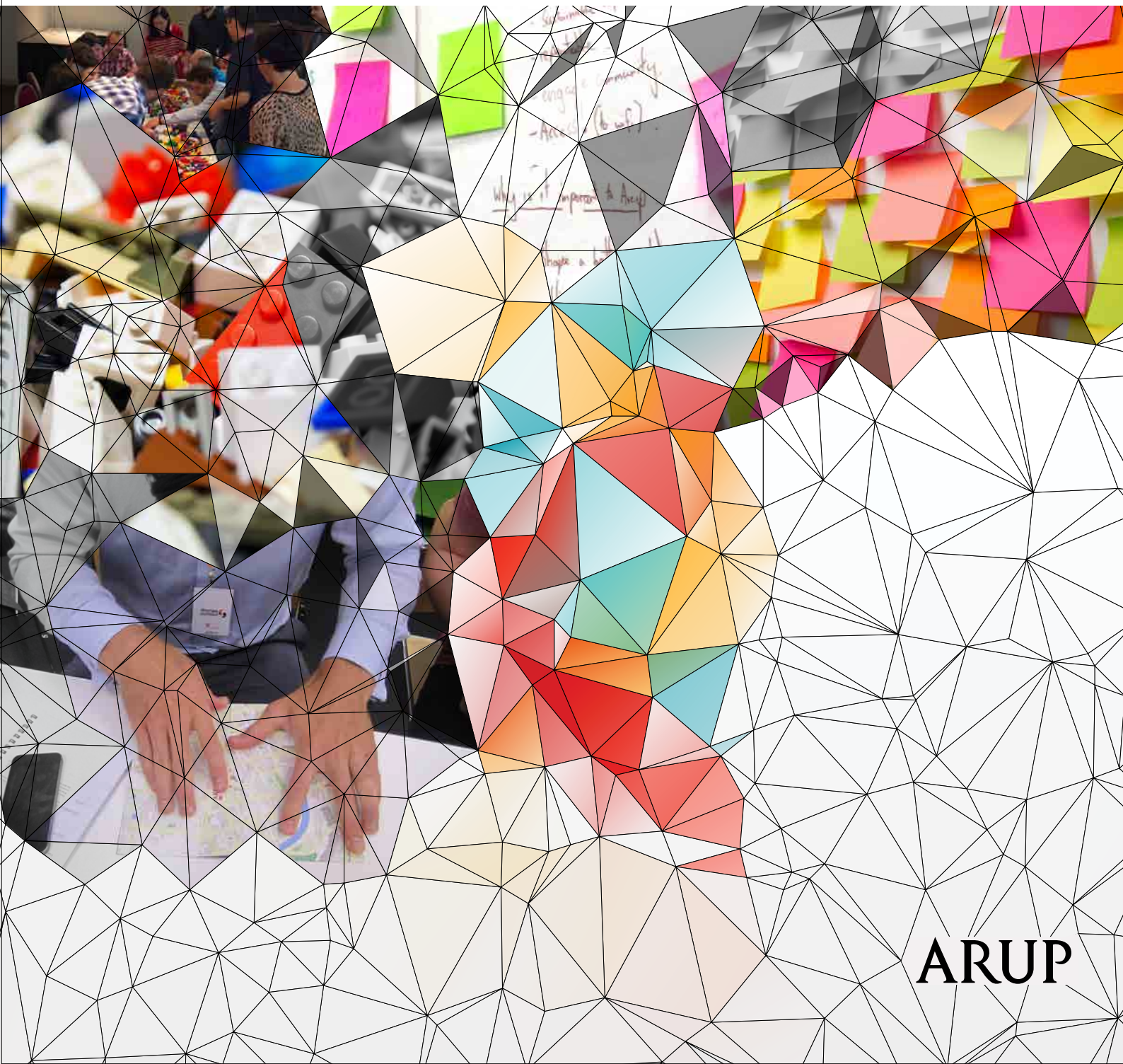


@4

Arup's quarterly review of
innovation, design and ideas.

Issue 13 | 2015



ARUP

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Collaboration is the driving force underpinning everything we do at Arup, and this issue of @4 investigates the opportunities and rewards that offers our staff, clients, and the wider community.

Renowned management thinker Margaret Heffernan gave a 2012 TED Talk, ‘Dare to Disagree’, in which she highlights a challenge faced by an Arup engineer working on the Beijing Olympics Equestrian Centre. A problem they hadn’t faced before - how much waste do thousands of highly strung horses produce? Rather than spend weeks calling vets and breeders, doing calculations and making estimates, they put the problem on the Arup skills network.

Within hours, a response arrived from a fellow engineer halfway around the world who also happened to have worked on an equestrian facility and had already resolved that issue. Sharing experience and knowledge and strengthening professional connections along the way, our skills network highlights our collaborative approach to problem solving.


Arup has over 12,000 people working around the world, so if you come across a challenge or are

looking for a new solution to an old problem, there’s usually someone a few key-strokes away that can help.

In this issue of @4, Marianne Foley shares her own experience with the skills network solving complex fire engineering problems. Dr. Robert Care AM, contemplates the inextricable links between the future of engineering and the future of society. Arup Design School, another ongoing collaboration tool, investigated the i dea of design for social change.

This issue also presents the findings of the Australian Consumer Water Survey, introduces Priscilla Radice ex-Brisbane Ports as our Australasia Ports Business Leader, and considers issues of lighting in urban design, noise in infrastructure development, and projects from around the region.

Kind regards,



Peter Bailey
Chair and CEO, Arup Australasia

25Zero and Arup take to the mountains for climate change

From 30 November – 11 December 2015, the member nations of the UN Framework Convention on Climate Change will meet at their annual Conference of Parties, COP21. Adopted in 1992, the convention outlines a course of action to stabilise greenhouse gases and combat climate change globally. After over 20 years of UN negotiations, COP21 will aim to achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C.

25zero, founded by Arup consultant Tim Jarvis AM, considers climate change to be the biggest threat facing humanity, and melting glacial ice to be one of its clearest indicators. The organisation, which draws its name from the 25 remaining glacial mountains on the equator, and the 25 years until zero ice remains upon them, will use this momentous occasion to highlight the real world impacts of climate change. Across the 12 days of COP21, multiple teams will ascend the 25zero mountains simultaneously, relaying powerful images and statements depicting the impacts of climate change in real time. These will be sent to governments attending COP21 and to multiple global media outlets reaching millions of people, raising awareness and inspiring them to action. ☎



Welcome to our new Australasia Ports Business Leader – Priscilla Radice



We are pleased to announce Ms Priscilla Radice has been appointed as Principal, Ports Business Leader in Transport and Resources. Ms Radice, a Board Member of IAQ and formerly with Port of Brisbane Pty Ltd, brings a diversity of experience at all stages of the project development lifecycle from port management, multimodal supply chains and feasibility of major infrastructure projects, to tourism development and retail.

Ms Radice's appointment completes a strong leadership team for Arup's Australasia Transport and Resources sector, joining Ben Schnitzerling (Australasia Transport and Resources Sector Leader) Neal Mumford (Rail), Anthony Schmidt (Highways), Daniel Lambert (Water and Urban Renewal) and Mike Straughton (Energy and Resources) in setting the strategic direction for the business. ☎



A vision of the future of rail

Arup's Future of Rail 2050 report unveils a vision of the future of rail travel in light of trends such as urban population growth, climate change and emerging technologies.

It foresees:

- Predictive maintenance of rail lines by robot drones
- Driverless trains travelling safely at high speed

- Freight delivered automatically to its destination
- Ticketless travel through smart technology

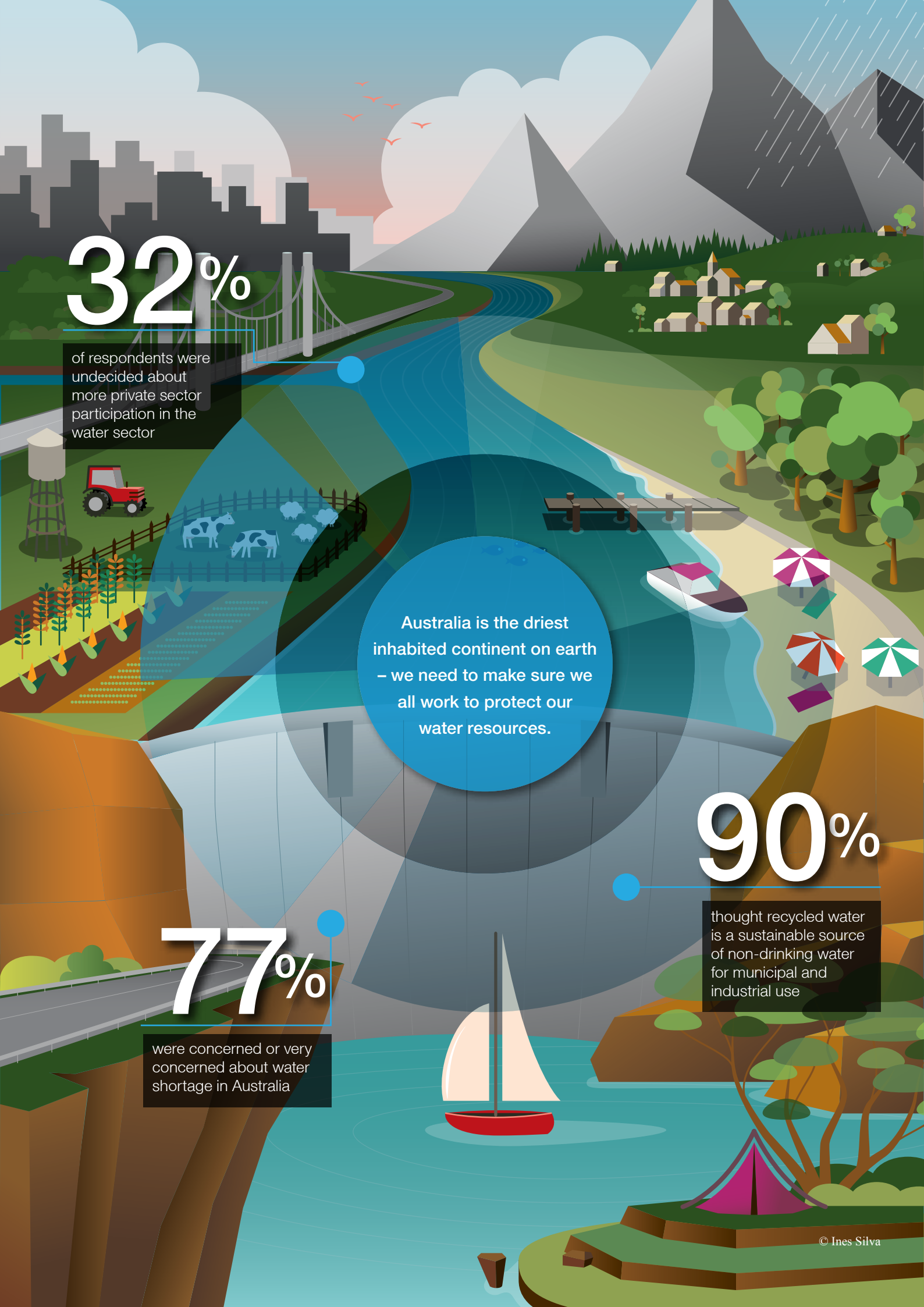
Colin Stewart, Arup's Global Rail Leader, predicts a bright future: *"By rapidly developing technology and taking bold steps to overcome capacity and cost challenges, the rail renaissance can deliver a future where it is the backbone of our travel system."*

