CIPFA

Investing in infrastructure:

Enabling fairer growth

March 2022

cipfa.org

About the authors

University of Birmingham, City Region Economic Development Institute (City-REDI)

Gina Coe was a summer placement student at City-REDI.

Abigail Taylor is a research fellow at City-REDI.

Anne Green is a Professor of Regional Economic Development at City-REDI.

www.birmingham.ac.uk/research/city-redi/index.aspx

CIPFA

Jeffrey Matsu is the Chief Economist at CIPFA. *

* For enquiries related to this report, please contact Jeffrey.Matsu@cipfa.org.

Making it count

CIPFA is committed to changing lives for the better.

As a global leader in public financial management and governance, our aim is to make a difference to the world we live in. Our work enables people to prosper, protects the vulnerable and helps sustain the environment for future generations.

As a professional institute, we support our members and students to act with integrity and deliver excellence in public financial management throughout their careers.

By setting standards and advising public bodies and governments, we help ensure the money and resources used on behalf of citizens are raised and spent fairly, transparently, efficiently and are free from fraud and corruption.

Our thought leadership puts us at the heart of the policy debate, while our education and training offerings and range of advisory services support our members, students and other public finance professionals, helping them add value to their teams and the organisations for which they work.

CIPFA is a global body, operating at local, national and international level. Wherever we find ourselves and whoever we are supporting, our goal is to always make it count.

Foreword

Infrastructure is the network that connects people and places to opportunities for growth.

Motorways and bridges link up continents and facilitate trade, cables transmit our near constant exchange of communication and information, while transport networks ferry people and cargo around the globe.

Investment in infrastructure projects can create outcomes that tackle one of the most pressing challenges affecting all countries: inequality. Poverty, lack of access to healthcare, education and jobs, low digital skills and low investment in a region are all symptoms of inequality. Infrastructure has the potential to stimulate economic growth and increase wealth and opportunities for those most in need. It can, quite simply, improve quality of life.

Nations around the world have been trying to tackle inequalities by implementing policies that aim to spread wealth and opportunity more evenly. In our recent report, 'Investing in Regional Equality – lessons from four cities', we looked at case studies in four international cities that have had considerable success in overcoming social and economic inequality and levelling up.

'Investing in Infrastructure – enabling fairer growth' builds on the previous report and considers six infrastructure projects in different countries that have delivered meaningful local results.

Infrastructure does not come cheap. Financing projects in a responsible and long-term way, one that delivers value for money, requires strong understanding of public financial management principles. Governments will need to innovate and work with local leaders, organisations and the private sector to successfully fund projects over the course of their lifespan. Central to this idea, of course, is the public finance professional.

This report provides valuable insight into how large-scale infrastructure projects can drive greater equality between regions. We at CIPFA hope that this report, and its key findings, will prove useful and informative to leaders and decision makers seeking to level up their communities.

Rob Whiteman CBE
CEO

Contents

Executive summary

Governments around the world have turned to infrastructure development to stimulate economic growth. From the UK's Plan for Growth and the European Green Deal to the US's Build Back Better Plan, infrastructure has been positioned as the panacea for better connecting people and places with opportunities. The sheer scale of investment, currently an estimated $79tn for G20 countries, is staggering.

Rapid urbanisation and evolving environmental and social priorities have placed growing demands on the ability of governments to attract private finance or raise debt. National infrastructure banks have stepped in to crowd-in investment or de-risk emerging technologies, with the aim to produce positive environmental, social and governance outcomes. This has been challenged by the ability to deliver projects on time and within budget.

The affordability of infrastructure and its ability to address resilience and sustainability needs vary widely based on a range of circumstances. For example, political instability or a lack of financial reserves can limit access to capital markets, particularly in areas that stand most to benefit from infrastructure upgrades. While such differences are stark between high and low-income countries, they are equally observable at a sub-national level where municipalities/local authorities are often forced to compete for funding without due regard to need or capacity.

This report supplements our earlier publication Investing in regional equality, which examined a range of initiatives undertaken in four cities around the world. We extend this learning by considering six projects focused on infrastructure – from rural broadband access in Italy and Lithuania, to a bridge linking Sweden and Denmark. All these projects have had some significant impacts on their respective regions, showcasing how different, often innovative, approaches to infrastructure development can yield positive benefits to local communities and a broad range of stakeholders. However, some of the projects did not achieve all their aims or proceeded more slowly than planned.

Key reasons for success

The six infrastructure case studies reinforce the main points identified in 'Investing in regional equality':

1

The importance of **appropriate financing mechanisms** for infrastructure that best reflect the governance structures, fiscal powers and long-term aims of the city or region. Different funding models have worked in the case studies examined.

2

The importance of **well thought-through competitive bidding processes** that provide sufficient capability for all to participate and robust appraisal. The Restart NSW and Smart Cities Mission India projects are examples of competitive-style funding mechanisms. They both introduced tiered monitoring, evaluation frameworks and independent agencies to analyse project proposals.

3

The importance of embedding **robust evaluation, monitoring and appraisal mechanisms** that are implemented, adjusted and updated throughout the project life cycle.

4

The importance of **partnership working** to unite and provide capacity. This is apparent with the use of forums in Greater Copenhagen in the Øresund region case study that aim to strengthen relationships between policy makers and industry stakeholders. The Bilbao case study also showcases the importance of bodies that unite public and private organisations around a common vision, while Restart NSW emphasises the role of central government in supporting local authorities to develop business cases and project proposals.

5

The role of **fiscal autonomy** in developing initiatives. This is particularly notable within the Bilbao case study. While this may be an important characteristic of these case studies with localised infrastructure, for national infrastructure this will be less relevant.

As with the 'Investing in regional equality' main report, monitoring, evaluation and appraisal are crucial. Similarly, context-relevant financing mechanisms and the capability and capacity to actively engage in policy interventions are a common theme. The role of the finance professional sits at the heart of these activities, and finance professionals have a crucial role to play in the development, monitoring, reporting and oversight of such policy interventions.

Overall, the case studies highlight the importance of learning from the experiences of other regions and nations and the need to explore alternative governance, fiscal, and operational mechanisms when designing initiatives aimed at addressing regional inequalities.

Aim, context and structure

Aim

This report sets out the experiences of investing in infrastructure across six jurisdictions. It looks at the governance and financing frameworks behind each of these initiatives to showcase how alternative systems and approaches can deliver key outcomes that help address regional inequalities.

The case studies focus on:

- City-wide regeneration in Bilbao, Spain.
- The Restart NSW Infrastructure Programme, New South Wales, Australia, funding high-priority infrastructure projects that promote economic growth and productivity.
- The construction of the Øresund Bridge linking the Øresund region between Sweden and Denmark.
- Wireless Verrua, a community-led experimental broadband network in Verrua Savoia, Italy.
- The Smart Cities Mission, a fund to improve infrastructure in key cities across India.
- RAIN projects designed to promote broadband networks in rural Lithuania.

The initiatives examined in these case studies vary significantly in their size, operations and impacts but are drawn together as examples of investment in infrastructure that provide learning and discussion points. The case studies were chosen to cover a range of international examples with different governance systems as well as to provide insights into the impact of improving physical infrastructure and digital infrastructure.

Context

Investment in infrastructure can boost a region's economic growth in the short, medium and long term. It can materialise in tangible outputs, such as upgrades and extensions to transport networks, as well as intangible outputs, such as the expansion of broadband services to rural areas. Both outputs can be equally beneficial, with physical regeneration able to significantly improve local economic outcomes[1] and inclusive digitalisation able to boost economic and social opportunities within regions.[2]

However, such infrastructure on its own is not sufficient. Investment in social infrastructure, which we discuss in Investing in regional equality, can be equally beneficial to promoting community resilience and growth opportunities. Indeed, inadequate social infrastructure can inadvertently contribute to the benefits from infrastructure investments accruing to those areas or demographic groups least in need of support. Therefore, strong networks that promote equal access and are affordable should be integrated early in the design and planning stages of such public spending initiatives.

The key impacts of investing in infrastructure include job creation, improving access to public services and facilitating innovation networks.[3] This investment can help address regional disparities in economic and social outcomes. Investment in infrastructure is a long-term effort that requires political consensus and a strong approach to the evaluation, monitoring and appraisal of projects.[4]

Structure of the case studies

Each case study:

- provides historic and socio-economic context relating to the need for the infrastructure investment in question
- outlines the governance and finance system in which each initiative has been implemented
- summarises the aim and impact of infrastructure investment in the case study area
- identifies challenges relating to the infrastructure investment in each case study area
- concludes with broader insights for policymakers in the planning, delivery and implementation of initiatives aimed at addressing regional inequalities.

To supplement our desk research, we conducted in-depth interviews with policymakers, academics and practitioners in New South Wales and the Øresund region to better understand the context of the policy settings and factors that support successful outcomes.

Bilbao | Spain

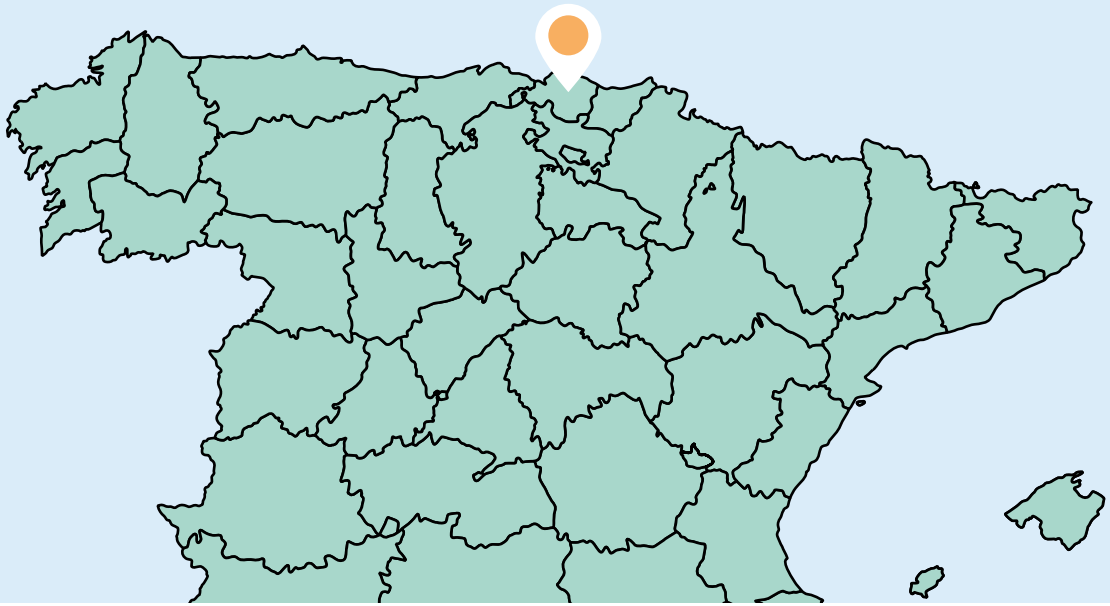

Figure 2.1: *Bilbao in its context.*

Key facts

Bilbao is the capital of Bizkaia (in Basque) or Vizcaya (in Spanish), one of the three provinces that form the Basque region of Spain.

The city of Bilbao sits within the metropolitan area of Bilbao, the 6th largest metropolitan area in Spain, which also includes several surrounding municipalities.[5]

In the early 1980s, unemployment peaked at 25% in the Basque region.

The Guggenheim Museum has attracted 1 million visitors per year since its 1997 opening and has contributed an additional $212m to Bilbao's GDP.

Industry accounts for 30% of Bilbao's total GDP.

History and context

During the mid to late 19th century, Bizkaia, as a major exporter of iron, underwent a period of rapid economic growth. This industrial upsurge contributed to Bilbao's position as the wealthiest city in Spain in the early 1900s.[6] Despite restrictions placed on the Basque region during Franco's dictatorship between 1935 and 1975, Bilbao continued to grow as an industrial centre.

However, the industrial crisis of the 1970s, which occurred slightly later in Spain than internationally due to the country's lower levels of global integration, brought about a period of heavy deindustrialisation that acutely impacted the Basque region.[7] Bilbao then entered an era of economic decline. This resulted in high levels of unemployment, peaking at 25% in the early 1980s, and large swathes of derelict land.[8] Meanwhile, the city experienced a severe population decline, largely down to the emigration of workers.[9] The population of Bilbao increased between 2001 and 2012 before beginning to fall again.[10]

In addition to this social and industrial decline, in 1983 the Nervión river flooded several inner-city neighbourhoods. The river was then heavily industrialised, inaccessible to Bilbao's residents and contained such dangerous levels of pollution[11] that it was declared ecologically dead.[12] This exposed the severe urban decay and declining living standards that needed city-wide interventions.[13]

Since the early 1990s, Bilbao has undergone regeneration across the city. It has revitalised its natural assets, made huge improvements to its physical connectivity and used creative branding and place-making to make the city a European cultural centre, with attractions such as the Guggenheim Museum.

