



Global Water Annual Review

2014/15

A summary of activities, achievements and key projects within the water business over the last year. Highlights in this issue include:

Foreword

June 2015



Mark Fletcher

Mark Fletcher
Global Water Business Leader

The World Economic Forum 2015 has identified water crises, failure of climate change adaptation and extreme weather events as some of the top global risks in terms of likelihood or impact.

Water is essential for life and in a changing climate the shocks (such as storms and floods) and incremental changes across the water cycle, for example global sea levels rising, increasingly affect our lives. We only have to consider the real issues in São Paulo and California to recognize the importance of water to society.

This year has seen the evolution of our global water business with increased focus on how we work across the water cycle. Our Design with Water concept is gaining momentum and our foresight work on the Future of Urban Water with Sydney Water has broken new ground. We are increasingly challenging pre-conceived norms to gain a better understanding of how we engage with and value water.

In a global world of water, the issue of public or private water is frequently discussed. It provides a subtle but very relevant context for public participation which is becoming increasingly relevant in rapidly urbanising

and customer-centric societies. Are you a customer or a citizen? The relationship between public utilities and their citizens is fundamentally different to that between private utilities and their customers.

We have also seen the significant impact of major projects around the world e.g. Tunnels, dams, water supply, wastewater and flood issues. We have an increasingly important role to play in these given their role providing 'solutions' to some of the global issues identified. This particularly applies to climate change adaptation.

Acknowledging that our people are our strength and inspiration and I am pleased to share with you that our knowledge community has grown to over 1440 people within a wider resource of over 13,000 Arupians globally. We should all be thankful for our own good fortune as we strive to tackle these global challenges for an increasingly vulnerable global population.



Global water issues

Addressing the global challenges

This year the Global Risks Landscape, a map of the most likely and impactful global risks, puts forward that 25 years after the fall of the Berlin Wall, “interstate conflict” is once again a foremost concern. However, 2015 differs markedly from the past, with rising technological risks, notably cyber attacks, and new economic realities, which remind us that geopolitical tensions present themselves in a very different world from before. Information flows instantly around the globe and emerging technologies have boosted the influence of new players and new types of warfare. At the same time, past warnings of potential environmental catastrophes have begun to be borne out, yet insufficient progress has been made – as reflected in the high concerns about failure of climate-change adaptation and looming water crises in this year’s report.

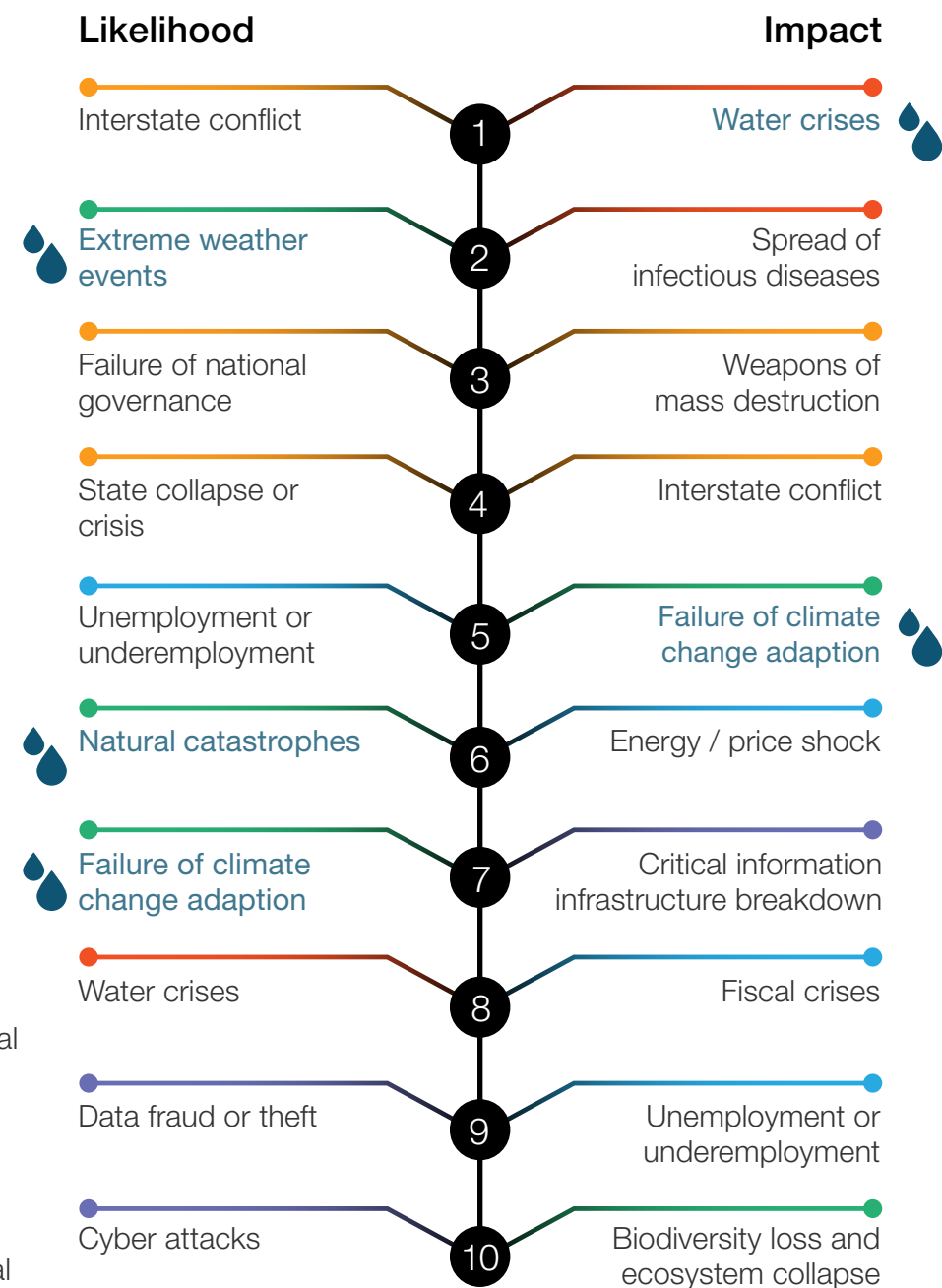
Ten global risks of highest concern

The World Economic Forum Global Risks 2015 identifies the likelihood of interstate conflict as the highest concern closely followed by extreme weather events. Also included in the top 10 global risks in 2015 are the likelihood of failure of climate-change adaptation and water crises. Demonstrating that at least 3, possibly 4 (if we consider natural catastrophes) of the ten most significant risks are water related. It’s important also to consider that the number one impact of these risks is water crises.

[Click here for more information on the report.](#)

- Economic
- Environmental
- Geopolitical
- Societal
- Technological

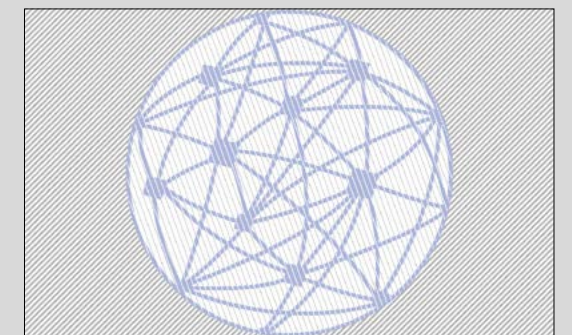
The top 10 global risks in terms of:



[Download](#)

Global Risks 2015: Insights Report

Download the report which highlights the most significant long-term risks worldwide, drawing on the perspectives of experts and global decision-makers.



Design with water

Understanding and influencing the water cycle



Vincent Lee, New York

Our Design with Water approach recognises the need to change the way we live within our constraints and leverage the full benefits of taking a whole of water cycle approach to water management. At its core, the process is about reducing risk, increasing resilience and perhaps most importantly making better, healthier places and improving the local environment. This can be achieved through the reintegration of catchment-scale water management with urban planning and landscape design.

By understanding and influencing the whole water cycle, Arup has developed particular expertise that enables us to assess risks and support our clients in taking a strategic approach to water management – as well as minimising mankind’s impact on the environment. We provide services across the water cycle, addressing issues relating to resilience, flood risk, water supply and wastewater treatment through sustainable and innovative planning, design and delivery.



Taking the plunge: The benefits of swimmable urban rivers

From New York to Sydney, more and more cities have plans to make their rivers swimmable. What’s behind this growing movement?

“This is about more than just a nice place to have a dip on a hot day,” says Michael O’Neill, a senior environmental consultant at Arup. “If a city has got its urban waterways up to a swimmable standard then it’s a sign that they’ve put in place all the elements needed to sustainably manage water running through the city.”

“It means that they have stopped pumping water out of the river for industrial and other uses and stopped, or are successfully managing, the discharge of wastewater into the river,” he says. “It means they’re using parkland and trees to capture and recycle storm water instead of channelling it straight into the river. It also means that any upstream dams are releasing enough water for the river to flow as naturally as possible.”

It’s perhaps no wonder that the idea is gaining traction. In O’Neill’s home country of Australia, the idea of making the Yarra River in Melbourne swimmable is attracting interest. Things are a little more advanced on the Parramatta River, where the Parramatta River Catchment Group of 12 local councils wants residents to be able to swim in the river by 2025.

But, warns O’Neill, a couple of things need to happen before we can all go jumping into our urban waterways. “This requires a vision plus the political will and funding to make it happen, fundamentally it’s a land use and planning issue. Also, the public perception that urban rivers are dirty is deeply rooted and it’ll take some effort to change that.”

If these hurdles can be overcome, there are different options depending on the river’s water quality and access requirements. The proposed filtering Plus Pool in the Hudson River in New York, on which Arup advised, aims to clean the river little by little while providing a spectacular place to swim.

Whether or not cities are able to make their rivers swimmable, O’Neill believes it’s an aim worth pursuing because they’ll be better off just for having tried. “To me, safe and free access to public land and public waterways is a no-brainer and a basic right of all citizens. It will make our cities much better places to be.”

Download

Design with Water just got interactive

Download the Design with Water ipdf to learn more about the valuable work Arup is undertaking across the water environment in the UK.





Hunters Point South, New York

Spectacular views and a stunning riverside park have made Hunter's Point South the talk of New York, but it's the hurricane tested green infrastructure design that really makes this emerging neighbourhood stand out from the crowd as a model of urban sustainability and resilience. Vindication for the team's efforts came unexpectedly early when Hurricane Sandy slammed into New York in October 2012 and surging waters inundated the partially constructed park, only to drain away exactly as had been planned.