Arup used developments from current rail projects the firm is leading around the world, as well as insight from the Arup Foresight + Research + Innovation team and global contributors, to inform the futuristic predictions outlined in the report. ☎

Future of Rail 2050

Image: New Delhi Railway Station Redevelopment, India
© Ministry of Railways / TFP Farrells





32%

of respondents were undecided about more private sector participation in the water sector

Australia is the driest inhabited continent on earth – we need to make sure we all work to protect our water resources.

77%

were concerned or very concerned about water shortage in Australia

90%

thought recycled water is a sustainable source of non-drinking water for municipal and industrial use

© Ines Silva

AWA and Arup surveyed thousands of Australians and produced the Australian Water Consumer Outlook

Water awareness

Authorities and other agencies increasingly understand that to best manage our water resources, and improve customer experience, they need to learn what customers know, don't know, and what their concerns are.

To support that, the Australian Water Association and Arup surveyed Australians nation-wide to understand consumers' views about water to produce the *2015 Water Consumer Outlook*.

Daniel Lambert, Arup's Australasia Water and Urban Renewal Leader supports an increased customer focus, "The water industry in Australia has recognised the importance of continuing to shift from a compliance focus to a customer focus. This commitment has been reflected in the utilities statements of obligation which acknowledge the importance of their customers."

The findings were illuminating. While there was some concern about the approach being taken to ensure our ongoing water security, there is strong support for alternative water sources, with 90% agreeing that water recycling was a sustainable non-drinking source.



Key features

77% of respondents were concerned or very concerned for water shortage in the whole of Australia.

Just 31% of respondents were confident there will be enough water in the future and only 34% thought the authorities were taking firm action on longer term water availability.

The top three perceived impacts on water were drought, climate change and population growth.

There was strong support for alternative water sources with 90% agreeing water recycling was a sustainable non-drinking source and 82% supporting stormwater re-use.

Alternative water sources were widely accepted for drinking, led by support for desalinated water at 82%, recycled water at 69% and stormwater at 56%.

In order to maintain and enhance a customer focus, it is critical for the water industry to understand their customers. The 2015 Water Consumer Outlook provides the results of a nation-wide survey designed to do just that. It provides a valuable insight into customer's

views on important issues facing the water sector. @

2015 Water Consumer Outlook



Lighting the urban nighttime – How light shapes 24 hour cities

Watch the film to find out how the use of light can transform urban spaces at night.

Lighting experts from different disciplines discuss the importance of lighting, and what needs to be considered when planning our cities.

It is time to consider life after dark, and lighting designers have joined fellow urbanists to rewrite the night. Today's cities are alive 24 hours, yet all too often town planners limit their work to the daylight hours. They neglect the potential of nighttime lighting to shape urban life after dark and support 24/7 economies.

Darkness accounts for 50% of the world's time, and that potential is huge. Well designed night-time lighting can influence the way you use and enjoy a city, the way you move around its streets and even the way you feel.

The power of night-time lighting

Have you ever stopped, for instance, to wonder why you take a certain route home at night or feel safe here but not there? Chances are it has to do with how public spaces are lit.

The right night-time lighting can make shift workers feel safe on after-dark commutes. It can make you more likely to walk or take public transport. And it can encourage you to socialise outdoors at night, contributing to its night-time economy.

We were commissioned to improve the lighting of the garden in London's famous Leicester Square. We noticed that it wasn't being used to its full potential at night and set about analysing peoples' movements within the space, then transforming it with light. We revealed how lighting can affect where we go, when we go and which route we take. [Q](#)

“Night-time is fundamentally different from daytime. In many hotter climates, it provides the best conditions for people to use outdoor urban spaces. It deserves its own design approach, and thinking harder and smarter about street lighting is a vital part of this.”

Leni Schwendinger, Lighting Designer and Urbanist at Arup

SoundLab

Making sound decisions

Nick Boulter



Projects are normally required to do an environmental impact assessment at an early stage. Noise will often form part of this assessment and is usually described in technical language that only a handful of specialists can easily understand. Just ask Joanne Public whether she thinks 50dB LAeq,18h outside her bedroom window is reasonable.

This techno-speak excludes non-specialists from the discussion, which seems at odds with a process that otherwise tries to be transparent. How am I, as a member of the community affected, going to judge what is reasonable if I don't even know what it is I am being asked to accept?

I think the best way to consult communities would be to enable them to actually listen to, and experience, the noise from proposed new trains, roads or airports. That isn't quite as easy as you might imagine, because the subjective impression we form of noise is mostly a function of difference – how much noise is there relative to what was already there?

So to demonstrate noise, you have to show the whole picture, incorporating all the different noises surrounding you. It's difficult, but it can be done. And it needs to be done.

Finding ways for people to experience and understand sound is something of a passion at Arup. We started looking at this many years ago when trying to engage some of the artistic stakeholders in decisions about the design of a concert hall. Having built our SoundLab, which can accurately create a fully 3-dimensional sound field, we found we could use it for other things too.

By capturing the existing environmental sound with 3D recording equipment we can overlay pretty much anything on to it. This means that noise can be demonstrated very effectively to people, and they can then form their own judgements.

We're starting to use this technique in community consultations on various projects to great effect. This has included a large wind farm in Tasmania, the HS2 railway project in the UK and more recently, demonstrations of aircraft noise. In many instances, people find that the noise they were worried about is not nearly as bad as they had been expecting.

That shouldn't detract from the need to control noise and vibration, which is still a major engineering challenge. But letting people experience noise for themselves means everyone can make a reasonable assessment of what is acceptable and what needs to be addressed.

Continue the conversation at [Arup Thoughts](#).

Designing for social change: Australasia Design School 2015

At this year's Design School, we delved into the idea of design for social change.



What do repurposing local shops as community hubs; growing food in cities; 'libraries' for housing parts; an Airbnb for office space; and libraries of the future have in common? They were all challenges addressed in this year's Design School.

Each year, Arup runs a Design School in the Australasia region, organised by Arup University. The aim is to give a small group of people a chance to set aside the day-to-day challenges of their work

and to think about, and work on, the kinds of things that motivate us all at Arup, regardless of technical background. In fact, the diversity of backgrounds and experiences is a crucial part of the program.

At this year's Design School, we delved into the idea of design for social change. We immersed ourselves in the opportunities design thinking offers for tackling not only physical design challenges, but also organisational, social and community

challenges. Across three days in mid-October, 30 staff from around the Arup world came to Melbourne for a programme of mind expansion, skill development, and fun.

Teams of participants were taken through a design thinking process to help them devise businesses which addressed the tricky challenges listed above. Between sessions, participants were challenged by speakers on topics ranging from social usefulness to agency, from disruption to buy-in. At the end of a packed program, each team pitched its business proposition using new-found skills in selling an idea.

Participants emerged from Design School exhausted but with insight into working in teams, in explaining, in sharing, in challenging, in looking at issues through a new lense and in stepping back and re-evaluating within a design thinking framework. Design School is about learning, of course, and participants identified a number of techniques and behaviours to take back to their daily work and to share with their teams.

Design School is one of the many activities that makes Arup unique; it is about sharing knowledge, thinking creatively, challenging preconceptions, building connections

and investing in our staff. Arup University, as convenors of Design School, pushes the boundaries of our projects, exemplifies our culture and puts our people, their skills and their creativity at its heart.

For further information on Australasian Design School, contact [Hayley Coombs](#). Our thanks to her and to Andrew Wisdom, of Distilled Wisdom, for designing and delivering an outstanding session. @



Images @ Arup

Shaping our City: Collaborative Sydney

The collaborative economy is enabling new styles of work, transport, better use of resources, and more digital interaction. But what does it mean for cities?

A panel of experts recently pondered this question in the latest of our Shaping our City events: Collaborative Sydney.

The collaborative economy is a familiar concept these days. It's an economic movement that allows

individuals and organisations to reallocate existing resources, sharing them between each other. This creates value from otherwise idle assets.

We know what that means for accommodation website Airbnb, but what it means for Sydney is a whole other question.

