MOTT
MACDONALD

Space

...to think

What we're thinking about

We look at challenges from a fresh perspective and never stop asking: ‘What if?’

At the start of every project, we ask ourselves: ‘What is the opportunity?’ That’s because, by challenging norms, we can unlock creativity and deliver long-lasting value.

For us the ‘opportunity space’ is where we can create better economic, environmental and social outcomes.

It’s a mindset born out of our status as an employee-owned company: with no external shareholders to serve, we have the independence to think and act in the best interests of our clients and communities. We are free to stretch our thinking and search out new connections.

This is our philosophy and culture, and it lies at the heart of our brand proposition: ‘Opening opportunities with connected thinking’.

This is what we do – in traditional sectors facing fresh challenges, and in the face of market-disrupting new trends, addressing climatic, demographic or financial pressures.

We make the most of our huge depth and diversity in skills, experience and geography by connecting our best minds, and by being connected to our clients and their end users.

In this review you can find out how we’ve been **opening opportunities with connected thinking** for others. What’s in your opportunity space?

Keith Howells
Group chairman

Cut carbon to cut cost

Carbon is fast catching up with cost as the construction industry's key bottom line.

The correlation between low carbon construction and reduced cost was identified in the UK Treasury's Infrastructure Carbon Review, which we co-authored in 2013. That's because carbon is a good proxy for the use of energy and resources, and therefore cost.

As with time and cost, using carbon as a performance metric encourages innovative design and construction solutions. On top of this, driving down capital and operational carbon reduces the impact on the environment, so whether it's to limit global warming or to reduce costs, cutting carbon just makes sense.

How can asset owners and managers begin to take advantage of the new bottom line?

Guidance is important, and we worked with the British Standards Institute to develop PAS 2080 – the first industry standard on carbon management in infrastructure, which was launched in May 2016. This standard provides a common framework for all members of the value chain to manage and cut carbon right through the delivery process.

But before you can begin to cut carbon, you need to establish a baseline to cut against. We developed the Carbon Portal – the first tool to calculate the carbon footprint of entire BIM-designed assets.

The benefits of carbon management are clear, and we envisage a time when carbon becomes fully embedded alongside scheduling and cost as the sixth dimension of BIM, with software providing automatic carbon assessments from the start of the design process.

It will take time for the infrastructure industry to get there. The Carbon Portal provides a glimpse of what the future has in store for the industry.

Thames Water

Super sewer is a clean winner

When it came to designing three of the five huge shafts for the Lee Tunnel super sewer, London's biggest environmental improvement project to date, completely fresh thinking was needed to meet tough performance criteria within a very tight budget. Reworking the shaft design saved 1500t of steel, cut construction time and reduced the risk of damage to the shaft linings due to steel corrosion over the projected 120+ year working life of the tunnel.

Project
Lee Tunnel

Location
London, UK

Client
Morgan-Vinci-Bachy joint venture for Thames Water

Driving down tyre costs with energy efficiencies

By making the most energy and water intensive processes more efficient at MRF's Trichy tyre plant, we've reduced its carbon footprint and contributed to annual cost savings of US$1M that enable the business to produce high quality tyres at more competitive prices. It's good for drivers – and for MRF's future prosperity.

Project
MRF tyre factory

Location
Trichy, Tamilnadu, India

Client
MRF

School lab earns top marks for sustainability

Dulwich College wanted to house its new science facilities in a sustainable building so we designed a thermally active building system connected to borehole cooling to maintain the temperature within 18 labs at a comfortable level. Our solution, believed to be the first of its kind installed in a UK school, is four times more energy efficient than conventional air conditioning. Operating the building's systems provides opportunities for teaching and learning, while additional educational value is derived from an energy dashboard which enables students to see the real-time benefits being delivered by the in-built technology.

Project
The Laboratory

Location
London, UK

Client
Dulwich College

Get ready for the smart infrastructure revolution

Data production along with our ability to process it is growing exponentially. Applying it to the built environment is changing how we think about these assets.

Every drop counts

H_2knOw-how, our innovative sensor-based water visualisation tool, has been used to control wastewater flows in cities including Wellington, New Zealand, dramatically reducing combined sewer overflows and the resulting environmental impact.

Project
Wellington CSO control

Location
Wellington, New Zealand

Client
Wellington Water

In mature economies, where the value of infrastructure 'in use' is far greater than that 'in development', there is little scope to increase capacity by building more physical assets, and constrained financial resources with which to do so.

However, demands for better service, population growth, urbanisation and pressures such as climate change mean asset owners and managers need to continuously improve performance.

Smart infrastructure is the most cost-effective way of making existing assets work harder. We've seen an explosion in the volume of data generated, from social media through surveys and surveillance, to SCADA, matched by ever greater capacity to manipulate it.

Smart infrastructure involves applying digital systems and thinking to economic infrastructure. It enables asset owners and operators to make better informed decisions, faster and cheaper, bringing incremental efficiencies that optimise performance and save cost – whether that's minute by minute operation or long-term capital investment.

Glimpses of what is possible have already been seen on the road network where real-time data allows traffic managers to avoid congestion by rerouting vehicles and relaying travel advice to commuters.

There is also potential for digital systems to simplify or automate the work of human operators. Going further, self-learning and self-improving infrastructure will revolutionise the sector.

The impact will be profound, enabling a shift away from asset creation towards asset management, and from a focus on capital costs to whole-life costs.

This will also bring massive changes to project execution, with linear delivery processes superseded by new processes which take the operational asset as the starting point.

These changes will be uncomfortable for developers used to current ways of working, but we are here to guide and support those willing to embrace the potential of smart infrastructure. Rewards are in store for those who do.

