficiency over a project's entire lifetime (Chan *et al.*, 2009). Standardisation of rules for PPP also helps disseminate expertise gained in this area by certain states, such as Victoria. In addition, these changes are bringing greater coherency and transparency between the PPP models used in the country, which helps lower transaction costs for potential participants and is conducive to competition.

Similarly, substantial gains may be derived by standardising transport policies. Regulation in this industry, which has historically been under the control of the states, has evolved in a piecemeal fashion that has been costly for business. Rationalisation in this area would yield substantial gains, which have been estimated at AUD 2.4 billion (0.2% of GDP) per year (Murphy, 2010). Reforms have moved forward in recent years. Single national regulators will be established for rail safety and investigation, maritime freight and the heavy goods vehicle sector. The states have agreed on the geographic location of the new regulators, and the new legislation must be endorsed by National Partnership Agreements, which are to be submitted to COAG for its opinion between late-2010 and mid-2011. This should allow these three national regulators to be operational in 2013.

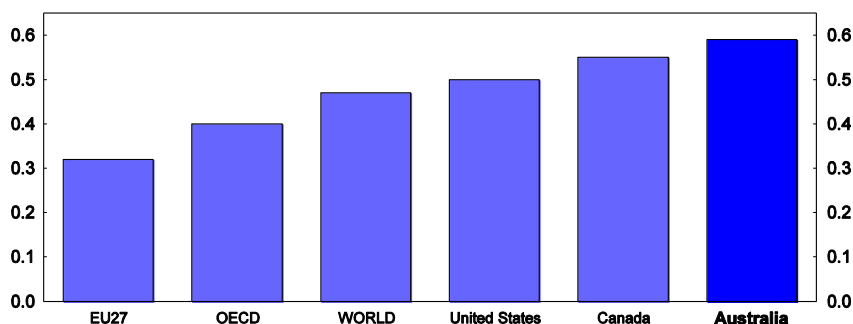
Greater regulatory harmonisation is needed in the energy sector, despite the progress already made to integrate energy markets as some jurisdictions have held on to exemptions from national electricity regulations. Harmonisation of safety regulations and elimination of legal obstacles to the exploration and development of gas deposits ought to be considered as well (Infrastructure Australia, 2008). In the energy sector, however, the most important regulatory issues that still need to be settled to ensure adequate development of infrastructure relate to reducing greenhouse gas emissions (Box 4).

Box 4. Setting a carbon price sooner rather than later is the best option for cutting CO₂ emissions

Australia, which is one of the hottest and driest continents on earth, is more exposed to the consequences of climate change than many other OECD countries (Commonwealth of Australia, 2010). Over the last decade, the average level of temperatures was the highest in recorded history and the country has faced severe droughts. The excessive increase in temperatures is threatening the Great Barrier Reef and irrigated agriculture in the Murray-Darling Basin, which accounts for one third of the country's food production. Although Australia emits only a small share of worldwide greenhouse gases (1½ per cent), its emission intensity measured either by per unit of GDP or *per capita* is high by international comparison (Figure 8). This is due to a dependence of the electricity sector on emission-intensive coal-fired power generation, which accounts for almost 80% of electricity production and a third of country's emissions.

Figure 8. Carbon dioxide emissions from fuel consumption

Kilogrammes of CO₂/US dollar, 2007¹



1. Using 2000 prices and PPP.

Source: International Energy Agency, IEA (2009), CO₂ Emissions from Fuel Combustion, International Energy Agency, OECD Publishing/IEA.

The government is committed to effective global and national solutions to climate change. It ratified the Kyoto Protocol in 2007 and the country is on track to meet its objectives. The authorities are also committed to reducing national emissions to 60% below 2000 levels by 2050. An intermediate target, agreed by all political parties, is a

unilateral cut of emissions to 5% below 2000 levels by 2020. This would be raised to 15-25% by 2020 if a global agreement involving both developed and developing countries are signed.

To meet these targets, the government proposed market-based mechanism to cut emissions. However, the proposed emission and trading system (the Carbon Pollution Reduction Scheme, CPRS) did not get sufficient parliamentary support. A national renewable energy target (RET) has nevertheless been approved to ensure that 20% of the electricity supply comes from renewable sources by 2020. This RET, which has led to the introduction of a number of initiatives supporting the use, investment and research in low-emission technologies, was part of a scheme to assist the transition of the energy sector to the introduction of the CPRS. Another attempt at approving a market-based mechanism to cut emissions has now been postponed to at least the end of 2012. In the meantime, the authorities will try to build a consensus on this issue, and have announced a set of transitory measures to promote a low pollution economy, including strict emission standards for new coal-fired power stations, an enhanced energy efficiency programme and fiscal incentives for companies to reduce their pollution. To increase certainty of future investments and ensure that firms taking early action on climate change will not be disadvantaged, assistance to trade-exposed industries under the future carbon policy would be assessed on the basis of 2007 emissions.