"Cities are still pondering how to embrace the collaborative economy and at what level," said Guy Raithby-Veall, a sustainability consultant at Arup who has an interest in emerging economic drivers.

"The opportunities and challenges that it brings are still being scrutinized. As much as there are good reasons to adopt collaborative

ideals such as economic development and community enhancement, there are also reasons to be wary. As a result, cities are moving cautiously and selectively on this."

Will Davies explained how his car sharing platform Car Next Door is changing the way we get around, towards a future with fewer cars on the road and increased use of public transport. He started the business because of how many cars he noticed sitting around not being used for large portions of the week, so he found a way of letting individuals easily rent their cars out to those who needed them.

"By enabling people to have the back-up of a car for those trips that really need it – like, when you're going right across town or you want to go up to the Blue Mountains – it

actually lets people use other forms of transport that are better for the whole city – and heaps better for you because you're getting exercise. We want people out of cars so that's what we're doing," he said.

Davies told the audience at Ambush Gallery in Sydney's Central Park that he estimates Sydney could do with 70 per cent fewer cars.

New attitudes about the necessity of ownership from younger generations is part of what's driving the collaborative economy.

"Generation Y, or your digital natives, care much more about access over ownership. That is really revolutionizing the way that we're looking at things and certainly opens up fantastic business models – one primarily around service instead

of a product," said Candice Quartermain, founder of Circular Economy Australia.

Resource innovation

While the collaborative economy was originally about technical innovation – such as using the internet to match people who wanted accommodation with those who had a spare room – Quartermain said it's more about resource innovation and making better use of what we have.

"What that means is we're going to be focusing a lot more on our resources, and how we're unlocking that value. What we're seeing within the collaborative economy is that people are starting to do this already," she said.



Urban planner Harry Quartermain is one of the founders of 2000 Acres, which tries to identify unused land around Sydney that can be turned into community gardens. “There’s a vast amount of space in the urban environment which is not used to its full potential – either for a temporary period or for longer times – and it’s about putting that land to work,” he said. “By providing community focus points, we allow people to not only connect with their food supply but also with each other.”

He said one of the difficulties faced by the collaborative economy in the built environment is that the regulations which drive the shape of buildings haven’t kept up with what people are doing. However, recent updates to the building rules for residential apartments are a start. These allow adaptable spaces or spaces that can be used for home offices as well as bedrooms, and also parking spots for promoting things like car-sharing.

The collaborative economy is also about empowering people and their communities, and giving them the chance to contribute to the design of their city. Georgia Vitale, the leader of Arup’s Integrated Design and Planning team in NSW, said there’s an expectation from citizens that they are not only involved in decision-making but are also actually part of co-creation of our cities.

Not just the inner-city

Many collaborative initiatives are centred on the inner-city, and an audience member asked what it means for outer suburbs like Blacktown. Car Next Door’s Will

Davies said that while the business had begun in Bondi he didn’t want it to be an inner-city only car sharing platform. As outer suburbs become more densely populated, and people there decide they don’t need to come into the city to work every day, services such as Car Next Door and other collaborative economy initiatives will move into those areas, he said.

Max Wilson, of property developer Mirvac, said that what was going on in the workplace was a microcosm of what is happening in the broader collaborative economy. People have been liberated from their desks and the “people factories” where they

used to do their work. “We’re seeing a real transformation at work at the moment where we’re designing spaces that are primarily places designed for human interaction. They’re not about processing stuff. They’re not about moving widgets from one side of the floor to the other. It’s about bringing people together,” he said.

Although some see the collaborative economy as contrary to corporate interests because it is often a grass-roots movement, Wilson disagreed. “My view is it is the most fantastic opportunity for corporate Australia to innovate, create, and change the way we do stuff. We’re not

about processing widgets anymore. We are a knowledge economy. There’s much, much smarter people in lots of organizations. As a corporate leader, my job is to be able to reach out and work together. It is the best thing we’re doing,” he said.

Arup Australasia CEO Peter Bailey rounded out the discussion by observing that the collaborative economy is based on a shift from centralized hierarchical institutions to decentralized networks and communities.

“I think this is really exciting. I think this is a chance for cities to really take charge and take hold of the debate themselves. It is an opportunity for Western Sydney. This decentralization of power is an incredible opportunity to revitalize all parts of our city,” he said. ☺



THE PANEL

Candice Quartermain,
Founder of Circular Economy
Australia

Will Davies,
CEO of Car Next Door

Max Wilson,
General Manager of Corporate
Solutions, Mirvac

Harry Quartermain,
Planner and Founder of
2000 Acres

ARUP

Guy Raithby-Veall,
a sustainability consultant
at Arup

Georgia Vitale,
the leader of Arup’s Integrated
Design and Planning team
in NSW

Peter Bailey,
Arup Australia CEO

Stories

LEGO: Not Just Childs' Play

By Joanne Greenlees



When I hold leadership development workshops at Arup, I surprise participants by arriving with a big bag of Lego.

They're even more surprised when I ask them to build a model summarising the performance of their team, or the top three improvements they could make to their business units, or where they see their career.

Their usual reaction is to question how they could build something as

abstract as that, but they start and in six to eight minutes they've come up with a model of the problem.

It's called Lego Serious Play and it can produce moments of startling clarity for participants.

The basic concept believes that building with two hands engages the whole brain, both left and the right sides, which means that participants get to solutions, concepts and ideas much more quickly and much more deeply than they would by just talking about them or writing them down. In fact, anything that gets both sides of the brain working together

would work just as well, but the good thing about Lego is that many people have warm childhood memories of it and feel comfortable with it.

Lego Serious Play was developed by researchers at Lego who were searching for more effective ways to meet the increasingly complex and challenging demands of the business world. "Through the use of modelling and metaphor, the objects of play can take on meanings and can embody abstract concepts, thus concretizing formal relationships that can otherwise be quite difficult to comprehend," Lego says.

Building the models is often a leap of faith for the participants. I tell them "don't have a conversation in your head about this – just build". (This can be a bit of a challenge for some of our engineers who often like things to be symmetrical.)

After participants have built their models we talk about them as a group, for about 45 minutes or so.

I see many of them arrive at an "ah-ha moment" and gain clarity about a problem that they hadn't been able to get to previously.



Lego Serious Play has provided all sorts of insights in our leadership development and strategy sessions, and we're starting to use Lego more widely at Arup.

Recently, I had a mid-level engineer come to one of my sessions, and she had just started leading projects and leading a team so was wondering what was next for her. Often when people are at that career juncture they don't know what the next step is and can feel a little stagnated and not really engaged.

The Lego's got me

I got out the Lego and she really wasn't keen on the idea. But she started building with both hands and built a model. Then we started talking about what she'd built – and this is where the magic happens.

"Oh my gosh, the Lego's got me," she said. She said she had just built a model that identified all of the problems that she knew were there, but which she hadn't been able to articulate or come up with an answer for.

By building with both hands, our engineer was able to observe everything, use whole brain thinking, and then come up with a solution. So she came up with an action plan with her model, went away and had it all implemented in four weeks.

It's about uncovering challenges and possibilities.



Lego Serious Play has provided all sorts of insights in our leadership development and strategy sessions, and we're starting to use Lego more widely at Arup.

At our office in Sydney we have a triangular table with a Lego-filled trench in it. We're encouraging teams and small meetings of two or three people to sit at the table and build as they're talking in order to access the whole brain, including the unconscious. It is all about creating new knowledge to clarify insights and solve problems.

Sometimes they'll build a strategy – all the components we need and how they link and what's the flow process.

People were a little hesitant at first about being seen playing with Lego at work, but Arup's Australian leadership has been very supportive of the idea, sometimes sitting at the table and playing themselves.

It's also required a shift in mindset for some leaders to see their people building Lego instead of sitting at their computer and knowing that they're going to get as good as if not a much better outcome.



It's one of the ways we promote a culture of creativity and innovation to help us arrive at better solutions.