The city's creative vision and identity are now crucial components of its economic diversification, with industry now accounting for 30% of total GDP.[14] Economic growth increased by 18% in the ten years to 2014, despite a difficult context for the national economy.[15] Bilbao has also seen a significant reduction in unemployment: by 2020, the unemployment rate had fallen to 9.6%.[16]

By 2035, Bilbao aims to be one of the top five mid-sized European cities for employment, GDP, education, health and wellbeing.[17] Unemployment in 2017 – the latest year for which comparable data is available – was lower in Bilbao than the Spanish national average.

Governance and finance

The Basque region's self-governance and fiscal freedoms were established in a 1979 statute of autonomy referendum.[18] These freedoms give the Basque region's three provincial governments tax collecting powers, with a percentage of these transferred to central government in Madrid.

Fiscal decentralisation is mirrored within the financing of Bilbao's initiatives. Both the airport and metro expansions were financed jointly by the Spanish Government and the Basque municipality.[19] The acquisition and construction of the Guggenheim Museum was financed by the Basque administration at a cost of $150m.[20]

Table 2.1 summarises the governance and financial structure of Bilbao Ría 2000 and Metrópoli-30, two organisations established to support the regeneration of Bilbao.

Table 2.1 Governance of Bilbao Ría 2000 and Metrópoli-30

Bilbao Ría 2000	Bilbao Metrópoli-30
• A private firm, established in 1992, that uses public funds to deliver urban renewal projects.[21] • Aims to recover disused land to deliver "balanced development and urban cohesion".[22] It works on behalf of public sector landowners.[23] • Jointly owned by Spain's central government and the Basque region's administrations, which together part-finance the organisation alongside EU subsidies.[24] • Raises funds through the re-zoning of land.[25] Bilbao Ría's operations were greatly reduced following the financial crash of 2008.[26]	• Established in 1991 to unite public and private organisations in the regeneration of metropolitan Bilbao.[27] • Founding partners include the Basque Government, Bilbao City Council, BBVA – a Spanish multinational financial services company, University of Deusto, Bilbao Port Authority and Petronor.[28] • Set up in response to an acknowledgement among political leaders that the public sector could not respond to the challenges created by de-industrialisation alone.[29] • Created to spur planning and research in the re-development of Bilbao, and notably drives the implementation of the city's strategic plan.[30] • Develops plans and brings forward long-term strategies for the metropolitan area.[31] • Decision-making relies on member consensus.[32] It is regarded as a public utility entity.[33]

Initiatives

Bilbao underwent a city-wide regeneration process, focused on the revitalisation of natural assets, improvements in physical connectivity, and creative branding and place-making.

Creative branding and place-making

Following significant consultation, Bilbao Metrópoli-30 created Bilbao's 1992 strategic plan. This outlined the aim of becoming a creative centre and leading business environment based upon the delivery of large-scale infrastructure investment.[34] To fulfil this vision, several metropolitan developments were undertaken to renew the city's downtown districts.[35] These developments focused on high quality design and aesthetics.[36] Cultural centrality was one of eight themes against which Bilbao Metrópoli-30 measured the progress of its revitalisation plan.[37]

Revitalisation of natural assets

Treatment of the River Nervión began in 1981 and is now regarded as one of the first steps in Bilbao's regeneration and renewal.[38] Bilbao Ría created a masterplan for the river and surrounding area. The organisation aided the relocation of industries that had previously dominated the Nervión's downtown riverbanks, and sought agreements with railway companies to re-route existing rail lines that constrained the city.[39] During this time, Bilbao Metrópoli-30 identified the waterfront as the place where Bilbao's new vision, identity and economy would be located.[40]

The Guggenheim Museum

Bilbao's government lobbied for the Guggenheim Museum, following a visit from architect Frank Gehry.[41] The museum was seen as a way of cementing the city's cultural vision and providing a much-needed economic boost.[42] Bilbao Metrópoli-30 played an important role in facilitating the construction of the museum.[43]

Considered "risky", the public sector covered the €144m costs, with funding provided by the provincial and regional governments.[44]

The Guggenheim Museum was established in 1991 and opened in 1997, designed by Frank Gehry.[45] The museum sits on Bilbao's waterfront and serves as a creative centrepiece to the city's cultural offerings. Since opening, the museum has attracted 1 million visitors per year[46] and has contributed an additional $212m to Bilbao's GDP.[47]

Figure 2.2: *Guggenheim Museum.*

Physical connectivity

Before these regeneration initiatives were undertaken, Bilbao was connected to the world via an isolated regional airport that had deteriorated and became disused in the 1990s.[48] Investment was considered essential to meet the needs of the city and in 1996 the airport was redeveloped, with a new terminal built in 2000 to increase international traffic.[49] Construction of the new terminal cost €60m, while modernising the airport totalled €204m. Central and regional government each provided 50% of the costs, which were partly re-financed through an airport tax.[50] The number of flights at the airport has more than doubled over a ten-year period.[51]

Upgrades to Bilbao's tram and train lines were undertaken to accelerate suburb-city and inner-city journeys. The tramline, which connects Bilbao's central areas and runs along the regenerated waterfront, opened in 2002 and is operated by the Basque transport consortium EuskoTren. Construction of Line 1 cost €30m. The regional government, through EuskoTren, covered 65% of the costs, while Bilbao Ría 2000 funded 24% and the city government 12%.[52] In 1995, Bilbao's metro, designed by renowned architect Norman Foster, was built to international acclaim.[53] Funded jointly by AENA national and regional government with some additional EU FEDER funding, total investment for Line 2 exceeded €900m.[54]

Challenges to implementation

Bilbao Ría and Bilbao Metrópoli-30 were established in an already complex institutional structure that has been criticised for a lack of co-ordination in how it uses regional resources.

Bilbao Ría, as a private entity, has faced criticism for its role in the privatisation of the planning system, lack of political accountability and focus on economic feasibility when considering re-development projects.[55]

A lack of executive power and limited resources have been identified as constraining the potential of Bilbao Metrópoli-30. Nonetheless, analysis by the Organisation for Economic Co-operation and Development (OECD) indicates that the key strengths of Bilbao Metrópoli-30 include its flexibility, non-political focus, way of bringing together public and private members, skilled workforce and use of international benchmarking, networking and member buy-in. A long-term focus on developing knowledge and expertise in urban strategic planning through international benchmarking has been "a key ingredient of Bilbao Metrópoli-30's success". Given power struggles between agencies in the city, the "non-threatening" position of the organisation has helped it to build relationships. Meanwhile, the OECD has recommended that for Bilbao Metrópoli-30 to increase its impact, citizens should be allowed greater involvement to create momentum and civic buy-in for projects and improve communication channels.[56]

Conclusion

Bilbao is an example of city regeneration grounded within a clear, defined and sustained vision for the city's identity and economy. Establishing strategic and individual project plans, while consulting with a range of organisations, have contributed to delivering successful investment in infrastructure.

Local leaders have played a key role in establishing entities to unite public and private organisations in a singular vision. This has helped in the development of joined-up infrastructure projects and plans.

Finally, the fiscal and governance freedoms afforded to the Basque region were essential to Bilbao's regeneration.[57] In particular, the tax raising powers of the provincial government have been identified as very important to the ability to fund investment.[58]

Figure 2.4: *Bilbao's connectivity, shown is the Nervión river and adjacent tram lines*

New South Wales | Australia

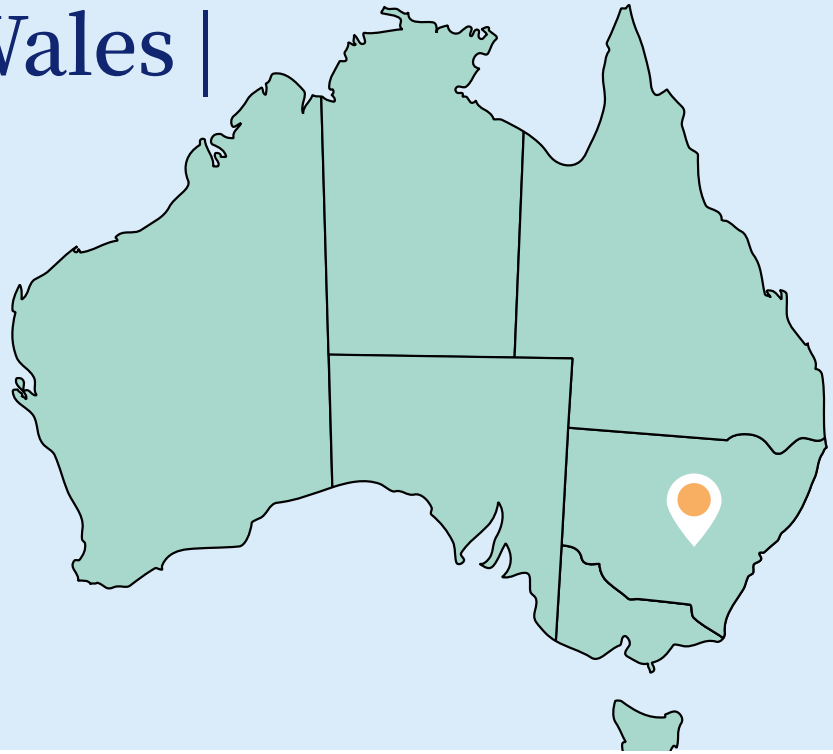

Figure 3.1: *New South Wales in its context.*

Key facts

Located in south-east Australia, New South Wales (NSW) is the most populous Australian state, with 8 million residents.[59]

The Restart NSW Fund targets 30% of its fund at regional and rural areas in New South Wales.

40% of the NSW population live within regional areas and contribute around a third of its total gross state product.[60]

As of November 2020, 750 local projects had been funded by the Restart NSW Fund.

History and context

The state of New South Wales is experiencing the hollowing out of its small towns and growth in regional centres such as Newcastle. The state's population is expected to grow significantly from 7.7 million to 12 million within the next 40 years, with Greater Sydney expected to house 80% of this growth.[61] Sydney's population grew by 18% between 2008 and 2018, compared to 8.5% growth across NSW as a whole.[62] Growth in the population of New South Wales has been mirrored throughout Australia, with the country facing a significant infrastructure gap.[63]

There is a strong urban/rural divide in New South Wales. For example, a larger proportion of young people are unemployed in rural areas compared to Greater Sydney and households in the region tend to have lower incomes. Meanwhile, the number of businesses in Greater Sydney grew by 16% over the five years to June 2019, in contrast with the 8% across regional NSW.[64]

The growth in infrastructure demand, coupled with a tightening of Australia's public finances – characterised by reductions in Commonwealth Government revenue and the increasing needs of the country's ageing population – has meant the need for smarter choices to optimise the distribution of infrastructure-related funds.[65]

This case study examines the Restart NSW Fund, established in 2011 to promote economic growth and productivity within the state. By November 2020, $36bn (AUD) had been paid into the fund.[66]

In New South Wales, the innovative asset recycling programme has delivered record levels of funding to finance the state's infrastructure development. Using its Restart NSW Fund, the government has financed over 750 different projects ranging from water security to freight linkages and digital connectivity.

Governance and finance

The Restart NSW Fund is governed by the Restart NSW Fund Act of 2011. A separate government agency, Infrastructure New South Wales, is responsible for assessing and recommending projects to be progressed.[67] These are presented to the state's Treasurer, who decides on the funding.[68] The Restart project management office then administers the fund's grants.[69]

The NSW Government's asset recycling programme has allowed New South Wales to deliver record levels of infrastructure while maintaining a healthy fiscal position.[70] As of November 2020, $36bn has been paid into the Restart NSW Fund.[71]

Two major schemes established from the Restart NSW Fund are outlined below.

