

Contribution from the SMART Infrastructure Facility (University of Wollongong) to the Inquiry into the Australian Government's role in the development of cities.

Introduction

The SMART Infrastructure Facility welcomes the opportunity to contribute to the inquiry and thanks the members of the Standing Committee on Infrastructure, Transport and Cities for their invitation. This contribution focuses on the second issue to be addressed by the inquiry: Growing new and transitioning existing sustainable regional cities and towns.

SMART Infrastructure Facility is one of the largest research institutions in the world dedicated to helping governments and businesses better plan for the future. SMART's work is augmented by collaborations with experts across UOW's Faculties in infrastructure-related fields such as energy generation and storage, water sustainability, environmental engineering, spatial geotechnics and social planning.

When the \$62 million SMART building opened in 2011 as Australia's first multi-disciplinary applied infrastructure research and training facility, it represented a commitment by the Australian and NSW Governments to apply a more scientific approach to infrastructure planning.

Since opening, SMART has built an international profile working with government agencies in Australia and around the world, and has developed a strong network of global collaborators. SMART brings together experts from fields such as rail, infrastructure systems, transport, water, energy, economics and modelling and simulation and provides 30 state-of-the art laboratories to facilitate this important research.

This contribution will focus on three pieces of research that have direct relevance to the inquiry, namely: (1) the Vision Illawarra regional planning tool, (2) the regional Digital Living Lab and (3) the study on transport connectivity between the Illawarra and Sydney (study commissioned by Illawarra First).

Vision Illawarra: an innovative and collaborative regional planning tool

Recognising the need for more integrated approaches to local and regional planning, SMART has developed Vision Illawarra, a web-based regional dashboard created to enable evidence-based planning and integrated development across the Illawarra.

The first of its kind in Australia, Vision Illawarra combines a public dashboard as well as a private subscription modelling platform.

The dashboard comprises publicly available data including recent economic, demographic, transport and land use figures, as well as the evolution of utility usage

over the last ten years (water, electricity, wastewater and solid waste). This data is regularly updated, allowing for robust benchmarking and spatial analyses.

The modelling platform is available through a subscription and provides a state-of-the-art regional growth model developed with the Geonamica Platform (RIKS, Netherlands). Stepping away from traditional trend analysis, this model integrates demographic, economic, land use and transport dynamics as endogenous processes, allowing for more realistic projections. This enables smarter and strategic decisions for the benefit of the region.

Vision Illawarra is a regional initiative bringing together data providers (Sydney Water, Endeavour Energy, Remondis and IRIS Research), tool developers (SMART and RIKS) and information users (NSW Department of Planning and Environment, the NSW Office of Environment and Heritage, Transport for NSW and Local Councils) within a Steering Committee that examines data privacy or security issues, and proposes new regional scenarios to be modelled.

Vision Illawarra is not only an innovative planning tool but also a vehicle to bring together regional resources through mutualisation of relevant expertise, existing data and available funding. Evidence-based and consensual regional planning, relying on common datasets and models characterises the approach taken by the Illawarra to become a more sustainable and vibrant region around Wollongong, its growth centre.

More information: <http://www.visionillawarra.org.au/>

Digital Living Lab: a community-oriented transition towards a smart future

Together with the SMART Infrastructure Facility, UOW has deployed a radio communication network across the region using LoRaWAN technology with other technologies joining the digital revolution. Through the ideas of Share, Enable and Create, the Digital Living Lab is facilitating a smart city solution, improving the quality of life for people in our community.

Share

Recognising the need for a dedicated and interactive research space for smart sensing and Internet of Things (IoT) technologies, the SMART IoT Hub was established. This hacking space is open to the whole community including entrepreneurs, researchers, students, start ups and small business. Other technology providers contribute to the hub with IoT development kits available. The Hub is building a community of technology enthusiasts and developers who are creating an open collaboration network for ideas and new technologies. The Hub's motto is: 'Build it! Hack it! Share it!'

Enable

UOW has deployed a radio communication network across the region using LoRaWAN technology with other technologies joining the digital revolution. Partnering with The Things Network, a global and community-based initiative, the Digital Living Lab provides an open and free-to-air platform for the Illawarra/Shoalhaven community. This open network enables individuals, community groups, business, IT developers,

researchers and students to develop solutions that can improve the efficiency of services and liveability of the region.

Create

The Digital Living Lab provides a test bed for new IoT technologies, such as sensors to monitor the environment or assets in real time, and will give rise to smart solutions for challenges facing the Illawarra/Shoalhaven community. The SMART Infrastructure Facility, in collaboration with regional partners, facilitates high impact community projects that address health, safety and environmental issues across the region. The SMART Infrastructure Facility is working with startups, local councils, aged care providers, school and community groups to develop and deliver projects that will enhance the community, provide people centric solutions and make the Illawarra/Shoalhaven a smart region.

