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Lloyd’s Register works with businesses and organisations around the world to enhance the safety of life and property at sea, on land and in the air. We help our clients face today’s challenges and plan for tomorrow and beyond.

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Welcome

To our latest issue of Insight.
Richard Sadler, Chief Executive

The statistics about urbanisation, population growth, the number of people moving towards centres of population near the sea and the shortage of traditional hydrocarbon resources are all well known and of increasing concern for governments, urban planners and society as a whole. Globalisation is both an opportunity and a threat in preparing ourselves for the inevitable consequences these changes will bring. It continues to add pressure to global shipping and infrastructure.

While one door closes, another opens. The decline in nuclear power confidence as a result of Fukushima coincides with the advent of shale gas as a mainstream resource that could change the socio-political landscape of the world. Increasingly, global thinkers are convinced that water shortages, or to be more precise, distribution, is becoming more of a threat to sustainability than energy resources.

All this is happening within the context of an increasingly unstable financial world bringing recession to many countries and regions.

There is less money in the hands of government and yet an increasingly ageing population to support in terms of housing, health and additional leisure time. Certain industries, such as the cruise industry, are benefiting from the change in demographics. The same is true for the rail industry; mainline, subways and metros maintain a phenomenal opportunity as society’s demand for cheaper and more effective public transport increases.

This copy of Insight looks at these issues and aims to provoke thought in our readers as to the likely impact, the solutions and the opportunities and threats for their own business.

Lloyd’s Register is proud to be involved in all the sectors that need to be efficient for society to be sustainable in 2030 and beyond. Our strapline of ‘Life Matters’ says it all. I hope you enjoy our latest issue and if you have comments or would like to contribute to future editions then please keep in touch.
Urbanisation

People have been moving from rural to urban settlements for centuries but the pace of that movement has increased rapidly in the last 60 years. Now we have 3.6 billion urban dwellers (over half of the world’s population) with estimates of this reaching 70% by 2050, according to UN figures.

In Latin America already eight out of 10 people live in cities, set to rise to 90% by 2050. Other developing regions, including Africa and Asia, are still mostly rural today, but will have more people living in urban rather than rural areas by 2050.

Along with industrialisation and the growth of markets, urbanisation is one of the main forces propelling economic growth, as witnessed in China and Singapore, an urbanisation success story described on page 14. Urbanisation has brought advantages to national economies and opportunities to improve people’s well-being, for poverty reduction and for the promotion of sustainable development, but it also brings serious challenges.

Planning is key, a view endorsed by India’s Larsen & Toubro senior executives on page 9. Cities need urban jobs, housing, energy and infrastructure to mitigate urban poverty, expansion of slums, a deterioration of the urban environment and natural disaster. In August 2010, a 60-mile traffic jam stopped a highway outside Beijing for 11 days. An efficient metro system, as discussed on page 12, is essential.

And cities put stress on food and water supplies. On page 16 we look at the issue of food security and the link between food production to climate change and on page 19 at the pressures on the globe’s water resources and the challenge to business of ensuring a supply to meet future needs.

The city is the future – it brings both new possibilities and challenges for development.
For the first-time visitor, the quickest way to get the measure of Tokyo is to take the express bus or train to Shinjuku station, the city’s main interchange. To the uninitiated Shinjuku is utterly bewildering: every day some 3.5 million commuters – as many as the entire London Underground will carry over the same period – calmly pass to and from the dozen different rail lines that serve the station. It has more than 200 exits.

The world’s busiest station at the heart of its largest city. It should be chaos, but it works: a microcosm of Tokyo itself.

Cities such as Tokyo are our destiny: crowded, frenetic, complex. Some 38 million people live here, a number that will only increase, as indeed will the populations of every other town and city on the planet. But Tokyo has the good fortune of having the necessary infrastructure and the mindset that will enable it to absorb increased numbers and continue to function. Not every city has that luxury.
Altogether now
In 2008 humanity passed a significant milestone. For the first time ever we became a predominantly urban species; the UN reports that 52% of us now live in towns and cities. Our attraction to the bright lights is not to be discouraged.

Cities are where we are at our most creative, places of exchange that connect continents, cultures and economies. With the advantage of scale and proximity they are able to provide education, healthcare and employment to millions.

Nowhere is the advancement of urbanisation more evident than in the proliferation of the ‘megacities’, a tag loosely attached to any city of 10 million residents or more. Today more than 20 settlements fall within this category, a group that has grown fivefold over the past three decades and will double again over the next 20 years. They will certainly be a more frequent feature of south and east Asia, where a number of cities, such as Chengdu in south-west China, will hit the 20 million mark before this decade is out.

To a bitter end?
Much of the future growth in the urban population will be outside the megacities with the vast majority of us to be found in settlements of fewer than 500,000 people. And what concerns economists, policymakers and strategists the world over is that too many of our urban centres are not where the necessary resources are.

This leads many to speculate on the consequences of so many of us living an urban existence.