Table 3.1 Context, governance and financing of Restart NSW projects

Project type	Snowy Hydro Legacy Fund	Digital Restart Fund
Context	Aims to deliver core infrastructure and priority initiatives identified in the 20-Year Economic Vision for Regional NSW, and the NSW Infrastructure Strategy 2018–2038, across regional NSW.[72] The fund focuses on water security, digital connectivity, activation precincts, freight linkages and rail and road passenger activity.[73] A case study participant noted that rather than picking individual projects, the fund commissions special activation precincts. These represent regions with unique opportunities for growth that can become business hubs.	Aims to promote infrastructure projects that use modern technologies and smart solutions across NSW.[74] An example initiative is the Smart Places Acceleration Programme, which aims to implement smart place initiatives and support post-COVID-19 recovery in the state.[75]
Governance	The fund is governed by the New South Wales state government, which has committed $4.2bn.[76]	The fund is administered by the Department for Customer Service, as part of the Digital Restart Fund Act 2020. A digital pipeline prioritisation tool is used to assess the eligibility of projects and their final selection.[77] It is regularly monitored by the NSW Government's Expenditure Review Committee and Delivery and Performance Committee.[78]
Financing	Constituted by specific appropriations from the budget, even though the 'attributed' source is the proceeds of the sale of the state's share of Snowy Hydro.	The NSW Government recently allocated a further $500m to the fund over the next three years.[79] Constituted by specific appropriations from the budget, even though the 'attributed' source is the proceeds of the sale of the state's share of Snowy Hydro.

Initiatives

The NSW Government established the Restart NSW Fund in 2011 to enable the financing and delivery of high-priority infrastructure projects that promote economic growth and productivity in the state.[80] The fund is a way of delivering the Rebuilding New South Wales Plan, a strategic ten-year plan created by the NSW Government.[81]

Restart NSW originally had relatively modest ambitions of just $2–3bn of electricity distribution assets to be sold, but it grew massively to create the fund. There was a delay between when the revenues from the asset sales were accrued and the distribution of funds, which has meant that the fund has also benefitted from accumulated interest.

Notably, the Restart NSW Fund targets 30% of its funding at regional and rural areas in New South Wales outside of Sydney, Newcastle and Wollongong.[82] This allocation was based on broad calculations made at the inception of the fund.

The fund has an administrative element to help support the development of quality cost benefit analyses (CBAs) and to address potential capacity issues in submitting grant applications. Some of the recent funds have sought to invest in new forms of infrastructure such as regional digital connectivity. While the projects may sound innovative, the private sector is catching up with the roll out of its own infrastructure, with public sector investment now pivoting towards smaller communities that are at a greater risk of being left behind.

NSW uses a series of risk-based gated reviews to ensure quality projects are delivered. As of November 2020, the regional government has provided funding via the Restart NSW Fund to over 750 local projects.[83] Of these, 350 projects have been completed and 395 are in various stages of delivery.[84] The Audit Office of New South Wales found that the Restart NSW Fund was a crucial source of funds for local governments in regional and rural New South Wales, where such investments may otherwise be unaffordable.[85] Furthermore, the fund and related Act are delivering infrastructure projects that actively benefit communities in the state.[86]

Restart NSW Operations

Funds are allocated to specific projects in NSW and grant programmes that involve a competitive bidding and selection process[87]. These programmes involve local authorities and external organisations.[88] Within these rounds, projects must present a strategic assessment, economic assessment, and cost-benefit ratio greater than 1.[89] Projects are also independently reviewed to ensure suitability for funding.[90]

An example programme is the *Regional Growth Fund: Growing Local Economies*, which aims to unlock the growth potential of local economies by supporting job creation and skills development. Meanwhile, the Resources for Regions programme helps local authorities and organisations deliver improved and new infrastructure in mining-related communities.[91]

Challenges to implementation

Monitoring and evaluation have been highlighted as a key challenge. The Audit Office of New South Wales found that grant recipients were not required to assess their project outcomes or benefits, and that certain projects were not assessed under the Resources for Regions or Fixing Country Roads programmes either.[92] A lack of evaluation could impede the learning from such projects for future investments in infrastructure. However, one case study participant noted the development of a bank of evidence wherein agencies develop evaluations of the selected projects.

A further challenge, highlighted by a case study participant, was ensuring that funds are spent on quality projects. To tackle this challenge, an independent agency was established at the time that the Restart Fund was created to review and recommend projects, with rigorous cost-benefit analyses implemented in the evaluation of their economic viability.[93]

Conclusion

The Restart NSW Fund provides insights into a government-led funding mechanism that is aimed at delivering high-quality infrastructure within the state. In providing a legislated benchmark of funding for regional and rural areas in New South Wales, it can ensure the continued prioritisation and allocation of funds to these areas.

It is a challenge to allocate funds between rural and urban areas as connectivity improvements benefit both. In addition, investment in some large urban infrastructure projects (eg hospitals) can support residents in the wider region. That said, a pre-defined allocation of investment funds to urban and rural areas can help to ensure that places feel included and acknowledged by policymakers.

During the fund's design stage, approximations on how money from the sale of the electricity distribution assets would be spent highlights the importance of forensic needs-based analysis in making such policy decisions.

Experiences with the Restart NSW Fund emphasise the importance of business cases, with a full business case needed before a funding decision is made. Significantly, this study shows how adequate resourcing to allow the development of business cases can be built into programme design.

Furthermore, using an independent agency to review and recommend suitable projects has been valuable to the funding of high-quality projects. This offers an example of a proactive adaptation to the governance and fiscal structures of investment in infrastructure.

The example of regional digital connectivity suggests that when investing in infrastructure, interventions should be focused on market failure where the private sector is unlikely to invest but where infrastructure investment could be transformative.

Figures 3.2 and 3.3: *Project examples*
Source: Infrastructure New South Wales, 2021. Source: link

Figure 4.1: Øresund region in its context (Source: *link*).

Key facts

Demand for a bridge across the Øresund strait has existed since at least 1900.

The bridge, linking Sweden and Denmark, opened in 2000. It is the longest combined road and rail bridge in Europe.

Between 2000–2010, the Swedish part of the region saw GDP increase by 21% and employment rise by 17%. The Danish area reported increases of 12% and 4% respectively.

The life sciences ecosystem in the region is nine times larger than it was in 1990.

History and context

The Øresund region, part of the wider metropolitan known as Greater Copenhagen, is a historic region of Sweden and Denmark that links together the Danish cities of Copenhagen, Odense and Roskilde with Malmö, Lund and Helsingborg on the Swedish side.[94] With a population of more than 4 million in 2019, it accounts for a quarter of GDP of both countries combined.[95]

Demand for a bridge across the Øresund strait existed since the 1900s.[96] The impact of deindustrialisation in the 1970s and 1980s strengthened calls for the bridge, and it was subsequently constructed in the late 1990s.[97]

Deindustrialisation was particularly felt in Malmö, a previously prosperous industrial city.[98] During this time, Malmö experienced a significant reduction in its industrial employment and an overall population decline of 35,000 residents.[99] Similar trends were experienced throughout the region, including in Copenhagen itself, sparking a need for policy interventions.

At the start of the 1990s, when the Øresund Bridge was approved, "the decline of traditional industries and the closure of shipyards as well as car and textile factories had visible effects on unemployment" in both the Swedish and Danish sides of the region.

Unemployment was higher on the Danish side during the 1970s and 80s, and then higher on the Swedish side in the 1990s. The gap narrowed in the decade to 2013, although structural unemployment issues have continued to exist on the Swedish side.[100] In the first quarter of 2021, the unemployment rate across the Øresund region stood at 8.8%. The Danish area had an unemployment rate of 6.7%, compared to 12.8% in the Swedish part.[101]

This case study examines the socio-economic impact of the Øresund Bridge linking Sweden and Denmark, which was completed in 2000. The two countries worked in partnership to construct and manage the bridge, which has opened the region and reaped enormous economic benefits.

Meanwhile the development of the Medicon Valley, a bi-national life sciences cluster, progressed after the Øresund Bridge was opened and is considered here within the context of planned future infrastructure projects.

Governance and finance

The projects featured in this case study have not relied on direct government funding. To progress the Øresund Bridge, both Sweden and Denmark established state-owned companies. They created A/S Øresund and Svensk-Danska Broförbindelsen Svedab AB, which constructed, own and continue to operate the fixed link through the jointly-owned Øresundbro Konsortiet.[102] On the Danish side, the holding company Sun & Baelt own 100% of the shares in the subsidiary A/S Øresund. The link was financed through loans obtained through domestic and foreign financial markets, which are guaranteed by the Danish and Swedish states. The tolls generated from the bridge are used to pay off these loans.[103]

Figure 4.2: *Organisational hierarchy map (information derived from Sund and Bælt, n.d.). Source: link*

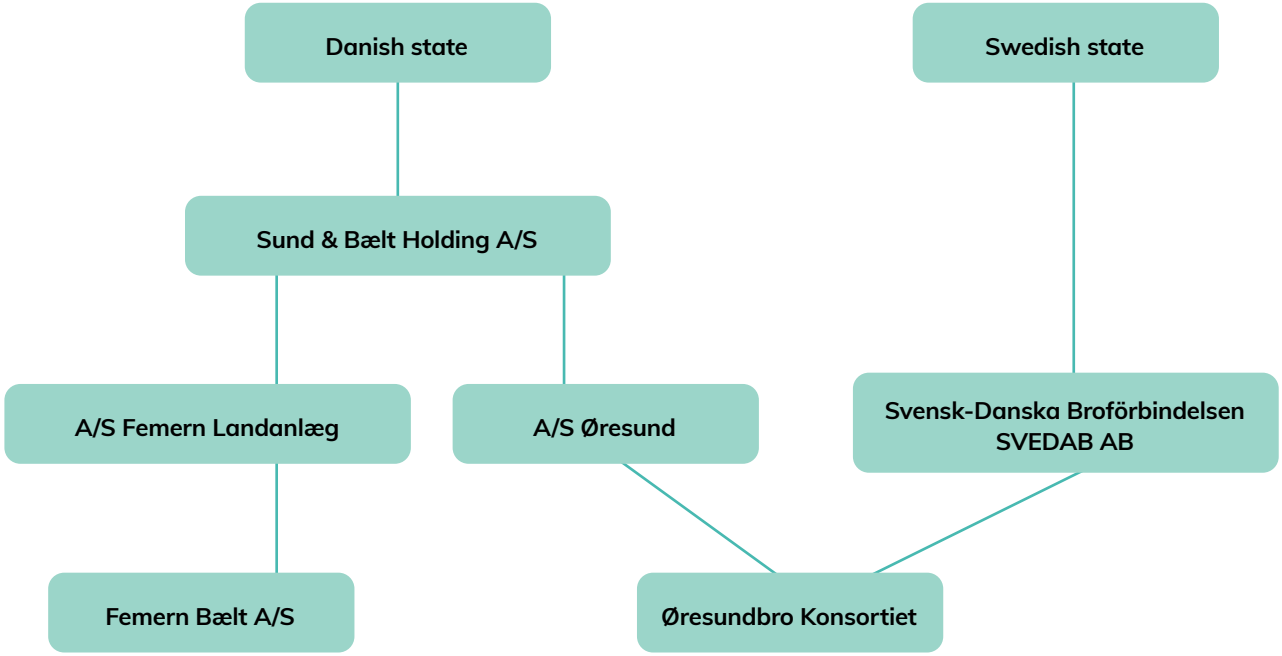

Figure 4.2 shows the organisational hierarchy responsible for the Øresund Bridge.

Construction costs totalled DKK 14.8bn (£1.7bn) in 1990, approximately DKK 24.5bn (£2.84bn) in 2018 prices. Due to the implementation of a new dividend policy by Øresundsbro Konsortiet, the repayment period of these costs, plus interest, has increased by 17 years. Moreover, the lower-than-expected average toll charges has meant that the Øresund Bridge will now be repaid in 2050, rather than 2033. Toll revenues have been below estimates due to a larger than expected number of commuters and lower than anticipated freight prices.[104] In 2019–2021, revenue was lower than expected due to the COVID-19 pandemic and associated travel restrictions.

Øresund Committee, Greater Copenhagen

The committee was established in 1993 as a political and economic forum aimed at maximising integration in the region. The committee is formed of equal numbers of Danish and Swedish representatives, with a secretariat that guides the implementation of cross-border initiatives.[105] The chair of the board changes annually. However, one case study participant explained that there are discussions to extend this tenure to two years to mitigate against the challenges to long-term planning.