More information: <http://digitallivinglab.uow.edu.au/>

Transport Connectivity between the Illawarra and Sydney

Context

In 2017, The Illawarra Business Chamber (Illawarra First) commissioned the SMART Infrastructure Facility UOW (SMART) to investigate options to improve the speed and reliability of passenger and freight rail transport services between the Illawarra and Sydney.

The Illawarra region, despite its geographic proximity to Australia's largest city, has historically suffered from relatively higher unemployment, particularly youth unemployment, in part due to poor transport connectivity to Sydney and a lack of industrial diversification. Traditionally a large employer of mining, mining services, steelmaking and port services, the Illawarra economy has often struggled to maintain healthy growth and low unemployment during mining downturns. Improving rail transport connectivity to Sydney can assist in providing labour market diversification and improve workforce participation.

The potential economic and social benefits of better connecting the Illawarra to Western Sydney in particular have been highlighted in several recent studies, for instance by the Greater Sydney Commission in its Draft South West District Plan (2016). The Commission cited the objectives established by Transport for NSW in relation to improving north-south transport connectivity in south-western Sydney, including: *"improved public transport and freight connectivity to Port Kembla and the Illawarra"* (p.50). And a 2014 report by PwC for Illawarra First found that: *"Accessing jobs and trading opportunities in Sydney already costs Illawarra residents and businesses around half a billion dollars a year. Without action, the time and out of pocket costs are expected to increase to at least \$690 million per annum by 2031"*.

The significant population and economic growth forecasts for Western Sydney will be further supported by the decision to build Sydney's second airport at Badgerys Creek and the development of Moorebank multi-modal terminal. In summary, the arguments

to better connect the Illawarra to Sydney via the southwest are strong and, in our view, will become stronger over the next two decades.

The Issue

The main rail line between the Illawarra and Sydney is the South Coast/Illawarra Line. The South Coast Line runs from Bomaderry station (in Nowra) in the south of the Illawarra to Waterfall station at the southern edge of the Sydney Trains Network. From Waterfall station, the Illawarra Line runs north and east, through Central Station and terminating at Bondi Junction.

According to the current Sydney Trains timetable, it takes 87 minutes to travel the 82 km line (ie 56km/h average speed) between Wollongong and Central Station in Sydney in the weekday morning peak. To reach Parramatta station at the geographic centre of Sydney, the journey from Wollongong (via Redfern) takes a further 27 minutes at best. On average, the total commute time between Wollongong and stations in southwest Sydney, such as Liverpool (125 minutes), Leppington (130 minutes) and Campbelltown (131 minutes) are all over two hours. Many rail commuters find it more convenient to opt for an extreme form of 'park and ride', driving the roughly 40 km along the M1 (Princess Motorway) and parking at Waterfall, Heathcote or Sutherland stations before utilising the Sydney Trains Network.

This lengthy commute for workers, students and day-trippers reduces economic and social opportunities for both Illawarra and Sydney residents in terms of accessing a wider range of jobs, business, trade, education, leisure and housing choices.

The South Coast Line is shared between passenger and freight services, with significant freight movement between Port Kembla and Sydney (being up to 23 slots per day). Thermal coal is transported by rail to Port Kembla (for export) from the coalfields in the Sydney Basin and imported container freight is sent from Port Kembla into Sydney. It has been previously estimated that the South Coast line will hit capacity in the mid- to late-2020s (ACIL Tasman, 2011).

The Options

SMART was tasked with first examining whether it was possible to improve the efficiency of the South Coast Line and at what cost.

In theory, rail commute times can be reduced by: (i) shortening the distance travelled (via line straightening, reducing steep gradients, and tunnelling), (ii) increasing train speeds safely (which often requires line straightening and/or investment in new signalling technology), or (iii) investing in line duplication to reduce bottlenecks and congestion. Often, a combination of these measures is required to make a significant difference to commuting times.

SMART found that reducing passenger commute times on the South Coast/Illawarra Line is limited by the geological conditions of the Illawarra escarpment and the consequent engineering challenges, such as in relation to tunnelling. SMART's high-level cost benefit analysis indicates that, in order to achieve a significant reduction in commute times between Wollongong and Central stations, an investment in the order of \$2 billion would be required. This high cost is driven by the fact that the South Coast Line is built on the Illawarra escarpment and significant line straightening by way of

tunnelling would be required. Previous work on infrastructure cost drivers by SMART indicates that tunnelling costs would be in the order of \$150 million per kilometre. In other words, up to 13 km of tunnelling could cost up to \$2 billion.