Conceived by the City of New York and backed by a legion of other public bodies,

the project is the city's largest residential development in decades and will eventually create 5,000 new housing units, with 60% available at below-market rates.

Phase 1 was completed in August 2013 with the opening of an elegant 11-acre park sculpted around an elliptical playing field and offering front row views of the Manhattan skyline. Arup was awarded Phase 2 of the project in summer 2014, which will add more streets, more varied parkland, shoreline wetlands and a promenade stretching out into the East River.



'Re-thinking Water' Exhibition, London

A new exhibition 'Re-thinking Water' went on display at Arup's offices in 8 Fitzroy Street, London with a successful internal launch on 23rd March.

The exhibition, a collaboration between Arup and artist Ian Mitchell, considered the complex relationship between water, technology, cities and the natural world. Ian's work, commissioned by Arup, interprets and represents the water cycle through 24 digital prints using his unique reductive graphic language. The works are personal, connecting memory, feelings and visual expression in response to a broad consideration of water over a nine-month period. The exhibition included a short film of Ian in conversation with Mark Fletcher, Arup Global Water Leader, and an interactive presentation exploring how Arup is re-thinking water and putting this into practice through our Design with Water framework.



"Current challenges linked to ecosystem protection, urbanisation, resilience and climate change, together with a renewed understanding of the benefits of integrated, ecological design are once again placing water at the heart of policy and planning. From global systems to human-scale design, this exhibition invites us to reflect on the water cycle, and its unique relationship with body, mind, culture and the built and natural environment."

— Mark Fletcher, Global Water Leader, Arup



Drivers of Change: Water

Arup's Drivers of Change investigate the key global issues and trends driving change in our societies and markets. It is one of the most well-known and comprehensive series of its kind. The cards are an effective way of raising awareness about our environment – both man-made and natural. They help initiate conversations, act as workshop materials, provide a foundation for further study and serve as an input for strategy and innovation processes. Drivers of Change: Water delivers a 2015 update of the previous water cards (first published in 2008). The new version was developed through a global programme of research, consultation and workshops. It includes new drivers such as smart infrastructure and waterless design, while continuing to highlight key social and political issues around water such as water access and privatisation.

[Click to view the Drivers of Change website.](#)

Social impact

Making an impact in the community

To date, 194 million people around the world have benefited from Arup's involvement across the water cycle during 2014-15. We embrace our role in influencing positive solutions to global water issues and take very seriously our opportunities to improve the lives of those we come in contact with. Our aim is to shape a better world for over 500 million in the next ten years.

This last year much of our 'social benefit' has been earned from a number of projects in two main areas: impact on water supply accounting for 42%, closely followed by wastewater at 33%. This is reflective of the demands placed on our global urban environments and the need to replace and improve existing systems.

Our global social benefit account

The benefit to people from our water activity during 2013-14 measures more than 194 million people around the world. We aim to shape a better world for over half a billion in the next 10 years.





Walk 4 Water

An event for WaterAid

In March 2014, 17 Arup staff members from our Melbourne, Sydney, Brisbane, Adelaide and Singapore offices participated in the WaterAid Walk 4 Water event.

By joining the campaign, the Arup team members committed to walk 10,000 steps a day for five days to raise much needed funds for WaterAid – a charity organization that transforms lives by improving access to safe water, sanitation and hygiene in the world’s poorest communities; including their neighbours in Papua New Guinea and Timor-Leste.

Collectively Arup staff from the Australasia region raised \$2,979.48 and Arup matched this amount from its Community Engagement fund, an approximate total of \$6K that Arup and its staff donated to WaterAid. The event has been a huge success as evident from the amount of funds raised and the number of active participants as well as support from the wider Arup community who generously donated for this great cause.

Some of the participants shared their experience of participation in the Walk 4 Water event.

“Nelson Mandela once said ‘let there be work, bread, water and salt for all’ – a simple, yet powerful message that it is still relevant in the 21st century. When I learned Arup was supporting the Walk 4 Water campaign, I enthusiastically joined the team to show my support for this extremely worthwhile cause. My journey to walk 10,000 steps a day was a great reminder of how easy it is to take water for granted and to reflect on those less fortunate. If in some small way, we have helped to improve access to safe water, sanitation and hygiene for the developing world, than every step was worthwhile!”

– Sarah Booiij, Arup Brisbane Office

“Walking 10,000 steps per day for Walk 4 Water was really great. It gave me a real appreciation of how far some people have to walk on a daily basis just to have access to something that I can get in 20 steps.”

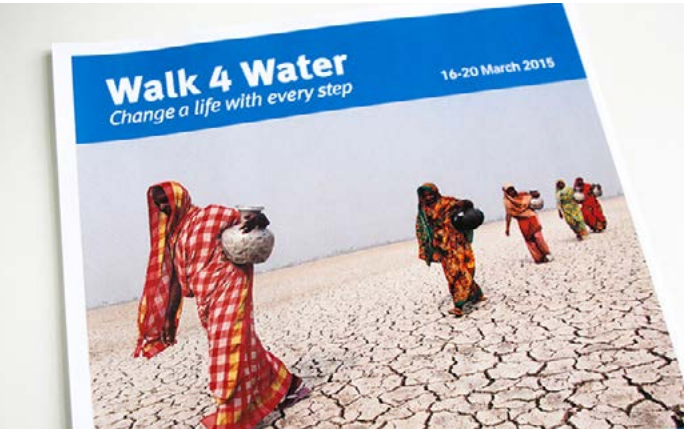
Katie Mackenzie, Arup Sydney Office

“I really enjoyed my time walking. I had a competition with myself to walk further and further each day. According to the trusty pedometer I clocked up 114,980 steps, which was plenty of time to think about those less fortunate than myself, not only walking but having to carry water back without tripping.

Everyone who knew I was doing this were so supportive and encouraging which inspired me to want to walk more.”

– Lynette Townsend, Arup Adelaide Office

[Click to view the Walk 4 Water website.](#)





City Climate Hazard Taxonomy

Cities have long managed the risks of sudden or chronic climate hazards, including extreme temperatures and flooding. With climate change, cities may begin to experience new or more intense climate hazards. Developed by C40 and Arup, the City Climate Hazard Taxonomy supports C40's commitment to help cities reduce their climate risk by providing a common language for stakeholders to recognise, assess, discuss and report on climate hazards they already face, and understand how these hazards may be influenced by future climate change trends.

The Taxonomy was created through wide-ranging research into existing scientific understanding of climate hazards with direct consultation with leading organisations working in this field including IIED, UNISDR, World Bank, Rockefeller Foundation and the 100 Resilient Cities.

C40 will use the Taxonomy as part of a broader programme to engage with cities around the world to accelerate local urban adaptation efforts and drive global collaboration among cities by tracking hazards from changing climate. The Taxonomy will also inform wider research on climate adaptation including C40's Climate Action in Megacities report.

[Click to view the c40 article.](#)



City Resilience Index - the Rockefeller Foundation

Urban populations face increasing challenges from numerous natural and man-made pressures such as rapid urbanisation, climate change, terrorism and increased risks from natural hazards. Cities need to adapt and thrive in the face of these diverse challenges - they must learn how to build resilience in an uncertain world. Armed with this knowledge and understanding, governments, donors, investors, policy makers and the private sector will be able to develop effective strategies to foster more resilient cities.

Supported by the Rockefeller Foundation, the City Resilience Index (CRI) is being developed. It builds on our extensive research to establish an accessible, evidence-based definition of urban resilience that culminated in the publication of the City Resilience Framework (CRF) in April 2014.

This provides a holistic articulation of city resilience, bringing together four dimensions that are critical for the resilience of our cities, namely: health and well-being; economy and society; infrastructure and environment; and leadership and strategy.

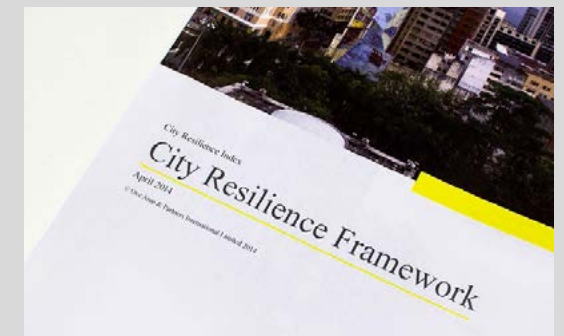
The index operationalises the framework by providing the means to measure and assess to what extent a city is achieving 12 key goals that contribute to its resilience. It will provide cities with a comprehensive, credible, and technically-robust means to assess and monitor their resilience in order to inform urban planning and investment decisions.

In this way, cities will be better able to survive, thriving in the face of diverse stresses and shocks.

[Click for more information on CRI.](#)

Download

Download the City Resilience Framework



Download the City Climate Hazard Taxonomy





engineers without borders

Engineers Without Borders, Australia

In March this year Michael O'Neill from our Melbourne office was selected to attend the Engineers Without Borders Australia Dialogues on Development program in Cambodia as part of Arup's Community Partnering commitment. The three week learning and engagement program took Michael along with three other Arup attendees on a journey to villages and rural Cambodia to observe first-hand the opportunities and challenges faced in this diverse and developing country.

Flying into Phnom Penh the cohort prepared for the Dialogues experience with workshops on community development, appropriate technology and the Cambodian context.

The topics covered included appropriate technology, capacity building, human rights, "volunteerism", corruption, child safety, NGO operation and gender issues.

"The program taught me that development is multi-faceted, complex but also rewarding and that we have as much, if not more to learn from developing nations on how to positively shape the future of this planet while responding to the challenges that life inevitably throws at us."

Michael O'Neill, Arup Melbourne Office

This was followed by a variety of educational visits to a number of smaller locally based NGOs supported by EWB to see how local people are addressing water and sanitation, infrastructure, energy, and livelihood development needs.

One of the partners visited was Rainwater Cambodia, a local NGO that designs and constructs rainwater harvesting and water supply schemes in rural areas. The visit focused on appropriate design to reduce costs and keep operational skill and maintenance requirements low. Rainwater Cambodia also explained the importance of community education in regards to hygiene and sanitation. This was witnessed first hand at a local school where they have been involved with hygiene education and installed a rainwater harvesting scheme that includes a handwashing station and new toilet facilities.

[Click to find out more on the Arup Community Engagement programme.](#)



Year in review

Activities and awards

This year has seen the global water team out and about a lot. We have been sharing our perspective on global water issues, our aims and foresights through high profile events, media, insights, topical studies, exciting projects and innovative communication pieces to name but a few.