The Øresund Committee merged with the Greater Copenhagen organisation in 2016 to form Greater Copenhagen. The aim of this body is to stimulate co-operation in the region.[106] This was designed to support the region's goal of becoming one of the world's strongest and most attractive metropolitan regions for growth, innovation and sustainability. One interviewee suggested the closure of the Øresund Committee was motivated by a desire to prioritise a growth agenda, particularly by the Danish side of the region. Meanwhile, the collaboration in Greater Copenhagen was strengthened further in 2019 when the Swedish region of Halland joined the organisation. The latter is financed by its members, with 4 of the 89 members accounting for almost 100% of Greater Copenhagen's finances.

Medicon Valley Alliance (MVA) is a bi-national life sciences cluster, developed after the Øresund Bridge was opened. The cluster was initiated by the University of Lund and the University of Copenhagen and was "strongly supported" by major pharmaceutical companies in the region such as AstraZeneca, Novo Nordisk and Lundbeck. The MVA is a non-profit organisation, predominantly financed by membership fees.[107]

Initiatives

Øresund Bridge

The Øresund Bridge was designed to address the economic, administrative, institutional and technical barriers within the region.[108] Following an initial agreement in 1973, Denmark underwent an election that significantly delayed progress on the bridge. After the Swedish and Danish governments signed a new agreement in 1991[109], construction began in 1995 and the link opened in 2000.[110] It currently hosts a railway and motorway connecting Copenhagen and Malmö.[111]

Following its opening, GDP increased on both sides of the bridge with commuting, student flows and cross-border residency initially increasing. 75,000 people use the Øresund Bridge daily, with half of all the freight between Sweden and Denmark crossing the fixed link.[112] As a result of this cross-border activity, the bridge has reportedly delivered estimated economic gains on both sides of the strait of €8.4bn (£7bn) since its opening in 2000.[113]

Notably, the Øresund Bridge has connected the labour markets within the region through the increased mobility and proximity to Copenhagen's international airport.[114]

Key impacts of the bridge include:

	Impact on employment, 2000–2010	**Impact on GDP, 2000–2010**
Swedish side	17%	21%
Danish side	4%	12%

Table 4.1: *Impact of Øresund Bridge on employment and GDP in the Øresund region 2000–2010.*[115]

The impact of the initiative can be seen in the Øresund Integration Index, which measures five fields of cross-border integration: labour market, transport and communication, housing market, business and culture. The composite index increased from 100 in 2000, when the bridge opened, to 170 by 2012.[116]

Until 2008, the higher salaries and house prices in Denmark, coupled with the higher unemployment rates in Skåne, Sweden, drove increases in commuting. High numbers of Danes moved to live in Sweden while still commuting to Denmark. Meanwhile, many Swedes continued to live in Sweden but chose to work in Denmark due to greater job opportunities.

Following the financial crisis of 2008, integration plateaued due a decline in house prices in Copenhagen, a rise in house prices in Malmö and fluctuations in currency exchange rates.[117] Case study participants noted that in recent years, the cross-border labour market has been hindered by stricter border controls and COVID-19 travel restrictions. Indeed, one observed that due to the complications caused by these increased restrictions, many people are looking for new employment opportunities that do not involve using the bridge.

Figure 4.3: *Øresund Bridge.*

Medicon Valley

In 1997, the Medicon Valley Academy was founded as an EU Interreg II project, an EU initiative that supports co-operation across borders (a goal of the EU Cohesion Policy 2014–2020) and is funded by the European Regional Development Fund. This academy was aimed at stimulating collaboration between research and business institutions in the Øresund region, bringing together the life sciences industries in the region under the name of 'Medicon Valley'.[118] In 2007, the Medicon Valley Academy changed its name to the Medicon Valley Alliance (MVA) to signal its broader foundation and ambitions in the life sciences ecosystem.[119] The alliance now focuses on the attraction of talent and venture capital as well.[120]

The region accounts for a large share of Denmark and Sweden's research and development. R&D expenditure is now 4.9% of GDP, mainly from the private sector.[121] Notably, the life sciences sector in the region is nine times larger than it was in 1990, and tax contributions have increased sharply in both countries. The growth in the life sciences ecosystem is due to the success of Novo Nordisk; AstraZeneca closed down in Lund.[122]

Metric	Number
Employees	40,000
Universities	12
Hospitals	32
Biotechnology, pharmaceutical, and medical technology companies	200
Science parks	7
Incubators	6

Table 4.2: *Key figures for the Medicon Valley.* **Source:** *link*

Future investments in infrastructure

Three projects are currently under discussion. However, one participant expressed some reservation on the future of these projects due to their potential to strengthen the Øresund region beyond the direct control of the national governments in Sweden and Denmark.

Table 4.3 *Future infrastructure investment plans in the Øresund region*

Project type	Fehmarnbelt Tunnel	HH Link	Øresund Metro
Context	An immersed tunnel that will connect Rødbyhavn on Lolland, southern Denmark, and the German island of Fehmarn, northern Germany. The tunnel will contain a four-lane motorway and two electrified rail tracks, making it the world's longest of its type. It is currently scheduled for completion in 2029.	A fixed link between Helsingbor, Sweden, and Helsingør, Denmark, is currently under investigation. This would consist of two separate tunnels – one for railway traffic and another for road traffic. The project aims to reduce bottlenecks associated with increased transport capacity in the region, anticipated following the opening of the Fehmarnbelt Tunnel.	The planned Øresund Metro will connect Copenhagen and Malmö, building upon the development of the Øresund Bridge. This transport network is seen as a further way of resolving the projected bottleneck issues of greater rail freight, anticipated following the opening of the Fehmarnbelt Tunnel. It would allow greater numbers of commuters to travel in the region.
Governance	Femern A/S, part of the Sund & Bælt Holding A/S that is owned by the Danish Ministry of Transport, will plan, build and operate the link.	The Skåne region has expressed interest in partnering with the Danish state in establishing a jointly owned company to deliver the HH link. This ownership model would look to copy that used in the case of the Øresund Bridge.	The City of Copenhagen and the City of Malmö have been exploring this infrastructure development, supported by the EU's Interreg Øresund-Kattegat-Skagerrak programme.
Financing	The project will be user-financed, with revenues from the tunnel used to repay the loans that financed the construction. This is the same financial model as the Øresund Bridge.[123]	The co-financing of the HH link by Swedish and Danish authorities through guaranteed loans is regarded as the likely financing model.[124] A case study participant noted that Region Skåne would like to own part of the HH link, to ensure some of the revenues generated return to its region. This was highlighted as a particular downfall of the Øresund Bridge.	The financing model will consist of user financing through ticket revenues from the metro of approximately £2bn, EU funding of around £230m, and contributions from the Danish and Swedish governments.[125] One case study participant noted that regional policymakers plan to use the surplus revenue from the Øresund Bridge, once fully paid off, to finance the metro.

Challenges to implementation

Economic development initiatives in the Øresund have been met with challenges, particularly centred around the Øresund Bridge's revenue structures. One case study participant pointed out that the tolls used to recoup the bridge's costs are generally considered rather high and have undergone price adjustments to improve commuter flows.[126] Another observed that differences in tax systems can be beneficial for some commuters, especially those who live in Denmark but work in Sweden and can take advantage of the lower tax rates.

Meanwhile, several participants noted that the bridge's revenues return to the Swedish and Danish governments, rather than to the region in which it is situated. Although this is designed to cover the cost of capital and maintenance, it also implies that those who most use the bridge do not share in any future returns. Ensuring a greater proportion of revenue returns to the area is something that regional governments are looking to adapt within the financial structure of future infrastructure investments.

A further challenge relates to the differences in responsibilities, delegated authority and tax systems between the regional governments of Sweden and Denmark. Notably, the Danish regional government holds fewer powers than its Swedish counterpart, so it is often the Danish national government that is involved in discussions of infrastructure investment. This can complicate cross-national discussions, due to the skew in governance levels and priorities between the Swedish and Danish parties. Indeed, a case study participant observed that those in Copenhagen may not always be interested in collaborating with smaller cities in Sweden, thus raising further power dynamics that can aggravate co-operation. One final challenge noted in the interviews can be seen in the limited collaboration and sharing of statistics between Sweden and Denmark. This was suggested as impeding the monitoring of commuting data and the evaluation of infrastructure projects more generally.

Case study participants noted that the Medicon Valley has been struggling over recent years, due to the volatile nature of the industry and emigration of major companies. This is reflected in the closure of AstraZeneca's research activity within Lund in 2010. The company moved to Mölndal, in western Sweden, to pursue increased collaborations with smaller research companies.[127] One participant noted that this relocation created an imbalance within the region, with life sciences industries now more concentrated on the Danish side of the Øresund. This highlights how the rapid growth of companies can result in their departure from the region, with science parks unable to expand at a similar rate. A participant observed that the region is responding by investing in the expansion of incubators and science parks within the region to retain such companies.

Conclusion

The Øresund region provides an innovative example of a bi-national infrastructure investment, governed by state-owned entities and financed through guaranteed loans that are recouped through user fees. It highlights that such collaborations can deliver positive outcomes despite national differences in governance and taxation. Furthermore, the case study illustrates challenges particularly around data sharing.

A key learning point is the distribution of revenue from the Øresund Bridge, which returns only to the national governments of Sweden and Denmark. How regional government can benefit from such future income streams is being considered within future infrastructure investment projects such as the HH Link.

The engagement of collaborative stakeholders to stimulate co-operation and partnerships within the region can be highly valuable. For example, a case study participant noted that the Greater Copenhagen organisation holds forums on cross-cutting thematic issues, bringing together senior ministers, politicians, industry leaders and trade organisations. This approach to co-operation within the region may generate ideas for future infrastructure investments.

Both the Øresund Bridge and HH Link show that continuous monitoring and evaluation is needed to ensure that a diverse set of objectives can be delivered. After projects have been delivered, additional measures may be needed to address unanticipated outcomes. To maintain economic outcomes that can endure into the future, issues pertaining to governance and financial management may need further consideration as well.

Verrua Savoia, Turin | Italy

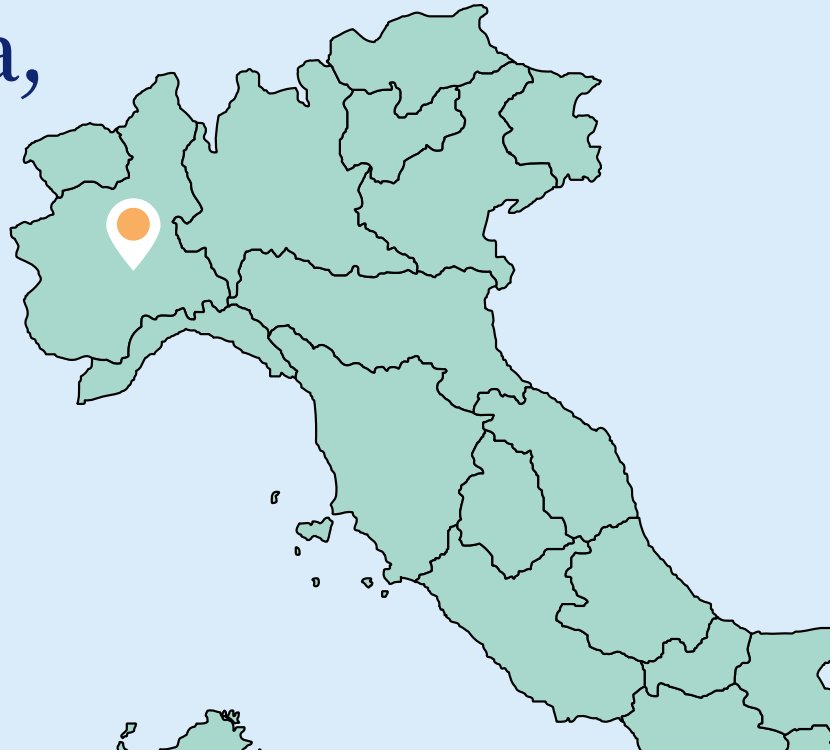

Figure 5.1: *Verrua Savoia in its context*

Key facts

Italy has one of the lowest rates of broadband connectivity per household in Europe.

The Wireless, Borderless Association is the first registered non-profit internet service provider in Italy.

Wireless Verrua covers almost all of the municipality, connecting 99% of inhabitants and 13 schools.

The network offers speeds of 20Mbps, compared to the 640Kps offered in neighbouring villages.