Making connections

Smart cities benefit from increased jobs and a rise in GDP. Our work in eThekwini municipality will extend broadband infrastructure. This will expand internet access and allow SMEs to tap into the digital economy, while paving the way for smart city applications in public service delivery including transport, logistics, utilities and e-government.

Project
eThekwini Smart City

Location
Durban, South Africa

Client
Development Bank of South Africa

Digital solutions made easy

Transforming business processes into digital solutions is often achieved using COTS (commercial off-the-shelf) products. But this usually means having to change the software to suit the business, or changing the business to suit the software. Neither approach is cheap, easy, desirable or guarantees successful outcomes. We use a new genre of low code/no code software to create solutions that are configured rather than coded, delivering solutions in days and weeks rather than months. This meets customer needs without the time or financial investment traditionally required to deliver bespoke solutions and, significantly, without compromising on quality.

Project
Online management systems, UK Government

Location
UK

Client
Cabinet Office and Department for Education

In times of crisis, think digital

In a crisis, decision makers need to share critical information quickly and effectively. Our crisis management tool Merlin supports strategic co-ordination by enabling access to real-time information through a secure, web-based collaboration platform. The product also provides a fully auditable record of incident management, allowing post-incident analysis and reconstruction. It has been used during the London 2012 Olympic Games and the Glasgow 2014 Commonwealth Games, where it supported transport co-ordination. It was also deployed at the Baku 2015 European Games, where it provided issue management capability during the event.

Project
Merlin strategic command tool

Location
Various locations in UK, Azerbaijan

Client
Local authorities and government clients

A more connected world

The economic and social vitality of a city, region and entire nation hinges on the ability to move people and goods quickly and efficiently.

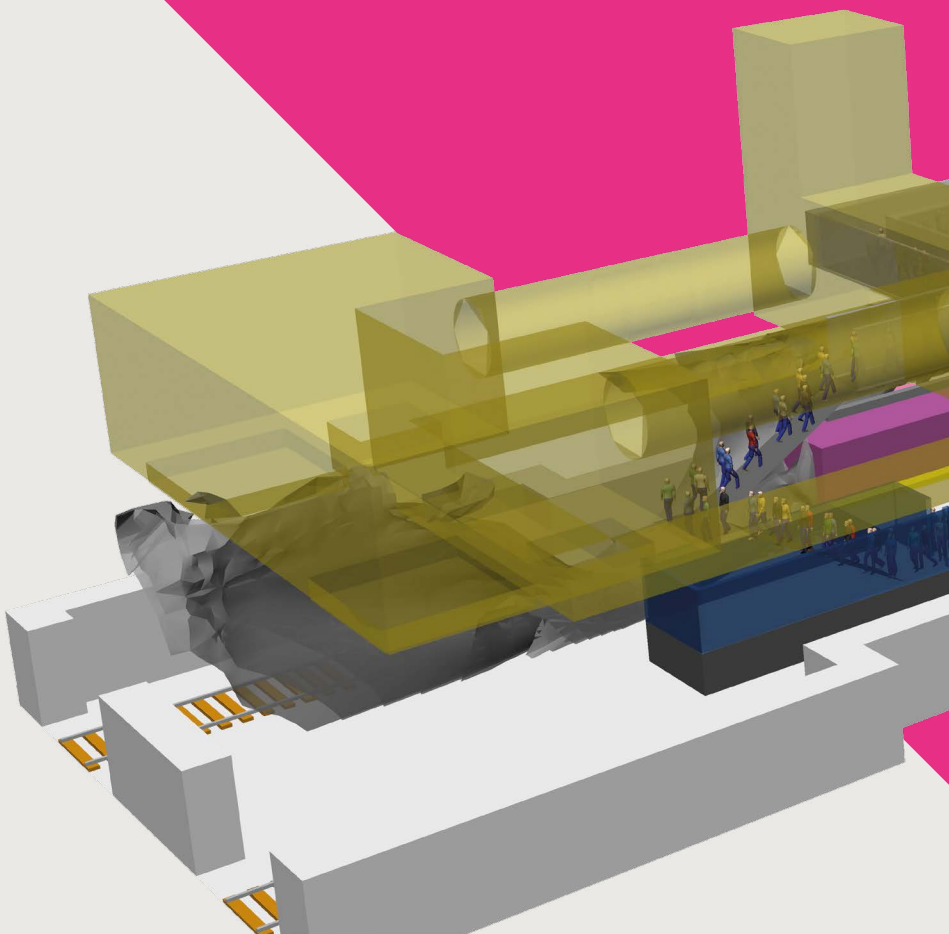
Tunnel vision? Not when it comes to passenger safety

Transport authorities attach the highest priority to maintaining passenger safety and at the same time demand more sustainable, cost-effective solutions. Fire safety in underground metro systems is all the more challenging because of the enclosed nature of tunnel environments. For LA Metro we used sophisticated computer modelling tools to design an on-board fire suppression system for train carriages that will protect passengers and achieve significant cost savings.

Project
Crenshaw/LAX LRT Corridor

Location
Los Angeles, USA

Client
Los Angeles County Metropolitan Transportation Authority



Transport hubs are hotspots for economic activity. They become fulcrum points for growth and enterprise that attract large corporations and services companies, SMEs and start-ups, universities and research institutes.

Improved local connections are routes to prosperity for deprived areas: they support regeneration and help to rebalance economic growth. Fully integrated transport not only brings employment and education opportunities within reach, it improves access to healthcare and recreation.