The Future of Urban Water – what your city’s water supply could look like in 2040 – is a good example of our forward thinking. The report addresses a number of water scenarios and discusses possible solutions on how to better manage our precious water resources.

Over the past 12 months we have also received recognition for achievements through a number of prestigious awards. It’s been an exciting year.



Out of the Blue - Social and natural capital knowledge catalyst

On 14 April 2014, we launched our ‘Out of the Blue: new thinking on water, social and natural capital’ publication at an event in London. This knowledge catalyst looks at the future of water and how social, environmental and economic factors can be better understood and valued. It brings together new thinking across sectors, disciplines and from around the world, with knowledge/thought leadership pieces by senior figures and policy experts from NGOs, academics, agencies, businesses and Arup itself, with each contributing a piece on new thinking or practice.

Contributors include Lord Chris Smith (Environment Agency Chairman), Mark Fletcher (Arup Global Water Leader), Stuart Orr (WWF International), Anders Berntell (Executive Director of the 2030 Water Resources Group) and Professor Peter Guthrie (Cambridge University) amongst others.

A video featuring Sir Philip Dilley was created to accompany the publication.

[Click to view the Out of the Blue video](#)

[Click to view the Out of the Blue launch event video](#)



Climate Change Adaptation

Arup has produced a short animation on why water is at the heart of climate change adaptation, which was shown at the COP 20 United Nations Climate Change Conference in Lima.

The animation is produced on behalf of AGWA - The Alliance for Global Water Adaptation. Membership of AGWA is by invitation only and Arup was invited as a result of AGWA members seeing our ‘Design with Water’ water cycle-based framework and our work on resilience.

AGWA members include representatives from US State Department, US Corps of Engineers, Dutch Government, Stockholm International Water Institute (SIWI), IWA, UNFCCC.

[Click to view the AGWA animation](#)

[Download](#)

Download the Out of the Blue publication



The Future of Urban Water: What your city's water supply could look like in 2040

How will cities around the world use and manage their water by 2040? This is the question Arup worked with Sydney Water to investigate in a recently launched report, *The Future of Urban Water*. Using Sydney as a reference, the report explores how social, technological, economic, environmental and political trends could shape our urban water future.

The study outlines how cities could manage their water and how consumers might access and pay for it in four possible scenarios.

Scenario one: [Incremental improvements](#)

This describes a world with little change to existing assets and operations. Water services are user-centric and provide greater personal choice and control over service levels and pricing. This requires increased deployment of digital infrastructures and data analytics to cope with system peaks and fluctuating demand patterns.

Scenario two: [Better together](#)

A scenario where industry and utilities better collaborate across a centralised water supply system with an integrated provision of utilities. Customers enjoy a seamless experience across multiple, integrated utilities – including shared billing, pricing and customer services. This demands better cooperation between urban utilities through collaborative planning, shared protocols and open data.

Scenario three: [Autonomous communities](#)

A world in which households, communities and industries develop independence in water collection, processing and distribution. Services enable customers to manage and maintain autonomous water systems at building, community or industry cluster levels. Cooperatives, virtual networks and community platforms govern and operate autonomous systems and small-scale water networks.

Scenario four: [Survival of the fittest](#)

A scenario with greater competition for limited resources and restrictions to supply with high disparities in usage behaviour and access. Applications provide customers with real-time data and information about water consumption, availability and pricing. This requires differential water pricing and services according to availability of supply, service plans and customer behaviour.

“These scenarios help us understand possible pathways into the future and enable conversations about how we can influence and shape that future,” explains Mark Fletcher, the leader of Arup’s global water business. “By understanding trends and planning for the future, water utilities can improve customer experience, enhance the liveability of urban areas and get more out of their current and future assets.”



Download

Download The Future of
Urban Water publication





Arup storms WEFTEC 2014 with a global presence

With an exhibition hall spanning nearly 1 mile long and attendance surpassing 20,000 people, WEFTEC, the Water Environment Federation’s Annual Technical Exhibition and Conference, is the largest conference of its kind in North America and offers water quality professionals from around the world with the best water quality education and training, plus an exhibition with access to the most cutting-edge technologies in the field. This year, the conference took place in New Orleans, with several sessions focused on climate change and resilience.

Arup was well represented showcasing our work across three of our regions, including Janine Witko (New York), the Americas water business leader. Vincent Lee (New York) presented on “Stormwater Resilience in Post-Sandy NY: Green Infrastructure Framework and Prioritization.” Rhys Anderson and Michael O’Neill (both from Melbourne) represented Australasia with Rhys presenting a tale of two Arup projects, including the

award-winning Yarra Park in “Over Kill? The Regulatory Impact on Delivery of Innovative Water Infrastructure.” Lastly, our global water skills leader, Justin Abbott (Leeds) gave the exhibition hall audience a world tour of innovative Arup water projects in a session moderated by the UK Trade & Investment.

In addition to our presentations and attendance in the technical sessions, our evenings were filled with networking events sponsored by GE Power & Water, Woolpert and Water for People. The presentations and discussions we had with numerous attendees are just one of the many ways we continue to showcase our water business to our most important clients and partners within the water industry.



Oz Water 2014

OzWater, Australia’s largest water industry conference, was held in Brisbane in May 2014. A number of our Australasian region staff attended the conference and submitted technical papers. Ragini Prasad and Ed Beling submitted a paper of the business case for catchment management options. Rhys Anderson and Michael O’Neill presented a paper on the Yarra Park Water Recycling Facility and the impact of regulations on delivery of innovative infrastructures. Michael also chaired a session on integrated water management, demonstrating a strong knowledge and understanding of the area. The Arup attendees and presenters continued to demonstrate a strong commitment to technical excellence and knowledge sharing, and demonstrated the technical, innovative and valuable work we undertake within the region.



UK Ecobuild Conference and Exhibition 2015

Arup featured strongly at this year’s Ecobuild held in London in March. Martin Shouler, Global Environmental Services Engineering Skills Leader chaired the session on ‘Effective Urban Water Management’ which outlined a strategic vision for integrated water management for cities, bringing together blue, green and grey infrastructure in order to create reliable, resilient and sustainable water services. This theme was built on by Mark Fletcher, Global Water Leader, as he chaired the session and presented a key note on ‘Water Resilience for Cities - London’ together with Environment Agency, Great London Authority and Thames Water. The focus was on how London is responding to the challenges presented by climate change, urbanisation and population growth and what a water stressed London might look like if action is not taken. Some of the proposed solutions are already been taken forward at Nine Elms on the South Bank. Currently, the development is the largest regeneration zone in central London.



Shanghai Climate Change Risk Workshop 2015

Our Shanghai water team presented and participated in the Climate Change Risk Workshop, which was jointly organised by the Shanghai Meteorological Service Bureau and British Consulate-General Shanghai. In this, Lanzhu Shao from our Shanghai office drew on experience and lessons learned from our work in the Asian Cities Climate Change Resilience Network (ACCCRN).



Melbourne Cricket Ground

Following on from our engagement with the Melbourne Cricket Club and an initial 2 year operating period, we subsequently worked with the Club to identify a preferred approach for renewing operational contract arrangements, leading to the receipt of five high quality bids from reputable local and international operations contractors. We also provided technical advice in the development and review of the tenders which resulted in the Club achieving a significant reduction in operating costs while maintaining existing operating knowledge of the plant. Our ability to work closely with the client, our knowledge of the water industry locally and globally, and our depth of technical understanding contributed to delivering significant value to Club, far in excess of our costs.



Wet Network: connecting innovators with investors

New thinking, technology and solutions are required to help better manage our water systems. Sometimes good ideas need help to become successful. Three times a year Arup co-hosts the successful Wet Network water technology innovation event with Pinsent Masons, the international law firm.

As Wet Network’s technology and engineering partner, we are able to help promote new and interesting technology from across the globe. Wet Network provides an opportunity for innovators to present potential funders and other interested parties. At our 25th event held in London in March 2015, a number of companies who had previously benefited from presenting at Wet Network returned and updated the audience.



HotHouse Event - Arup keynote address

HotHouse events are for thinking people looking for something new and exciting in the sustainability space. It’s fast-paced, provocative, entertaining and accessible to everyone. At the November 2014 HotHouse event, the topic of how we can work with water to reimagine our cities of the future was explored. This involved ensuring security of supply, resilience to a warming climate and healthy liveable communities.

Daniel Lambert was involved in two talks at the HotHouse event: ‘Water, people and place’ and the ‘Future of Urban Water Infrastructure’ panel discussion.

[Click to view Daniel Lambert in the ‘Water, people and place’ talk.](#)

[Click to view the ‘Future of Urban Water Infrastructure’ panel discussion.](#)



DTX – Sustainable Drainage Design Guidelines, Hong Kong

This project is funded by Invest in Arup and will create an internal guideline for developing sustainable drainage plans for new and existing/adaptive development projects in Hong Kong. The guideline will identify local stormwater pollutants of concern, develop a list of up to 10 mitigation measures, establish performance and sizing criteria for design, and provide a summary of successful international case-studies.

The guideline will be based on a review of international best practice manuals from the UK, USA, and Singapore. The guideline will also capitalize on a test trial project of one rain garden and one bioswale concurrently prepared for the HATS Stage-2a wastewater treatment facility by DSD. The results will inform plant selection, sizing and treatment performance criteria for use on future government projects in Hong Kong.



Arup on the radio

Arup was recently interviewed on Sydney’s beach water quality. The interview was aired on 2SER.

Daniel Lambert outlined the issues affecting water quality for beaches and his views on how this could be improved.

[Click to listen to the interview.](#)



THE AMERICAN INSTITUTE OF ARCHITECTS

The Latrobe Award

The American Institute of Architects (AIA) College of Fellows has awarded the 2015 Latrobe Prize to the Arid Lands Institute for its 'Drylands Resilience Initiative: Digital Tools for Sustainable Urban Design in Arid and Semi-Arid Urban Centers.'

The \$100,000 award will fund development and testing of a proprietary design tool that supports water-challenged communities to capture stormwater resources.

Arid Lands Institute co-directors Peter Arnold and Hadley Arnold led a team that includes Rowan Roderick-Jones (Arup), Deborah Weintraub (Los Angeles Department of Public Works) and Leigh Christy and John Haymaker (Perkins+Will).