History and context

Verrua Savoia, a municipality in the city of Turin and located in the region of Piedmont, recorded a population of 1,350 inhabitants and 616 families in December 2020, spread across 20 miles of valleys and hills.[128]

The municipality is rural, with over half of its population aged over 65.[129] Evidence indicates that the elderly possess fewer digital skills than their younger counterparts, with 53% of over 65s having no foundational digital skills.[130] This may be due to more limited opportunities available to acquire digital skills, or possibly a general reluctance to engage with technology.

Italy has one of the lowest rates of broadband connection per household in Europe, resulting in a significant digital and cultural divide.[131] In Verrua Savoia, the mountainous terrain has further exacerbated this digital divide, with internet service providers reluctant to commit to the large, upfront capital investment necessary to roll out wider broadband coverage. [132]

Despite this obstacle, a research project started by a local electronics professor in 2010 has now blossomed into Italy's first non-profit, citizen-led internet service provider. The network covers 99% of Verrua Savoia, connecting nearly all of its inhabitants and 13 schools.

This case study examines the experimental broadband network, Wireless Verrua, which was designed to help overcome the digital barriers that limited the opportunities available to residents of Verrua Savoia.

Governance and financing

Wireless Verrua was constructed between August and October 2010, with its design and implementation undertaken by university students to lower project costs.[133] Initially, the network was financed as a research project managed by iXem Labs at the Polytechnic University of Turin. Subsequently, the project received €15,000 in additional funding from the municipality of Turin.[134]

As the research project neared completion in 2014, the Wireless, Borderless Association, Senza Fili Senza Confini, was established.[135] This association is a non-profit, citizen-led internet service provider that adopted Wireless Verrua's network with the aim of further addressing Verrua Savoia's digital and cultural divide.[136] Notably, the association is the first registered non-profit internet service provider in Italy.[137]

Verrua Savoia's experience was facilitated by a 2005 ministerial decree by the Italian Ministry of Economic Development, which states that small internet service providers can adopt broadband networks in rural areas not currently covered by broadband services.[138]

Initiative

In 2010, Daniele Trinchero, Professor of Electronics at the Polytechnic University of Turin, established an experimental broadband network, Wireless Verrua, on behalf of Verrua Savoia's municipal administration and in collaboration with TOP-IX consortium.[139] The network was aimed at overcoming the digital divide that restricted Verrua Savoia's inhabitants and built upon previous experiments with low-cost communication devices that facilitated high bandwidths over long distances.[140]

By 2014, the network had been expanded to cover most of Verrua Savoia, connecting 99% of its inhabitants and 13 schools.[141] The network offers speeds of 20Mbps, compared to the 640Kbps offered in neighbouring villages.[142] This scope and the speed of the network can be considered key successes for the municipality.

Wireless Verrua's operations

Experimental research project 2010–2014

- Network connectivity was initially free to boost resident uptake, and later required a €50 annual subscription.[143]
- iXEM labs offered computer literacy courses to those with weaker digital skills while local authorities altered their educational curriculum to include an introduction to ICT.[144]

Wireless, Borderless Association 2014–present

- The association substituted the research project's experimental equipment with certified replacements to become a registered and commercially viable internet service provider.[145]
- Residents can join the association for a small fee, and become part-owners of the network. The membership fees finance the association's operational overheads and the co-ordination of experts to maintain and further the network.[146] The association continues to offer computer literacy courses for children, senior citizens and those in need of greater ICT skills.[147]

Conclusion

Verrua Savoia's experience offers insight into an alternative model of infrastructure investment that has been facilitated by government financing and proactive decrees. The case study illustrates how a key stakeholder with the backing of local institutions can make a significant difference to the quality of life in a local community.

The commitment of local residents to invest in a local project that stimulated demand for high-speed connectivity has been identified as an example of good practice in project planning to address the digital divide in rural areas.[148] Furthermore, an exploration of alternative and community-centred models of financing, implementation, management and monitoring is a key learning point from Verrua Savoia's experience. This alternative mechanism has proved successful in an area that has traditionally received less government funding, which can be the case for those left behind or in rural or semi-rural locations.

Ultimately, the capacity for project delivery will guide the suitability of such alternative models. Indeed, the model is likely to only be effective for small-scale infrastructure projects, which are unlikely to attract private-sector interest, but where the gains from infrastructure investment could potentially have much wider socio-economic benefits.

Verrua Savoia, in the context of this project, significantly benefitted from its proximity to the Polytechnic University of Turin and the individual expertise of researchers, notably Professor Trinchero.[149] In addition, the topography of the region was particularly suited to this form of wireless network.[150] While these factors might not be entirely replicable elsewhere, the ability to harness local assets, in whatever form, can make a difference.

Smart Cities Mission | India

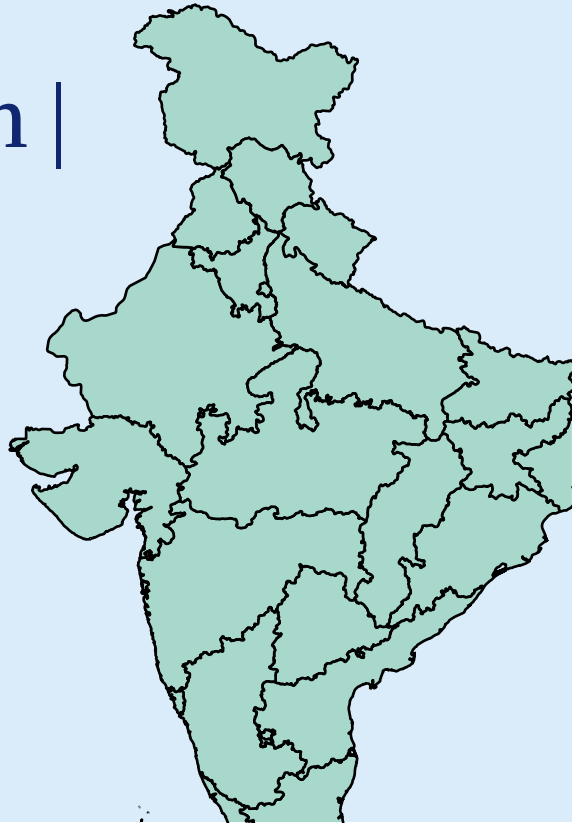

Figure 6.1: *India in its context*

Key facts

Urban areas are expected to be home to 40% of India's population and account for 75% of the country's GDP by 2030.

The Smart Cities Mission was launched in 2015 to tackle issues related to urbanisation and promote smart solutions to challenges experienced in key cities.

The private sector currently accounts for around 25% of funding for city initiatives.

More than 50% of projects undertaken relate to basic infrastructure.

History and context

India hosts 28 administrative states and eight union territories. The country is the world's largest democracy[151], with a population of 1.38 billion in 2020.[152]

In 2019, India's GDP hit $2.9tn (USD)[153] and the country is predicted to become the world's third largest economy by 2030.[154] Due to the impact of COVID-19, however, GDP in the 2021 fiscal year contracted by 8.5%.[155]

Meanwhile, GDP per capita is lower than in the best-performing OECD countries. Productivity is 82% lower than the OECD average, while the employment rate is relatively low and was falling prior to the onset of the pandemic.[156]

India also has higher inequality rates than in most advanced economies. For example, the poorest 20% of households earn just 4% of total income.

India is one of the world's most rapidly urbanising countries, with its town and cities expected to account for 75% of the country's GDP by 2030. In response to this growing trend, the Indian Government increased its focus on urban development, launching its Smart Cities Mission in 2015. The initiative was designed to meet the comprehensive infrastructure needs of its growing urban areas.[157]

This case study looks at the Smart Cities Mission, which aims to provide core infrastructure such as water, sewage, physical infrastructure, digital connectivity and smart tech solutions – including integrated multi-modal transport – with governance and processes that pave the way for economic development. Over 6,000 projects are now underway, with a value of £18bn.

Governance and finance

The Smart Cities Mission scheme is sponsored by India's central government with a pledge of Rs. 48,000 crores (£4.75bn) over five years. This is to be matched by the relevant state or urban local body for projects.[158] Furthermore, the annual funding instalments are subject to the project's progression and meeting of specific milestones.[159]

Grants from both central and state government are used to attract internal and external funders. An emphasis has been placed on private public partnerships (PPPs) [160] as the private sector currently accounts for around 25% of the funding for city initiatives.[161]

To manage the implementation of a smart city proposal, municipalities must create special purpose vehicles (SPVs),[162] which are listed as limited companies.[163] Currently, all selected areas across 35 states have established SPVs.[164]

Initiatives relating to Smart Cities Mission are monitored at a range of jurisdictions. Nationally, the Apex Committee measures progress and authorises the release of funds. At the state level, the powerful Steering Committee monitors the initiative's focus, while at the city level this responsibility is undertaken by an advisory forum designed to promote collaboration between stakeholders.[165]

Initiatives

Launched by the prime minister in 2015, the Smart Cities Mission aims to tackle urbanisation related issues.[166] The programme marks a shift in India's urban development strategy by promoting initiatives within existing urban areas rather than greenfield development sites.[167]

Key objectives include helping cities deliver core infrastructure, clean and sustainable environments and a decent quality of life for residents.[168] This can be achieved through a focus on improving economic growth and standards of living through investments in social, economic, physical and technological solutions. Such investments can be delivered through either area-based development or pan-city initiatives.[169]

Tenders have been issued for 6,130 projects, worth INR 1,815bn (£18bn).[170] Of these, 2,898 projects, worth INR 504bn (£5bn), have been completed.[171] More than half of these relate to basic infrastructure.[172]

The Smart Cities Mission operates as a two-stage competitive process.[173] First, states are asked to nominate potential smart cities based on a set of predefined criteria.[174] Next, a shortlist of 100 cities is produced. The candidates are asked to produce a proposal that includes a concept, vision, development model and plan for implementation.[175]

While the programme offers support to municipalities in the development of their proposals,[176] the Indian Housing and Land Rights Network has emphasised that consulting firms are often tasked with the responsibility.[177] This may reflect both the complexity in gathering the required information and a desire to submit more comprehensive and competitive bids.

Several complementary initiatives have been introduced as well. These include the National Urban Living Platform (NULP), launched in 2020, which was designed to promote capacity building. A collaboration between the Ministry of Housing and Urban Affairs, the National Urban Institute of Urban Affairs (NIUA), EY, PWC and Societal platform, the initiative offers virtual training programmes designed to develop leadership skills and facilitate partnerships.[178] Adopting an ecosystem approach to build capacity to better solve urban development challenges in India, the NULP digitally convenes actors from across government, academia, industry and civil society.[179]

Example project: Pune Transport Command and Control Centre

City mobility is a key issue for the city of Pune, which has a population of over 5 million. Through the Smart Cities Mission, Pune was able to invest in its public transport system to deliver a command and control centre.

This central hub provides information on the real-time movement of buses, vehicle health monitoring, surveillance for increased safety onboard and public information systems. Moreover, it is expected to increase revenue by 4–5% through improved fleet utilisation, as well as better asset management, which could save 10–20% of annual maintenance costs.

The project is entirely financed by Pune Mahanagar Parivahan Mahamandal Ltd, with a total estimated cost of INR 48 crore (£4.8m).

Challenges to implementation

The biggest challenge for many cities is the improvement of basic infrastructure. This has been prioritised over tech-based smart city solutions. [180]

An evaluation of the first five years of the Smart Cities Mission indicates that progress has been "uneven" across the cities targeted by the programme. By the end of the six-year mission, less than half of the projects had been completed. Progress has varied by state. Overall, the release of funds has been lower than expected, with many states/union territories failing to mobilise a counterpart share of funds.[181]

In some cities, the functioning of the SPVs that had been established to implement the mission were hindered by "inadequate managerial, technical and financial capabilities".

Key issues noted in the evaluation include audit violations, board irregularities, inadequate understanding of data and how to use it to develop effective solutions. A lack of funding at the national, state and local government levels has created difficulties in mobilising funds, transferring them to SPVs and using the funds efficiently.[182]

The evaluation of projects progressed under the Smart Cities Mission recommends the establishment of training programmes to expand the managerial and financial capacities of staff employed by the SPVs and urban local bodies. The report stresses the importance of properly identifying training needs and providing "adequate funds, trained personnel, and proper equipment" to the SPVs to facilitate skills development.[183] The Smart Cities Mission was expected to be completed by 2019–2020 but has since been extended to 2023 due to the slow progress in its implementation.[184] This has been further impeded by the impact of COVID-19.[185]

Figure 6.2: *Cycle for Change Initiative (source:* Government of India, n.d.).

