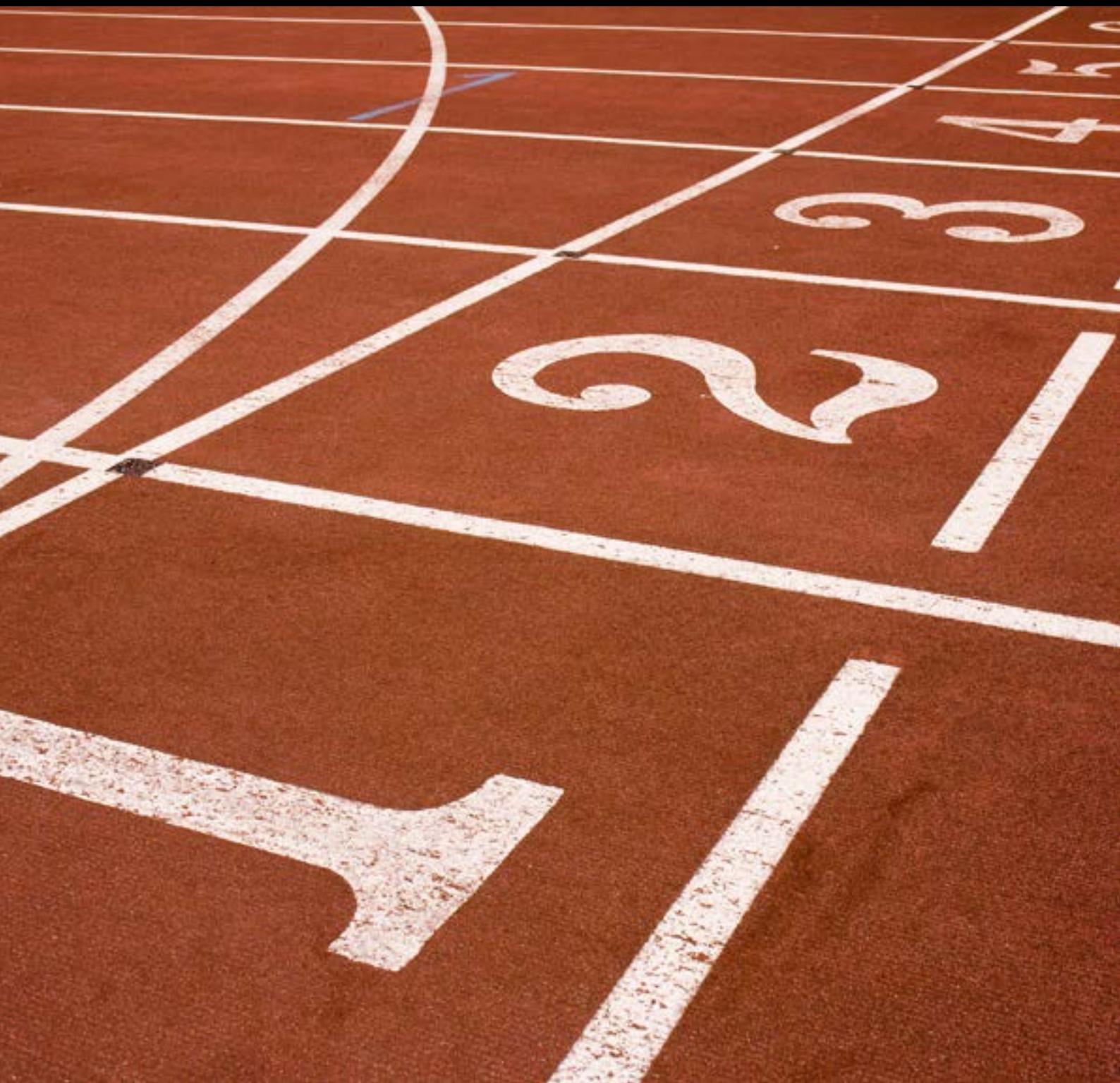




ARUP

Arup's quarterly review of innovation, design and ideas **CONNECTIVITY EDITION**



Welcome to the 3rd edition of @4

@ = at Arup.

4 = quarterly focus on cities,
connectivity, resources and
healthy people and communities.