"Latrobe Prize funding comes at a crucial stage in the tool's development, as we continue to build it out and test it. Ultimately, the Drylands Resilience Initiative will result in a fully automated tool that supports communities and design teams developing distributed infrastructures, absorptive landscapes, innovative building systems, and water-smart public policy for drylands urbanism. The tools and systems developed and tested in Los Angeles will have potential applications in drylands globally."

– Peter Arnold, Principal Investigator and Director of Research for the Arid Lands Institute.

The Latrobe Prize, named after architect Benjamin Henry Latrobe, is awarded biennially by the AIA College of Fellows for a two-year program of research leading to significant advances in the architecture profession. The \$100,000 award will enable the team to further develop and test "Hazel," a digital design tool that aims to enable arid communities to design and build the infrastructure needed to capture, retain, and distribute stormwater runoff.

The technology builds on previous public- and private sector-funded research to maximise low-carbon localised water supply; shape water-smart urban planning, zoning, and building policy; identify key sites for public and private investment; develop pilot projects that are scalable and replicable; build water-conversant design professions; and support water-sensitive design education. Arup's Water and Energy Resource Characterization Model (WERCM) and Rainwater Harvesting Analytics with GIS (RHAGIS), both projects internally funded through Invest in Arup (IiA) and managed by Rowan, offer two fundamental capabilities of the future integrated "Hazel" model;

"We were impressed with the overall research plan, the working partnerships that were part of the proposal, and the social justice that was at the centre of the research."

David Cronrath, AIA

footprinting embodied resources in water and energy portfolios and optimising rainwater storage volumes based on daily, triangulated rainfall data.

"The critical global issue of securing low-carbon and sustainable urban water supplies within arid urban centres affects billions of people around the world. The Arid Lands Institute and its Drylands Resilience Initiative model a new way for design professions to partner with scientific and public policy communities to catalyse public imagination and action in the face of growing climate challenges."

– David Cronrath, AIA, Dean of the School of Architecture, Planning, and Preservation at the University of Maryland and chair of the 2015 Latrobe Award Jury.

The "Drylands Resilience Initiative" was selected by a jury of AIA Fellows following a presentation of research programmes by finalists.

Arup has long been a driving force in resilience planning and implementation for cities, organisations, and assets.



British Construction Industry Association Awards 2015

The British Construction Industry Association Awards are like the Oscar's of the civil engineering world; they set the benchmark for excellence in the field. The under £10m category, which our Green Infrastructure project won, is aimed at recognising and rewarding the smaller projects with the biggest impact. The Arup design won the award for Stebonheath School; a retro-fit green infrastructure project designed to manage surface water flood risk and river water quality whilst providing a green sanctuary in the heart of the town for pupils to learn and play. The project won as it offered something genuinely unique and ground-breaking in the UK – this is a real life example of how surface water can be managed in a more naturalised and sustainable way within the complex fabric of our old towns and cities; bringing wide ranging community benefits which go beyond flood risk and city resilience.



Consult Australia Awards - Future Leader Award

Receiving the Future Leader Award, Rhys was recognised for his leadership and considerable contribution to the firm, the engineering industry and the community. Rhys played a key role in the delivery of the Yarra Park Water Recycling Facility, and co-led the development of an early career professional's cohort within the firm.

In addition, Rhys manages the Australasia Region's water skills network. Demonstrating a strong interest in research, Rhys has sought co-research opportunities with both utilities providers and large users, and regularly presents to industry on wastewater treatment, groundwater desalination and the promotion of water recycling.

Consult Australia Awards - Gold Award

Melbourne's Main Outfall Sewer project was recognised with a Gold Award for Sustainability in Design. Arup applied its 'Design with Water' framework to this landmark project. Working closely with owner Melbourne Water we developed a vision for the corridor that would allow this substantial asset to once again be of regional significance. The design offers a number of features including 100ha of linear park providing a central spine through Melbourne's growing western suburbs; a corridor providing a number of symbiotic functions which benefit the environment, community and enhance the region's water balance. The space will also provide a haven for local flora and fauna, and improvements to water quality and stormwater harvesting and flood mitigation for the region.

The ICE Wales Cymru Prize - Ben Barr Award

This award is given to an outstanding civil engineer recently professionally qualified. The judges look for young people that have achieved excellence in their careers so far and have overcome barriers and challenges to get there.

Receiving this award for 2015 was Yvonne Murphy, a Civil Engineer for Arup based in Cardiff. Yvonne managed the delivery of a flood risk management scheme for a small valley community in South Wales, protecting a local community and promoting sustainability. Also a dedicated volunteer and member of Engineers Without Borders Young Professionals Network, RedR, Engineers for Overseas Development and an active elected member on the ICE Wales' Graduate and Students Group.

Water Industry Achievement Awards 2014

Sustainable Drainage and Flood Management Initiative of the Year - Winner
AMP5 Rainscape Stebonheath Primary School, Brynallt Terrace, Llanelli, Dyfed, Wales

Engineers Australia 2014

VIC Engineering Excellence Awards - President's Award
Melbourne Cricket Ground - Sewer Mining Scheme, Melbourne, Victoria, Australia

Zumtobel Group Award for Sustainability and Humanity in the Built Environment 2014

Urban Developments and Initiatives Category - Winner
Reconstruction Plan, Constitucion, Chile

Concrete Society 2014

Civil Engineering Category - Winner
Beckton Sewage Treatment Works, London, United Kingdom

CEEQUAL Awards 2014

Interim Client and Design Award
Cheddar Reservoir No.2, Bristol, United Kingdom

China Civil Engineering Society 2014

Tien Yow Jeme Civil Engineering Prize
Hong Kong West Drainage Tunnel

LAMA Community and Council Awards 2015

Best Civil Engineering Project - Winner
Greystones Harbour Development, County Dublin, Ireland

Institution of Civil Engineers 2015

Yorkshire and Humber Awards - Centenary Award - Winner
Scarborough Revised Bathing Water Directive

Yorkshire and Humber Awards - Smeaton Award - Certificate of Excellence
Mill Beck Reservoir, Market Weighton, York

Yorkshire and Humber Awards - Centenary Award - Certificate of Excellence
Bridlington Revised Bathing Water Directive

Knowledge, skills and people

Arup employs more than 12,000 people across the globe. Our community of talent and expertise grows every year, as does the global water skills network which now consists of over 1,406 people.

Our technical, commercial, financial and physical environments are always changing; the regions experience different market conditions, resourcing needs vary and there is a continuing need to keep our skills at the leading edge. At the same time we must continue to develop our staff and create opportunities to grow their careers.

Over the past year there have been a number of inter-office skills exchanges, strengthening local teams and sharing knowledge. In particular, skills in flood risk management, integrated water management and process engineering have been enhanced through staff transfers.



Water Asset Management: A vision and roadmap for the future

In October 2014, Arup hosted an event in Cape Town for high level leaders and managers across the Southern African water sector. The workshop focused on the trends and issues shaping change in water asset management, and the implications of these for asset managers in terms of future risks and opportunities. It is hoped that the outcomes of the event will inspire water utility providers, governments, cities and other related organisations in South Africa to think about the challenges and opportunities for asset management in the water sector, and to explore how these may be addressed going forward.



Water Leaders Group

Mark Fletcher is a member of the Water Leaders Group at Global Water Intelligence. This provides a unique opportunity to engage with some of the leading organisations and individuals across the global water sector. With recent Global Water Summits in Seville, Paris and Athens, this compliments our involvement at World Water Week in Stockholm, Singapore International Water Week, WEFTEC and WATEC. This is about support, engagement and thought leadership on the key issues affecting our world – water is right at the top of the global agenda.

futureagenda

The Future of Water – Future Agenda

Daniel Lambert and Michael O’Neill gave an initial perspective into the ‘Future of Water’ for Future Agenda, including an overview of the Global Challenge, Options and Possibilities and the proposed way forward.

[Click to read the article.](#)



Gobi March Ultra-Marathon for Water Aid.

Paul Taylor (Hong Kong) successfully took part and completed the Gobi March, a 250km ultra-marathon held between 1 and 7 June 2014 in far northwest China.

The 7 day race requires competitors to carry all food, clothing and bedding whilst completing four consecutive marathons within 5 day and a 72km mountain climb ending at Sayram Lake (elevation 2,000m) close to the border of Kazakhstan. Paul finished the course in 46 hours coming 49th out of 109 competitors.

[Click to view the Water Aid website](#)



Global Water Link, Melbourne

Last November Arup’s leaders and emerging leaders from our global water business converged on Melbourne for our biennial Global Water Link, joined by a range of specialists from our urban planning, landscape architecture, economics, environmental and international development offerings. This represented the first time that GWL has been held in the southern hemisphere, with Australia chosen in recognition of the world leading work and research being undertaken with regard to green infrastructure planning, urban resilience and implementation of programs towards water sensitive cities.

These core themes coupled with a strong emphasis on the benefits of collaborative cross discipline design were the focus of GWL this year and delivered under the broader banner of Water Urbanism. For the first time we opened the event to our important partners and clients who have a crucial role in how our cities ultimately deliver on the benefits that a holistic approach to water planning promises. A Collaborative Design Workshop focussed on future leaders tackling a shared problem based around Melbourne and implementation of green infrastructure to improve the Yarra River with a view to swimmability. At the

end of the session attendees could take the lessons learnt and knowledge shared back to their cities and organisations and begin implementation within their own local and organisational context. The problem was based on the premise that the ultimate goal of achieving swimmable waterways in highly urbanised environments is highly ambitious and visionary in most city contexts. Working toward this goal is a useful proxy for prioritising and measuring the success of catchment based initiatives which can be delivered at a number of scales by a multitude of organisations and individuals. It also sets the basis for a long term program of actions. A number of global best practice case studies were presented particularly around successful urban retrofit of green and blue infrastructure and water first design of greenfield urban areas.

Concurrently the Executive Water Business Forum was held and participants also toured the Yarra River by bike looking at Arup’s innovative work at the Melbourne Cricket Club and the home of the Australian Open Tennis along with tours of the Royal Botanic Gardens and a trip to the famous penguin colony at St Kilda pier to see first-hand the importance of improving water quality in our rivers and bays.

You can explore and contribute to the Collaborative Map to see examples of the opportunities, challenges and ideas of how Green Infrastructure has and can improve our cities.

[Click to view the interactive collaborative map.](#)



InterWater Australia

In October Michael O’Neill and Rhys Anderson spoke at the inaugural InterWater Australia conference in Melbourne. Michael presented on the topic of “Putting water first in urban development: What it means to put sustainable and efficient water use at the top of the urban planning agenda” while Rhys joined a panel debate tackling the topic of “Whether drinking recycled wastewater is inevitable.”