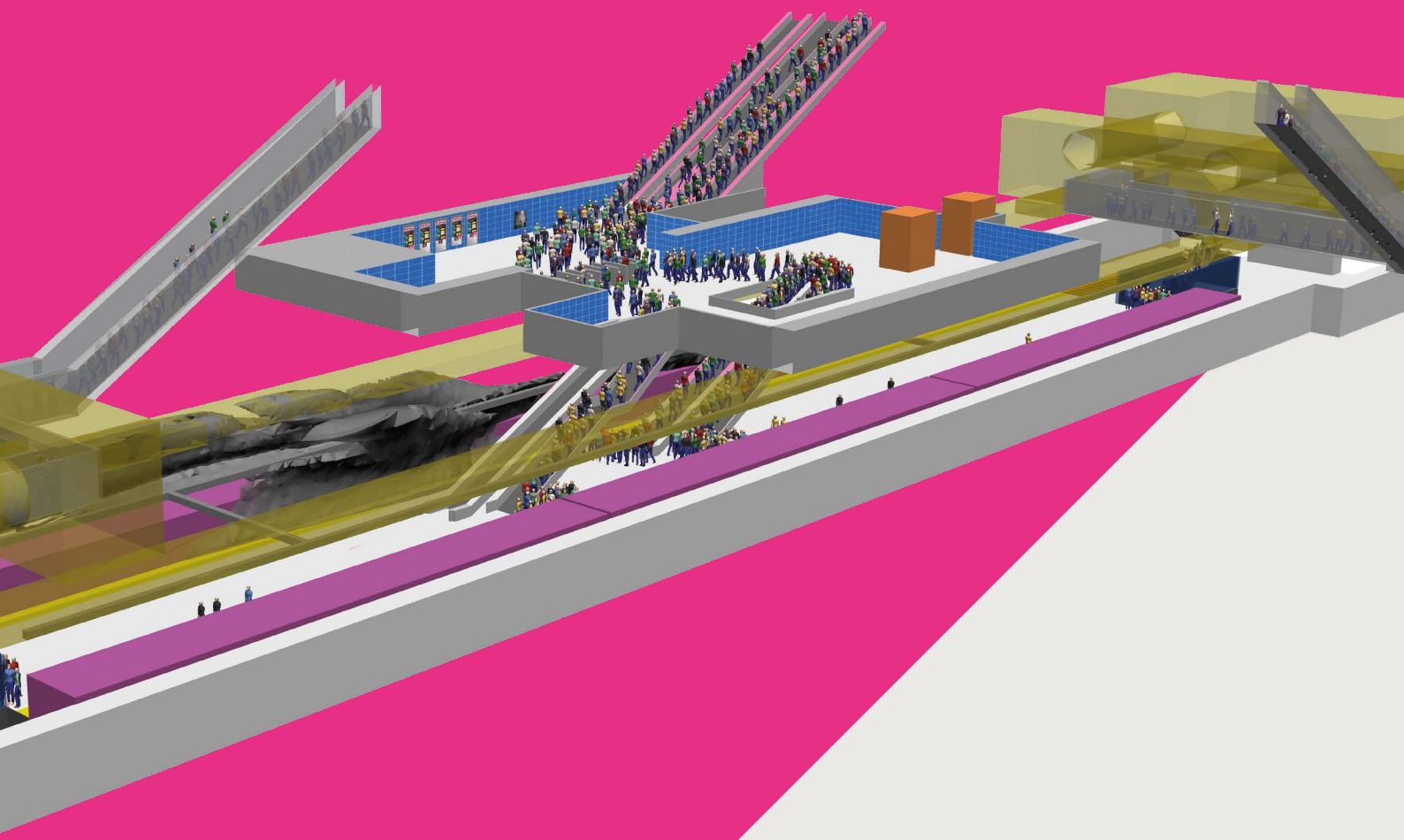
Transport infrastructure is on its own journey – a journey of transformation through digital technology. Personalised travel information and journey planning systems, integrated scheduling of public transport and smart ticketing systems are cutting congestion and making multimodal journeys simpler.

The UK rail industry is looking to find space for up to 40% more services on existing track through new traffic management systems. Similarly, digitisation is leading to the development of more sophisticated air traffic control systems that can boost capacity in the skies.

Smart motorways are increasing the capacity of strategic road networks while the roll-out of vehicle charging points will support the transition to low carbon electric and driverless vehicles, which will lower air and noise pollution.

The logistics sector is also adopting automated technologies – the cargo ships of tomorrow will be crewless – that will improve efficiency and cut carbon emissions.

We have been developing sustainable transport solutions for more than a century and understand the full value of any investment in transport infrastructure will only be captured if you consider the wider economic, social and environmental benefits. Our expertise will strengthen your business case for investing in a more connected world.



Planning ahead will bring savings down the line

For Baku's expanding metro system, we designed one of the main shafts for launching and receiving tunnel boring machines to share part of its structure with the yet-to-be-built neighbouring station. This will reduce their overall footprint and the amount of excavation required, meeting our client's demands to cut costs, speed up construction and reduce traffic disruption.

Project
Baku Metro

Location
Baku, Azerbaijan

Client
Baku Metropolitan CJSC

Aspirational design

Historic cities need modern transport systems but want new infrastructure to be in keeping with their distinct heritage and character. As part of Auckland's City Rail Link, we're taking a holistic approach to the design of three stations, striking a balance between cost, performance and sustainability while ensuring the architecture reflects local culture and the city's aspirations.