The postponement of the adoption of an emission and trading system (ETS) has increased uncertainty of investments in the energy sector and abatement cost over the longer term. In July 2010, a survey by the Energy Supply Association found that the planned capital expenditure in power generation over the next five years only reached AUD 8 billion, down from AUD 18 billion projected a year before (ESAA, 2010). Potential builders of energy-efficient low-carbon emission gas power plants are reluctant to invest because they are not competitive today and there is no guarantee that an ETS or carbon tax will put them on competitive terms with coal in the next few years (Daley and Edis, 2010). Building a new low-emission, high-efficiency gas power plant takes five to six years. Delaying mitigation action increases climate change risks and prevents low emission technology being developed which raises the cost of achieving any given environmental goal.

Attempting to reduce emissions through regulatory and subsidy arrangements would also be costly for the economy. Current emissions are already 6% above 2000 levels and they will rise to more than 20% above that mark by 2020 according to recent "business-as-usual" projections (Wong, 2010). Achieving the 5% cut of emissions below 2000 level by 2020 would be equivalent to removing emissions associated with all cars on the road and almost half of Australia's electricity generation (Commonwealth of Australia, 2010). As recognized by the government, the costs of regulatory approaches to reduce emissions can be more than twice as high as the costs of market-based approaches (Tietenberg, 1990). Past experience has also shown that using subsidies to reduce emissions would involve large and ongoing fiscal costs with substantial administrative and compliance costs to promote new genuine emission reduction activities which would rely on estimates of hypothetical business-as-usual scenario (Wong, 2010; Commonwealth of Australia, 2010). Since the authorities have retained their commitment to carbon reduction targets, setting a carbon price sooner rather than later is thus the best option to put Australia on a more sustainable low-pollution growth path.

Box 5. Recommendations for promoting adequate and well-functioning infrastructure

Improve the co-ordination and planning of public infrastructure to meet the country's needs

- Future audits assessing infrastructure needs should pay more attention to estimating demand for (or target of) services requested in the various infrastructure areas, and to evaluating imbalances in relation to supply on the basis of regularly updated indicators.
- Further improve infrastructure selection process:
 - Systematically publish the cost/benefit analyses with sufficient details for the projects evaluated.
 - Independent evaluation should be made mandatory for investment projects exceeding a certain amount.
 - Bolster the technical quality of CBAs with the creation of a reference centre able to help agencies involved in the analyses to shore up their works.

Enhance incentives for capital investment and capacity utilisation

- Remove state subsidies to water companies, which prevent the pricing of public infrastructure to ensure full cost recovery. Lift regulatory obstacles to water trade between rural and urban areas. Consider putting an end to public monopolies of urban water management.

- In the road freight sector, implement swiftly a pricing scheme that takes into account the intensity of network use (mass transported and distances travelled) and place of use.
- Consider reforming arrangements for managing and funding road infrastructure to enhance consistency of decision-making with regard to expenditure and revenue: investment choices would be more efficient if a consistent and accountable setting and spending of road user charges was managed by public firms on a commercial basis.
- In general, pursue efforts to give public enterprises clear objectives, make them responsible for their results and provide them sufficient managerial independence from the government, in respect of capital spending.
- Introduce location-specific and time-varying congestion charges in large cities to use more efficiently existing road infrastructure. Use the resources collected to improve public transports.
- Install “smart meters” for electricity more widely to improve demand management. Remove provisions limiting the impact of price signals on demand for services: tenants should pay their water bills directly; rebates on electricity and water bills for certain socioeconomic groups, such as pensioners, should be replaced by targeted transfers.
- Improve the regulatory framework for private investment. Conduct a detailed assessment of the national access regime implementation over the past years to draw lessons from the experience to date. Consider fine tuning regulatory provisions to better take into account the specifics of each industry.
- In the telecommunication sector, maintain competition between technologies in the broadband sector, and within each technology, between Internet service providers.
- Continue regulatory harmonisation between the states. In particular, harmonise safety regulations and eliminate legal obstacles to exploration and development of gas deposits.
- Lift swiftly uncertainties affecting investment decisions in the energy sector by clarifying climate change policy with the adoption of market mechanisms setting a price on carbon emissions.

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