With their voracious appetites for fossil fuels – and as mass-producers of asphalt, air pollution and greenhouse gases – cities are possibly already the planet’s primary cause of climate change. Paradoxically, many of our cities have the most to lose from climate change: three quarters of our urban settlements are within coastal areas at risk from rises in the sea level.

But while keeping carbon emissions under control should top the to-do list, for many city leaders there is also the duty to support local economies and see living standards rise. It is one of the unwritten ‘contracts’ between the city and its residents that it can be an exit route for those wanting to escape poverty and seek out a better life.

And this is where the numbers start to overwhelm: already more than a billion people live in makeshift homes – urban slums – lacking in basic amenities. Not all inhabitants will be poor, many will have work, but it is often the city’s ongoing failure to provide sufficient accommodation, transport and resources that is keeping them there. And it is within these environments, often nestled among affluent neighbourhoods, where poverty concentrates and where society can be at its most desperate and dangerous.

This leads pessimists to envisage a point beyond which a city cannot support its people: an inexorable drift towards a society all but collapsing under the pressure of its ungovernable sprawls with people left to compete over increasingly scarce resources.

Mega-eco-city:
CHINA

Nowhere has the transition to an urban society been as rapid as in China. In 1980 fewer than 20% of its population lived in the cities, today more than half – around 690 million (twice the entire US population) – are classed as urban.

The speed of this transformation is unmatched in history but comes with an equally unparalleled range of environmental and social problems. As a result, China is one of a number of countries exploring the concept of the eco-city. On land that was formerly non-arable salt flats and small fishing villages just outside the port of Tianjin, around 100 miles south-west of Beijing, the construction of the world’s largest low-carbon sustainable community is under way, with support from Singapore, a model for urban development (see page 14).

Experimental ‘eco’ towns and cities have their detractors who remain sceptical about the feasibility of entire communities adopting long-term sustainable behaviours, let alone how the concepts could transfer to our older, constrained cities. In truth, many of these showcase towns do lose their initial focus as day-to-day living gradually takes a grip, but some, such as Pondbury in England or Masdar City in the UAE continue to fulfil their brief.

Tianjin Eco-city is on a different scale altogether. Within a decade, it is expected to be home to 350,000 people. Around 70% of domestic refuse will be sent for recycling, renewable sources will provide up to a fifth of its energy needs, while a hermetically sealed pneumatic municipal waste system will cut the amount of refuse removed by trucks by as much as 90%.

Cars will not be banned but low-carbon transport is central to the vision, with residential areas clustered along a landscaped central green thoroughfare through which runs a tram service and cycle lanes.

A city able to start with a clean slate hardly offers a realistic template for towns and cities to replicate, but the scale of the plans in Tianjin does set it apart. If its developers can demonstrate that communities of this size – and it is expected to be half the size of Manhattan – can function perfectly well on less energy, it will hopefully offer inspiration for future neighbourhoods and present some lessons for crowded, car-choked cities the world over.
Nowhere is the advancement of urbanisation more evident than in the proliferation of the ‘megacities’, a tag loosely attached to any city of 10 million residents or more.
Development dilemma: LONDON

With intense competition for air supremacy from Frankfurt, Amsterdam, and even Doha, many of London’s business and civic leaders genuinely fear the city’s decline as an air transport hub.

Hemmed in by west London’s suburbs, there is no room for Heathrow airport to accommodate any more flights. Nor can it find a way to expand within its existing footprint without running into exhaustive disputes with its neighbours or falling foul of its own caps on carbon emissions, primarily from the additional road traffic more flights would create.

Momentum is building again around proposals for an entirely new airport in the Thames Estuary. The attractions are obvious: flight paths over the sea mean fewer households affected by noise; four new runways fit for the new era of the super-jumbo; and 60% of passengers expected to arrive by public transport thanks, it is claimed, to new high-speed rail links.

The location also has a ring of sense about it. By 2020 London will be expected to absorb an extra million residents, up from eight million in 2011. The area between the proposed airport and the edges of the city, the Thames Gateway, has long been marked down for a large proportion of the new housing required. Plus, a major new employer in the region will be welcomed.

If all of that is not bold enough, how about this: the proposals require that Heathrow airport is closed. Even a city like London requires only one airport hub, and much of the funding would come from what Heathrow would leave behind: Europe’s largest urban land bank allowing for an entirely new west London neighbourhood to be built.

The benefits are undeniable, but there is a long way to go yet. Britain’s planning system is not good at digesting big infrastructure; a new runway to increase Heathrow’s current capacity was backed in 2002 but 10 years of planning disputes later it remains shelved. It will also take a bold set of politicians to make the call. Heathrow directly or indirectly supports over 100,000 jobs in the local area.

But London will have to decide soon. Surrounded as it is by ‘green belt’ land with strict planning controls that have kept the city’s footprint in check, the new airport offers a chance to punch through and spread towards the Thames Estuary.

Either that or Londoners will have to squeeze together even more.
Cities have more to offer

Many economists suggest that, though unpalatable, the presence of poverty within the city – along with makeshift communities, black markets and backstreet factories – is also a sign of a successful city, one that still offers something. People choose to remain because, whatever their circumstances, the city still gives their best chance of a better life.