[Click to listen to the presentation.](#)

New Regional Water Skills Network Leaders

“Our Global Water Skills Network numbers continue to grow and broke through the 1400 mark in early 2015. We are looking to our new global skills leads to help co-ordinate our activities and we will be strengthening the network through the development of bespoke learning modules.”

Justin Abbott, Global Water Skills Leader

Research

Global Water Research Review 2015 and Research Roadmap

Arup has invested significantly in water research over the last 12 months. Our research programme is informed by our 3 year Research Roadmap, which was refreshed last year, with a focus this year on flooding; green infrastructure and catchment management.

Our programme includes:

Now Research - responding to current business needs

New Research - pushing the boundaries of a discipline

Next Research - opening up new business areas



Valuing green infrastructure

Definition and analysis of metrics to quantify the cost-benefit and value of green infrastructure in addition to water quality and flood risk management impacts. The research reviews existing data sources to develop metrics and empirical formulas using GIS. The research will produce a set of metrics that can be applied at multiple scales (site, city, regional) to quantify economic, environmental, and social benefits of green infrastructure solutions.



Cities and sea level rise

Successful cities need to understand and manage those risks that are of strategic importance and dominate their future well-being. This project collates current international work specifically related to flood risk from sea level rise, and aims to provide single, market-focussed guidance on the estimation of sea level rise and the assessment of risk/ vulnerability and adaptation/ mitigation interventions. The outputs will include references to tools, models and guidance documents and will be developed through collaboration with universities in Europe and North America as well as multiple Arup offices.

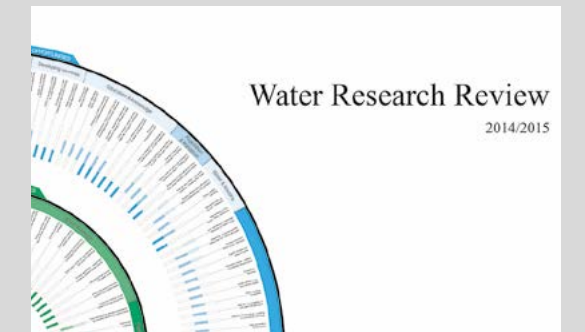


City resilience and 3D models

Creation of a navigable city model of Sheffield capable of displaying environmental information within a 3D games engine, in this case overland flow of surface water. The output is an executable game that can be launched from a computer and controlled with keyboard commands or an Xbox controller. The model is capable of being shared with our client to highlight flow routing in the city. Future developments include the potential to include traffic models or artificial intelligence for contingency planning.

[Download](#)

Download the Global Water Research Review 2015 ipdf



Regional activity

An Arup Global snapshot
Shaping a better world

This map provides a real snapshot of where Arup projects are around the world. What is immediately apparent is that we have been actively working in all four corners of the globe. In this review we are able to share only a small scope of projects we have been involved in within our key regions.

This last year has consolidated our position in more established regions whilst branching out in to critical areas such as Africa. As water becomes increasingly recognised as a diminishing priority resource, especially in the major cities in the world, we anticipate strengthening our partnerships in delivering long-term solutions.



Regional activity/
Americas



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The region has seen continuing need for resiliency planning and design and has worked to develop innovative approaches; achieving increased community resiliency for clients and physical adaptations to critical infrastructure features mitigating the impacts associated with flooding. The need for redundant and reliable infrastructure has also resulted in expanding water tunnel projects in the US, including water and wastewater conveyance and stormwater collection and conveyance.

There is growing interest and opportunities in an urban plunge movement considering the feasibility of revitalizing waterfronts with urban swim areas. We are also continuing work on waterfront park developments in New York City. The team has been instrumental in the planning, design and implementation of significant numbers of green infrastructure elements - reducing CSO impacts and improving water quality.



Corktown Commons Park, Toronto, Canada

Client: Southland-Technicore Joint Venture / Peel Region

Once home to a famous Canadian brewery, the park has been created in the hope it will become a catalyst for future development.

Water plays a prominent role in park design through two important features. The first is a series of water fountains called the Waterplay. The second is a marsh feature providing an oasis of quiet from the surrounding noise of the city. Supporting both of these features sustainably proved a significant challenge. For example, it was discovered that the marsh could not be fully replenished by rainwater alone.

To resolve this issue our engineers decided to filter greywater, generated from the water fountains, distributing it into the marsh feature. Any overflow from the marsh is then stored on-site for use in the park's irrigation system. The prescribed flow of water from the Waterplay to the marsh provides necessary oxygen levels required allowing an ecosystem to form and thrive within the feature.



NYC Department of Environmental Protection Green Infrastructure Initiatives

Client: NYC Economic Development Corporation and NYC Department of Environmental Protection

The Initiative focuses on leveraging green infrastructure to reduce combined sewer overflows, meeting and exceeding the water quality standards of New York City's waterways. As prime consultant we are managing the site investigation and design team for three separate sewershed areas (and contracts) that encompass nearly 1,400 acres in the Bronx, Queens and Brooklyn. Planning and design efforts include leading the civil engineering work on tributary drainage analysis, site selection, mobile data collection, GIS data management, detailed engineering design, and design services during construction.



Mexico City Airport (SAADMCR) Pre-Masterplan – storm drain design overview

Client: Aeropuertos y Servicios Auxiliares (ASA)

The Mexico City Airport's existing site has issues with capacity, and further expansion of the site is constrained by development. A new location has been selected but has proved challenging in terms of ground conditions and hydrology. A series of canals crossing the site feed the Casa Colorada pump station that diverts the flows out of the city. In periods of sustained rainfall a lagoon adjacent to the pump station stores water on the site. Considering these challenges, we have been instrumental in developing the conceptual design for the new airport's storm water system. Now approved, the design for this complex site includes connections to Conagua's proposed stormwater tunnel together with new storage lagoons at the site boundary to collect and treat stormwater runoff from the entire airport site. This strategy will free up the site for development.

Regional activity/
Americas



Pier 55, New York

Client: Hudson River Park Trust

The plans for Pier 55, an ambitious New York City park designed by Thomas Heatherwick, was announced to the press in December 2014.

Pier 55 will provide over two acres of public park and outdoor performance space on an undulating landscape rising to over 60ft above the Hudson River. The landscape will be supported by 264 'pots', each supported on piles down to rock. Our multi-disciplinary influence is stamped on the project, from the innovative tessellation of the pots to planning the three performance spaces.

The park plan will involve developing a stormwater management strategy that responds to the complex geometry and undulations, integrates the drainage design with the public realm, and ensures both the quality and quantity of runoff are managed prior to discharge into the Hudson River below.



Rim Forest Fire Emergency Geotechnical Design Services

Client: City and County of San Francisco Public Utilities Commission, Hetch Hetchy Water and Power

The fire started in late August 2013 burning over 400 square miles of the central Sierra Nevada region. This included a large portion of the Hetch Hetchy Water and Power (HHWP) system area including Hetch Hetchy reservoir that provides water and power to San Francisco and other nearby cities. Arup and its teaming partners assisted with emergency support services, first travelling to the area when the fire was still burning. Initially services concentrated on erosion control and rock fall hazards; evolving into a variety of design services, as needed. This included replacement bridges, water systems and tanks, highway guard rails and buildings. Environmental and historical constraints were ongoing considerations. Our services assisted with restoration of damaged and destroyed facilities, limiting further damage due to seasonal precipitation, and enhanced public safety in the fire area.



Hanlan Feedermain, Toronto, Canada

Client: Construction Joint Venture of Southland, Technicore and Mole (STM)

In the city of Mississauga we have developed the value engineering proposal for a 1500mm watermain; providing much needed redundancy to the city centre and enabling its continued expansion into a prominent urban centre. Also a 2400mm water main which will provide much needed infrastructure upgrades across the wider region.

Our proposal has eliminated many of the original vertical alignment changes to allow a single tunnelled section and a single open-cut section; significantly reducing the traffic staging impacts, construction zones and construction cost. Maintenance has been improved by providing single points of access to isolation valves and by-pass piping for the 1500mm and 2400mm pipe segments. We have also been responsible for the design of the tunnel, both rock and soil shaft initial support, as well as excavation support for valve chambers and open cut pipeline.

Regional activity/

Australasia



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Arup has continued to develop its reputation as a thought leader in the water industry in Australasia. This reputation has been developed through the provision of strategic advice to water authorities in both urban and rural areas. This advice has focussed on key risk and opportunities for our clients business operations including asset management, demand management, business case analysis, integrated water management, liveability, privatisation and effects based licensing.

Our ability to successfully provide this strategic advice (to both the public and private sector) has been underpinned by our strong design capability in water supply, wastewater, desalination, dams and stormwater management.

Arup's success over the last 12 months has been highlighted by the delivery of innovative and first of a kind projects and a diverse range of project and individual awards.



Development of Nutrient Emission Abatement Roadmaps, Queensland

Client: Queensland Urban Utilities (QUU)

Growing populations mean increased wastewater flows. Environmental legislation and licensing conditions limit the flows and pollutant loads that can be discharged to waterways. Price regulation, political pressure and scrutiny by the Queensland Competition Authority means there needs to be robust, transparent business cases for future investment.

Faced with all these challenges, we have been commissioned by Queensland Urban Utilities (QUU) to develop licensing roadmaps for all of its 27 sewage treatment plants.

Working on a catchment by catchment basis our team is looking at the most cost effective and sustainable options to manage the treated wastewater discharged from each treatment plant. The ultimate objective of the project is to streamline licensing discussions with the Queensland Government and provide greater certainty to QUU planners regarding future upgrades and the need for future capital expenditure.

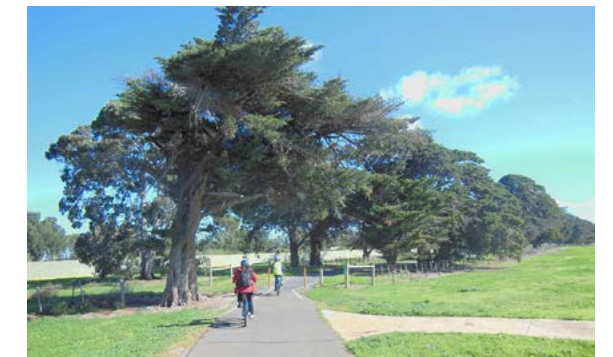


Mornington Island Water Infrastructure Project

Client: Queensland Department of Infrastructure and Planning

Arup designed and managed this important project; involving major water supply and sewerage infrastructure upgrades in the remote indigenous community of Gununa. Our rigorous analytical approach identified numerous opportunities to reduce costs, enabling the limited budget to focus on the highest priority works for the community.