@4= innovation, design and ideas
from around the Arup world.



Bruce Tanner Arup's Australasian Infrastructure leader

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Data and informatics: new digital sources to help look at and think about design

The approaching NBN reality of Australia-wide high speed broadband will grant urban thinkers like Arup's Michelle Tabet never ending access to the high speed data so essential for their latest design needs — at the same time creating a vast digital platform for the latest communications technology and plug-and-pay applications for cities.

"The concept of real-time cities is very exciting. As well as the deployment of sensor technology to gather real-time information, we have one in two Australians carrying smart phones. With easy deployable technology and wi-fi networks we can start to think differently about how we plan and develop urban spaces," she enthuses.

The Rundle Mall redevelopment in Adelaide's premier shopping precinct is a recent project Tabet has been working on for Arup, planning an array of digital applications for the refurbished urban environment.

"At Rundle Mall we are looking at putting fibre optic cables under the pavements as the base infrastructure to deliver free and uninterrupted wireless internet access and even power points available for buskers or for plugging in digital arts.

"We are creating a plug-and-play platform for technology that will enhance people's experience of the city," she says. "We're also looking at using sensors to collect environmental data and see how people are interacting with the area."

Tabet blogged recently about the idea of 'curating' in urban design.

"Rather than a park bench and a fountain or a static piece of public art, I'm already seeing clients go for more flexible options that can host digitally enhanced activation strategies that allow for multiple interpretations of space and the city. This is largely borrowing the language of 'curation' from the gallery world and transposing it into the urban realm," she wrote.



"So, for example, they might invite an architect to curate a space, as an artist might do in a gallery. The MAXXI Museum in Rome has a program like this where every year, their public space is redesigned by young emerging architects. The real value-add here is the opportunity to create a renewable landscape, one that can change with events, seasons, programs and create a real reason to come again."

In Sydney, Michelle Tabet (and other Arup designers) regularly partner with University of Technology academics and students on adventurous urban landscape projects such as the key pedestrian spine from Central Station to Darling Harbour — and participating, for instance, in discourse on public space concepts



such as the ‘performative aspects of space’ — the importance of spectator and performer roles, and the social acceptability of performative actions in public spaces.

Ben Cooper-Woolley works across the Arup world in spatial technology; he has recently been taking advantage of emerging data visualisation technologies to better communicate information and complex data to all stakeholders, including participating community members.

“Data visualisation is really just a graphical representation of any form of data — recently it’s taken on a whole range of other forms through some of the web-based technologies that have become available, allowing people to gain a perspective of the world through our eyes” he explains.

Cooper-Woolley says data visualisation can take many forms: from infographics that provide a concise visual representation of cumbersome pages of data or text to detailed interactive time series visualisations that enable users to navigate through spans of time at the click of a mouse, or explore virtual 3D digital environments — and the usually unseen infrastructure and information flows that keep them alive.

“Rarely is this more apparent than on some of the large-scale infrastructure projects I’ve been involved with both in the UK and

across Australia,” he says. Cooper-Woolley is based in the Arup Sydney office but has previously been based in the Cardiff and London offices and continues to work on projects across the globe.

“For local communities and stakeholders affected by a highway project being able to interact with a visual representation of our latest thinking on the project design allows for a much greater understanding of how it affects them. Users are able to navigate the project through a familiar web-based map, or explore a virtual environment to see how the areas familiar to them will be affected,” he says.

“The visual representation of data isn’t only useful for engaging and communicating externally to the organisation. As a firm full of world leading technical experts our work tends to create a vast amount of data that needs to be understood by a range of people, across disciplines, quickly and effectively, so decisions can be made.”

To illustrate Cooper-Woolley mentions a ‘walkability’ app he is developing in Perth, WA. A digital version of the Department of Transport’s ‘Walkability Audit Tool’ to streamline field based reporting. The application has been designed to offer users an intuitive visual experience allowing users to undertake audits and collect all the associated information and immediately send it back to the office for reporting.

Faster, higher, stronger city infrastructure left behind



Post-Games East London 2012 is a well planned, innovative urban redevelopment for a previously deprived community.