And governed properly, the city will provide its own salvation. As a breeding ground for new industries, technologies and skills, it can not only call upon the resources it needs to address its future challenges, they can also redefine what they will be. The key is not just short-term intervention – a task force here, a shopping centre there – but also about allowing cities to be better positioned to look after themselves.

Some cities generate more output than entire nation states yet lack the authority to decide their own budgets or planning laws. Few of the giant Asian cities, for example, have the option to raise taxes or generate revenue from utilities or transport systems. Planning regulations, often enshrined in national laws, continue to restrict their ability to grow, a problem London frequently experiences (see opposite). The time could be approaching to give the world’s leading cities more autonomy and greater powers to manage their own affairs.

Successful economies also need a continuous supply of skilled labour and capable entrepreneurs. Communities that invest in education tend to thrive. In his book Triumph of the City, Edward Glaeser, a professor at Harvard University, reports that for every 10% increase in the proportion of the population with university degrees, per capita gross product rises by 22%. More educated people are then attracted to those communities because they want to live and trade with those more like themselves, which in turn nurtures new enterprise.

And it is a skilled and knowledgeable workforce which provides a platform to build more efficient societies. This starts, for example, by finding ways to analyse real time data about transport, energy and resource usage and feed it back into the system to help manage limited resources, but it extends into all aspects of city life, from extracting energy from waste to cost-effective modular construction techniques (build off site, assemble on) of transport systems.

Global problems locally tackled

Stronger governance, investment in education, technical innovation – it will take a mix of all three, and plenty more besides, to help cities steer themselves out of trouble. But always, the recipe should have a local flavour.

A report published last year by the UK’s Institution of Mechanical Engineers set out a number of proposals that can help cities absorb the extra population. It found that while there were few technical barriers preventing their wider adoption, solutions were frequently lifted from one location and transplanted to the next without full consultation or without taking into account local specific needs, cultures and even geography. Narrow, ‘off-the-shelf’ solutions have a tendency to reinvent problems: the slum clearances that merely break up communities, under-utilised tram systems that drain city finances.

Born to survive

The city has always faced scenarios of impending apocalypse.

In the early 1900s London’s street were home to estimated 10,000 cabs powered by horse. This led planners and engineers to fret over whether London and cities like it, such as New York, would one day soon have to be abandoned amid streets buried under horse manure. Yet the city saw off that particular crisis and many others since. The real challenge ahead, then, is not to focus on the worst of the predictions, but instead look to extract the many opportunities that a growing city will create.

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Facts and figures

see overleaf p8
Under current fertility rates, the world’s population will pass **25bn** before the end of the century.

Stood shoulder-to-shoulder, Los Angeles (1,300 square kilometres) could accommodate the world’s population.

**Over 6%** of humans who have ever lived are alive today.

As at 2011, there were **23** cities in the world generally regarded as megacities.

**52%** of the world’s population live in cities <500,000.

Megacities account for around **4%** of the world’s population.

**6.3bn people** will live in urban areas by 2050.

**75%** of the global population will be in urban settlements by 2100.

**75%** of urban settlements are at risk from a rise in sea level.

As at 2011, there were 23 cities in the world generally regarded as megacities.
A MISSION TO CREATE VALUE

Larsen & Toubro’s Chairman, Anil Manibhai Naik and other L&T senior executives talk to Richard Cook about the company’s transformation to become a global giant and the challenges of urbanisation.
It is monsoon season in Mumbai but Anil Manibhai Naik, the larger-than-life Chairman of Larsen & Toubro, is not letting the torrential rain outside – or the noise of traffic as the afternoon rush hour begins to swell on the streets below – disturb his flow.

“My mission has been to create value” says Naik. “I launched L&T’s transformational journey in 1999, when I became CEO and Managing Director. I learned from my father that you get respect when you are valued… We have to create value in everything we do. We will not start a business that is not centrally focused on building India. There are quick wins out there, plenty of low hanging fruit but we will not pursue them. We will never deviate from our mission of creating value.”

To say Naik is remarkable is understatement. He went to a mud-floor village school and, via a succession of scholarships, made sure he got himself an elite education. He joined L&T in 1965 as a junior engineer in the boiler shop and has been with the company ever since. “It is likely I will reach 50 years with L&T before I finish” he says, matter-of-factly.

Naik is openly devoted to the company he has built into a global giant and is a self-confessed workaholic who, for many years, worked seven days a week. Today L&T turnover is just under US$13 billion a year and it employs around 50,000 people who mostly work in key sectors of India’s economy; construction, power, heavy engineering, shipbuilding, finance and IT. L&T was involved in the construction of India’s first nuclear submarine, is an integral part of the country’s nuclear power sector and works very closely with India’s aerospace industry.