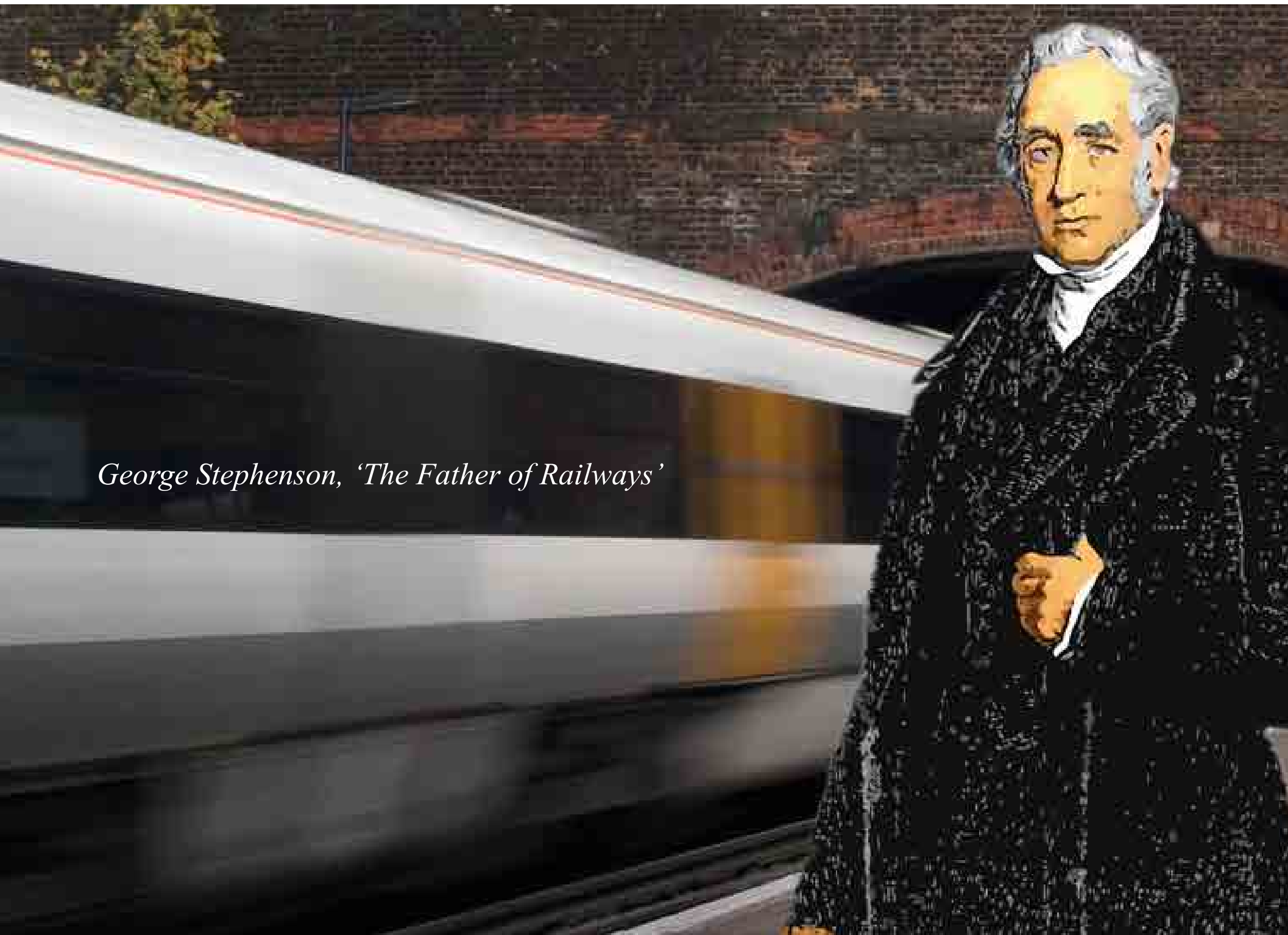
Sometimes I think that instead of packing our Lego away as we grow up, we should leave it out and keep playing with it. ☺

Joanne Greenlees is an organizational development associate at Arup and helps develop future leaders.

MORE ENGAGED

THE FUTURE OF ENGINEERING

Dr Robert Care



George Stephenson, 'The Father of Railways'

There is no doubt that engineering has been fundamental to the wonderful lives we in the developed world lead today, or that engineers will continue to make lives better.

In fact, I cannot separate the future of engineering from the future of society and indeed of humanity. Because to me that is why we do engineering. It is not about things, it is about people. Too many in the community think we are obsessed with things. Indeed, too many of us appear to be obsessed with things.

For engineering to make the largest possible contribution to improving our futures, engineers need to take a broader role than focussing on things.

We need to view what we do in a broader societal context. We need to be aware of the politics, not just the physics; of the finance not just the manufacture or construction; of the consequences of decisions not just the solutions.

Two of the great engineers from the past were George Stephenson, 'The Father of Railways', and Laurence Hartnett 'The Father of the Holden', though some might quibble that strictly speaking he was a designer and not a professional engineer.

These men are best remembered for their technical achievements, but it might surprise you to know Stephenson and Hartnett spent

more than half their time with politicians and bankers. They recognised that they had to do this in order to create their world – and consequently our world.

For example, it is suggested that Hartnett drafted many of the Australian government's letters that he received, so that he could then show them to his General Motors masters to indicate the seriousness of the Australian government's intent to have an Australian car.

How many of us can say we take the same sort of real-world approach to getting our projects off the ground?

How many of us get involved in politics? Take the current NSW Parliament, for instance. I only know of two engineers – Greens MLCs John Kay and Mehreen Faruqi – but there are any number of lawyers, who make up about 25 per cent of the political class.

(It is interesting to note that eight of the nine members of the supreme Central Committee of the Communist Party of China are either engineers or scientists.)

I'm not just poking fun at lawyers here. Engineers approach problems differently to lawyers.

Lawyers take a side and then look for evidence to justify the position. If necessary, they can equally argue either side. Engineers, on the other

hand, take the situation they find and develop solutions for the good of all.

Perhaps an even better perspective is that engineers don't just develop solutions, but ensure we are solving the right problem. They frame the right question.

We could do with more of this approach among our political decision makers.

Society's challenges are engineering challenges

The world we live in faces a raft of challenges, including poverty and unequal wealth distribution; resource scarcity and security; the consequences of climate change; and dealing with an aging population at the same time as the burgeoning Millennial generation.

We also have to deal with the issue of whether cities are the problem or whether they are the solution to an increasing lack of resilience in our economic and social infrastructure.

To me these are all engineering challenges or opportunities that define our future.

But if our discipline is to make the sort of contribution that it is capable of doing, we need to raise the public perception of engineering.

Too often engineers are having the wrong conversations and being

pushed away from the decision tables. We have to change that. But it won't come from withdrawing from the main game and sticking with just the technical stuff.

We need to show that we understand the problem not just in terms of the engineering challenges, but also the commercial and political challenges, and at the same time make sure that we're having the right conversations.

Otherwise, if we have leaders who don't understand the technicalities and specialists such as engineers who don't engage with the conversation then we'll end up being cut out of the conversation and the decision. We risk falling into what's known as 'malicious obedience', where we follow instructions, even when we know there's a better way.

Sometimes we are not respected or feel we are not respected because we are seen to be the bad guys responsible for many of the ills of the world and forgetting all the good stuff or taking it for granted. We have to understand that and maybe concede *mea culpa* on some issues to win back the hearts and minds of the public.

Only by doing this can engineering fully live up to its potential to improve our world. This is also Arup's mission – "We shape a better world".

What do we mean by this?

We would say that a better world is one that is safer, healthier, more resilient and of greater amenity, yet within our financial and ecological constraints. A world that promotes wellbeing. A world that provides for the 9.5 billion we will have by 2050.

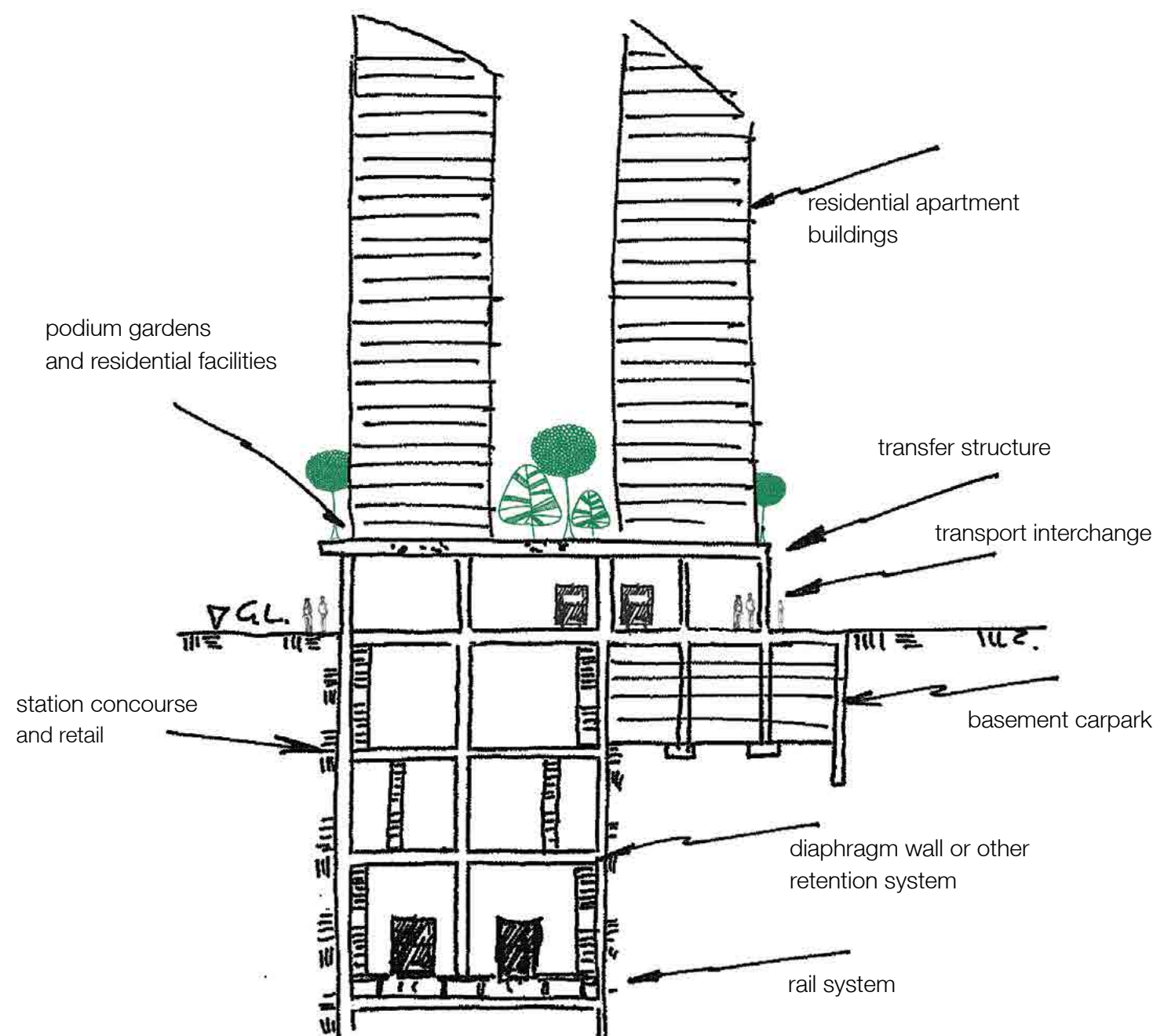
And for engineers to play their part, this means a world with a stronger link between engineering and the society it serves – people not things.