Project
City Rail Link

Location
Auckland, New Zealand

Client
Auckland Transport

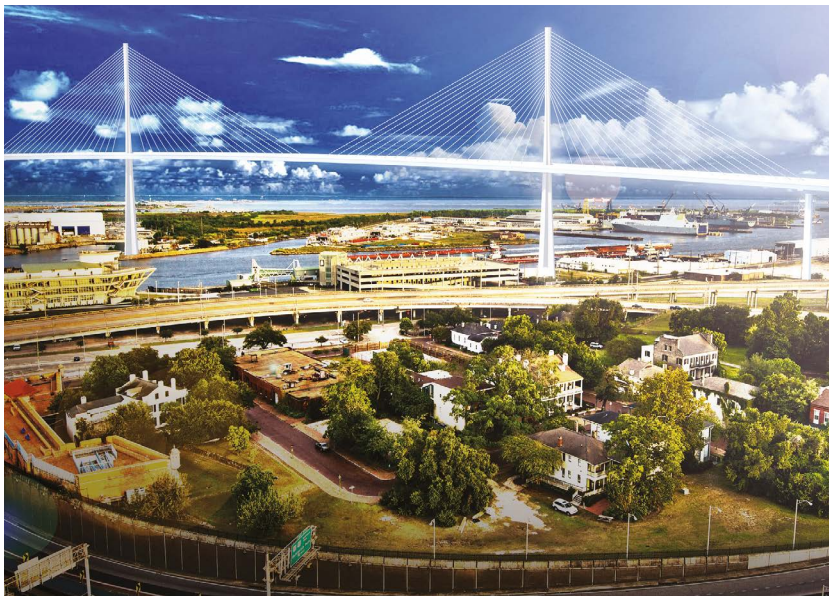
Working in another dimension

Crossrail, the biggest infrastructure project in Europe, is being built while London's existing transport systems keep on running. This was all the more challenging during construction of two shafts at Liverpool Street Station, the deepest on the new line. The accuracy of our 3D modelling of the site meant work was completed without impacting services on adjacent London Underground lines, located in places less than 5m away, and helped this part of the Crossrail tunnel construction programme to stay on schedule.

Project
Liverpool Street Station

Location
London, UK

Client
Crossrail



Building bridges

More capacity was needed to accommodate increased traffic crossing the Mobile River in Alabama. We are supporting the development of a suspension bridge, alleviating congestion on surrounding roads and transforming views with an iconic new landmark.

Project
Cable-Stay Bridge

Location
Mobile, USA

Client
Alabama Department of Transportation

Keeping people moving

It's not just airplanes that count. Journeys within airports need to be efficient too. That's why we are designing tunnels linking Terminal 2 and the new concourse building planned as part of Hong Kong International's expansion from a two- to a three-runway airport. The 2.6km tunnels will house an automatic people mover and baggage handling systems to speed passengers easily on their way.

Project
HKIA Three Runway System APM/BHS Tunnels

Location
Hong Kong

Client
Airport Authority Hong Kong

Time to take climate resilience seriously

Losses due to climate change are rising, but businesses can turn risks into opportunity.

Preparation is everything

From flash floods to droughts, Singapore has suffered more than its fair share of weather extremes in recent years. Our work will help the country's energy and telecommunications sectors to anticipate and remain strong in the face of climate change.

Project
Second National Climate Change Study (Phase 2)

Location
Singapore

Client
National Environment Agency

Fuelled by population growth and the drive for social development, the world's physical and social infrastructure is set to grow at an unprecedented rate, increasing its economic value three, four or even five times over the coming decade.

Economic losses due to severe climate events are recorded at over US$100bn/year and without urgent investment in climate resilience, the cumulative loss over the next two decades will be between US$5trn-US$10trn.

Although some residual losses from the most extreme of events are unavoidable, it is cost effective to protect against the majority of them.

Investing to avert up to 50% of the projected losses will provide good returns. However, asset owners will be reluctant to fund the balance, as costs will be disproportionate to company bottom-line returns. Here, there is an urgent need for innovative public-private funding arrangements.

There's a very good reason for taking action on this. Resilience isn't needed merely to protect assets. It is required to protect society – the customer base and workforce on which all business ultimately depends.

Climate resilient businesses benefit from a 'resilience dividend'.

As climate impacts hit rivals, resilient businesses can out-compete them and improve profitability thanks to the rebalance between supply and demand. They are better able to sell their services as they can show the strength to withstand external risks. This means they can also attract more funds from risk aware investors and financial institutions.

As climate impacts increase in frequency and severity, more businesses will be hit by extreme weather events. How well they resist and recover will depend on how seriously they take climate resilience.

Preparing the next generation

We are working in Nigeria to strengthen the physical and institutional infrastructure of the country's primary education sector. This has been a good opportunity to build in climate resilience and environmental education, so future generations of school children are equipped with essential information to build a resilient future.

Project
Education Sector Support Programme

Location
Nigeria

Client
UK Department for International Development

Tackling heat and water stress

The countries of the southern and eastern Mediterranean and Turkey are likely to suffer from increased heat and water stress as a result of climate change. Our study for Turkey looked at ways of reducing energy and water use, by introducing new technologies, establishing a policy dialogue and unlocking new finance streams.

Project
Climate Resilience in Buildings Framework

Location
Egypt, Jordan, Morocco, Tunisia and Turkey

Client
European Bank for Reconstruction and Development

Resilient irrigation

Agriculture is crucial to Nepal's economy, but the impacts of climate change combined with a burgeoning population pose major risks. Our study is helping to strengthen the country's irrigation schemes, making them more resilient to climate impacts and increasing food security.

Project
Framework for Effectiveness and Resilience of Irrigation

Location
Nepal

Client
Climate and Development Knowledge Network

Exit your comfort zone to boost sustainability

Embracing change improves an organisation's ability to manage risk, creates opportunity and strengthens commercial performance.

Sustainability can make you stronger and more successful. But it involves disruption and discomfort. The most effective leaders are those willing to move out of their comfort zones to embrace transformative change. Here's how:

Harness the power of competition

Create competition between departments and within supply chains. Get them to find radical and cost-effective ways of meeting your needs by breaking with 'business as usual'.

Turn risks into opportunities

Being aware of your business's strengths and weaknesses is the starting point for transforming risks into value by identifying which will deliver competitive advantage if adequately addressed.

Embrace big data

Gather performance data, analyse it, use it. And when creating new assets, embed instrumentation to see whether design assumptions are correct, then apply observations to following projects.