Tackling the challenges
At the age of 70, Naik feels his work is far from finished. “I am also now the Chairman of the Indian Institute of Management, Ahmedabad. It’s the number one management school of India. And there I have seen how hardly anyone joins manufacturing, heavy industry or infrastructure. It’s banking, financial services, business strategy, branding and marketing or IT.”

It’s something that Madhukar Vinayak Kotwal, L&T Director & President (Heavy Engineering), readily recognises. “In India we can now produce anything but productivity is just one thing. To compete with the best in the world, we must produce as efficiently as the best in world… The biggest challenges are urbanisation of course, and managing health, but it’s also around education and employment. Major changes are needed in the way we manage our policies here.”

Chairman Naik continues with the theme. “The brain drain from India is enormous. Six out of ten graduates leave. Only one and a half come to manufacturing. But when you talk about heavy industry or infrastructure, it’s half out of ten. This is work crucial to our country and who is going to do it? It has to be tackled so we have started a programme that is doing exactly that. Another thing that must be tackled is the poverty here. India needs so much social work.” Naik screws his face, in a mix of anger and determination. “Actually the sky is the limit… and we are tackling it.”

“...the sky is the limit... and we are tackling it”
Anil Manibhai Naik

Modern urban story
The poverty Naik speaks of can be seen pretty much all over Mumbai where L&T’s traditional home has been since 1948, in the north-eastern fringes of the city at the manufacturing complex of Powai. The corporate office where Naik is speaking is in the district of Andheri, also in the northern suburbs. An area of a few square kilometres, home to an astonishing four million people, Andheri is a microcosm of India’s modern day urban story. A century ago, it was a fishing and farming village. Today it is an incongruous mix of gleaming offices and malls, ancient temples and row upon row of apartment blocks. And, more than anything, Andheri is for about 20 hours a day an incredible mass of humanity on the move – in cars, buses, mopeds, trucks, cabs and three-wheeler taxis. People do not talk distance in Mumbai they talk time – instead of three kilometres they say 45 minutes (and in rush hour in Andheri, three kilometres in 45 minutes might be optimistic).
Bisecting the suburb is the construction works of an overhead metro line that will link the international and domestic airports – both in Andheri – with the centre of town and will, in theory, alleviate this daily traffic chaos. For now the works’ concrete, plant and trucks just add to the daily traffic problems. However this high, ever-expanding concrete structure, slowly snaking its way across the suburb does provide temporary shelter from the daily downpours for those forced to live on the streets until they get on the first rung of the urban ladder.

Planning essential
While L&T’s expansive corporate social responsibility programmes that Naik talks about with such passion and conviction are working across India’s cities, L&T is also playing a very active role in helping modern India improve its infrastructure.

“Key to the L&T brand is the notion of nation building,” says Krishnamurthi Venkataramanan, L&T’s MD & CEO. “One of the big challenges that India is facing is basically the same challenge that has been seen by all countries that have moved from an agricultural to an industrial economy, as large numbers of people move from the countryside to urban centres. The challenge is how to grow new modern cities. This really requires planning. We are now seeing second level cities that have been developed in a planned environment. Chandigarh is a good example as are the new urban developments like Gurgaon that have grown around Delhi. These have required more imagination in terms of the infrastructure that connects them and L&T is playing a prominent role in many areas here.”

Venkataramanan cites L&T’s new special economic zone in Chennai that integrates a container port, a shipyard, and an offshore yard built alongside each other in the same sprawling purpose-built coastal complex.

Anil Thapliyal, Chief Executive, L&T Shipbuilding says L&T is using this Chennai facility to engage the largest clients in the shipping world. “Everything can be done here because we are committed to using the absolute best,” says Thapliyal. “There is a state-of-the-art container port, next door to that is a shipyard – that can build anything from submarines to FPSOs – and then there is a commercial repair yard that has one of the biggest ship lifts in the world. It’s a vast site that uses a lot of innovation. It has a whole lot of potential.”

“It’s a first in India,” adds CEO Venkataramanan, “and facilities like this are so important to our future success. The Indian story for the last five, 10, 20 years is a great story. The next few years will be a story of challenges. Development and change comes about more slowly in a democracy. You need consensus but also good planning mechanisms in place. We need to ensure people and infrastructure link effectively. Land is an issue. We need land for development but we also need to protect the fertile lands. We have one billion plus people. Our land area is important.”

Venkataramanan, just like Naik and Kotwal, has come through the L&T ranks from the shop floor and will be entering his 47th year of service in 2013. Also like Naik and Kotwal, when he talks about L&T he does so with more than passion. Venkataramanan says quality people have been, and will remain to be, absolutely essential to L&T’s success. “Innovation and working with the best technology have of course been crucial but, in addition, we have always selected competent young people, groomed them to the L&T way. We have worked hard to give them good leadership, good values. Our brand is synonymous with quality. And safety is of paramount importance. But we are always mindful to treat people with dignity. It takes effort to retain young people but great organisations are built where people stay.” He pauses for a moment before smiling and leaning forward.

“I have always said for most people L&T stands for Larsen & Toubro. But for me it will always mean Love and Trust.” Who would doubt him.