It's a world where creativity leads rule making, rather than rule making, and the bureaucrats behind it, stifling creativity.

Finally, it's a world where our profession worries less about status and respect but as a result of doing the right thing becomes valued by the community and earns status and respect.

The world is a rosy place, full of potential for us to create a better world. ☺

Dr Robert Care AM, is Arup's Strategic Geographies Leader in Australasia and has over 40 years' experience as an engineer in Australia, the UK and Asia.



Better Results from a Collaborative Culture

Dr Marianne Foley

About a decade ago, I struck a difficult technical problem.

Property developer Stockland had decided to upgrade eight stories of an existing office tower in central Sydney to become its new head office. The company wanted to create an office where people bumped into each other and interacted, but they were in offices that were very segmented and compartmentalised.

Their architect BVN came up with the idea of connecting the floors with an open atrium and central staircase, which would allow interaction and free air flow.

However, this would have contravened the Building Code of Australia fire codes.

So Arup's fire team devised strategy using a combination of operable horizontal and vertical fire curtains that met the performance requirements of both the BCA and New South Wales Fire Brigades.

But horizontal fire curtains had never been used before in Australia and we needed answers to a lot of questions about how this could be done, materials, suppliers, reliability and so on.

As part of my search for answers, I posted some questions on Arup's Fire Engineering Skills Network.

This is just one of Arup's 45 different Skills Networks, essentially global communities of various disciplines that are practiced within firm, such as mechanical engineering, acoustics, architecture, or transport planning.

Each of the networks has a leader who determines what sort of skills development is needed for their particular discipline to ensure that everyone is kept up to date with the latest from their industry.

But perhaps most importantly, the networks also have an online forum where members (or even others within Arup who have a question from outside their own discipline) can post questions and help others with their technical difficulties.

Arup's skills networks

Very quickly after posting my fire curtain question, I received answers from Singapore, from the UK and from the Americas about where people had used curtains and the things that go wrong with them, things to watch out for, suppliers we liked, ones we'd had problems with, and which problems we'd had with them.

The Stockland project, I'm pleased to say, was an absolute success and increased interaction and satisfaction among the staff.

The Skills Networks exemplifies the highly collaborative culture at Arup.

If I don't know the answer to a technical question on a project I can put it on the Fire Forum as my skills network is called, and 200 fire engineers around the world will read it. Several will put aside what they are doing to help me, even though they may never have met me. I am thus able to truly deliver to my clients world's best practice and experience in



no time at all, minimising their risk and helping their projects.

I believe Arup's collaborative culture arises in a large part from our unique ownership structure.

When Ove Arup and the firm's other founding partners retired, instead of selling the company they put the shares in a trust for the benefit of past, present and future staff. There are no external shareholders to worry about stock prices or takeover bids.

This filters through to the company culture. No one's ever going to get rich working for Arup because it's not the kind of firm where a handful of directors own all the shares.

This means that what we do, we do for our own interest, and that of our clients.

Globally all our profit goes back to the centre and is redistributed as shared profits, so I can't do well

unless all my colleagues in Australia and around the globe also do well.

A focus on fairness

When I joined Arup in 2003 it was to be involved in the firm's innovative projects. I wasn't disappointed; Arup is all about the technical excellence. As a company owned in trust, we do projects because we believe them to be interesting and worthwhile rather than for the benefit of our shareholders.

Our focus on projects means we are always looking to deliver original and innovative solutions and this translates to the best possible outcomes for our clients.

After I'd been here for about six months, I started to realise the firm really had a unique corporate culture.

Arup has a very strong focus on fairness. We don't just pick our

top talent and pour resources into developing them alone – everyone in the firm has a chance to develop through Arup University. In this way, we don't create a competitive culture where for one person to do well they have to make sure they do better than their colleagues.

Instead we collaborate. This can deliver really great thinking, drawing on the best insights and experience from Arup people all around the world.

A sense of curiosity also permeates Arup. We're very much a project-focused organization; we're very interested in the work that we do and our focus is all around the projects and the people as opposed to share price or profit. I think if you encourage curiosity and give time for it, then people are more likely to share ideas.

I recently did a secondment into the Department of Defence for a few weeks, helping to review their projects for fire safety. We struck a technical difficulty to do with smoke detection in buildings.

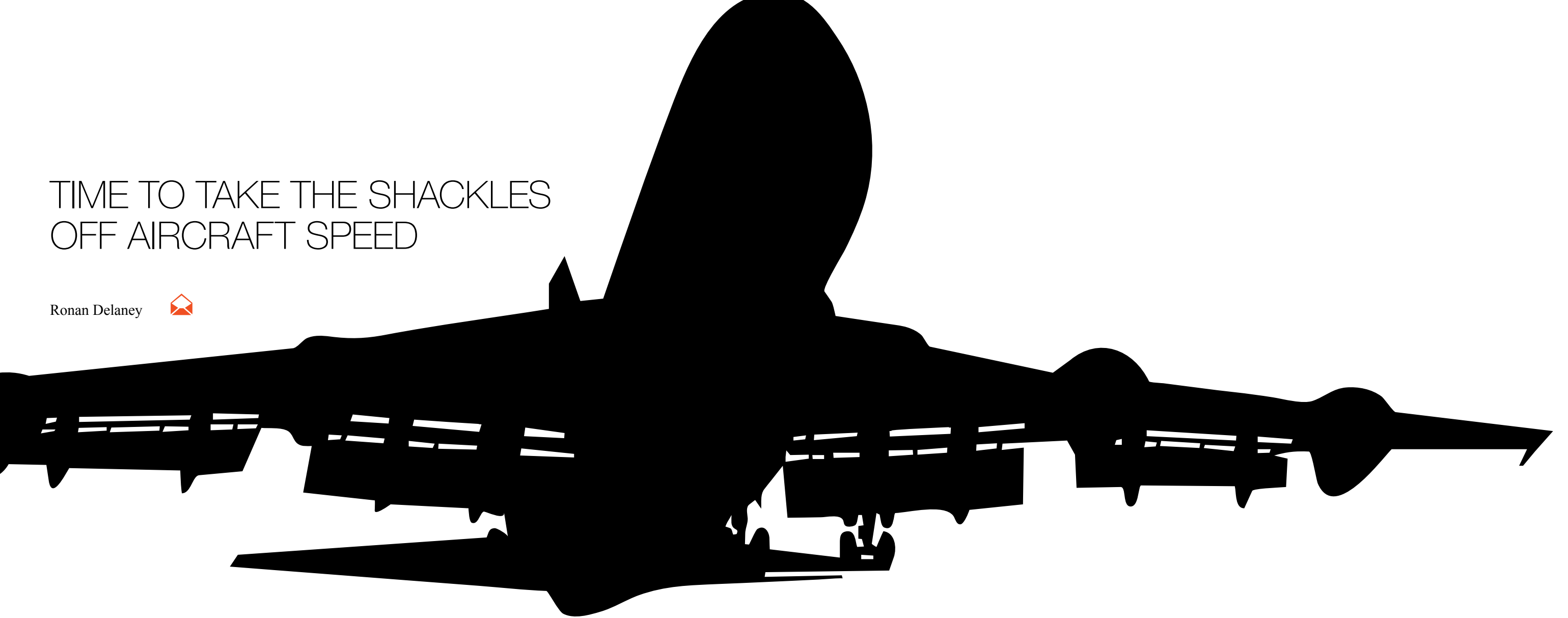
I told our client about our Skills Networks and how we could draw on Arup's global expertise, but he was sceptical that we'd get any help. I posted the question on Tuesday night and by Wednesday morning we had three very good technical answers from experts in three different countries.

The client was blown away because he just hadn't thought that people really do share information like that. It was a good reminder of just how unique Arup's culture really is.

Marianne Foley is a fire engineer and leads Arup's Consulting business in NSW/ACT. @

TIME TO TAKE THE SHACKLES OFF AIRCRAFT SPEED

Ronan Delaney



The Boeing 747-400 has been the queen of the skies since the mid-1990s and is the standard by which other wide-bodied aircraft are judged. It burns about 3.26 litres per seat for every 100 kilometres it travels, so it's no surprise that it needs a fuel capacity of over 200,000 litres to fly the routes between major cities.

Fuel efficiency has improved dramatically since then. Modern aircraft, including the Boeing 747-800 and the Airbus A380 burn 20 to 30 per cent less fuel on equivalent journeys. And there are more advancements on the way.

Better fuel efficiency is of course improving environmental outcomes but also increasing the flight range

of aircraft and has the potential to change our travel patterns.

The lower fuel consumption starts with much more efficient engines which burn less fuel. Planes are also lighter, built with carbon fibre composite materials rather than aluminium alloy and even the paint, which on some aircraft can weigh half a tonne, is getting lighter. Another advantage of the carbon fibre composites is that they can withstand more internal humidity than the aluminium bodied planes, meaning less of the dried out feeling that comes with long-haul flights.

And aircraft paint manufacturers are working on shark skin-like coatings for aeroplanes that will reduce drag.

But there are more fuel savings to be made yet.

One of the next big steps in commercial aircraft technology is the introduction of folding wingtip technologies. Boeing's 777X will have folding wingtips which will increase wingspan to around 72 meters. This will improve the lift characteristics and reduce wing-span vortex drag and hence fuel efficiency. But because they fold in to just 65 meters, they'll be accommodated by a lot more airports than if they remained at full size.

Once the first of these planes is delivered in 2020, they're expected to increase fuel efficiency by a further 15 to 20 per cent on top of the recent gains.

These developments will change the way we get to our destinations.