Given the likely costs of significantly improving the efficiency of the South Coast Line, SMART also investigated the potential for an additional passenger and freight line between the Illawarra and Sydney, by completing the 35 km Maldon-Dombarton line (referred to in this report as the South West Illawarra Rail Link (SWIRL)), which was partially built in the mid-1980s. The rail link would connect the Main South Line (Sydney-Maldon) and the Moss Vale-Unanderra dedicated freight line at Dombarton. The 7 km rail link from Dombarton to Unanderra station would require electrification. In sum, the SWIRL would comprise:

- completion of the original 35 km Maldon-Dombarton freight line;
- making the line a dual passenger/freight track (except for the two main bridges and the 4km tunnel) with electrification; and
- electrifying the 7 km section of the Moss Vale-Unanderra Line.

Our central estimate for the total cost of constructed the SWIRL as specified above is **\$1,689 million** in 2016-17 dollars.

In SMART's view, SWIRL could meet the transport connectivity objectives set by TfNSW at a lower cost and provide many economic and social benefits for residents of the Illawarra and Western Sydney and is, therefore, worth serious consideration. For instance, the SWIRL and the South Coast/Illawarra Line operating together would increase total passenger and freight rail network capacity and open up jobs, business, trade, education, leisure and housing opportunities for both regions. A new line could also limit the cost of congestion, short-term closures (for upgrades) or a catastrophic geological failure on the South Coast Line. Shutting the South Coast Line in the event of a significant rock fall/landslide on the Illawarra escarpment would severely disrupt the region's economy, preventing coal exports and container imports as well as forcing rail commuters onto already congested roads in peak times. The availability of a second passenger and freight line between Sydney and the Illawarra would clearly greatly reduce these costs.

Finally, the 'two-lines' option could reduce the Illawarra's traditionally higher average rate of unemployment by better connecting the region to Australia's largest and deepest labour market. By way of example, the difference between the long-term average rates of unemployment (over the period 1998-2016) between the much better connected Brisbane (5.6%) and Gold Coast (5.9%) regions is 0.3%, whereas the difference between Greater Sydney (4.9%) and the Illawarra (7.1%) is 2.2%.

Key findings

In SMART's view, there are substantial net economic benefits that would accrue, in particular to the Illawarra and southwest Sydney regions, from completing the \$1.7 billion SWIRL. We have estimated a benefit-cost ratio (BCR) for a passenger-freight SWIRL to be between 1.02 and 1.24, with our central estimate at the standard 7% discount rate being **1.13**. At a 4% discount rate, which is the standard lower-bound

estimate but in our view a more appropriate measure in the post-GFC world, our BCR central estimate is **1.56**.

SMART has also estimated the economic impact on the Illawarra region of completing the SWIRL. Our detailed economic modelling indicates the benefit to the Illawarra region would be \$2.6 billion (in NPV terms at the standard 7%) and over 1,100 additional jobs per year on average (in FTE terms). This indicates the return to the Illawarra would be **\$1.84 for each \$1 invested in the SWIRL**. There are many potential benefits deriving from the completion of the SWIRL, including:

- A more direct route into the industrial heartland of southwest Sydney, including the proposed Sydney second airport at Badgerys Creek. The SWIRL would provide a faster route for rail commuters to stations in western and south-west Sydney such as Liverpool, Leppington and Campbelltown.
- To accommodate potential increases in coal and other freight moving between Port Kembla and Sydney, and the Lithgow coal fields and Port Kembla (thus largely bypassing the Sydney Trains Network).
- To augment the capacity of Port Botany by bringing more freight through Port Kembla.
- To address increasing passenger and freight congestion on the South Coast Line by providing an alternative entry point into the Sydney Trains Network.
- To connect the Illawarra with opportunities and services related to Sydney's second airport at Badgerys Creek and the Moorebank intermodal terminal.
- To reduce heavy truck traffic congestion on Mt Ousley and other roads near Port Kembla (by taking some freight off trucks).
- To encourage investment in the Illawarra to counter the impacts of the mining downturn and loss of the steelmaking industry.
- Indirect benefits such as reduced noise and pollution in urban areas in Wollongong and southern Sydney.
- To minimise the costs of a major upgrade to the South Coast Line, for instance as a result of landslides or rock falls, by providing an alternative route into Sydney.

In SMART's view, completing the SWIRL to better connect the Illawarra with Sydney (and in particular southwest Sydney) aligns with the Strategic Priorities of Infrastructure Australia and the Australian Government's National Infrastructure Plan.

For instance, Infrastructure Australia seeks to identify projects that:

- Expand Australia's productive capacity (SP1)
- Increase Australia's productivity (SP2)
- Diversify Australia's economic capabilities (SP3)

In our view, the SWIRL meets these criteria. The addition of the SWIRL to the existing South Coast Line will significantly enhance the freight capacity through Port Kembla. Directing thermal coal exports from the coalfields in the Sydney Basin to Port Kembla via the more efficient SWIRL will increase productivity, as found by ACIL Tasman (2011). And improving passenger and freight rail connectivity between the Illawarra

smart
infrastructure facility



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and Western Sydney will diversify Australia's economic capabilities by enhancing jobs, education, business, trade and leisure opportunities.

Prof Pascal Perez

Director

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