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Founded in 1938, Larsen & Toubro (L&T) is a technology-driven engineering and construction organisation, and one of the largest and most respected companies in India’s private sector. L&T has an international presence, with a global spread of offices. L&T believes that progress must be achieved in harmony with the environment. A commitment to community welfare and environmental protection are an integral part of the corporate vision.

Lloyd’s Register’s Energy division has worked with L&T for more than 40 years and now all four divisions of Lloyd’s Register provide services to L&T.
Next year marks the 150th anniversary of the UK’s Metropolitan Railway, the world’s first underground passenger railway. The original six-kilometre line extended from Paddington to Farringdon, near London’s financial district, and offered an 18-minute journey on gas-lit wooden carriages pulled by steam locomotive.

It proved an instant success, carrying an estimated 40,000 passengers on day one, affording the teams of trailblazing engineers a quick chance to pat themselves on the back before doubtlessly having to shoot off to defend their project against the newspaper critics: “Neither the locomotive power nor the rolling stock at their disposal was at all in proportion to the requirements of the opening day… the crowds were immense, and the constant cry, as the trains arrived, of ‘No room’, appeared to have a very depressing effect upon those assembled,” reported The Guardian on 11 January 1863. Some relationships were never to change.

Nevertheless, within two years the railway was averaging a million passengers a month. By the turn of the century the concept had spread to cities such as Paris and New York and steam had been replaced by electric traction – the age of the urban metro was upon us.

Nobody does it better

Today there are around 180 urban metros of various sizes across the world. Not all are in the largest cities, not all are loved and not all are fully utilised, but they are most definitely part of the urban fabric.

What counts as a ‘metro’ system is not universally agreed. It tends to be attached to electric-powered, high-frequency railways operating on their own infrastructure independent from other rail or street traffic, usually with large sections either underground or elevated. This is opposed to light rail, tram or electric bus systems, which tend to weave through the traffic at street level.

In short, they move higher numbers more frequently: metros tend to be regarded as being able to support around 50,000 to even 70,000 passengers per hour, per direction (pphpd); light rail around 10–30,000 pphpd.

Though far more expensive to build, with sufficient levels of patronage they tend to be more cost-effective to operate and
maintain and can reach into outlying suburbs. They have also tended to be held in higher esteem by civic leaders – just see how many cities have excitedly bid for funding for a shiny new metro, only to lose interest altogether when told to consider guided buses instead. Expensive mistakes have been made in the past, where the metro is less an integrated transport provider and more of a marketing ploy.

**Numbers game**

Simply put, an underground metro costs: constructing a high-quality, double-track route beneath a city, which will involve reshaping existing subterranean utilities and cables, can start at around £100 million per kilometre.

That means metros need numbers in order to repay investment: linear routes with population catchments roughly every kilometre that can provide sufficient demand over a 20-hour-day operational timetable. But predicting passenger demand is an art form in itself, involving complex software-driven modelling based on extensive surveying of local residents’ travel habits and potential to switch mode.

Even then, very few systems in the world cover their operating costs from the fare box alone – meaning many continue to demand government funding to maintain services and upgrade systems over time. That caused many systems to be run down, with maintenance rationed and passenger comfort marginalised. At their worst, the metro came to inherit an unfortunate image of being only for those who could not afford to drive but also willing to take their chance amid regular delays and well-practised pickpockets.

**Meeting expectations**

Yet in this age of rapid urbanisation, and despite the inherent risks with predicting demand, managing build costs and the subsequent operation, it is unarguable that the metro has no equal when it comes to moving large numbers across a congested city.

They help remove traffic from the street level, attract regeneration and investment to neighbourhoods and improve accessibility for millions. Furthermore, they emit no local polluting emissions and design improvements – such as recovering the energy generated during braking – are making them increasingly more energy efficient.

The challenge, particularly on new systems, is to continue to find ways to increase patronage by presenting the metro as the mode of choice for day-to-day travel. That means exceeding passenger expectations over levels of comfort, convenience and security, such as improvements to the station ambience – lighting, cleanliness, passenger information, Wi-Fi – all of which help users feel more at ease.

But it could also involve technological developments, particularly in the signalling system, to improve service frequency and reliability. A recent upgrade of London’s Victoria Line reduced service intervals (headways) from just over two minutes to one minute 45 seconds or less.

**Transit fit for the 21st century**

The recent emergence of communications-based train control as the standard signalling system for urban metros over the past decade has also encouraged the planning and development of entirely ‘driverless’ systems. This could have a profound impact on how and where future metros develop.

Most urban systems would relish a move to this driverless technology as services can then be run more cost-effectively with the flexibility to adjust frequencies during sudden peaks (such as at the end of a sports event) without being dependent on staff rotas. They report impressive figures regarding efficiency, reliability and safety performance and help to present an air of modernity that can attract extra clientele.