Invest for the long term

Conventional business plans requiring 5-10 year returns on investment prevent firms from looking at whole-life costs which often have the bigger bearing on the strength and sustainability of a business.

Question everything

Just because things have always been done a certain way doesn't mean we should continue to do them that way. Question standard solutions and practices, look at the potential of new techniques and technologies, and pilot new ideas.

Set audacious goals

Companies that use sustainability to achieve the most dramatic business improvements are those that have shaken free of 'current' thinking and set radical goals. Instead of asking 'What do we think we can achieve', they ask 'What would we like to achieve?'

Challenge suppliers

Every product or service supplier is an 'R&D centre' and a potential provider of innovations that will add efficiency. Specify the outcomes you want to achieve, not processes you expect in your design. Set ambitious goals, then empower your suppliers to pursue them, providing reward for doing so.

Sustainability isn't for the faint-hearted. But who dares wins.

Putting sustainability first

The redevelopment of 356 hectares of land at the heart of Toronto will boost jobs and economic growth in Canada's biggest city. But it's also an opportunity to ensure sustainability is built in from the outset. Our advice will help to make the new district low-carbon and climate resilient.

Project
Sustainability, innovation and resilience framework for Toronto Waterfront

Location
Toronto, Canada

Client
Canadian Urban Institute

Pollution isn't just an outdoor problem

It's a modern business dilemma: airtight offices are perfect when it comes to heating and cooling systems, but mean that chemicals released by building materials can accumulate, affecting indoor air quality. We specified healthy materials for the fit-out of a major new corporate headquarters, safeguarding our client's most valuable resource – their staff.

Project
Management and improvement of office health and wellbeing

Location
London, UK

Client
Major multinational company

Sustainability is a capital idea

Ageing infrastructure coupled with extreme weather events are focusing the efforts of utility providers on enhancing the resilience of their assets. Our management of Washington DC's water distribution investment programme is improving the efficiency and performance of its infrastructure by hardening assets, diversifying facilities, creating emergency plans and making cost-effective 'capex light' investments. The programme forms part of the capital's drive to become the healthiest, greenest and most sustainable city in the USA.

Project
Water distribution system

Location
Washington DC, USA

Client
District of Columbia Water and Sewer Authority

How do you solve a problem like Rotorua?

With its geysers, volcanoes, hot mud pools, steam vents and 18 lakes, the Rotorua District on New Zealand's North Island offers a spectacular, but environmentally sensitive tourist destination. When the local authority asked us to expand a wastewater treatment plant to meet the needs of the growing population, our water specialists came up with a solution that increased capacity by 40% while keeping costs low, and without enlarging the site's footprint.

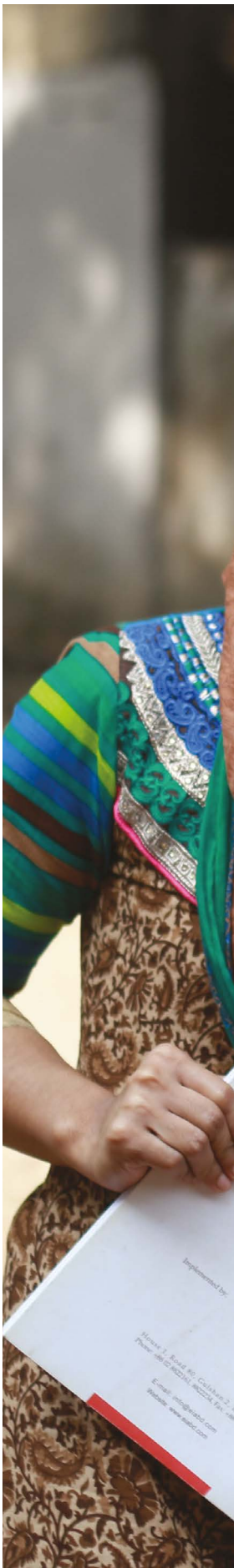
Project
Rotorua membrane bioreactor plant

Location
New Zealand

Client
Rotorua District Council

New tech in health and education

Effective health and education systems are the foundations of prosperous, progressive societies.



Technology is emerging as a key enabler in the global quest to raise standards of health and education provision and improve life chances for all.

Developed countries have ageing populations with long-term chronic diseases but financial resources are constrained. Innovative technical solutions can drive up efficiencies in established health systems to ensure sustainability of future service delivery and long-term financial viability.

Education authorities, under similar budgetary pressures, are benefitting from IT processes that save money and free up staff to deliver more frontline services in the community. As technology costs fall, educators will be able to deliver better educational outcomes and close achievement gaps.

Affordable technology can improve health and education outcomes in developing countries, too. The battle against deadly diseases such as tuberculosis is being aided by cost-effective equipment that can cut the time from testing to diagnosis from days or weeks to just two hours.

Around 90% of the world's poor are now covered by a mobile phone signal. We're breaking new ground by taking advantage of this to transmit learning content to teachers and students. Low-cost mobile phones and tablets can make excellent tools to aid teacher training and improve classroom practice.

Mobile learning can support education reforms and investment in skills that increase employment opportunities and stimulate economies, opening up a route out of poverty and into work.

We are also pioneering smarter uses of established mass media platforms – radio and TV, as well as the internet – to create learning opportunities for millions of adults who have previously had little or no schooling.

Our unique expertise lies in designing and implementing projects that reduce inequality through the application of the right technology.

Better learning can change lives and life chances – by the million!

An individual can find a better job by learning to speak another language. A nation will transform its economic prospects if it can improve the language skills of its present and future workforce. We have changed the landscape of English language learning in Bangladesh by developing innovative ways of using low-cost accessible technologies to aid teaching in the classroom and the community. By 2017, our programme will have improved the English proficiency of 7M students, provided support to 51,000 government teachers and given more than 28M adults access to learning.