Currently, if you want to fly from Manchester to Perth, for instance, you'd probably hop on a plane in Manchester to fly to London where you'd board a hub-to-hub aircraft like a 500 or 600 seat A380 to fly on to Perth. Passengers have to make this two leg journey because there's not enough demand to fly direct from Manchester to Perth to fill all the seats in a hub-to-hub aircraft.

Better engines and lighter bodies could change all this.

The new Boeing 787 and Airbus A350 composite aircraft are sufficiently fuel efficient to make this journey direct, despite the fact

that they are much smaller planes. With only about half the number of seats of the A380, it could find enough demand to fly direct from the north of England to the West Coast of Australia.

These sorts of changes will enable more flights to bypass the major hubs such as Heathrow, Dubai, and Singapore's Changi. Which will in turn help airports and airlines accommodate the doubling of passenger numbers over the next two decades forecast by the International Air Transport Association without having to double airport capacity or the number of aircraft.

The new Boeing 787 and Airbus A350 composite aircraft are sufficiently fuel efficient to make this journey direct, despite the fact that they are much smaller planes.



But imagine hopping over to London on a three hour flight. You wouldn't even have to adjust to the UK time zone. You'd do it to attend a meeting or function but your body clock wouldn't need to adjust so you'd avoid the major effects of jetlag.

Sydney to London in three hours

This new technology raises an interesting possibility for air travel in the future.

Commercial aircraft currently fly at Mach 0.9 – that is, a little bit below the speed of sound, which is Mach 1.

There's no technical reason why they can't fly faster – after all, the Lockheed SR-71 "Blackbird" has been able to fly above Mach 3 since the 1960s. And the Concorde could carry passengers at Mach 2 in the 1970s, though it had to slow to Mach 0.9 above land to avoid sonic booms.

What's holding back the speed of commercial aircraft are concerns about noise and pollution. But technology is helping to overcome these issues, so it's time to consider whether these artificial speed limits are still appropriate.

Imagine being able to fly at Mach 6, which would conceivably mean a journey from Sydney to London in about 3 hours.

Consider what that would do for trade and business. Being able to fly from the UK to America in 35 minutes, from the UK to Australia or Asia in under three hours, would change the whole way the world works.

For me, making four-day business trips to Europe isn't an unusual occurrence, although it was unthinkable in the 1970s when a trip to Europe had to be about two weeks to make the long haul flight and expense worthwhile.

But imagine hopping over to London on a three hour flight. You wouldn't even have to adjust to the UK time zone. You'd do it to attend a meeting or function but your body clock wouldn't need to adjust so you'd avoid the major effects of jetlag.

There are undoubtedly technical issues that need to be resolved but while the artificial speed limits remain in place, there's little incentive for aircraft manufacturers to devote significant resources to solving them.

For one, planes need to accelerate more gently to above the sound barrier so they reduce the sonic boom that can be so disruptive to communities. Modern composite technologies are on the way to achieving this and also mean that these planes can be built and operated much more cheaply than the Concorde.

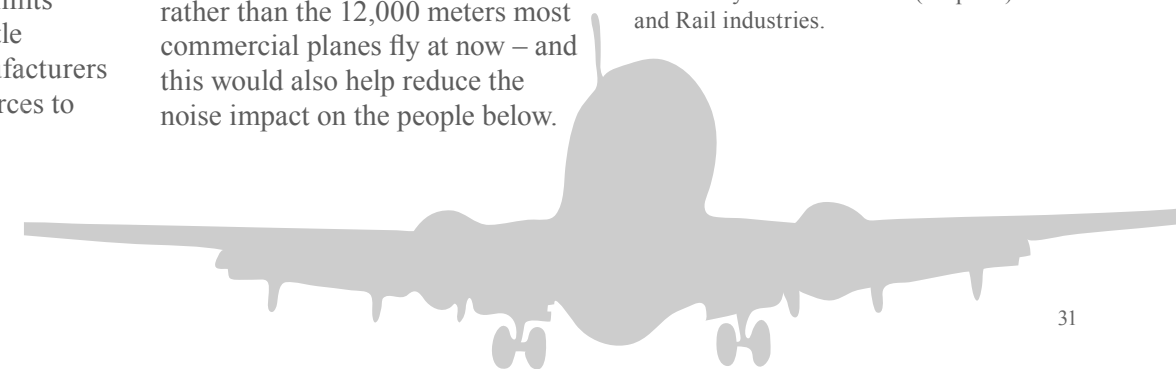
And these new materials also enable aircraft to withstand much higher internal pressures and temperatures because they don't suffer the same levels of fatigue as aluminium bodied aircraft. They could fly much higher – say 28,000 meters above sea level rather than the 12,000 meters most commercial planes fly at now – and this would also help reduce the noise impact on the people below.

Environmental considerations and the impacts on those on the ground must always remain important considerations, but it's time to start looking at how we can remove the current speed shackles from passenger aircraft.

Once the human race overcomes the technical challenges, it will unlock a raft of benefits for passengers, business, trade and leisure. ☺

Ronan Delaney is the Aviation Business Leader for Arup in Australasia.

With over 25 years of design and construction experience of major international projects. He has worked extensively in both Aviation (Airports) and Rail industries.





Mitchell Freeway Widening opens a gateway to Perth

The widening of Mitchell Freeway northbound from Graham Farmer Freeway to Hutton Street included the construction of an additional lane, a new on-ramp and widening of traffic bridges over Powis Street, Vincent Street and Scarborough Beach Road.

The additional lane on the Mitchell Freeway northbound, from Graham Farmer Freeway to Hutton Street, was constructed along the left-hand side of the freeway to Vincent Street. It then travels along the median (right-hand) side of the carriageway to Hutton Street, adjacent to the Public Transport Authority's rail reserve and away from environmentally sensitive Lake Monger.

Constructability was integral in our design. We were heavily involved in the assessment of temporary works design solutions for the construction of the bridge widening, providing design solutions and advice to the construction team. Due to the proximity of the widened freeway to the existing rail corridor, we worked closely with the Public Transport Authority to ensure their design and access requirements were met.

As a part of the project we provided drive-through visualisations to Main Roads Western Australia (MRWA). The visualisations were uploaded to the MRWA website to enhance their public awareness campaign for the project.

The project has delivered significant benefits to commuters using the freeway, including improved merging arrangements, increased northbound capacity and an improved exit arrangement at Vincent Street.

The widening of the freeway will also mitigate the impact of major projects such as the Elizabeth Quay development which sees Riverside Drive realigned.

Read more about this [project](#).



Use active transport to solve the housing crisis

I think active transport infrastructure holds the key to solving the housing crisis.

Many major world cities are suffering from a chronic shortage of housing. The solution isn't as simple as just building more homes. All the city's residents have to be able to get around the city too.

That's why housing density in London (and Toronto, Manchester, Cardiff and Abu Dhabi among others) is linked to public transport provision. If there aren't the rail, bus and tram services to keep new residents moving, high density

housing would lead to unacceptable rises in car use, with associated congestion and pollution. Hence planning laws are often used to restrict the area's housing density.

But public transport accessibility formulae (such as the PTAL system in London) take little or no account of active transport infrastructure like cycle paths and walking routes.

If there were better active transport infrastructure, more of it, and more people using it, then more homes could be accommodated. In this way, I believe we could potentially double the permissible housing density across half of Greater London, for example. This is the idea I submitted to the New Ideas for Housing

Brendan Cuddihy 

International Ideas Competition run by New London Architecture and supported by the Greater London Authority, and I'm pleased to say it's been selected as one of the ten winning entries.

So what would this look like? For people on bikes, we need more segregated cycle paths so that riders feel safe even when the roads are busy. Pedestrians want to feel that they're safe from vehicles too, and protected from street crime. That means wide pavements and well-lit streets. And people both walking and cycling need routes that are direct and convenient, with good signage.

The benefits don't just include more housing. City residents would be

fitter and healthier. In a world with growing epidemics of obesity and inactivity, this would reduce strain on health services. It's less polluting, with no harmful nitrogen dioxide or particulate emissions, and virtually no carbon dioxide.

It's cost-effective, too. In London, for example, the Mayor and Transport for London are currently constructing 15km of segregated cycle lanes for a cost of £59 million. That's substantially cheaper than the £1bn it's costing to extend the London Underground 3km to Battersea.

That's not all: walkers and cyclists spend more money locally, so you get a thriving local economy and a stronger sense of community.

What will it take to make this a reality? Well, I think both city leaders and the general public will need to change their mindset. We need city leaders to see active transport as a solution rather than just an afterthought.

It's been said that cycling infrastructure in particular only benefits young, healthy men – that women, children, older people and those with mobility problems can't or don't want to walk or cycle. I don't buy into that argument. If we had the kind of high-quality active transport infrastructure you can see in Copenhagen, for example, it would be attractive to many more people.

We need to change the perception of cycling so it's seen as normal, and accessible to everyone. That's exactly the situation in the Netherlands, which has the best cycling infrastructure (and the lowest obesity rate) in the western world.

If we're agreed that our cities are going to grow, and that we need to build more homes, then active transport infrastructure would not only make this possible, it would make our cities better places to live for everyone.

Continue the conversation at [Arup Thoughts](#). 

How do you find the next winning idea, whether it's a product, software, an app or an equity opportunity?

Ian Rogers


I think the future will be all about collaborating in the innovation process. This approach enables early identification of the best ideas – and has many more benefits than just financial success.

At Arup, we've recently adopted a new collaborative process for harvesting ideas. People from across the firm can post their idea onto our web-based platform for others to give their view using social media functionality. Our ventures leaders – the leaders of our products, apps, equity investment and software teams – watch the platform. They make the final decision on whether or not to invest.