Our role included scoping, concept and design extending through to tendering, procurement and construction project management, working collaboratively with the government and local councils to identify the highest priority works. Key components included pump stations, chlorine disinfectant system, water and sewerage reticulation, artesian water bore, and wastewater treatment lagoons.



Melbourne Water Transformational Asset Management

Client: Melbourne Water Corporation

We have been commissioned to develop a transformational Asset Management Strategy, reflecting the complete business transformation Melbourne Water is currently going through - shifting from an asset focussed business to a customer service focussed business. The implementation of the new Asset Management Strategy will result in a number of existing policies and strategies being revised.

The document has been developed through information extracted from a number of steps including customer interviews, challenge workshops with key stakeholders and environment scans. Our role also involved developing an Implementation Road Map, a Benefits Realisation Plan, a Change Readiness Plan, and a Future Governance Plan.





Sydney Water Demand Management Decision Framework

Client: Sydney Water

Arup, in conjunction with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), is working with Sydney Water to deliver a decision support framework and assessment tool to explore, assess and prioritise potential water demand management programmes across Sydney Water's delivery areas. A recognised world leader in demand management, Sydney Water is looking to explore next level opportunities which are economically viable to implement across supply geographies and customer segments.

This innovative piece of work will assist Sydney Water in developing robust business cases and continue to optimise water delivery in the context of continued population growth and changing weather patterns.



City to the Lake, Canberra

Client: ACT Economic Development Directorate

One of Australia's largest urban renewal projects, City to the Lake is making the most of the best public land in Canberra to create a city that is vibrant, modern and dynamic. There are some amazing views and the project aims to extend the city address all the way to the lake. It's an ambitious and is really transforming the landscape.

Arup is developing the major Masterplan in Canberra including stadium, conference centre, new waterfront, and major road infrastructure.

The City to the Lake (CTL) is a key project under the draft City Plan and the precinct intervention is the basis for transformational urban development that will knit Canberra City with the Central National Area, by allowing implementation of linking the city to the Central National Area consistent with the objectives of the National Capital Plan.

Regional activity/

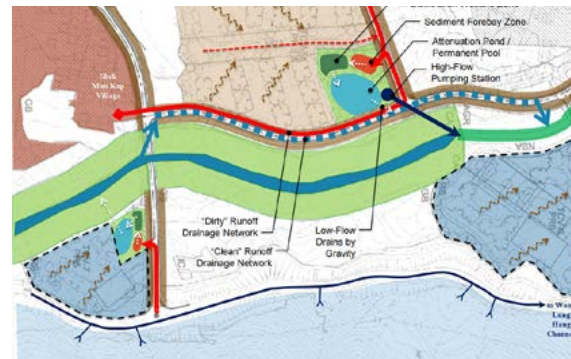
East Asia



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For developing Asia, there is a growing call to look at the serious challenges facing the water cycle more holistically and acknowledge water as a fuel, as the region faces rapid urbanisation, increased agricultural activity and a swelling industrial sector. Our water business is facing a changing landscape. Over the past year water skills are diversifying into new areas, as clients begin to tackle water stress issues. For example our water team in Manila is helping to deliver the new Putatan Water Treatment Plant to help provide additional resilience against diminishing water quality and quantity using innovative, efficient design solutions.

Involvement in China's water sector has also continued to grow. Services range from the initial planning of projects, in helping clients to integrate water into urban development by planning from the earliest stages to maximise the opportunities for sensitive water cycle management, to asset management advising water asset owners on how to improve operational efficiency.



Sustainable Drainage Design for the remaining development in Tung Chung - Feasibility Study, Hong Kong

Client: Civil Engineering and Development Department (CEDD)

The planned development in Tung Chung Valley will change existing land uses of the middle and lower reaches of the Tung Chung River and increase impermeable surfaces. Due to the high ecological sensitivity of the river and the low-lying ground level along the banks, a polder scheme consisting of raised earth embankments will be needed on both sides of the river to provide adequate flood protection. Arup is pursuing two major design considerations to preserve the natural environment of Tung Chung Valley; one addresses flood risk under the polder scheme while the other addresses stormwater quality. Arup is undertaking detailed 2D hydraulic modelling to minimize the height of the polder embankment, thereby reducing impacts to the river basin and saving substantial costs.



Putatan Water Treatment Plant 2, Manila, Muntinlupa City, Philippines

Client: Maynilad Water Services Inc.

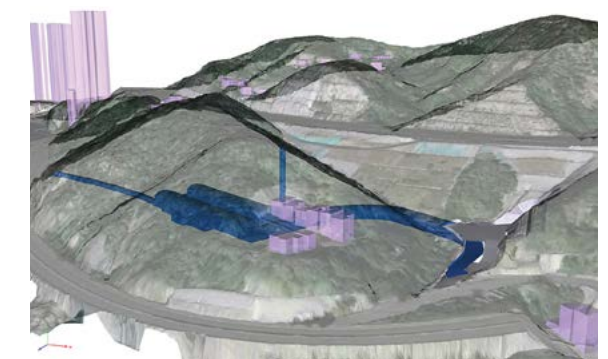
We are providing consultancy services for the design, procurement, and construction management of the proposed Putatan Water Treatment Plant 2, which will be designed to give a maximum output of 150 MLD. The aim of the project is to improve water supply coverage in the southern part of the Manila's West Zone and will strengthen resilience to climate-induced water supply scarcity in the future.



Yongding River Sustainable Storm Water Management, Beijing

Client: Beijing Municipal Institute of Urban Planning & Design

We are developing a sustainable urban drainage system for the Yongding River Ecological and Cultural Area in the Fengtai District of Beijing, as part of Changxindian, a new low carbon city development. The low impact rainwater development plan for this area is expected to improve flood resilience, targeting the retention and storage of surface runoff for a 50 year flood return period. The system designed is a combination of Best Management Practice, integrated ecology and conventional drainage planning and was developed using SUSTAIN modelling software.



Sham Tseng Sewage Treatment Works, Hong Kong

Client: Drainage Services Department

We are carrying out a detailed feasibility study into the possibility of relocating an existing 56,000m³/day sewage treatment works into innovative rock caverns in order to release scarce land for the future development of Hong Kong.

Regional activity/

Europe



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Last year we continued to develop our strategic water skills network. Opportunities arising from the implementation of the Water Framework Directive, and the Flood Directive, has provided us with a good source for tenders. Ireland has instigated a major coastal flooding protection programme which we are actively involved in and we are also planning to win more work from this scheme.

Next year we will be focusing on Turkey and the Balkans. Significant investment by the World Bank and the European Bank is being offered for reconstruction and development in the water industry, water resources and hydropower. We will jointly support this initiative in liaison with other local offices. Our engagement with the Irish Water Framework has provided real opportunities and a focus for further developing our work there.



Centre for Water Excellence, Krakow, Poland

Client: MPWiK Krakow

Water Treatment Works Bielany is the oldest treatment works supplying potable water for Krakow Municipality. Krakow Water Company (MPWiK) intends to undertake modernization of the plant to increase its treatment capacity and secure source of pure and wholesome water for the city.

Arup, with Israel's National Water Company Mekorot, one of the world's most experienced water companies, is working on a concept design that combines the modern treatment works with research and educational facilities, creating a technologically advanced Centre for Water Excellence.

The Centre aims to provide a nourishing environment for collaboration between academics and practitioners in water industry on a local and global scale with particular focus on innovative water technologies. This will further develop our Client's leadership capability in water technology and infrastructure asset management.



Swords Bus Rapid Transit, Ireland

Client: National Transport Authority

Arup have been engaged as lead designers for Bus Rapid System (BRT) for Dublin. The BRT route from Swords to the City Centre is approximately 20km in length and crosses seven watercourses.

The water team in Dublin are responsible for a detailed design of the drainage network for the scheme. We are also preparing a Flood Risk Assessment for the project and will explore potential flooding impacts on watercourses and the existing drainage network as well as risks to the BRT due to existing flooding issues. The proposed design includes the construction of a new bridge over the Ward River. The bridge lies in a flood prone area and will require compensatory floodplain storage to ensure there are no impacts on the surrounding lands. The water team are completing hydrological and hydraulic modelling of this bridge to feed into the overall design process.



Coastal Protection Works Cloughaninch, Ireland

Client: Clare County Council

Arup was appointed to carry out a detailed coastal flood and erosion risk management study to identify and model the coastal processes in Cloughaninch and the surrounding area.

A suite of models are to be developed as part of the study to simulate the water levels and velocities associated with extreme coastal surge events, investigate wave overtopping conditions and simulate the sediment dynamics and long term future coastline evolution.

The results of the models will be used to create flood risk maps, coastal erosion and coastal accretion risk maps for both current and future scenarios. Following a preliminary environmental assessment and stakeholder consultation, an assessment of the various engineering options to address the risk of flooding and coastal erosion will be undertaken.

Regional activity/

UKMEA



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Our work with Welsh Water and Yorkshire Water continued with increased focus on achieving ambitious efficient targets. Our new relationship with Severn Trent Water generated work in the Midlands and we continued to play a key role in the largest water infrastructure project in the UK - Thames Tideway. All this work is fostering strong relationships with leading contractors.

Arup's city-scale resilience work helped develop opportunities with a wide range of Local Authorities including Bristol, Leeds and Sheffield City Councils. We continued to work with the Environment Agency/Natural Resources Wales and developed a new relationship with the Scottish Environment Protection Agency.

Our skills have supported a range of infrastructure owners and operators by helping them to improve the resilience of their assets. Our work in the sphere of water sensitive urban design has increasingly been recognised as industry-leading.



City-scale Flood Resilience Projects

Client: Various Clients

Arup's work on city-scale flood resilience projects, an area where we are established leaders, continues to grow. Working with the Environment Agency we are developing a £1bn investment strategy aimed at protecting communities, industry and agriculture from the effects of sea level rise on the Humber Estuary, with particular focus on the city of Hull over the coming century.

We have been appointed by Bristol City Council to manage a major study, already scoped by Arup, balancing flood risk against the city's plans for future economic growth. In the City of Leeds, construction of a £45m

Arup designed scheme, removing flood-risk related obstacles to city-centre regeneration, is already underway. Finally Sheffield City Council has recently appointed us to look at a major scheme improving the long-term flood resilience of Sheffield.