Former top UK government special advisor on housing, local government and urban regeneration and former advisor to Lend Lease on the Olympic Village in London, Dr Tim Williams this year joined with Arup's Australasian Cities team and is strategic advisor of the Committee for Sydney. In this vodcast he discusses the opportunities provided by the momentum of major events.



The Building and spaces of the 2012 London Paralympics: an athlete's perspective

© Arup



Paralympic athlete Richard Colman is in London for the Games from 29th August - 9th September. Colman first competed for Australia in 2002 and went on to win gold in the 800m in Athens 2004, plus silver and bronze in the 200m Beijing. For the Connectivity issue of @4 he shared his thoughts on how important the design of the village can be to an athlete's preparation and performance.



I believe having the best facilities are crucial for athletes in their preparation for the games. While preparing for competitions it is essential to have an environment which creates a positive atmosphere. During these crucial times leading up to a competition, as an athlete you want to have as few worries as possible, allowing you to focus on your sport.

With such a large number of athletes – 4200 for 2012 – located in a relatively small area, access throughout the village and specifically each unit is very important. Within the buildings themselves, being able to reach shelves to store equipment and clothing is just as important as having enough space in the living room to move around while the other athletes watch TV. But to a disabled athlete, it is often the trivial things, such as being able to see the mirror in the bathroom or being able to reach food in the dining hall, that have the biggest impact on comfort during the games.

The spaces around the village and the Olympic park are often the talking point of the games among athletes. Large open spaces help athletes relax at this crucial time, before they compete. These areas allow athletes to gather and make new, often life-long friends, play ball games and talk about anything but their sport.

The open spaces help to create a happy and friendly environment which takes everyone's minds off the pressures at hand. Having great open spaces allows for easy direct access between buildings. Wheelchair athletes want things to be simple and not have to go the long way around to get somewhere, just because there isn't easy access such as a simple ramp.

Every athlete's village is a different experience from the last. With London 2012 now my third Paralympics I have had the privilege to experience the euphoric moment when an athlete first arrives into the village. While first impressions are vital, we all know what to expect in terms of the layout and appearance of the village from the media coverage and images released

in the lead-up to the games. However, this does nothing to dampen the feeling of excitement and exhilaration that an athlete experiences when first entering the village.

The first few days when you enter the village are the most exciting for anyone as more and more athletes arrive, the atmosphere builds and the village is a-buzz with activity. Exploring the village during this time brings a sense of achievement for your four years of hard work and is always a memorable experience.

The accommodation can be almost as vital to the final result at the games as the four years of training each athlete does. Personally, I think a few basic comforts can make the world of difference.

With 4200 athletes in the village, it can get quite noisy at times, and often athletes have varying schedules so it's crucial that the rooms are quiet and the beds are comfortable to allow athletes to get sufficient rest prior to competing.

The units need a good sized communal area, where athletes will be able to socialise with team mates, but also have enough room to be able to move around.

For a disabled athlete accessibility is the biggest issue for the arrival into the country. It has improved each year to be an amazing experience, and creates a positive first image and feeling of London. Step access throughout the venues is hugely important to disabled athletes.

Great access makes the whole experience enjoyable for everyone involved and creates a positive feel to the event which will be carried home to the athletes' home country, increasing interest in London. The benefit to the athlete of having sufficient access to the facilities reduces the stress level before competition. Athletes don't want to have to climb down steps, enter through a back kitchen door or crawl into the bathrooms because their chair doesn't fit through a door.

Digital connectivity allows athletes to escape from the pressures of the competition. It enables athletes to relax during their free time by watching TV shows and movies, catching up on the news or listening to music. The internet allows athletes to keep the media and sponsors up to date with how things are going on a regular basis and provides greater publicity after a major achievement.

For any athlete it is so important to have some familiarity with their normal life. The internet provides access to friends and family back home by the use of video calls and social media which helps athletes stay grounded; to remind themselves of all the hard work they have done leading up to the games; and that people back home are thinking of them. I believe this will play a crucial role in how well I perform in London – at the time of my first race I will have been away from home for 13 weeks!

Read more about Richard @ <http://colman.com.au>

Or follow him on Twitter @RichardColman84

More incremental change necessary in infrastructure development



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As Leader of Arup's Infrastructure team in Australasia, Bruce Tanner is well schooled in managing the strong public and private expectations for infrastructure development and delivery.