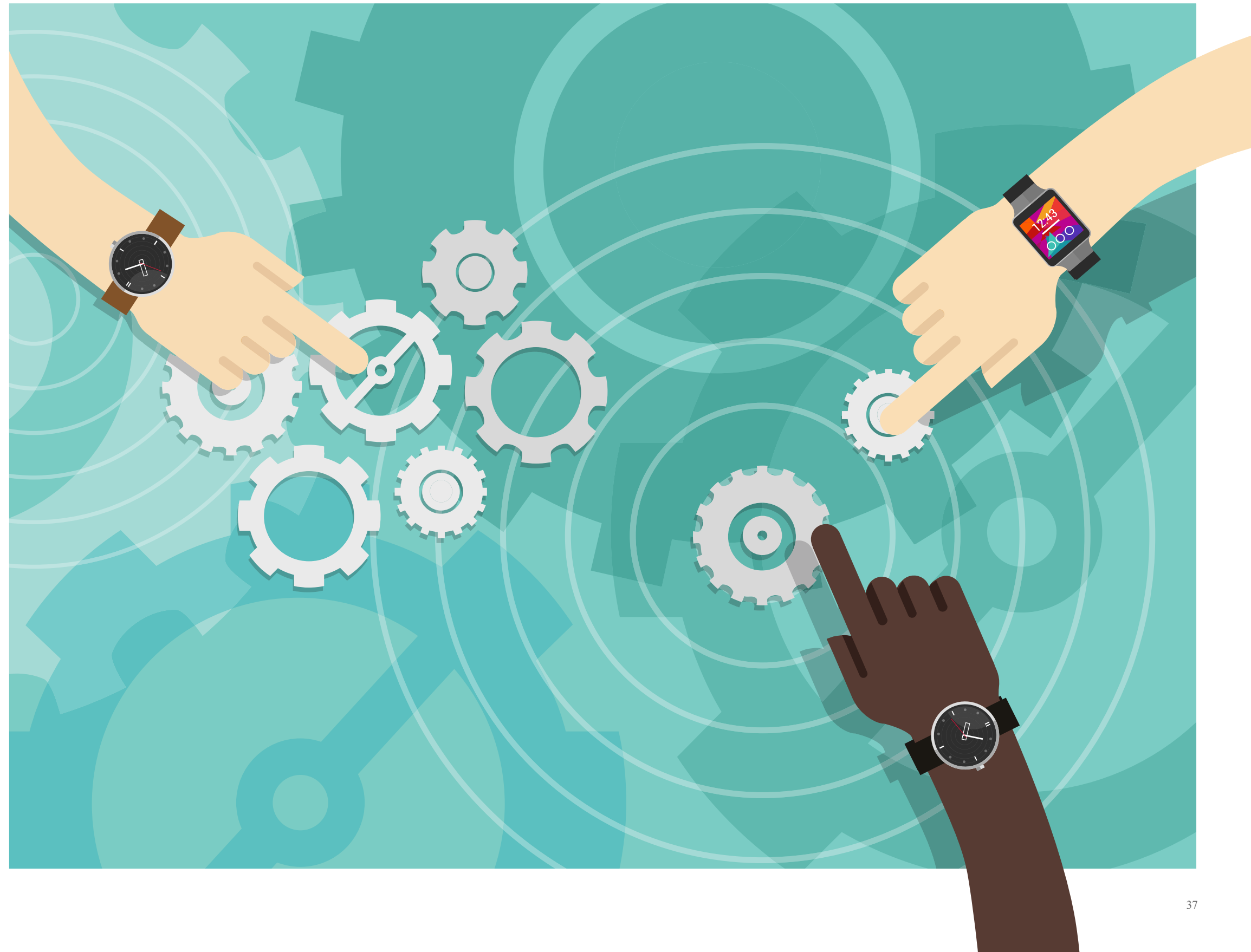
This approach doesn't just help find the next big thing; it also helps to build connections between people in a global organisation like ours. And people enjoy taking part in something that fosters their entrepreneurial spirit. That's good for any firm that wants to attract and retain the best people.

What's more, collaborative innovation forges valuable connections with people outside an organisation, even if they aren't directly related to venturing. Immediately after the initial launch of this platform, conversations it fostered led to our software team finding someone ideal to recruit. We also met people interested in working with us on major projects in Africa.

Collaborative innovation has replaced the 'Dragons' Den' approach Arup used to use, where people pitched ideas in person to a panel of directors. The downside of this was that it favoured people based in London and failed to tap into the breadth of skills across the firm. Using social media democratises ideas, increases transparency and promotes collaboration on a global scale. Bouncing ideas around a range of minds quickly kills off bad ideas and makes the good ones more likely to emerge.

This approach is still at the experimental stage but the early indications are positive. An ideas competition has produced a range of strong ideas and we've already had some former employees approach us to post their ideas and partner with them. In due course we could open the process up to clients and others and embrace open innovation. 

Collaborative innovation is the future





“How do we help people access the equity in their home, so if they wish to stay in their home they can, and if they wish to downsize they’re not penalised for that?”

A city for older Melburnians

Arup and the Committee for Melbourne recently hosted the sixth forum in the Shaping our City series looking at how we can shape a better Melbourne for a population that is ageing.

Moderated by Arup’s Peter Bowtell, our panellists engaged in an insightful and passionate discussion on how we can collectively shape a city that better enables older people to enjoy life, work, get around, invest and learn.

Our panel of experts included:

Sue Hendy, CEO,
Council of the Ageing

Derek McMillan, CEO,
Australian Unity
Retirement Living

Charles Waingold, General
Manager Strategic Transport
Planning, Public Transport Victoria

Tracey Slatter,
CEO, City of Port Phillip

They were first asked to highlight what they see as barriers to improving liveability for Melburnians as they age. Sue Hendy started the discussion commenting ‘it’s the attitudes we hold that shape our communities’.

Derek McMillan raised his concern that the current assets test for the pension currently provides a major disincentive for older people to downsize and move to more age-appropriate accommodation. ‘How do we help people access the equity in their home, so if they wish to stay in their home they can, and if they wish to downsize they’re not penalised for that?’

Issues around mobility and connectedness were also discussed, Charles Waingold highlighted the importance of a public transport

system that enables the community to effectively and independently move around. This plays an important role in promoting a socially inclusive society and avoids issues of isolation. The role of safe, accessible walking routes to transport nodes were also noted as an inherent element of effective public transport within the city.

Sue Hendy added there are clear opportunities which can come from embracing these challenges, we just need to change the way we think about age. ‘One of the things we do is link chronological age with value. We don’t value ourselves into the future, so we undervalue people, and therefore underutilise this amazing resource in the public domain. I think that’s the challenge for us to completely

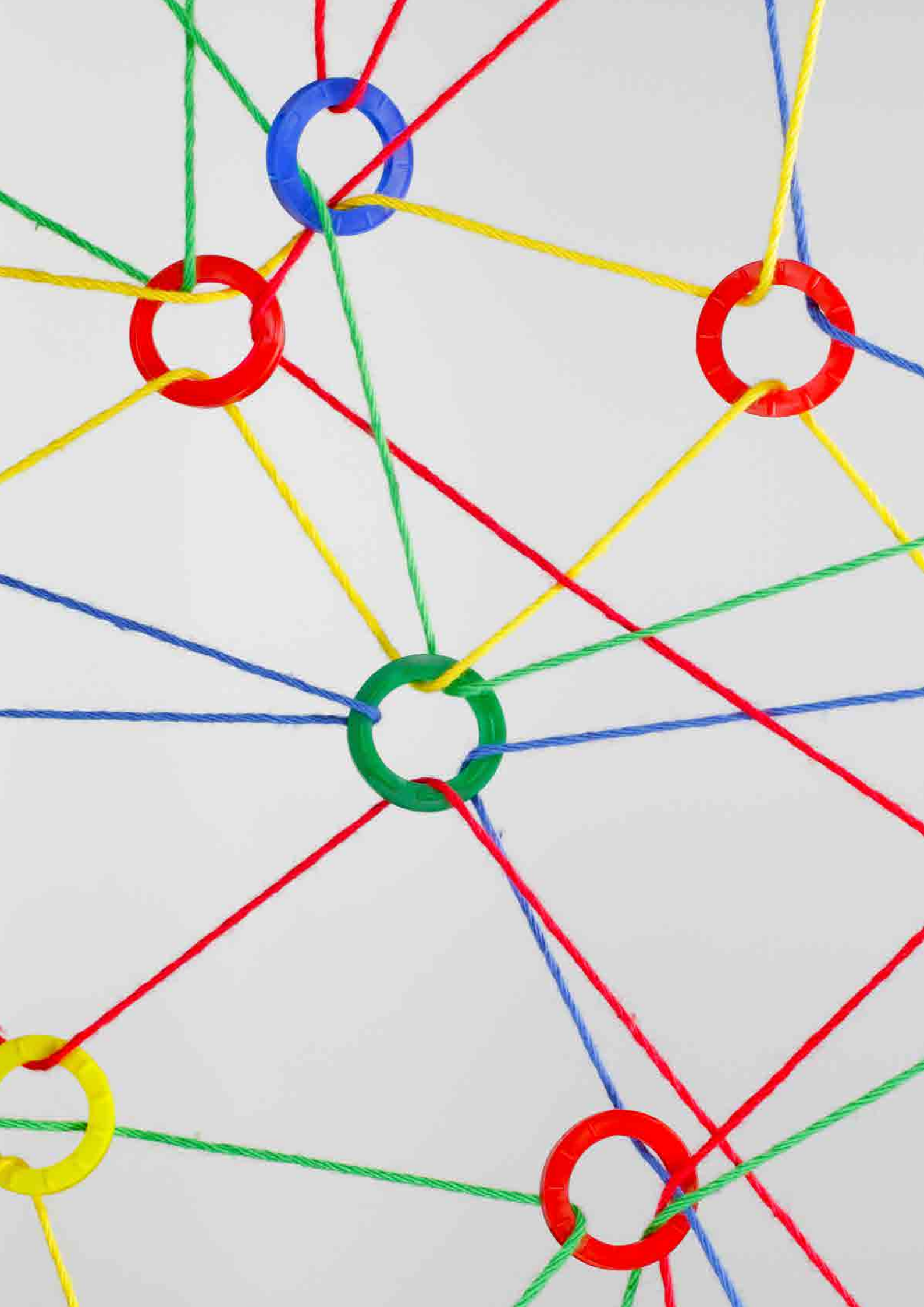
change the paradigm about ageing and see it as an opportunity for us and for our communities as an amazing potential collection of expertise, knowledge and skills – and there’s the opportunity.’