Project
English in Action

Location
Bangladesh

Client
UK Department for International Development

The best of the old and the new

Counting with stones goes back thousands of years while learning by mobile communications could not be more modern. Traditional teaching aids can cost nothing at all but technology can also be designed to be affordable for developing countries. We are harnessing both old and new methods to equip teachers in Nigeria with the skills they need to be effective educators.

Project
Teacher Development Programme

Location
Nigeria

Client
UK Department for International Development

Economic growth starts in the classroom

Years of a child's education can be 'lost' if bad teaching goes undetected. At a national level, poor levels of education will hinder a country's growth and development. Our consultants are helping Jamaica to make sweeping improvements to its school inspection system that will improve life chances for young people and boost the island's economic prospects.

Project
School inspection system

Location
Jamaica

Client
Ministry of Education

Working towards a TB-free world

Tuberculosis (TB) is a curable disease but it still kills three people every minute. Early diagnosis and treatment is vital. TB REACH is a global programme that provides grants to organisations that make use of innovative technologies to improve detection rates among poor and hard to reach populations in low income countries. Our role is to assess whether the programme is delivering real value for money and achieving its intended outcomes – effective care for all who need it and the progressive eradication of TB. To date, close to 2M people have been treated in nearly 50 countries.

Project
TB REACH

Location
Worldwide

Client
STOP TB Partnership

Prefab-ulous!

Good transport links are crucial to successful regeneration. We are using all the benefits of Level 2 BIM to enhance collaboration and to maximise offsite construction techniques – bringing time, cost and material efficiencies to a major metro extension project.

Project
Northern Line Extension

Location
London, UK

Client
London Underground

Next generation construction

We're using design for manufacture and assembly (DfMA) to bring the many benefits of standardisation to construction, a sector where it has been traditional to design bespoke components from scratch for every project.

Grimshaw Architects

DfMA has the potential to significantly enhance safety and cut cost, carbon, waste and construction times. These benefits will be realised from the pre-construction design stage through to asset operation. And even though we are using standardised components, we can still create unique solutions that meet the individual demands of each project.

DfMA utilises building information modelling (BIM) technology to design assets from libraries of modular components which are prefabricated in factories and assembled on site.

BIM allows components to be designed and improved so they use the minimum amount of materials; they can be virtually integrated to assure a perfect fit. BIM also incorporates data – on dimensions, cost, carbon, power and water demand, procurement, commissioning, operation, maintenance and decommissioning.

Prefabrication delivers higher and more consistent product quality and eliminates much of the 25% wastage of materials associated with conventional construction methods. Switching work from the building site to the factory cuts labour costs – by up to a quarter – and improves health and safety as there is less handling of materials in situ. In the water industry, we have slashed onsite construction times by up to 90%.

Effort is traditionally spent designing bespoke solutions to problems that are superficially different but that often have much in common. BIM and DfMA allow that effort to be refocused where it is of greatest value – on meeting needs and objectives in the optimum way.

A landmark in design – and on the cityscape

When designing a new entrance to Leeds Station, one of the busiest in the UK outside London, our project team had to work around electrified railways, a river, residential properties and large numbers of pedestrians. Within this highly constrained site, we saved construction time and cost and reduced maintenance needs by using BIM to optimise the building's complex architectural geometry.
We also used the model to communicate key details to the construction and maintenance teams via walk-throughs and animations. Costs were further reduced by using offsite manufacturing techniques.

Project
Leeds Station Southern Entrance

Location
Leeds, UK

Client
Carillion for West Yorkshire Combined Authority and Network Rail

Legato by name, Lego by nature

When an earth embankment at Denton service reservoir showed signs of instability the tried and tested engineering solution was to support it by constructing a gabion wall at its toe. We saw the potential to apply design for manufacture and assembly (DfMA) to this challenge. Using precast concrete Legato blocks that clip together like Lego turned a slow and potentially dangerous task into a fast-track and cost-efficient operation.

Project
Denton service reservoir

Location
Greater Manchester, UK

Client
United Utilities

AHR Architects/Daniel Hopkinson

Good sense finance

Long before construction work begins – and long after it ends – it's essential for clients, users and investors alike that a project has been thoroughly risk proofed.

Get ready for take-off

Istanbul's new US$13bn airport is set to be the world's biggest, helping Turkey achieve its ambition of becoming the leading aviation hub, with vast direct and indirect benefits to the wider economy. We provided the due diligence to take the project to financial close, and are on the ground providing construction monitoring to ensure the design, quality and safety of work. And despite its scale, our support will ensure New Istanbul Airport opens for business within three years of the land being released.

Project
New Istanbul Airport

Location
Istanbul, Turkey

Client
Ziraat Bank, Vakiflar Bank, Halk Bank, Denizbank, Finansbank, Garanti Bank

As the world's pre-eminent lenders' technical advisor we know a thing or two about unlocking the investment needed to get new projects off the ground. Last year alone we advised on more than 230 PPP/PFI projects in 39 countries, bringing public and private sector together to realise new assets.

The best designed assets bring economic benefits while having a positive social and environmental impact. Resilience is also important – in the event of unexpected social, economic, climatic or natural shocks, well thought through designs and business plans impact on service and returns on investment alike. This is especially crucial in the developing world where much of the estimated US$5trn a year in infrastructure investment will be spent.

Sustainability and resilience are not traditional evaluation criteria. But evidence is mounting that they lead to direct and indirect financial returns. So we are using our experience in project finance to highlight the value of a more holistic approach to asset design and funding.

We are on the stakeholder council of SuRe – the Standard for Sustainable and Resilient Infrastructure – launched in December 2015 by the non-profit foundation Global Infrastructure Basel which promotes investment in sustainable global infrastructure. This new standard provides a platform for the public sector, investors and project developers to ensure wider risks and benefits of projects are considered.