Conclusion

India's Smart Cities Mission closely resembles the competition style funding for regional and local development projects within other countries. However, the tiered monitoring and evaluation of projects contrasts with the arrangements found elsewhere. This could support continued accountability and inclusivity across different levels of government while maintaining a shared vision across political departments and geographies. Ultimately, such an approach to policy making can contribute towards more joined-up economic development at both regional and national scales.

While the scheme has provided for oversight mechanisms at the central government and state level, the implementation process has drawn criticism due to its state-centric approach and lack of local representation.[186] By not engaging fully with local communities throughout the life cycle of a project, there is the risk that the returns on investment may be less than optimal. A lack of appropriate managerial, technical and financial capabilities has hindered implementation of the SPVs in some cities. The establishment of the NULP is an example of how multi-channel platforms can be developed to support capacity building, particularly leadership skills, across partner organisations.

A final observation is that the direct involvement of consulting firms in the production of development proposals can lead to the most attractive, rather than the most deserving, cases winning.[187] Although not unique to the Smart Cities Mission, countering this bias will require reflection on how best to allocate funding in a way that most effectively reflects local priorities and values. Towns or cities, regardless of their size, location or existing capacity, should have equal access to opportunities for growth and advancement.

Rural area information technology broadband network (RAIN)| Lithuania

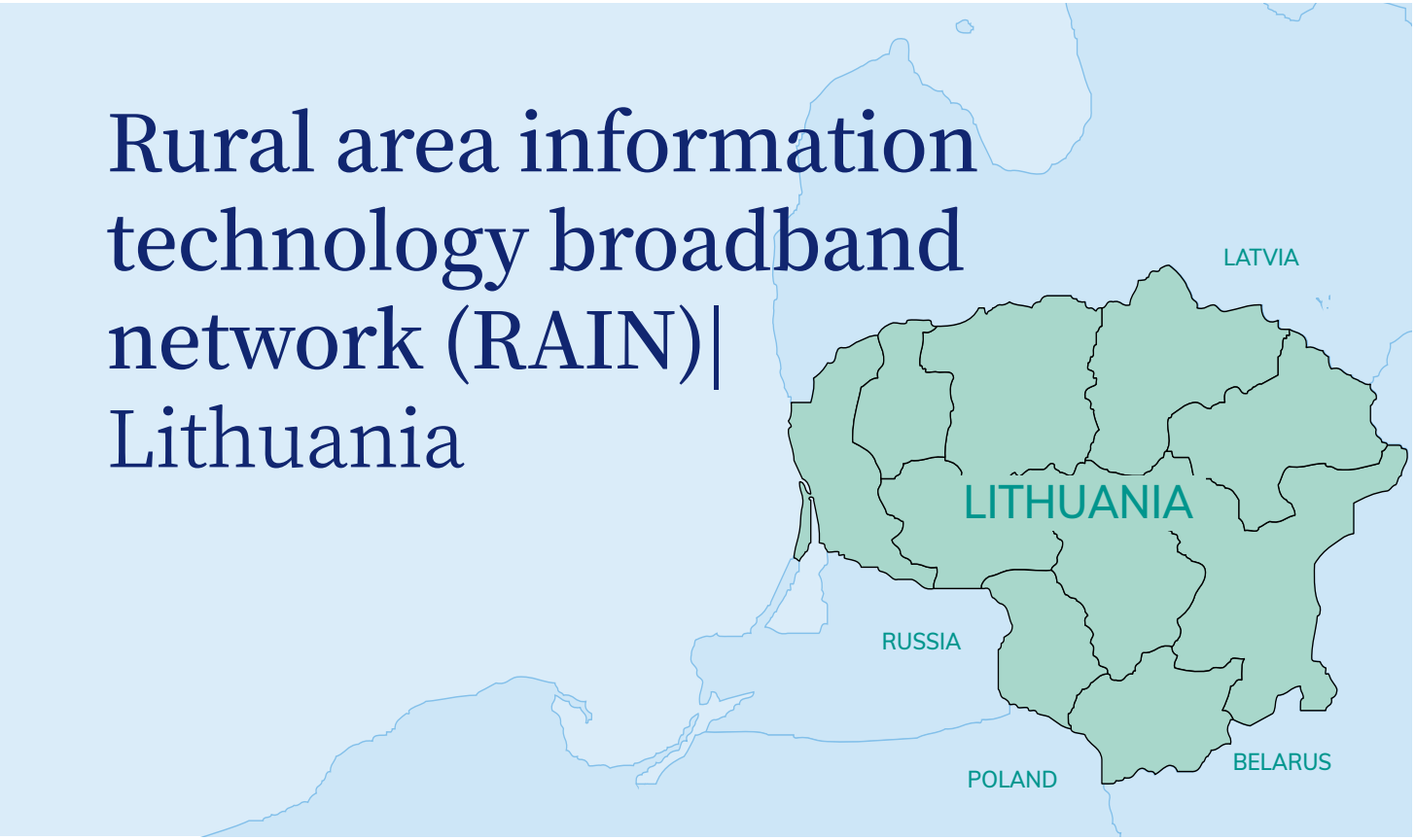

Figure 7.1: *Lithuania in its context*

Key facts

Lithuania is an Eastern European country and the largest and most populous of the three Baltic states.[188]

In 2020, Lithuania's population was 2.8 million.[189]

The RAIN (Rural area information technology broadband network) reached over 1 million inhabitants between 2005–2013.

Lithuania ranks eighth globally and is now the European leader in FFTH (fibre to the home) internet network penetration.

History and context

GDP per capita and productivity in Lithuania are on a par with those of the best-performing OECD countries, but inequality within Lithuania is higher than in most advanced economies. The poorest 20% of households earn just 6.3% of total income.[190] Meanwhile, the country has a high employment rate that was increasing prior to the onset of the COVID-19 pandemic. Lithuania's rural townships are generally geographically scattered with a higher proportion of lower income residents.

According to a 2007 report by Lithuania's Communications Regulatory Authority, household access to the server most commonly used for broadband services was 99% in urban areas but 67% in villages.[191] Just 4% of rural areas with fewer than 1,000 residents had access to broadband.[192]

Between 2005 and 2013, the Lithuanian government launched its RAIN (Rural area information technology broadband network) projects to address the digital divide between urban and rural areas. Higher initial investments were required to deliver broadband infrastructure to these rural areas as the townships were considered less economically viable.[193] During this period, the number of households that could access broadband increased 12-fold. By 2018, 62% of rural households were using broadband, up from 4.9% in 2006.

This case study sets out the governance and financing of RAIN, its impact and the key challenges to implementation. It highlights the importance of sustained, long-term initiatives, coupled with the efficient usage of previous investments aimed at reducing the digital divide between urban and rural areas.

Governance and financing

RAIN is owned by the state and supervised by Plačiajuostis Internetas, a state-owned public company established in 2005.[194] Plačiajuostis Internetas aims to create broadband access, provide services, prepare and implement projects and manage information technology infrastructure in Lithuania.[195] The networks are maintained by private firms that are commissioned through public tenders,[196] and are governed on the principles of open access, technological neutrality and service competition. End users are able to choose the most suitable service.[197]

At the onset, Plačiajuostis Internetas set project targets for RAIN such as providing data transmission services to 80% of rural schools and 75% of rural public administrative authorities.[198]

European Regional Development Funding (ERDF) played an important role in the financing of RAIN. This is summarised in Table 7.1.

RAIN-1 (2005–2008)	RAIN-2 (2009–2013)
Costed at €21.4m, with €11.3m of this coming from the ERDF. Additional funds were provided by the Republic of Lithuania.[199]	Costed at €50m and jointly funded by the ERDF and Republic of Lithuania (Plačiajuostis Internetas).

Table 7.1: *Financing of RAIN projects*

Initiatives

RAIN was established with the aim of eliminating Lithuania's digital divide to increase social cohesion, create attractive business conditions and spur economic development.[200]

The first RAIN project (RAIN-1) was implemented between 2005–2008 by the Institute of Mathematics and Informatics, Plačiajuostis Internetas, the Ministry of Transport and Communications, and the Ministry of Education and Science.[201]

RAIN-2 was implemented in 2009–2013 by the Ministry of Transport and Communications and the Institute of Mathematics and Informatics.[202] This second phase was aimed at addressing the remaining 700,000 inhabitants without broadband, and the 'higher cost' missing parts of the network that had previously deterred internet service providers from these rural areas.[203]

Combined, RAIN-1 and RAIN-2 have reached over 1 million inhabitants, with more than 9,000 km of network lines built.[204] In 2018, 62% of rural households were using broadband, up from 5% in 2006.[205] Meanwhile, the number of public institutions offering public services online rose from 1.5% in 2006 to 28% in 2014, marking a major shift to online administration and governance.[206]

According to Lithuania's Ministry of Transport and Communications, the number of households accessing broadband has risen 12-fold between 2005–2015, with internet speeds increasing by 45 times during the same period.[207] The country is now ranked eighth globally and considered the European leader in FFTH (fibre to the home) internet network penetration.[208] The RAIN-2 project also won the European Broadband Award in the socio-economic impact and affordability category.[209]

Challenges to implementation

Due to the high cost associated with establishing digital networks in rural areas, a key challenge during RAIN-1 was incentivising internet service providers. This was addressed in RAIN-2, which established network infrastructure for high-speed broadband for affordable and wholesale use in rural areas.[210]

Additional projects have made use of this shared network to roll-out further broadband access in Lithuania's rural areas and to tackle the country's digital divide.[211]

Conclusion

Lithuania's RAIN provides an example of how sustained, long-term efforts can successfully reduce the digital divide between urban and rural areas. Progressing initiatives beyond the initial investment outlay, coupled with a strong focus on community-led outcomes, has enhanced productivity and economic growth. By including partner funding from the ERDF and private investors, RAIN has leveraged additional funding while sharing project risk.

The principles grounded within the RAIN projects – of open access and service competition – have facilitated the participation of internet service providers in regions of weak economic viability, thereby maximising the benefits for end users. Such applications have the potential to spur digital infrastructure investments across a wide range of governance structures and socio-economic conditions.

Conclusion

The six selected case studies offer important lessons for investment in infrastructure across a range of international jurisdictions. The projects vary significantly in size from national initiatives, such as the Smart Cities Mission in India and RAIN in Lithuania, to those aimed at specific municipalities, such as the implementation of Wireless Verrua in Verrua Savoia, Italy. This variability highlights the opportunities presented within all infrastructure investments, assuming the foundational elements of the initiatives are appropriate and suited to the local areas they serve. Indeed, the Wireless Verrua case study showcases what a university and community can do at a micro scale when such foundations are in place.

Meanwhile, the financial operations of the initiatives profiled varied greatly as well. This emphasises the need to consider alternative financing mechanisms to ensure that the investments are calibrated to the governance structures, fiscal powers and long-term aims of an area.

For example, the Restart NSW Infrastructure Programme and India's Smart Cities Mission involve competition-style funding mechanisms. These have relied on the construction of tiered monitoring and evaluation frameworks, and the establishment of independent agencies to analyse project proposals. Capacity and capability are needed to ensure that all places receive the support needed to compete for funding. Without this provision, regional inequalities are likely to persist as grant funding flows to larger or better resourced local authorities who are in a position to submit more credible bids. Indeed, the Smart Cities Mission case study evidenced how the availability of supporting bodies and handholding agencies has aided municipalities in the creation of their smart city proposals.

Furthermore, a holistic approach to project design, monitoring and appraisal can strengthen the delivery of outcomes. Understanding the impact that infrastructure investments have over the lifetime of a project, rather than at the bidding or approval stage, can facilitate more reliable estimates of return on investment. The identification of best practices, and how these can be applied to future initiatives, is also improved when evaluation is embedded into a project's scoping. The case of the Øresund region and, to some extent, the Restart NSW initiative, showcase this proactive adaptation.

In some instances, investment in capacity building is important to enable effective monitoring and appraisal. Experiences with the Smart Cities Mission indicates the importance of effective programme management and capacity to understand data and how it is used to develop effective solutions. Multi-channel platforms are one way of supporting such capacity building, particularly leadership skills, across partner organisations. These can help to ensure that investment in infrastructure is successful.

Throughout the evaluation process, mechanisms should be in place that capture a project's impact on hard to reach groups. This was a large contributing factor to the success of Wireless Verrua, Smart Cities Mission and RAIN.