In 2011, the Dubai Metro opened its second line to become the world’s largest unattended train operation (UTO) at 75 kilometres. It is now expected that around 75% of future systems will be similarly automated. The recent retro-fit of Paris’s line 1 to UTO operation proved that even existing networks can now seriously consider converting. This will all add towards making urban metros more economical, more reliable, more passenger-focused and ultimately, better prepared for the 21st century.

The metro might be approaching the grand old age of 150, but there’s plenty of life left in it yet.

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While the problems of rapid and uncontrolled urban growth – slums, crime, pollution – are all too apparent in cities around the world, if we want reasons to be cheerful about the rise of urbanisation, we could do worse than look to Singapore, says Matt Shinn.

Singapore is among the most densely populated cities on Earth, with more than five million inhabitants living in just over 700 square kilometres, an area less than half the size of Greater London.

Yet according to a Knight Frank and Citi Private Wealth report in August 2012, the city-state, which is a centre for international finance as well as home to many multinationals, is the wealthiest nation in the world by GDP per capita. Other studies rank Singapore’s infrastructure as among the best in the world, with its roads, port and air transport facilities second to none. And yet this is also one of the cleanest and greenest of cities. Clearly, Singapore is doing something right.

A history of planning
Singapore is the archetype of the planned city, with a tradition of deliberate design that goes back to its founding, by Sir Stamford Raffles in 1819, as a deepwater harbour serving British interests in the Far East (the maritime industry continues to be an important contributor to Singapore’s economy – see feature opposite). The colony’s original plan can still be seen in the pattern of Singapore’s streets and zonal layout.

Today, Singapore deals with the challenges that face all of the world’s great cities –
providing housing and sanitation, dealing with waste, helping businesses to thrive – in an unusually centralised way, with its Urban Redevelopment Authority keeping a tight grip on land use in the city.

Singapore is severely constrained by lack of space, and while land reclamation has alleviated the problem to some extent (adding at least a hundred square kilometres since it was founded), this is still the world’s most densely populated country. It is a central aim of urban planning, therefore, to use land as efficiently as possible.

Singapore is laid out as a series of partially self-sufficient towns and districts, helping to take some of the strain off the city’s central business district. Housing is almost all high-density. And since lack of space rules out landfill, more than half of the city’s waste is recycled.

Traffic pollution, meanwhile, is dealt with by carefully controlling the numbers of cars in the city. Only 16% of Singaporeans own vehicles: doing so means first getting a Certificate of Entitlement through public auction, and then being subject to tolls, based on when and where you drive. Singapore’s Mass Rapid Transit system is a highly efficient alternative, transporting more than two million passengers every day.

Exporting expertise
And aspects of the Singapore model for urban development could be coming to a city near you, as Singapore starts to export its expertise in urban planning. For example, last autumn saw work begin on a new ‘eco-city’ in Tianjin in north-eastern China, which is being jointly developed by a Singaporean planning team (see page 4).

Technical assistance is sold through the Singapore Co-operation Enterprise, launched in 2006 to deal with foreign requests to share the city’s public sector experience (it receives some 10 delegations each month from other countries), while Urban Redevelopment Authority International, set up two years later, deals specifically with requests for help in urban planning.

The role of technology
Singapore is also looking to position itself as a leader in the technologies needed by the cities of tomorrow. The city has made itself a test-bed for innovations which both help it to meet its own challenges, and can also be marketed abroad.

Over the past decade, for example, Singapore has opened a series of NEWater filtration plants, which, together with others that use desalination processes, now meet nearly half of the city’s water needs. And the expertise that Singaporean companies have built up through these projects has helped them compete for work abroad: in the past six years over 100 contracts for water treatment, worth some US$5 billion, have gone to businesses from the city.

And in many other areas too, technology in Singapore is providing solutions to common urban problems.

Singapore is pioneering the use of clean solar energy technology, for example, with public housing precincts across the city beginning to meet their own energy needs through solar power, while also helping to develop new solar technology specifically designed for the tropics. Singapore’s Clean Energy Research Programme, which also supports research and development (R&D) in fuel cells, wind and marine energy, biomass, and energy efficiency, is expected to contribute more than US$1 billion to Singapore’s GDP by 2015.

New technology is also being applied to the management of traffic pollution. Singapore introduced the world’s first electronic road toll collection system to regulate car use in the city, especially at certain times of day. Singapore is also a centre for study of electric-powered vehicles in a tropical environment.

A model to follow?
There is much in Singapore to emulate then: as a city without a hinterland, it has had an unusual degree of freedom in managing its own affairs and developing its own solutions. Urban authorities around the world may look to Singapore for ideas, perhaps with some envy of the city’s ability to impose top-down solutions.

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Global food challenge

Ensuring global food security – and ending hunger – has always been viewed as a mammoth task, one which society has largely failed to meet. But recent recognition that it is intimately linked to climate change has started the clock on finding a solution like never before. Russell Barling explores the challenge.

Creating a sustainable global food system that will eradicate hunger is one of the greatest challenges facing modern civilisation. Attempts to find a solution have been variously complicated by complacency, economics, politics, logistics and urbanisation; they are now being made more difficult – and more urgent – by the need to address climate change.