We have also been working with the Sustainable Infrastructure Foundation to develop the International Infrastructure Support System (IISS), an online platform that will significantly speed up public sector asset delivery by demonstrating the bankability of projects.

With constant demands for better service, the pressures of urbanisation, and a growing world population, the need for good, sustainable infrastructure is more important than ever. Our project finance expertise helps to get well designed, sustainable projects to completion.

University challenge

Kenya's second largest university wanted to increase access to higher education and improve welfare for current students. This required a substantial increase in student accommodation and, with our support, the first PPP-financed student hostels in East Africa are now taking shape, ready to house the next generation of leaders, academics and business people.

Project
Kenyatta University student hostels

Location
Kenya

Client
Kenyatta University

PPP contract leaves nothing to waste

With its waste management services contract due to expire in 2016, the Municipality of Curitiba identified an opportunity to make a step-change in the management of the city's waste, creating wider benefits such as resource conservation, as well as promoting job creation and social inclusion. We were tasked to assist the municipality in procuring a new, integrated waste management system for the city that would be recognised as an example of best practice nationally and internationally.

Project
Curitiba waste management public private partnership

Location
Brazil

Client
International Finance Corporation

Big things have small beginnings

PPP financing is a great way of sourcing investment for major developments. However, some countries have little experience of public-private collaboration and need support in developing projects for private sector engagement. Our work has set Mali and Mauritania on the road to leveraging private investment to build crucial new assets, including port developments, a new container terminal and a mining school.

Project
PPP pipeline

Location
Mali and Mauritania

Client
World Bank and International Finance Corporation

Cruising towards a brighter future

The expansion of Calais Port – France's fourth biggest sea terminal – will bring much needed capacity to support the growing number of passengers and goods crossing the Channel. We advised on technical and contractual risks that could impact the feasibility of this PPP-funded project and provided advice to ensure financing of the works would be consistent with international best practice.

Project
Calais Port Expansion, France

Location
Calais, France

Client
Société des Ports du Détroit (project company), Meridiam, Caisse des Dépôts Infrastructure, Chambre de Commerce et d'Industrie Côte d'Opale, Port de Dunkerque

Powering the world

A multidisciplinary approach is needed to tackle the challenges facing the power sector.

Power is crucial to social and economic development. But the sector faces several challenges, most notably the need to decarbonise to combat global climate change, while maintaining security and affordability.

A move away from coal will reduce emissions, but some countries with abundant coal supplies or legacy coal stations with decades of life remaining will find this challenging. Meanwhile, volatile oil prices and increased unconventional gas production are buoying fossil fuel generation.

For example, the US is expected to turn from a net importer to an exporter of liquefied natural gas in 2017 as it continues to tap into its shale gas resources. Driving efficiency and cutting emissions are key.

The renewables sector continues to grow, and we are helping governments diversify their energy economies and developers/lenders deliver projects. China is the biggest market, with 80GW of wind/solar power added in just the last two years, comparable to the US's total wind/solar capacity.

We anticipate that global take-up of renewable energy will increase rapidly as the costs of developing the infrastructure falls and performance improves.

However, innovation is needed to find better solutions to mitigate fluctuations in supply from wind and solar PV power plants, with responsive back-up generation, energy storage, increased interconnections and demand management the key factors.

New nuclear, which has been on hold in the last decade, is receiving renewed interest from governments and technology developers, with the focus now shifting towards small modular reactors which are more flexible and potentially easier to deliver than large-scale units.

All this is occurring within a wider context of increasing digitisation of the global economy, new security threats and ever shifting geopolitics. It's a challenging environment, but we are confronting today's challenges and meeting tomorrow's needs with solutions that build in resilience.

Going underground

Singapore's relentless growth as a regional and international business hub means increasing demands for power. We are managing the work of seven slurry tunnel boring machines (TBMs) as they dig more than 18km of new 6m diameter tunnels at depths of up to 60m to expand the capacity and resilience of the country's power network for the future.

Project
North-South Power Tunnels

Location
Singapore

Client
Singapore Power

Power to Peru

One of the world's largest concrete-faced rockfill dams has been constructed at Chaglla, Peru, and will provide 13% of the country's total hydro capacity. The project's sheer size and complexity, along with the dam type and topography, posed significant potential risks that needed clear identification and management to reassure lenders. We reviewed all technical and contractual components to achieve successful financial close of this US$1.2bn project, followed by regular construction monitoring. The project has already brought many positive social impacts to the local community including the creation of 2500 direct jobs and 10,000 indirect jobs.

Project
Chaglla Hydroelectric Power Plant

Location
Peru

Client
The Bank of New York Mellon (on behalf of senior lenders)

Developing a gas field from scratch

Siba gas field has huge potential but is completely undeveloped with unexploded ordnance adding to the challenges of the site. Our work included ground investigation and a geotechnical survey to assess and mitigate risks. Moving into design, we saved cost on the field's many foundations by converting helical pile designs to precast pile or pad footings. When up and running, Siba will produce 100M cubic feet of gas each day for export while opening up a new source of LPG extraction.

Project
Siba gas field development

Location
Iraq

Client
Kuwait Energy Iraq Limited (KEIL), Turkish Petroleum (TPAO), Missan Oil Company and South Oil Company

Fast-track management, to the power of 50,000

We managed US$5bn of engineering, procurement and construction (EPC) contracts for the 400,000 barrel a day Ruwais Refinery Expansion Project. Having 50,000 workers on site for the fast-track schedule presented a number of challenges, but we achieved over 100M working hours without lost-time injury and the refinery is now in full operation.