Fiscal autonomy and flexible governance structures have played an enabling role across many of the infrastructure initiatives profiled in this report. For example, Bilbao's regeneration efforts were enhanced by the greater efficiency with which local authorities could administer investments in infrastructure. In contrast, differences in responsibilities, delegated authority and tax systems between the regional governments of Sweden and Denmark present considerations for future economic development initiatives in the Øresund region. These experiences may be insightful to other countries considering greater devolution of statutory powers, responsibilities and resources aimed at addressing regional inequalities.

Finally, the case studies highlight the importance of partnership working. In Greater Copenhagen, the establishment and ongoing use of forums has strengthened relationships between policy makers and industry stakeholders. Meanwhile, Bilbao Ría and Bilbao Metrópoli-30 showcased the importance of organisations that unite public and private organisations and their interests within a common vision, while Australia's Restart NSW emphasised the role of central government in supporting local authorities to develop business cases and project proposals. Knowledge exchange around a shared vision has proven to be instrumental in maximising the impact of these infrastructure investments.

Government ambitions to tackle regional inequalities should recognise that the challenge requires both scale and stamina. Short-term pots of funding lack the certainty required for local governments to corral the stakeholders and other resources necessary to deliver good value for money. Smaller authorities or those located in areas of high deprivation will benefit from support mechanisms that enable them to access funding based on proper needs assessments. Similarly, better resourced localities should be incentivised to share their skills and best practices in a way that rewards collective achievement.

Investments in infrastructure that support more inclusive economic development can be the golden thread that lifts productivity and the standard of living for everyone. While reducing regional disparities has been the focus of this report, poor people and other marginalised groups exist everywhere. Good public financial management can help to ensure that our limited public resources are used efficiently and effectively to support the lives of people – wherever they live.

Appendices

Appendix 1:

Glossary

Digital divide	A general description of the widening gap between the increasing reliance of many economic activities on the internet, and the cities, towns, localities and individuals who do not have easy, reliable or quick access to the internet.
Fibre to the home (FTTH)	Internet network programmes to connect optical fibre internet directly to residences.
Fleet utilisation	Approach to optimising the use of transport and vehicles of an organisation.
Green growth	A term used to describe economic growth that is perceived as environmentally sustainable.
Infrastructure gap	The differences in scale and quality of infrastructure between countries, regions and localities.
Life sciences industries	The generally high-tech economic sector where businesses operate in pharmaceuticals, biotechnology, medical devices and similar.
Self-government	The description of the high level of autonomy and devolved powers specifically in relation to the Basque region in northern Spain.
Separatism	The proposition for a region in a country to separate and form its own independently governed state.
Union territory	A centrally administered subdivision of India. There are eight union territories in India.

Appendix 2:

Interview participants

With grateful thanks to the following interview participants (in alphabetical order):

John Bransgrove	Associate Director, Economic Strategy Division, NSW Treasury
Simon Chrisander	Deputy Mayor of Malmö, Head of Urban Planning and Environment
Christian Hørdum Andersen	Senior Advisor, Greater Copenhagen
Ziggi Lejins	Director Regions, Water and Energy, NSW Treasury

There were additional interviewees who have asked not to be named.

Appendix 3:

References

1 What Works Centre for Local Economic Growth. (2021). Evidence briefing: Levelling Up Fund interventions and impacts, What Works Centre for Local Economic Growth.

2 Vironen, H. and Kah, S. (2019). Meeting the Challenges of Digitalisation: Implications for Regional and Rural Development, European Policy Research Paper, No.111, European Policies Research Centre, University of Strathclyde, Glasgow.

3 Msulwa, R. (2021). What is the role of infrastructure in relation to levelling up?, Bennett Institute for Public Policy, University of Cambridge.

4 Msulwa, R. (2021). Ibid.

5 Plöger, J. (2008). Bilbao city report, *CASEreport 43*. Centre for Analysis of Social Exclusion, London School of Economics and Political Science, London.

6 Gazura, K. (2018). From grey city to metropolitan icon: Basque cultural revival and urban redevelopment in Bilbao, Spain, *Honors College*. 334.

7 Plöger. (2008). Ibid; Power, A. (2016). Bilbao city story, *CASEreports (101)*. Centre for Analysis of Social Exclusion, London School of Economics and Political Science, London.

8 Gazura. (2018). Ibid; Plöger. (2007). Ibid; Gómez, M.V., 1998. Reflective images: the case of urban regeneration in Glasgow and Bilbao, *International journal of urban and regional research*, 22(1), pp.106–121. DOI: 10.1111/1468-2427.00126.

9 Plöger. (2008). Ibid.

10 OECD. (2020a). Metropolitan Areas. Population, all ages, administrative data.

11 KPMG. (2014). Magnet cities. Ibid.

12 Plöger. (2008). Ibid.

13 Plöger. (2008). Ibid; Power, A. (2016). Ibid.

14 KPMG. (2014). Ibid.

15 KPMG. (2014). Ibid.

16 OECD. (2020a). Regional Labour, TL2.

17 Farnsworth, K. (2018). Bilbao.

18 Gazura. (2018). Ibid.

19 Plöger. (2008). Ibid.

20 Riding, A. (1997). A Gleaming New Guggenheim for Grimy Bilbao, The New York Times.

21 Gomez. (1998). Ibid.

22 Bilbao Ría 2000. (n.d). What is Bilbao Ría 2000?; Power. (2016). Ibid; Plöger, J. (2008). Ibid.

23 OECD (2010), 'Bilbao Metrópoli-30 (The Association for the Revitalisation of Metropolitan Bilbao)', in Organising Local Economic Development: The Role of Development Agencies and Companies, OECD Publishing, Paris.

24 Gazura, K. (2018). Ibid.

25 Bilbao Ría 2000. (n.d). Ibid.

26 Power. (2016). Ibid.

27 Gazura, K. (2018). Ibid; Plöger, J. (2008). Ibid; Power. (2016). Ibid.

28 Bilbao Metrópoli-30. (n.d.). Association.

29 OECD. (2010). Ibid.

30 Gazura. (2018). Ibid

31 OECD. (2010). Ibid.

32 Gazura. (2018). Ibid

33 Mas Context. (n.d.). Three Key Organizations: Bilbao Metrópoli 30, BILBAO Ría 2000, and Bilbao Bizkaia Water Consortium.

34 Gazura. (2018). Ibid

35 KPMG. (2014). Ibid.

36 Gomez. (1998). Ibid.

37 OECD. (2010). Ibid.

38 Gazura, K. (2018). Ibid.

39 KPMG. (2014). Ibid.

40 Gomez. (1998). Ibid.

41 KPMG. (2014). Ibid.

42 Gazura. (2018).

43 OECD. (2010). Ibid.

44 Plöger. (2008). Ibid.

45 Gazura. (2018). Ibid; KPMG. (2014). Ibid.

46 Plaza, B. (2007). Museums as economic re-activators: challenges and conditions for their effectiveness, paper presented at EURA Conference, Glasgow, 12–14 September. Cited in Plöger, J. 2008. 'Bilbao city report', *CASEreport 43*. Centre for Analysis of Social Exclusion, London School of Economics and Political Science, London.

47 KPMG. (2014). Ibid.

48 Gazura, K. (2018). Ibid; KPMG. (2014). Ibid

49 Gazura, K. (2018). Ibid.

50 Plöger, J. (2008). Ibid.

51 Power. (2016). Ibid.

52 Plöger. (2008). Ibid.

53 Power. (2016). Ibid.

54 Plöger. (2008). Ibid.

55 Gomez. (1998). Ibid.

56 OECD. (2010). Ibid.

57 Gazura. (2018). Ibid; Plöger. (2008). Ibid.

58 Plöger. (2008). Ibid.

59 New South Wales Government. (2021a). Key facts about NSW, New South Wales Government.

60 New South Wales Government. (2020). Making it Happen in the Regions: Regional Development Framework.

61 Infrastructure New South Wales. (2018). Building Momentum: State Infrastructure Strategy 2018–2038.

62 Angus. C. (2020). Regional NSW: A demographic and economic snapshot. NSW Parliamentary Research Service.

63 Nangia, I., Brinded, T., Tilahun, L., Trueman, P., Watson, B., Joseph, S. and Sahulhameed, R. (2019). Australia's infrastructure innovation imperative, McKinsey & Company.

64 Angus. C. (2020). Ibid.

65 Infrastructure New South Wales. (2018). Ibid.

66 Infrastructure New South Wales. (2018). Ibid.

67 Infrastructure New South Wales. (2018). Ibid.

68 Audit Office of New South Wales. (2018). Regional assistance programs: New South Wales Auditor-General's Report: Performance Audit; New South Wales Treasury. (2017). Report on the review of the Restart NSW Fund Act 2011.

69 Infrastructure New South Wales. (2021). Ibid.

70 New South Wales Government. (2017). Infrastructure Statement 2017–18: Budget Paper No.2.

71 Infrastructure New South Wales. (2018). Ibid.

72 New South Wales Government. (2021b). Snowy Hydro Legacy Fund, New South Wales Government.

73 New South Wales Government. (2021b). Ibid.

74 New South Wales Government. (2021c). Digital Restart Fund, New South Wales Government.

75 New South Wales Government. (2021c). Ibid.

76 Iannunzio, E. (2018). Snowy Hydro Legacy Fund priorities identified, Energy.

77 New South Wales Government. (2021c). Ibid.

78 New South Wales Government. (2021c). Ibid.

79 Brookes, J. (2021). NSW 'Secret weapon': $500m boost for digital restart fund', Innovation Aus.

80 Infrastructure New South Wales. (2021). Restart NSW, We are Infrastructure New South Wales; New South Wales Government. (2017). Ibid.

81 New South Wales Government. (2017). Ibid; New South Wales Treasury. (2017). Ibid.

82 Infrastructure New South Wales. (2018). Ibid; Infrastructure New South Wales. (2021). Ibid.

83 Infrastructure New South Wales. (2021). Ibid.

84 Infrastructure New South Wales. (2021). Ibid.

85 Audit Office of New South Wales. (2018). Ibid.

86 New South Wales Treasury. (2017). Ibid.

87 Infrastructure New South Wales. (2021). Ibid.

88 Infrastructure New South Wales. (2018). Ibid; Infrastructure New South Wales. (2021). Ibid.

89 Infrastructure New South Wales. (2018). Ibid; Infrastructure New South Wales. (2021). Ibid.

90 Audit Office of New South Wales. (2018). Ibid; New South Wales Government. (2017). Ibid.

91 Infrastructure New South Wales. (2018). Ibid; Infrastructure New South Wales. (2021). Ibid.

92 Audit Office of New South Wales, (2018). Ibid.

93 Infrastructure NSW Act 2011, Part 3, s11.

94 Parkin, K. (2018). What can Oresund Bridge teach us about cross-border growth?, BusinessWest.

95 The Local. (2019). This is how many people now live in the Öresund region, The Local dk; Aulnette, A. (2018). Good practices: Oresund strategy: Denmark and Sweden's cross-border commuters, European Commission.

96 Oresund Committee. (2019). About the Oresund Committee, Öresundskomiteen.

97 Ejermo, O., Hussinger, K., Kalash, B., Schubert, T. (2021). Innovation in Malmö after the Öresund Bridge, *Journal of Regional Science*.

98 Nauwelaers, C., Maguire, K., Ajmone Marson, G. (2013). The case of Oresund (Denmark-Sweden) – Regions and Innovation: Collaborating Across Borders, OECD Regional Development Working Paper, 2013/21, OECD Publishing.

99 Green, A., Kispeter, E., Sissons, P. and Froy, F. (2017). How international cities lead inclusive growth agendas, Joseph Rowntree Foundation.

100 Nauwelaers, et al. (2013). Ibid, p.12.

101 Öresundsstatistik och analyser. Öresundsdatabasen (engelsk). (2021). OEAKU11D: Unemployed by region and sex.

102 Matthiessen, C.W. (2004). The Öresund Area: Pre-and post-bridge cross-border functional integration: the bi-national regional question, GeoJournal, 61(1), pp.31–39.

103 Ejermo et al. (2021). Ibid; Matthiessen. (2004). Ibid; Oresundbron. (n.d). Welcome to the Øresund Bridge, Oresundsbron.

104 Sund & Bælt. (n.d.). Construction costs for the Øresund Bridge, Sund and Bælt; Oresundsbron. (2008). Facts worth knowing about the Oresund Bridge.