"We're now at a point where particularly governments think and realise infrastructure is sexy again," he says. "All those elements that connect our society are really infrastructure. Basically it's so crucial to us all – but it's also very hard to pay for."

"For now and the near future we have to work on how you really get the most out of what you already have; how you maximise efficiencies of the roads, the rail and the ports that you already have; when do you invest in new capital, new works; and how do you do it so it's lean, really efficient and effective?"

Tanner says the economic times now demand that infrastructure stakeholders must plan for "more incremental change that can keep assets really delivering economic value."

All the more reason, he thinks, for government to harness the advice and guidance of the new infrastructure agencies that have become a recent and positive manifestation as state (and federal) governments grapple with the economic efficiencies and voter expectations of better infrastructure delivery.



“Whether it’s Infrastructure Australia, Infrastructure NSW or Projects Queensland, they are all starting to realise we need entities that can help work out what the priorities are – and be a bit detached from the political process as much as they can, to look really hard at all types of infrastructure and say what is the real cost and benefit of doing each project.

“I think the infrastructure agencies are a really important change: how do you really plan for new roads and rail in particular, and ports? How do you plan for them and address what we will need in 30 or 40 years, in an economic reality where the scale of that investment is so large?” Tanner says.

He also wants more discussion about how to get the private sector to contribute more to infrastructure – a very tricky proposition in his opinion.

“If they (the private sector) can’t get a return on their investment then they’re not going to put money into infrastructure whether it is roads or rail or ports. So, ultimately part of the solution is finding ways to provide that return – and that means tolling, in all its various forms and also the raft of other possible ways to generate those sorts of revenues.”

Bruce Tanner has been with Arup for more than 20 years with a strong technical background based on direct design experience in all the key aspects of transport infrastructure – road, rail, aviation, maritime and site development work. Recently in Queensland, where he is based, the local infrastructure team has delivered an equally diverse set of solutions including strategic water infrastructure planning (in Gladstone and North Queensland), work on major infrastructure planning at Brisbane Airport and on the Airport Link, the Northern Busway and Airport Roundabout project – now Australia’s largest ever road infrastructure project.

The Airport Link is his favourite recent project “a great collaboration to arrive at a design marvel, and I get to use it every day to get me to and from home and work.”

“This year it’s the whole light rail space which is pretty exciting for us because it’s a much more intimate mode of travel. We’re

currently on the delivery team for the Gold Coast Rapid Transit light rail which is being built now – and we are also doing the planning in consortium for the Sydney Light Rail Strategic Plan.”

In Sydney, Anna Squire is similarly enthusiastic about the benefits of light rail. She leads the firm’s substantial infrastructure group in NSW, having made the trip to Sydney from Arup in the UK in 2007 where she worked with major rail clients such as Union Railways, Network Rail, London Underground, Tube Lines, Thameslink and also Sound Transit in Seattle.

“I’ve worked on a number of infrastructure projects in NSW over the last four years and it’s remarkable how light rail now stands out by having almost unanimous support among the stakeholders – from the state government to the City of Sydney – even the press are very supportive.

“It’s not an alternative for heavy rail in the urban areas we’re looking at,” Squire stresses.

“Light rail is targeted at much more congested urban areas where there’s shorter distances between stops, it’s also generally ‘at surface’ so people don’t have to go underground, and therefore interchange times are very quick.”

Anna Squire’s Arup team has been appointed to provide engineering advice to the Sydney Light Rail Strategic Plan which aims to expand the existing light rail network along three key corridors, through the central business district to Barangaroo, to the University of New South Wales and to the University of Sydney.

Arup is working with Transport NSW to identify the preferred routes within these three corridors.

Other projects on the Sydney team’s rail agenda include the Northern Sydney Freight Corridor Upgrade which involves implementing new passing loops and new track to reduce the impact of freight trains on passenger services and provide locations for passenger trains to overtake slower freight trains.

As well as reducing transport costs, and improving the competitiveness of freight rail and boosting productivity, the freight corridor project will also deliver benefits to the wider community, particularly commuters by taking hundreds of thousands of trucks off Sydney’s roads and motorways.