Project
Ruwais Refinery Expansion

Location
Abu Dhabi

Client
Takreer (Abu Dhabi Refining Company, part of Abu Dhabi National Oil Company)

Just the beginning

With commercial operation from the end of 2016, this 30MW facility off the New England coast is the first offshore wind farm to reach financial close and be built in the US. The site is capable of powering 17,000 homes, but is just a demonstrator project. Its success has set in motion the development of a further 300MW of offshore wind capacity off Rhode Island, with the potential for substantially more GWs of offshore wind projects across the US.

Project
Block Island offshore wind project

Location
Rhode Island, USA

Client
Deepwater Wind

24-hour solar power

It's exactly when conventional solar generation tails off that power demand peaks: sunset. We developed a method of after-dark generation by heating a reservoir of molten salt to 365°C, allowing thermal energy to keep power production going throughout the night. The experience gained here provides confidence in the development of follow-up schemes both in South Africa and anywhere with abundant sunshine, paving the way for more efficient technology on future CSP projects.

Project
KaXu and Xina Concentrated Solar Power (CSP) plants

Location
South Africa

Client
Abengoa

Local problems need local solutions

Economic development demands attention to the challenges and needs of people on the ground.

While it's the high profile projects which make the news, effective economic development depends on understanding the conditions and needs of local people, and providing bespoke solutions to their problems. But this can be challenging when both public and private partners have the big picture in mind and find it hard to visualise local solutions.

For example, traditional cost-benefit analyses are very good at providing a business case for large projects with benefits on the macro scale. Returns on investment are clear, so projects get the political and financial backing they need. But what about the countless smaller projects which make little impact on a national scale but bring crucial economic benefits to local people and businesses?

By developing our own assessment tool we are now able to highlight the local economic impacts of projects, such as job creation, access to housing, education, healthcare and resultant improvements in salaries and gross value added (GVA) to the national and local economy. We have used our Transparent Economic Assessment Model (TEAM) to make the business case for a number of schemes that would not have received funding otherwise.

Local thinking also shapes our economic and social interventions. For example, we're technical advisor on a programme which aims to alleviate poverty for 150,000 households in the coastal regions of Bangladesh.

The project involves facilitating co-operatives which bring villagers together to decide on

Khalid Hossain Ayon and Anis Pervez

projects that will bring them most benefit, and provide training in farming and land management skills. Better harvests allow farmers to trade, moving away from subsistence farming and creating new revenue streams which allow further investment in production and economic growth. When technical and financial assistance comes to an end, these autonomous groups will have the skills and market linkages to sustain development and to support the needs of villagers independently. Local people, empowered to build a brighter future.

Think water management is just about water? Think again.

Poverty alleviation, raised living standards, improved women's participation and private sector enterprise are among the benefits of our work in coastal areas of Bangladesh, where we're creating local co-operatives to provide sustainable water management and flood protection.

Project
Blue Gold

Location
Bangladesh

Client
Bangladesh Water Development Board and Bangladesh Department of Agricultural Extension

Where traditional methods fail, local data proves project viability

We developed an assessment tool that highlights the economic impacts of new schemes at the local level, providing the business case to bring several much-needed projects to reality. For example, we calculated that implementing the Chester Central Bus Interchange project as part of a wider regeneration of the area would bring in more than £60M in gross value added over 60 years, against a cost of £21M. The tool has been used across the UK on infrastructure, transport, regeneration and environmental projects. It has also supported projects in North America, the Caribbean, Columbia, South Africa and Kenya.

Project
Transparent Economic Assessment Model (TEAM)

Location
Multinational

Client
Various public agencies as well as public and private investors in infrastructure and economic growth

Working with citizens to realise their smart city aspirations

Indian premier Narendra Modi has set the goal of creating 100 smart cities – socially inclusive, high tech, environmentally sustainable and economically prosperous. We worked with the citizens of Jaipur, the fabled 'Pink City', to support its bid for development funding. Jaipur came in ahead of 97 rival cities and is on course for transformation into a metropolis fit for the next generation.

Project
Jaipur Smart City

Location
Rajasthan, India

Client
Jaipur Nagar Nigam

Digital is the new normal

Our engineers add value by using computer models and algorithms.

Want to know how people will behave inside a building, station or stadium before it's built?

Digital simulations, which populate environments with virtual pedestrians modelled on real human behaviour, enable us to optimise the design of buildings and infrastructure, optimising performance, saving time and cost, and improving safety.

Our tools also help clients to maximise the revenue-generating potential of facilities by pinpointing the best locations for retail and food outlets, siting advertising where most people will see it, and reducing queuing at ticket booths and barriers to improve the visitor experience.

Computer models are based on algorithms – step-by-step procedures used in mathematical calculations – and we are now developing our own algorithms to automate design processes.

By reducing human input, we can offer clients significant cost savings and deliver projects faster. Using our new Create app, it has been possible to

reduce the design time for a pumping station from 15 days to 15 minutes!

Create is the first product of our newly launched Ideas Lab, where our brightest minds meet to develop disruptive technologies. The Ideas Lab team is now looking at other automation opportunities across the business, identifying which tasks would be best done by machines and which tasks should still be carried out by humans.

The benefits will be more than just increased efficiencies. Automation of repetitive, mundane processes frees our people to do what they're best at: innovating and working alongside customers to gain a deeper understanding of the challenges they face, leading to better, higher-value solutions.

Good vibrations

Disturbance caused by noise and vibration from railways is an increasingly challenging, costly and policy-driven problem. Our new in-house software tool, ReVERB, quickly and accurately predicts ground-borne noise and vibration levels accounting for an unlimited range of possible scenarios, presenting results in an attractive and intuitive way, ensuring assets can be designed to mitigate adverse effects.

Project
ReVERB

Location
Suitable for all rail and metro projects

Client
Internal development

Opening opportunities with connected thinking.

Engineering. Management. Development.

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