On the topic of inclusive communities, Derek McMillan commented that we will, in the future, see precincts being developed where the service model is underpinned by older people which then radiate out to services for any age with a cost efficiency around creating service ‘hubs’ for all ages.

This shift in attitude applies also to how we engage in our future city planning with Tracey Slatter referring to the fact that councils in Victoria plan to spend \$2bn in infrastructure this year alone. ‘One of our challenges is how we

leverage that investment with other initiatives in the public and private sector to make more of that money. We’ve got to get smarter about how we work together if we’re going to tackle some of these challenges – I think we can do it though.’

A number of interesting questions were posed from the floor, with a strong theme emerging around the responsibility of the whole design community to apply a joined-up thinking approach to the future built environment – engaging across all demographics – to create communities for everyone which promote connectedness, lifelong learning, social support and participation. ☺



Collaboration: realising benefits of yet to be opened data

Walter Reinhardt



*Some of the largest data custodians are governments and their agencies. The value of their data is often unknown or unrealised and the process of opening data can be challenging. Arup has – and is – helping to realise the benefits of this data for governments (national, state, provincial and local), their departments, multilateral agencies, authorities, satellites, private firms and universities. **Walter Reinhardt, Economics, Strategy and Policy specialist at Arup,** says collaboration realises the benefits of data, even if it is yet to be open.*

Collaboration is working together for a common purpose. By working together, we can realise the benefits of all types and forms of data, even data that is yet to be opened up to public access.

Three major classes of benefits we see in government open data are in informing existing policy, developing innovative new policy and opening up commercial opportunities which benefit society.

Open data can inform existing policy and government operations by identifying opportunities to improve efficiency, effectiveness or equity. A longstanding example of the use of open data is the Australian Bureau of Meteorology’s weather

and water datasets, which are accessible online, and used to inform everything from local engineering standards through to the direction of Australian Government drought relief packages in rural areas. The accessibility of open data to external parties enables evidence-informed feedback to government about the operation of a given policy.

Open data assists to develop innovative policy by identifying new or alternative avenues for government operation. The Australian Government has attempted to foster this through facilitating ‘GovHack’ days, where policy challenges are set and volunteer teams work together

to generate new and alternative programs and measures to address the challenge. The 2015 GovHack had challenges such as ‘best disaster mitigation hack’ and utilised the open data of over twenty Australian Government agencies and departments.

Commercial opportunities arise from open data, and these can generate much social benefit. An example is the provision of realtime public transport data to support smart travel apps. Smart travel apps enable people to more effectively use public transport, providing greater societal benefits from active transport and better use of public resources. The developers of apps receive a commercial return.

The provision and use of open data often challenges governments culturally, practically and for benefits realisation.

Open data is an uncomfortable fit with government culture. Public service codes of conduct clearly debar the improper use of information, and norms of behaviour

lean strongly towards risk and harm minimisation. Governments have access to privileged information and the sometimes vague process of opening data challenges deeply ingrained cultures and norms.

Making use of large datasets, be they open or not, can be a practical challenge for governments and businesses. Resource and capacity constraints within their organisations can limit the uptake and use of data to inform policy and business. Furthermore, realising value from data often requires technical training and conceptual knowledge to use and interpret the results of analysis.

Providing open data does not in itself result in benefits realisation. Use and analysis of data may need to be directed to generate value. GovHack days are undertaken on a volunteer basis and are resource intensive to organise.

It’s vital to collaborate on open data, and yet to be opened data, in ways which address the cultural, practical and beneficial outcomes.

Cultural challenges can be overcome by structuring collaboration in ways which observe privacy, confidentiality and information treatment standards. In many projects we provided advice and undertook analysis on a confidential basis on data which is yet to be opened. At times this included in situ work in client office locations.

Substantial depth of technical skill and conceptual knowledge are essential elements when interrogating large datasets. When data analysis generates results, we can explain and interpret these based on conceptual and technical background to great benefit to the data custodian.

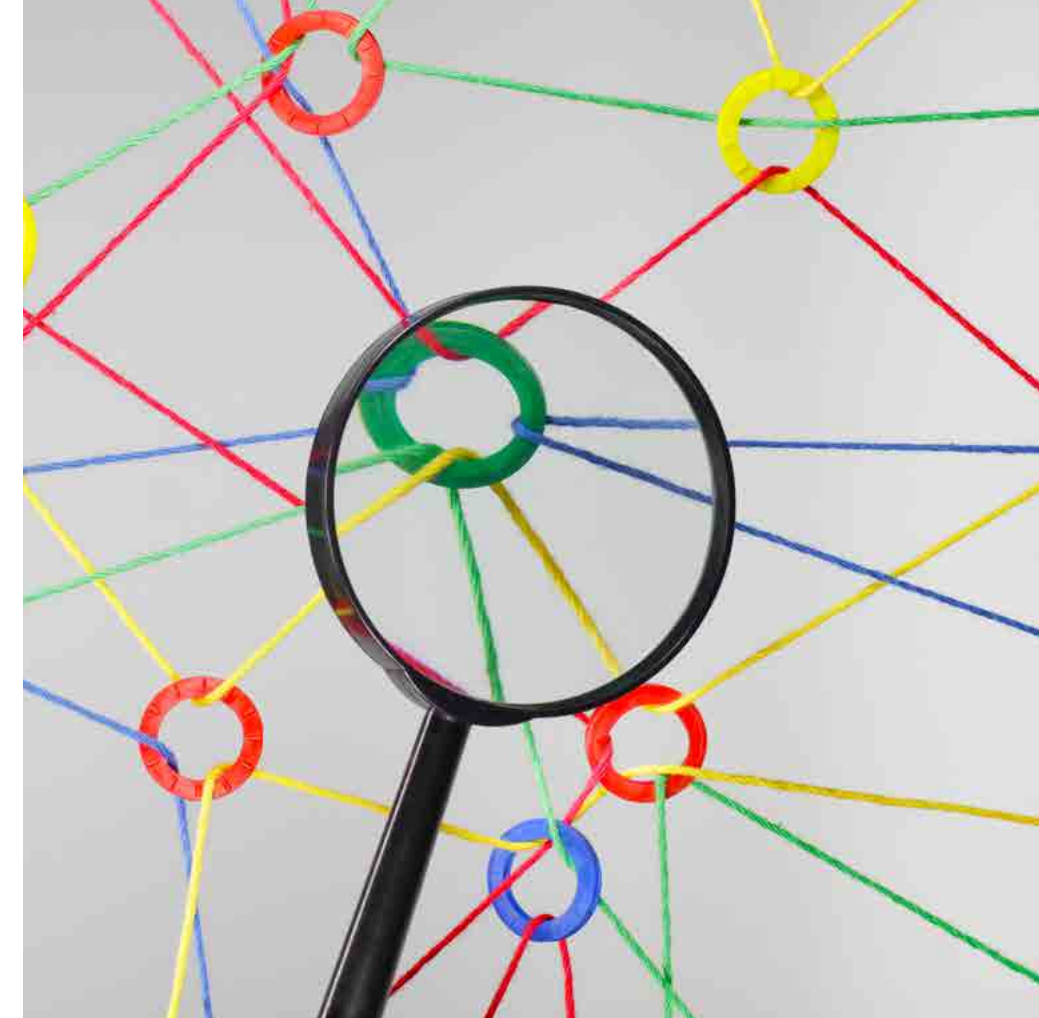
When collaborating we seek to structure the project outcomes to realise the desired benefits. Often our collaboration has particular policy challenge in mind, such as establishing best practice or prioritising investment. We use government open data as well as data which is yet to be opened.

The opening of government data is a continuing trend.

One of the key tools of governments is their position as a central node in society. Through their central position, governments absorb and access information from different sources in a multitude of ways. Using the information for public benefit, governments make evidence informed policy.

Governments are resource constrained. The information received by governments far exceeds their analytical ability. The provision of open data allows parties outside of government to analyse data, to identify opportunities, trends and change. Political discourse supports open data, as demonstrated by the Cameron Government’s and Turnbull Government’s respective support and initiatives.

Yet the provision and use of open data presents challenges to governments. Collaboration with skilled and technical specialists provides a way to realise the benefits of open data, as well as data that is yet to be opened.



Project case study: Understanding government regulation at a portfolio level

Arup worked with a Department of the Australian Government to understand their regulation at a portfolio level. Nearly one thousand regulations were itemised and costed under a broad whole of government process to understand the regulatory cost burden. Arup worked *in situ* on the confidential dataset, providing broad category of cost insights and then delving deeper into best practice regulation and indicators for high cost regulations. While statistical and econometric analysis techniques were used, the conceptual framework drew on deeper understanding of the tools of government and the policy frameworks used within the Australian Government. Working closely with the Australian Government staff, we conducted analysis and provided results in familiar terms. As a consequence the findings were readily utilised and put into practice following completion of the project.

In an open data environment, and open government environment, the data analysis could have occurred remotely. The constraints of the data required Arup to work in situ from the client offices. We found additional benefits working in situ, such as fostering a more responsive collaboration and providing a more tailored project outcome. In an open data environment it is important not to lose track of the benefits that come from physical colocation and collaboration. ④

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