Also high on her priority list of advice for government transport organisations is better management of road, rail, and property assets – an area of crucial current importance to infrastructure bodies – and where Squire says there is much of room to maintain assets more effectively.

Airport link



Airport Link, Northern Busway and Airport Roundabout Upgrade is a 6.7km free-flow toll road and is Australia's largest road infrastructure project. Arup provided acoustic consulting, civil engineering, structural engineering, geotechnics, IT and communications systems, programme and project management, fire, tunnel design, transport consulting, environmental consulting.



© Arup

Following an intense six month tender submission period, Parsons Brinckerhoff and Arup – as the PBA JV – have spent the last four years delivering the design for Australia's largest transport infrastructure project, the Airport Link, Northern Busway (Windsor to Kedron) and Airport Roundabout Upgrade projects, or the AirportlinkM7 project as it is known.

Characterised by its sheer size, extreme complexity and world class innovative design, the projects together form an extensive AUD\$5.6bn transport infrastructure project to provide a vital transport solution for the demands of Brisbane's burgeoning population.



Although they are three distinct projects delivered under separate Design and Construction or Public-Private-Partnership (PPP) models it was essential they were all developed and constructed concurrently due to the tightly integrated nature of the alignments and surface connectivity. Constructing the project within the tight constraints of suburban Brisbane under live surface road traffic and within an exceptionally short timeframe were key challenges, in addition to the overall challenge of delivering a project on such a significant scale.

Groundbreaking on so many levels, the AirportlinkM7 project delivers an economic and social legacy for the broader Brisbane community. It has literally changed the maps, redefining the urban fabric of our city through an innovative and inspired design.

Motorways that talk to travellers are given the green light

Kerry Farley is an Associate with Arup whose specialty is intelligent transport systems (ITS). He now leads the Australasian ITS group and his career background includes not just 11 years of ITS experience in the UK and Australia – he also served 13 years in the Royal Navy as a Weapons Engineer.



Some of the key projects for Farley include the Monash-CityLink-Westgate Freeway upgrade project, and the Gateway Motorway and Airport Link Tunnel / Northern Busway / Airport Roundabout Upgrade projects in Brisbane.

He considers that the first time ITS technology was effectively used to show a measurable benefit to Freeway management in Australia was the Monash-CityLink-Westgate upgrade three years ago which “really improved how congestion is managed on the freeway.”

More recently Farley project managed the detailed design for the Gateway Motorway in Brisbane, featuring a variable speed limit system and ramp signalling throughout the 15km motorway.

“What we are aiming to do with all the data that we are collecting is use it to provide traveller information, so we can provide messages on our variable message signs to inform travellers if there’s congestion ahead, or the road is blocked.

“We can also use it in our ramp signalling systems which is basically controlling the flow of traffic onto the motorway. This helps to ease congestion on the motorway and actually allows the vehicles to keep flowing without flow breakdown,” Farley explains.

“There’s a much bigger picture (in terms of connectivity) if we look at the cities where ITS is now playing a bigger role in vehicle to vehicle communications and vehicle to infrastructure communications. It’s an emerging technology within the ITS world but what it will mean is that at some point in the future you will be able to drive up to a set of traffic signals and they will turn green. Essentially your car will be talking to the traffic signals on approach, saying — ‘I’m coming turn green’”

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Vital role for rail in connecting cities

Arup draws on worldwide project experience to tailor local transit solutions.

A brief summary of Arup's worldwide rail accomplishments must be listed not just geographically or on a project basis. Any overview should include all the various transport modes that now come under the broad banner called 'rail': high-speed rail, suburban rail, metro and mass transit, monorail and automated people movers (APM), light rail, guided bus and personal rapid transit. And then there's heavy-haul freight!

A recent statement by Colin Stewart, Arup's Global Rail Business Leader noted: "We have been instrumental in high-speed and rapid rail projects in the UK, Europe, USA, China, Hong Kong, and South Africa. We are also helping to improve efficiency in freight across the globe, from Western Australia to the UK. In Botswana, for instance, our freight distribution assessment helped the Ministry of Works and Transport take a strategic look at transport policy to improve freight transport efficiency within and between towns."