“More food is needed from less land, with less water, using less energy, fertiliser and pesticide, while not increasing greenhouse gas emissions,” Sir John Beddington, the UK government’s Chief Scientific Adviser, told delegates in May at a forum organised by the Foundation for Science and Technology.

Simply put, the global food system is one of the greatest emitters of the greenhouse gases (GHG) that are currently responsible for warming the Earth.

Depending on where you draw the boundaries for the food system, estimates of the amount of the GHG it emits vary greatly. For example, according to a 2011 report, agriculture, which includes the production of fertilisers, ‘directly contributes 10% to 12% of global GHG emissions; this figure rises to 30% or more when land conversion and costs beyond the farm gate are added’ (The Future for Food and Farming, UK’s Government Office for Science).

With agriculture currently missing from most national GHG initiatives, there is little doubt that the proportional contribution from this sector will increase, according to the report. While there are some regions – such as in the UK – where the volume of GHG emissions from agriculture is on the decline, in general, GHG from food production can be expected to rise as the global population increases, becomes more prosperous, and more desirous of foreign or out-of-season foods.

Beyond the farm gate
Food production aside, there is considerable energy burned packaging food and getting it to market, causing emissions beyond agricultural practices that contribute to the pace of climate change.
According to Dr Peter Holmgren, a former Director of Environment, Climate and Energy at the UN’s Food and Agriculture Organization, the food system is responsible for about 30% of global energy consumption, 80% of which is realised ‘beyond the farm gate’.

With so much of the footprint created outside the farm gate there would appear to be solutions available by following the lead set by owners of non-food supply chains; for example, by embracing the best-practice solutions promoted by energy-efficiency standards such as ISO 50001. These include transitioning to lower carbon or biofuels, finding more efficient transport routes, and encouraging better demand forecasting to minimise waste and redundancy at factories, distribution centres and retail outlets.

But in the food system the cause of wastage varies greatly, so bespoke solutions are often necessary. It is estimated 30% to 40% of the food we produce is never consumed: in the developed world it is wasted; in the developing world, the food produced often does not even get to market.

**Obvious solutions?**

To the untrained observer, the solutions may seem obvious: if people are starving, why not grow more food? If getting food from Africa to market in Europe is burning too much energy, why not encourage consumers to source their food locally?

However, local initiatives to improve sustainability can have global consequences that undo the most sensible of strategies, no matter how logical and well-intended. The use of biofuels to reduce carbon emissions in the food transport chain is a good example. “Two billion people depend on eating the food we are using for biofuels,” said Dr Holmgren. “That is an issue.”

Changing trading and consumption patterns to encourage people to ‘buy locally’ also can have unintended consequences. According to the report, *The Future for Food and Farming*, about a million livelihoods in Africa are supported by UK demand for the continent’s fresh fruit and vegetables, most of which are perishables sent by air. It is estimated that moving production to the UK would reduce Britain’s total emissions by less than 0.1%. But the associated job losses may also send tens of thousands of Africans back to subsistence living, encouraging them to convert more forests to farmlands, and releasing more of the nitrous oxide and methane gases which are the largest sources of GHG emissions from agriculture.

Clearly, the trade-offs of any local initiatives need to be understood in a global context.

**Reducing emissions**

Despite the complexities, the report suggests there are four ways to give impetus to emissions-reduction activities in the food system. One would be by creating market incentives to reduce emissions; these could include grants, subsidies, levies, carbon taxes or caps and trade schemes. Secondly, the introduction of mandatory emission standards or limits, by direct regulation, may change production costs and be linked with market adjustments.

A third way is adopting low-emission strategies through market pressures driven by consumer choice. This requires informed consumers and sources of accurate and trusted information such as emissions labelling or product certification. Finally, there could be voluntary (non-profit driven) measures taken by industry in line with corporate social responsibility.

What is now evident is that food security and global warming are inextricably linked. Ensuring food security has become a prerequisite for committed action on climate change because no democratic government can introduce measures to reduce GHG if they have significant effects on their citizens’ access to food.

While finding a solution is complex, proving success or failure in the search for global food security could be very obvious. Because effectively, if there is hunger, you do not have sustainable development.

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More people. There are always more people. But there is no more water.

Between 1960 and 2000 the population of the world grew from three to six billion. It is now more than seven billion and is forecast to reach around nine billion by 2050. As an absolute minimum, these people will need to eat and drink.

They will also need somewhere to live. More of them are living in cities – two more every second, according to the UN. They want a better life: better food, better clothes, more opportunities. They will need transport and power.

For the past century water use has been growing at more than twice the rate of population, according to the Food and Agriculture Organization. By 2025, water withdrawals are predicted to increase by 50% in developing countries, and by 18% in the developed world.

Considering how essential fresh water is to all life on earth, it is astonishing how little there is – and how little attention we pay to it. But that’s going to have to change, and businesses need to start adapting, reports Martin Beaver.

Water
The new carbon?
But still, there is no more water.