Nine Elms Development, London

Client: Nine Elms Partnership

Arup is at the cutting-edge of promoting water sensitive design on major new developments. In London, Nine Elms is the first project in the UK of its scale where water management has been considered holistically in full collaboration with the main stakeholders - the Greater London Authority, Thames Water and our client, the Nine Elms Partnership which comprises most of the developers regenerating the area.

During this Partnership our water specialists have developed an understanding of the current infrastructure capacity and estimated additional loads. This has resulted in an optimized integrated water management strategy that prevents or defers the needs for upgrades. Various sustainable and integrated water management practices are proposed that will make this development industry leading.



Elan Valley Aqueduct (EVA) Resilience Programme

Client: Severn Trent Water

The project is part of Severn Trent Water's Strategic Resilience Strategy to safeguard the area's long term water needs. The EVA supplies water from Mid Wales to 1.2 million customers in the Birmingham area; its continuous operation is critical.

The many challenges have included ageing infrastructure, a tightening of regulatory requirements and increasing customer expectations.

We have provided optioneering design services identifying cost effective alternatives to maintain a reliable supply whilst helping to achieve efficiency targets. This has involved consulting stakeholders, providing environmental statements for the schemes (including the provision of temporary access roads, ground investigations and flood risk, contaminated land and advice on waste). We have co-located staff ensuring rapid exchange of information and ideas resulting in efficient, responsive working practices.



RainScape Llanelli, Wales

Client: Dŵr Cymru Welsh Water / Morgan Sindall / Arup

This innovative scheme manages surface water in a town in South Wales using the Dŵr Cymru Welsh Water “RainScape” approach. The area has historically been served by a combined sewer network that drains both foul and stormwater flows. The strategy for the Llanelli catchment involves managing flood risk and discharges from the combined sewer network by lowering the rate and volume of stormwater entering the system in the first place. Instead, some solutions include temporarily holding stormwater in purpose-built landscaped features within the urban environment that create improved amenity for people and the environment.

The overall strategy will ultimately result in achieving benefits for Welsh Water customers and the environment in a way that is more cost beneficial when compared to using a traditional approach. The first schemes implemented won DCWW, Arup and Morgan Sindall, the UK Construction Industry Awards - Civil Engineering Project of the Year, 2014.



Scarborough Bathing Waters Directive Scheme, England

Client: Yorkshire Water

The £50m scheme is designed to help Britain’s first tourist resort’s beaches reach the highest bathing water quality standards. Marine impact modelling helps minimise the construction work whilst maximising the benefits. By understanding the detailed nature of the risks to bathing water quality the solution is refined, value engineered and optimised. The scheme still involves major engineering works, aimed at temporarily storing and pumping wastewater also upgrading the existing waste water treatment works. This is achieved through installation of a dedicated storm Ultraviolet light water disinfection system.

This is one of a number of major schemes where Arup has acted as lead technical consultant for Yorkshire Water in the AMP5 period. The scheme has won the coveted Centenary Award from the Institution of Civil Engineers’ Yorkshire Region, 2014.

Regional activity/

Africa



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Arup continues to address the challenges of water in Africa and are currently in the process of preparing industry leading guidance on asset management in the water sector. We have recently completed studies for the development of the new Foxwood Dam in South Africa and are providing a range of services to lenders on hydropower projects across the Southern African region. In Botswana we are working closely with Government to improve water and sanitation services in Maun at the edge of the renowned Okavango delta and with leading companies in the mining sector to address water scarcity challenges. In East Africa we are Chair of the Expert Panel for Dam Safety within the Kenya Water Security and Climate Resilience programme and have assisted GIZ with a strategic water resource assessment in Uganda.



Grootegeeluk Mine Water Study, Lephalale, South Africa

Client: Exxaro Coal (Pty) Ltd

Recent expansion of the mine has increased annual water consumption, and development of inter-catchment bulk water transfer has significantly increased cost of water, resulting in increased financial risk to Exxaro. Arup was appointed to develop the mine's pit water management to minimise the need to import fresh water to site and to reduce flood risk within the pit.

Arup has rationalized current and future surface water catchments and determined critical storm flood flows using the MicroDrainage software package.

Management of water storage and supply has been determined in conjunction with a new water balance for the pit. Development of a water balance optimises potential for re-use of captured stormwater in the process.

Dewatering and water treatment options were developed for future scenarios over the life of the mine and beyond mine closure.



Risk in governance in the South African Water Sector

Client: The Water Research Commission

In collaboration with the University of Cape Town, Arup is undertaking a research study on behalf of the Water Research Commission, investigating risk governance practices in the South African water sector. We will develop a risk maturity assessment tool and use this to interview stakeholders including water boards, water utilities and municipalities. The findings from the assessments will provide us with an understanding of the range of risk governance maturity levels. More importantly the study will explore how risk management and governance activities are integrated into wider municipality or business functions, inform strategic decision making and where such integration adds value. We will produce a compendium of case studies showcasing examples of best practice, and an implementation guide for risk managers to improve their risk governance capabilities.



Kenya Water Security and Climate Resilience Programme

Client: Kenya Ministry of Water and Irrigation

The achievement of Kenya's development objectives on food security, poverty reduction and economic growth depends on the ability of the country to efficiently use and manage its water resources. Through the Kenya Water Security and Climate Resilience Programme (KWSCR), the Ministry of Environment, Water and Natural Resources (MEWNR) has increased water storage per capita through new reservoirs and improvements to existing dams. A Dam Safety Panel of Experts was established by the MEWNR in September 2013 to provide independent review and recommendations to the Government for ensuring that safety issues of dams to be financed by the KWSCR are adequately addressed in terms of design, construction, operation and maintenance as required by the Dam Safety safeguard policies. Arup is providing the Chair of the Dam Safety Panel who is advising on dam engineering and construction aspects of several planned dams.





Foxwood Dam Feasibility Study

Client: Department of Water and Sanitation, South Africa

Arup was appointed by the Department of Water and Sanitation to investigate the feasibility of developing a multi-purpose dam at the Foxwood site on the Koonap River near Adelaide in the Eastern Cape, South Africa. The project is being considered for implementation as a strategic initiative to mobilize the water resources in the Koonap River as a stimulus for socio-economic development in this rural, economically depressed region. Key areas of the study include: hydrology and ecological water requirements, assessment of domestic, commercial and irrigation water requirements, models for sustainable

irrigation schemes, dam type and option analysis, economic impact assessment, stakeholder engagement, public participation and environmental screening.

This vision is assessed in the context of agricultural development, land reform and rural development policies within the framework of the National Development Plan (NDP) of South Africa.



Innovative solutions to water scarcity for mining clients

Arup has assessed and identified innovative means through which the resilience of future water supplies to the year 2050 could be improved at a major mine in Botswana. Our scope commenced with a technical and commercial assessment of a desalination plant that can treat ground water that is over four times as saline as sea water with costs offset through the commercialization of salt based products.

Arup independently identified an alternative option that involves capturing water that is currently being evaporated to the atmosphere by a separate industry.

This offers a 'win win' scenario to both parties; with our client receiving a water supply that was entirely 'new water' for which there is no competition from other users. Arup has subsequently been working to help prepare the justification for the business plan. This has involved assessing alternatives and demonstrating the risks that exist under a business as usual scenario.

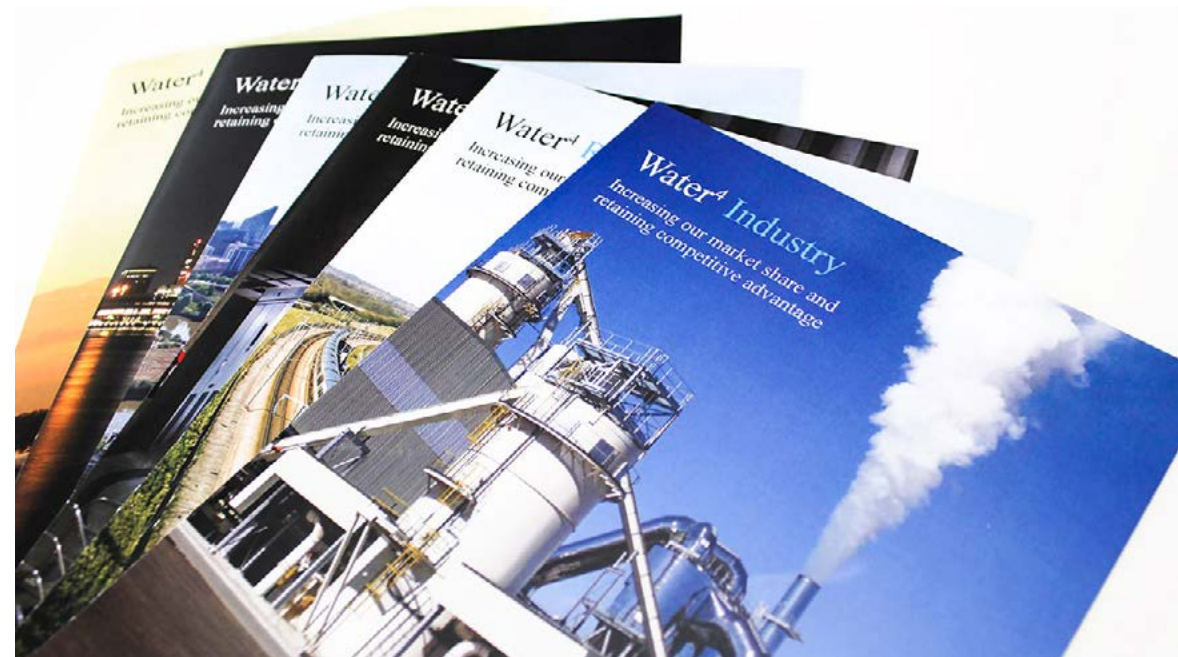
Our services

About Arup

Arup is the creative force behind many of the world's most prominent projects in the built environment and across industry. From 90 offices in 38 countries with over 13,000 designers, engineers, scientists, planners and business consultants delivering innovative projects across the world with creativity and passion.

Water at Arup

Our capability encompasses water in natural catchment systems, including flood risk management, water treatment and supply, its uses in municipalities, the built environment and industry, and its treatment, re-use, recycling and return to the environment.



Water⁴ The Water cycle in global markets

The water cycle transcends the built environment. Cities are located within river catchments, highways and railways cross streams and rivers and energy generation requires water for a variety of uses from cooling to hydropower. Airports use and recycle water and water is a key enabler for industry.