105 Nauwelaers, et al. (2013). Ibid; Parkin. (2018). Matthiessen. (2004). Ibid.

106 Oresund Committee, (n.d.). Greater Copenhagen and Skåne Committee, Öresundskomiteen.

107 Medicon Valley Alliance. (n.d.). MVA's History, Medicon Valley Alliance

108 Matthiessen, C.W. (2004). Ibid.

109 Nauwelaers et al. (2013). Ibid.

110 Achten, S., Beyer, L., Dietrich, A.M., Ebeling, D., Lessmann, C. and Steinkraus, A. (2019). Large scale infrastructure investment and economic performance–a case study of Oresund. *Applied Economics Letters*, 26(1), pp.21-26; Ejermo et al. (2021). Ibid; Knudsen, M.A. and Rich, J. (2013). Ex post socio-economic assessment of the Oresund Bridge, *Transport policy*, 27, pp.53–65; Matthiessen. (2004). Ibid.; Oresund Committee. (2019). Ibid.; Parkin. (2018). Ibid.

111 Achten et al. (2018). Ibid.; Knudsen and Rich. (2013). Ibid.; Parkin. (2018). Ibid.; Oresund Committee. (2020. Why Oresund Bridge is so Important?, Öresundskomiteen.

112 Rees, M. (2017). A bridge to zen, European Investment Bank.

113 Aulnette. (2018). Ibid; Parkin. (2018). Ibid.

114 Aulnette. (2018). Ibid.

115 Ejermo et al. (2021). Ibid.

116 Nauwelaers et al. (2013). Ibid, p.23.

117 Nauwelaers et al. (2013). Ibid.

118 Medicon Valley Alliance. (n.d.). Ibid; Nauwelaers et al. (2013). Ibid.; European Commission. (2007). Medicon Valley.

119 Nauwelaers et al. (2013). Ibid.

120 Medicon Valley Alliance. (n.d.). Ibid.

121 Nauwelaers et al. (2013). Ibid.

122 Medicon Valley Alliance. (2020). State of Medicon Valley 2020: An Analysis of Life Science in Greater Copenhagen.

123 Femern A/S. (n.d.). The Fehmarnbelt link in numbers, Femern SundBælt.

124 Sørensen, J. (2021). Two new tunnels between Sweden and Denmark are planned. Both between Helsingborg and Helsingør, Tunnel Contact.

125 The Öresund Metro. (n.d.). About the Öresund Metro, The Öresund Metro.

126 Knudsen and Rich. (2013). Ibid.

127 Rönnberg, P. (2017). AstraZeneca's closure of two R&D facilities marked a new beginning for many, IVA, Royal Swedish Academy of Engineering Services.

128 Municipality of Verrua Savoia. (n.d.). Il commune in breve, Brunazzi, D., Stefanelli, R. and Trinchero, D. (2011). Experimental analysis of the sensitivity to interferences in geographical unlicensed wireless networks, *(2011). XXXth URSI General Assembly and Scientific Symposium*, pp.1–4. DOI: 10.1109/URSIGASS.2011.6050790; European Commission. (2020). Facing the challenges of broadband deployment in rural and remote areas, European Commission.; Trinchero, D., Stefanelli, R., Brunazzi, D., Casalegno, A., Durando, M. and Galardini, A. (2011). Integration of smart house sensors into a fully networked (web) environment, SENSORS, 2011 IEEE, pp.1624–1627. DOI: 10.1109/ICSENS.2011.6127374.; Pianigiani, G. (2014). A Village Has What All of Italy Wants: The Internet, Verrua Savoia Journal, The New York Times.

129 Brunazzi et al. (2011). Ibid; European Commission. (2020). Ibid; Trinchero et al. (2011) Ibid.

130 Good Things Foundation. (n.d). Older people, Digital Health Lab.

131 Pianigiani. (2014). Ibid; European Commission. (2016). Enhancing access to, and the use and quality of ICT: Support to the implementation of the ERDF Investment Priority, European Commission.

132 Brunazzi et al. (2011). Ibid; European Commission. (2016); European Commission. (2020); Mastrolonardo, R. (2014). The ISP made by the people, for the people: Filling in broadband notspots the DIY way, ZDNet; Pianigiani. (2014). Ibid; Trinchero et al. (2011). Ibid.

133 European Commission. (2016). Ibid; European Commission. (2020). Ibid.

134 European Commission, (2016). Ibid; European Commission. (2020). Ibid.

135 European Commission. (2016). Ibid; European Commission. (2020). Ibid; Mastrolonardo. (2014). Ibid.

136 Pianigiani. (2014). Ibid.

137 iXem Labs. (n.d.). Senza Fili Senza Confini, iXem Labs; Senza Fili Senza Confini. (n.d.). Who we are, Senza Fili Senza Confini.

138 European Commission. (2016). Ibid.

139 European Commission. (2016). Ibid.; European Commission. (2020). Ibid.

140 European Commission. (2016). Ibid; Trinchero et al. (2011). Ibid; European Commission. (2020). Ibid.

141 European Commission. (2016). Ibid.; European Commission. (2020). Ibid.

142 European Commission. (2016). Ibid.

143 Brunazzi et al. (2011). Ibid; European Commission. (2016). Ibid; European Commission. (2020). Ibid; Trinchero et al. (2011). Ibid.

144 Berra, M. and Nuciari, M. (2013). Smart Cities. ICT infrastructure for social participation?, *Quaderni di Sociologia*, 63, pp.127-153. DOI: 10.4000/qds.427; European Commission, (2016). Ibid.

145 Mastrolonardo. (2014). Ibid.

146 European Commission. (2016). Ibid; European Commission. (2020). Ibid; Mastrolonardo. (2014). Ibid; Pianigiani. (2014). Ibid.

147 iXEM,(n.d). Ibid.; Pianigiani. (2014). Ibid; Senza Fili Senza Confini. (n.d). Ibid.

148 European Commission. (2020). Ibid.

149 Mastrolonardo, (2014). Ibid.

150 Brunazzi et al. (2011). Ibid.

151 World Bank. (2021). The World Bank in India.

152 World Bank. (2020). Population, total – India.

153 World Bank. (2019). GDP (current US$) – India.

154 United Nations Industrial Development Organisation. (n.d.). Country context.

155 World Bank. (2021). Ibid.

156 OECD. (2021). India Economic Snapshot. Economic Forecast Summary (May 2021).

157 Ministry of Housing and Urban Affairs, Government of India. (2021). Smart Cities Mission.

158 Ministry of Housing and Urban Affairs. (2021). Ibid.

159 Housing and Land Rights Network. (2018). India's Smart Cities Mission: Smart for Whom? Cities for Whom? Housing and Land Rights Network, New Delhi.

160 Ministry of Housing and Urban Affairs. (2021). Ibid.

161 Anand, A., Sreevatsan, A. and Taraporevala, P. (2018). An Overview of the Smart Cities Mission in India, *Centre for Policy Research India, New Delhi.*

162 Anand et al. (2018). Ibid.

163 Housing and Land Rights Network. (2018). Ibid.; Ministry of Housing and Urban Affairs. (2021). Ibid.

164 Ministry of Housing and Urban Affairs, Government of India. (2020). Annual Report 2020-2021. New Delhi, India; Smith, R.M., Pathak, P.A. and Agrawal, G. (2019). India's "smart" cities mission: A preliminary examination into India's newest urban development policy Journal of Urban Affairs, 41(4), pp.518–534. DOI: 10.1080/07352166.2018.1468221.

165 Ministry of Housing and Urban Affairs. (2021). Ibid.

166 Jawaid, M.F. and Khan, A.R. (2020), November. The Smart City Mission in India and Prospects of Improvement in The Urban Environment *IOP Conference Series: Materials Science and Engineering*, 955(1), pp.1–8. IOP Publishing. DOI: :10.1088/1757-899X/955/1/012001.

167 Smith et al. (2019).

168 Aijaz, R. (2021). India's Smart Cities Mission, 2015–2021: A Stocktaking, *ORF Special Report*, No. 155, Observer Research Foundation; Ministry of Housing and Urban Affairs, Government of India. (2020). Annual Report 2020-2021. New Delhi, India; Ministry of Housing and Urban Affairs. (2021). Ibid.

169 Ministry of Housing and Urban Affairs. (2020). Ibid. Ministry of Housing and Urban Affairs. (2021). Ibid.

170 Aijaz, R. (2020). The Smart Cities Mission in Delhi, 2015–2019: An Evaluation, ORF Special Report, No.98, Observer Research Foundation.

171 Aijaz. (2021). Ibid.

172 Smith et al. (2019). Ibid.

173 Aijaz. (2021). Ibid.

174 Housing and Land Rights Network. (2018). Ibid; Ministry of Housing and Urban Affairs. (2021). Ibid; Smith et al. (2019). Ibid.

175 Aijaz. (2021). Ibid; Housing and Land Rights Network. (2018). Ibid; Ministry of Housing and Urban Affairs (2021). Ibid; Smith et al. (2019). Ibid.

176 Ministry of Housing and Urban Affairs. (2021). Ibid.

177 Housing and Land Rights Network. (2018). Ibid.

178 Aijaz. (2021). Ibid.

179 National Urban Living Platform. (No date given). About Us.

180 Chugh, D. (2020). Appraisal of Smart City Mission: Rising Challenges in India, *The International Conference on Future Cities-2019*, Indian Institute of Technology, Roorkee.

181 Aijaz. (2021). Ibid, p.2.

182 Aijaz. (2021). Ibid, p.24, 22.

183 Aijaz. (2021). Ibid, p.20, 24.

184 Housing and Land Rights Network. (2018). Ibid.

185 Aijaz. (2021). Ibid.

186 Waghmare, M. and Singhal, S. (2021). Monitoring and evaluation framework for inclusive smart cities in India, *Development in Practice*, pp.1–19. DOI: 10.1080/09614524.2021.1907535.

187 Housing and Land Rights Network. (2018). Ibid.

188 Nations Online. (n.d.). Lithuania.

189 World Bank. (2020). Population, total – Lithuania.

190 OECD. (2021). Lithuania Economic Snapshot. Economic Forecast Summary (May 2021).

191 Kavaliūnas, R., Martišienė, O. and Martišius, S. (2009). Development of information infrastructure using optical fibre network created by RAIN project, *RURAL DEVELOPMENT 2009*, pp.271-276.

192 Kavaliūnas et al. (2009). Ibid.

193 Tvaronavicius, V. (2014). Rural Area Information Technology Broadband Network (RAIN) – Case study of the broadband infrastructure investment project in Lithuania, European Commission.

194 Tvaronavicius. (2014). Ibid.

195 European Commission. (2018). Improving broadband access in rural Lithuania, European Commission; Tvaronavicius. (2014). Ibid.

196 European Commission. (2018). Ibid.; Tvaronavicius. (2014). Ibid.

197 European Commission. (2018). Ibid.

198 European Commission. (2018). Ibid.

199 European Commission. (2018). Ibid; Feko, A., Sass, M. and Nagy, G. (2011). The role of broadband developments financed from EU Structural Funds in the enhancement of regional cohesion in the NMS-10, Studies in Agricultural Economics, 113, pp.152–160; Kavaliūnas et al. (2009). Ibid; Tvaronavicius. (2014). Ibid.

200 European Commission. (2018). Ibid; Feko et al. (2018); Tvaronavicius. (2014). Ibid.

201 Tvaronavicius. (2014). Ibid.

202 Tvaronavicius. (2014). Ibid.

203 Kavaliūnas et al. (2009). Ibid.; Tvaronavicius. (2014). Ibid.

204 Ministry of Transport and Communications. (2015). Strategic project for Lithuania RAIN-2 won the international award, Ministry of Transport and Communications.; Plačiajuostis Internetas. (n.d., a). RAIN, Plačiajuostis Internetas; Plačiajuostis Internetas. (n.d., b). 'RAIN-2', Plačiajuostis Internetas.

205 European Commission. (2018). Ibid.

206 Plačiajuostis Internetas. (n.d., a). Ibid. Plačiajuostis Internetas. (n.d., b). Ibid.

207 Ministry of Transport and Communications. (2015). Ibid.

208 Ministry of Transport and Communications. (2015). Ibid.

209 European Commission. (2018). Ibid; Ministry of Transport and Communications. (2015). Ibid.

210 Plačiajuostis Internetas. (n.d., b). Ibid.

211 European Commission. (2018). Ibid.

77 Mansell Street, London E1 8AN
+44 (0)20 7543 5600

The Chartered Institute of Public Finance and Accountancy.
Registered with the Charity Commissioners of England and Wales No 231060
Registered with the Office of the Scottish Charity Regulator No SC037963.

cipfa.org