"With Hong Kong's MTR Corporation, we have developed multiple strategies and programmes to improve commuter rail in one of the world's most densely populated areas – from urban underground extensions (such as the Kwun Tong and Island lines) to interregional connections (such as Shenzhen Metro Line 4 and the Guangzhou-Shenzhen."

For this Connectivity issue, the @4 editorial team had a phone conference on the region's growing transit and freight demands with Michael McGowan, Arup's Infrastructure Business leader in Singapore and Neal Mumford, Rail Business Leader at Arup, speaking from our Brisbane office. (Click on podcast below).

From his South East Asia perspective in Singapore, Michael McGowan has seen how cities in his region are building successful urban metro systems.

"Although Singapore has many advantages, including a geography that keeps development close together, there are plenty of other cities that can learn from its experience. For example, land use planning is driven from a high government level," he notes.

"Projects are also backed by a government commitment to fully fund the infrastructure. This includes all the track, rail systems and rolling stock."

McGowan says Hong Kong takes a similar approach resulting in such an efficient system that, in parts of Hong Kong Island, there is as little as 90 seconds between trains.

"There's not much in terms of technology employed in Singapore or Hong Kong that isn't used anywhere else. But it's a system that has produced a successful urban rail network."

McGowan also points out that while Singapore does face the challenge of upgrading systems first installed in the 1980s, it does benefit from having a relatively young metro system.

"In cities like London, many unavoidable challenges come from the age of the metro network," he says.

Internationally, Arup states how it recognises the growing challenges to meet transit and freight demands for "pressured industries and congested, polluted cities, with increasing energy efficiency" – a view of increasing pertinence to Australia's ageing rail systems.

From the congested and polluted perspective of east coast cities in Australia, Neal Mumford encouragingly highlights Veolia Environnement and their high volume transport of waste as a great example for freight and its potential impact on healthy cities.

According to Veolia's estimates, the company takes in some 500,000 metric tonnes of waste at its Sydney transfer station and ships it by rail to their landfill, located 250km from the city, eliminating the disturbance associated with 35,000 annual round trips by truck.

In our rail podcast Neal Mumford also discusses the much expressed frustration at multiple railway systems throughout Australia; and the problems of achieving change in already congested, older established systems like Sydney where Arup has put forward several initiatives to increase capacity on the rail network for passengers and business.

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Fast turnaround in Sydney for QM2

When the Sydney Ports Corporation put a call out for clever ideas to allow large vessels like the Queen Mary 2 (QM2) to berth at the city's Overseas Passenger Terminal for the first time ever, Australia's maritime boffins came to the rescue to make it happen.



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Gary Lucas, Arup's Maritime leader says: "At the start of 2012, the Overseas Passenger Terminal at Circular Quay — opposite the Sydney Opera House — could not accommodate large cruise vessels, like the QM2.

"These type of large vessels would instead berth at the Department of Defence facility at Garden Island, which is far from desirable for an international city like Sydney.

"By enabling larger vessels to berth at the Overseas Passenger Terminal, it improves passenger and goods processing and especially the Sydney visitor experience."

The QM2 is 345m long, displaces 151,400 tonnes, and at 62m in height cannot fit under the Sydney Harbour Bridge to berth at Sydney's other western cruise terminal.

Other constraints were related to the terminal's location in a historic and heritage listed area, which means expanding the

In March 2012, the Queen Mary 2 (QM2) berthed at Sydney's Overseas Passenger Terminal in Circular Quay for an overnight stay, becoming the largest cruise ship to visit this iconic city location. The visit was made possible through services provided by Arup.

berth or adding structures protruding above the water line would require a rigorous and long planning approvals process. In less than three months, Arup's team designed a solution which not only overcame all these challenges for the QM2, but also enabled subsequent large cruise ships to visit and berth at this prime location.

"We assessed, designed and supervised the installation of a temporary mooring drag anchor system within Sydney Harbour off the vessel's bow," Gary Lucas says. "The anchor solution we designed is intended to stay in place for another three to four years — until a more permanent mooring solution is provided." "Our geotechnics team scoped and managed two geotechnical investigations to ascertain properties of the seabed to inform the anchor design; and we also established the serviceability and structural capacity limits of the existing quay facilities at the Overseas Passenger Terminal to facilitate these large vessels." In March 2012, the QM2 successfully berthed at Sydney's Overseas Passenger Terminal in Circular Quay for an overnight stay, becoming the largest cruise ship to visit this iconic city location.