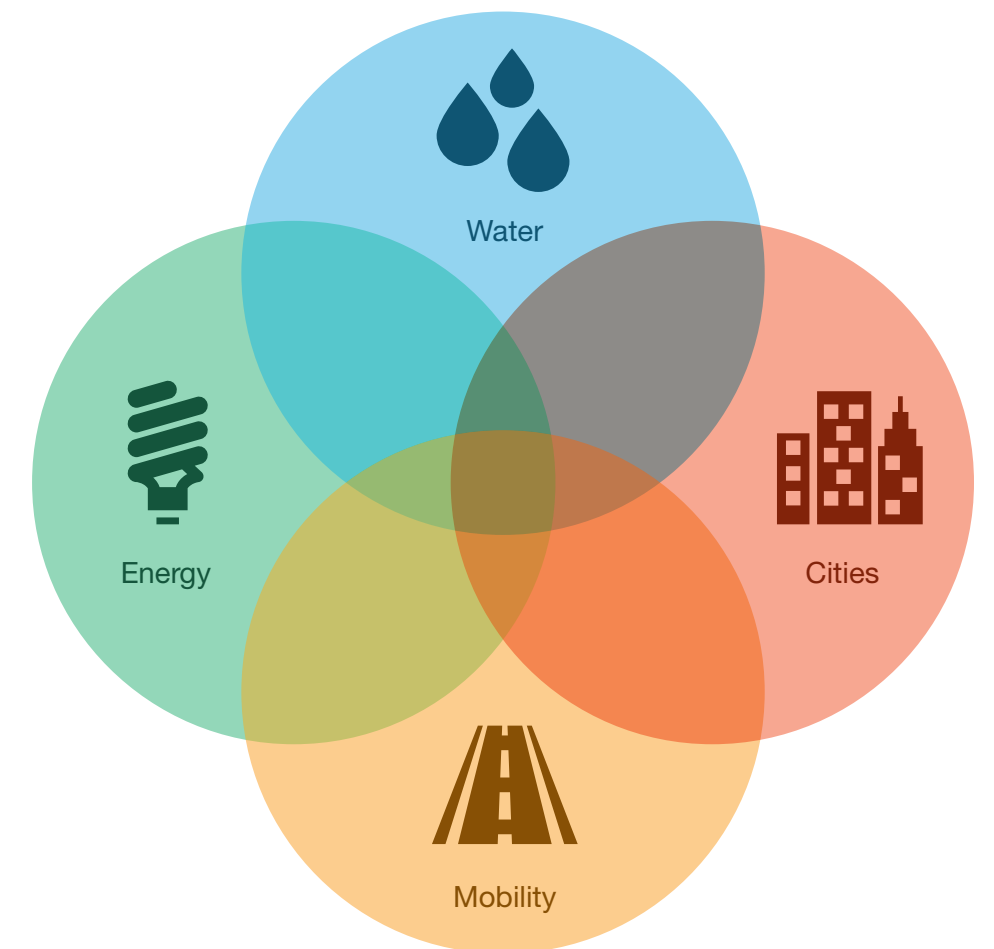
The Water⁴ project started with an internal focus, helping us to identify market areas within our own company where water was an important facet to the effective delivery of our projects. We have been able to provide specialist advice and expertise across the

water cycle, embracing and putting in to action our 'Design with Water' principles.

The Water⁴ initiative has helped us to refocus on water related services across the wider Arup group and the different markets within which we operate.

This simple diagram on the right illustrates the essential relationship the water cycle has in the context of major global markets.

For more information please contact Kathryn Kimball.
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Advisory services

Arup offers a unique blend of advisory services for water that integrates our technical, planning and design capabilities with our management consulting expertise in areas such as programmes projects and costs, operations, digital services and finance and economics.

These integrated services enable our clients to fully evaluate opportunities and better manage potential risks, whether they are delivering complex capital projects, or looking to improve the performance of their business.

During the past year we have helped clients successfully tackle a range of issues across the world: helping water utilities, such as Melbourne Water, revise their asset management approach to yield clearer customer outcomes; securing planning consent for new vital water resources; helping companies drive efficiencies in “Totex” through implementation of new systems and processes but more importantly through adoption of culture and behavioural change. We are identifying opportunities for further improvement through intelligent use of data analytics. We provided due diligence and corporate finance advice on water transactions such as hydropower, desalination plants in Africa and Europe and the Thames Tideway Tunnel in the UK.

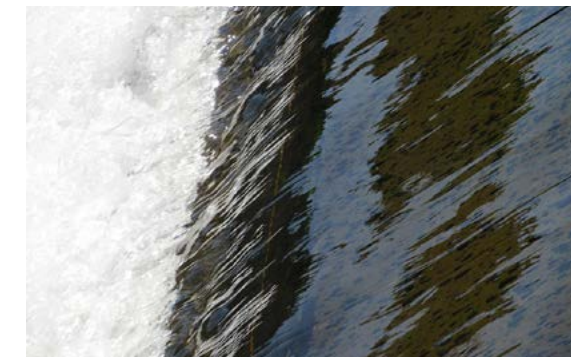


Cheddar Reservoir, UK

Client: Bristol Water

Preparation and submission of a planning application for a 9,000ML raw water storage reservoir, flood compensation nature area, visitor centre and associated amenity uses. The scheme comprises construction of a

new reservoir south of the existing Cheddar reservoir. The full planning application was approved by Sedgemoor District Council in November 2014, the first such permission in the UK for over thirty years.



E.ON Hydropower Portfolio, Spain

Client: Macquarie

E.ON have agreed to sell all of its Spanish and Portuguese businesses to Macquarie for an enterprise value of €2.5bn. Arup advised Macquarie to undertake technical and environmental due diligence of E.ON’s portfolio of energy assets in Spain which include 12 hydropower plants with a total capacity of nearly 700MW.



Melbourne Water Asset Management Strategy, Australia

Client: Melbourne Water

Melbourne Water has taken the initiative to overhaul their old business model to implement a new customer-centric strategic direction to demonstrate greater benefit to customers to support tariff increases. In collaboration with Melbourne Water, Arup developed the Asset Management Strategy, which pivots the focus from pure asset management to delivering on the promises within the Customer Service Charters.



Thames Tideway Tunnel, UK

Client: Thames Water Utilities

The proposed Thames Tunnel is being designed to capture flogs from the 34 most polluting combined sewer overflows that discharge untreated sewage into the River Thames. The tunnel will run up to 32km from West to East London and up to 75m below the bed of the River Thames.

We have provided a wide range of environmental and planning services to enable the project to progress through planning consents. We are also providing due diligence services to one of the shortlisted bidders for the financing of the project.



Stortemelk Hydropower, South Africa

Client: Stortemelk Hydro

The project is being implemented under the South African Renewable Energy commitments and project finance is provided by Rand Merchant Bank. The scheme is for the installation of a new hydropower plant in an existing dam on the river. On behalf of the lender, Arup have undertaken technical, financial and contractual due diligence up until financial close and are currently engaged for construction monitoring.

Awards



Partnership Awards - PPP Technical Adviser of the Year

Arup won the Global PPP Technical Adviser of the Year for the second year in succession at the Partnership Awards in London in May 2014. This recognised Arup's wide range of roles on PPP projects around the world.

Both of these prestigious awards recognise firms delivering excellence, achievement and innovation in infrastructure finance and delivery over the last 12 months



Infrastructure Journal Awards - Technical Adviser of the Year

Arup won the 'Technical Adviser of the Year' category at the Infrastructure Journal's Europe & Africa awards in February 2015. Over the course of the year, Arup used its knowledge of water transactions from around the world to support projects in expanding infrastructure markets and help to bring innovative pathfinder projects to emerging markets in Africa.

Advisory services

- Management consultancy
- Programme and project management
- Risk and security management
- Socio-economic impact assessment
- Data analytics & system optimisation
- 3D city modelling & visualisation
- Partnerships and funding advice
- Technical due diligence
- Planning applications
- Commercial strategy and management
- Planning policy and spatial planning
- Water resilience strategy
- Masterplanning and urban design
- Carbon management
- Energy strategy
- Asset management and BIM
- Water risk consultancy
- Water technology & research

Technical services

- Water resource planning
 - Dam engineering & planning
 - Hydropower
 - Water supply and treatment
 - Desalination
 - Water distribution networks
 - Water efficiency
 - Smart water management
 - Flood risk management
 - Natural flood management
 - River engineering and management
 - Green infrastructure & stormwater
 - Water re-use networks
 - Wastewater treatment
 - Sludge management
 - Coastal management
 - Tidal power
 - Renewable energy
 - Ecology and ecosystems services
- EIA and sustainability assessment
 - Catchment science
 - Feasibility studies
 - Anaerobic digestion
 - Hydroecological assessment
 - Integrated drainage modelling
 - Water quality assessment
 - Hydrodynamic modelling
 - Climate change studies
 - Community and stakeholder engagement
 - Mechanical, electrical and ICA design (MEICA)
 - Construction supervision
 - Health, Safety and Welfare management
 - Design management
 - Commissioning
 - Post-project appraisal
 - Resource efficiency and waste management



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Our people

Arup is already leading the industry when it comes to diversity and inclusion, however there is still more to do.

“If we can reach a stage where each man or woman is respected for the job they do, and is doing his or her best because the atmosphere is right, because they are proud of what we are and do and share in the general enthusiasm, then we are home.”

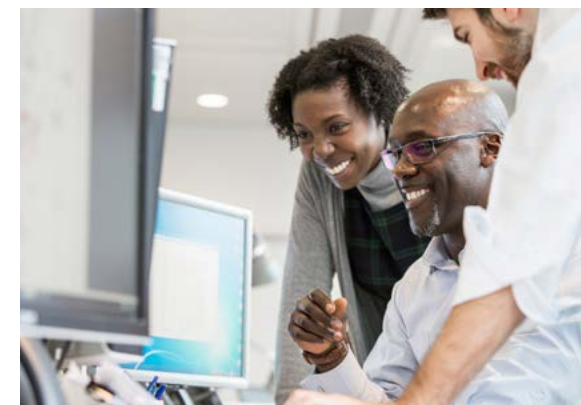
Sir Ove Arup



Diversity and Inclusion

Everyone is different and everyone's perspective matters. At Arup we recognise that diverse teams stimulate innovation and respond better to society's needs.

By embracing an inclusive culture that supports diverse talent, our people collaborate successfully and enable Arup to compete effectively.



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