In March 2012, the Queen Mary 2 (QM2) berthed at Sydney's Overseas Passenger Terminal in Circular Quay for an overnight stay, becoming the largest cruise ship to visit this iconic city location. The visit was made possible through services provided by Arup.

Technology and the passenger experience



Planning the airports of the future

Ronan Delaney is Arup's business leader for aviation in Australasia (and the Sydney rail team leader). After 15 years in Hong Kong and China, working on the design of efficient new multi-modal transport interchanges and mass transit systems experience to Sydney as the city works to unlock its transport difficulties, to further realise its potential.

In this podcast he outlines why emerging technology and a continued focus on passenger experience promises to offer travellers a smoother ride – particularly in the aviation industry where Arup plays an increasingly significant role.



The green economy: the sixth wave of innovation

In April this year Arup Principal, and Perth Office Leader, Allan Mason and Curtin University's Professor Peter Newman announced what is hoped to be a truly sustainable — and sustaining — relationship with the formation of the Arup-CUSP collaborative partnership, with the aim, Allan Mason says “of bringing theory and practice together”.

Peter Newman is the well known and long respected Professor of Sustainability at Curtin University and Director of the Curtin University Sustainability Policy (CUSP) Institute where as many as 60 PhD students are working on all aspects of the green economy.

“We are an Institute trying to do things in the real world. We do want to help change the world for the better and there are many problems that we know our researchers can contribute solutions to,” Professor Newman says in an interview for Arup @4.

“It’s often hard to make that link with practical projects that can make a difference — Arup is in that space and the opportunity for us at CUSP to work on real projects is very important.”

Sustainable urban infrastructure is a major plank in the planning for any sustainable city, alongside the associated desirability of more ‘productive infrastructure’.

Professor Newman says there are many examples of productive cities in Europe — and in our region the best example is Singapore, which he has recently been studying.

“A really productive city has highly productive infrastructure that enables people to live and work in dense environments — and that very density is what creates the productivity. We’ve been able to produce what are called ‘agglomeration elasticities’ which can be used in the assessment of transport infrastructure, for instance where we have outcomes which can be measured from rail projects that bring greater densities.”

(For the unfamiliar among us, ‘agglomeration elasticity’ is a measurement format, now of central importance in the evaluation of the wider economic benefits of transport investments with respect to density.)

Newman calls the green economy the sixth wave of innovation, unfolding on top of the vast fifth wave “which was primarily about the digital economy, about smart infrastructure and the use of ICT.

“The opportunity now is to radically reduce resource consumption, while improving wealth; it is about doing it in a way that does not involve nearly as much energy and water and waste; it is about particularly bringing in renewables as the key to the next energy source.

“All of these agendas are not new, but they are being worked out in practice now,” he says.

“The data that I now have underlines that it is happening much quicker than we ever thought. The renewable transition is dramatically occurring through the investment profile that you can see around the world now: car use is going down dramatically; the opportunities are greater for having households, buildings, commercial buildings, schools, offices that are much more productive, much more enjoyable, filled with life and natural systems, and yet they use a half, a third, a quarter of the energy.

“This is the green economy. It is a new kind of economy and it is recognisable right on top of the different economic waves we have had in the past — but it is more productive and it is green.”

For a podcast of the interview with Professor Peter Newman, including the plans to make Geraldton — in the Mid West region of Western Australia — a more liveable regional city of the future, listen [here](#).

LISTEN

Next issue

– resources



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Finite resources and climate change are forcing the need for step changes and efficiency improvements in all resource markets.

In the next edition, we will delve into key issues affecting the energy and resources sector.

We speak to experts about the future of renewable energy in Australia and Singapore and look at how the energy landscape is changing and becoming more accessible.

In the mining sector there is a need to reduce the need for skilled workers in remote mining towns and transfer job opportunities to more populated areas. We explore how mining centres can be better equipped to cope in the long term without having to rely on increasing manpower.

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