Although 70% of the surface of the earth is water and it falls free from the sky, less than 5% of it is suitable for human or animal consumption, and only 0.6% is easily accessible.

“Yet because everyone needs water,” says Jeremy Mann, Head of Geosciences & Technology Development at the global mining company Anglo American, “when you buy it, it is normally priced at a low level that everyone can afford. However, this is unlikely to be the case in 20 years’ time.” Therefore, he says, companies need to treat water as “a strategically important, non-renewable resource.” This is a major business risk. With demand increasing and supply staying the same, the eventual consequences are not difficult to imagine.

And then there is the impact of climate change.

Predictions of how and where climate change will affect water supply are difficult to make accurately. Try to factor in when the impacts will occur, and businesses are faced with a highly complex matrix of possibilities.

“Shifts in the availability of water are one of the main ways in which climate change will manifest itself,” says Richard Garner, who is responsible for Anglo American’s water strategy. This is a view echoed by UNESCO’s World Water Assessment Programme. Melting ice caps could see coastal areas suffer from a rise in sea levels, disrupting infrastructure and displacing populations. Dry areas of the world could become drier – or wetter. Or both.

“As a company, we are expecting variable supply, escalating cost and increasing regulation of water,” Garner says.

Mining is a relatively vulnerable industrial sector, being a heavy user of water and investing in assets that have unusually long timescales. But it is far from alone.

“Industries such as food, beverage and apparel face significant risks,” says Edwin Piñero, Executive Vice President of Veolia Water North America. Agriculture – which underpins these industries – uses 70% of the world’s fresh water.

Statistics relating to water use are plentiful – though not always easy to authenticate. To produce 1kg of beef, for example, it is said to take 13,620 litres of water. Global production of beef in 2010 was more than 25 million tonnes. A single cotton t-shirt requires around 1,500 litres of water.

But, as Piñero points out, the issues facing manufacturing companies relate not only to their own water use, but to that of their supply chain – direct and indirect. Here the numbers for essential items can become terrifyingly large.

It is said to take around 250,000 litres of water to make one tonne of steel – with global production at around 130 million tonnes a month according to World Steel Association figures. Up to two thirds of this water might be recycled. But, as Anglo American’s Jeremy Mann says, “once you have destroyed the quality of water, it is very difficult to reinstate it.”

According to the US Institute of Electrical and Electronic Engineers, ‘fossil-fuel-fired thermoelectric power plants consume more than 500 billion litres of fresh water per day in the US alone’. Although power plants use water primarily as a “non-contact, once-through coolant,” Piñero says, “in areas of highly variable or low availability, even industries that use water only for cooling and then return it to the ecosystem can still be at risk.”

As water supply tightens, competition for its use will increase. “Companies will face the additional risk of having their access to water restricted by local governments wanting to ensure adequate supply for their residents,” Piñero says. “Yet companies may well not know exactly where their suppliers have water risk exposure. Simply knowing there is adequate water in your own ecosystem is not enough.”
So what to do? Can technology solve the problems?

Technology can certainly help, though shifts in weather patterns are probably beyond mankind’s ability to solve.

There are mega schemes under way that aim to move water from wet places to dry ones. The Chinese government is halfway through the world’s biggest water diversion project, transporting water hundreds of kilometres from the country’s wetter south to the dry, heavily populated north. India has even more ambitious plans for water diversions that could total US$120 billion.

At a lower corporate level, Anglo American has invested in a desalination plant in Chile that will secure the future of one of its copper mines. But at a cost of US$100 million. It has invested a similar amount in treating waste water from some of its South African coal mines to supply drinking water to residents of a nearby city. Partnerships with local governments are valuable.

The long-term answer, for all businesses, is to use less water. However, this demands an appreciation of the strategic importance of water, data on current use, and a methodology for achieving strategic goals. Mann says Anglo American “is now looking at its entire operation – from start to finish – from the perspective of water.”

Could water be the new carbon?

Even 20 years ago a ‘carbon footprint’ was not a significant element in many companies’ strategic thinking. But it is today.

Water footprints might follow. And a real difference is that, unlike carbon, “water issues are local and access to it is a very sensitive human rights issue,” says Piñero. This could make water an even more potent issue.

“Companies need to have enough water, of the right quality, at the right time, in the right place,” Piñero says.

The challenge they face is ensuring that they do.

Martin Beaver is a freelance writer who specialises in health and safety, and energy industry issues.

Manufacturing fresh water: desalination

Where water is scarce, desalination may be the only viable means to provide the water supply necessary to support population growth and sustainable development. The Middle East is the biggest market for desalination, with large-scale programmes also in Australia, Algeria and Spain. China is forecast to become one of the biggest desalination markets.

“Spain is a microcosm of the world’s irregular water distribution; four years ago, Barcelona’s supplies were so low that it imported water by ship,” says Jorge Aldegunde, Lloyd’s Register’s Energy Business Manager Spain.

“Consecutive governments have prepared different water plans, changing from a proposal for a big transfer of water from the Ebro River to the manufacturing of 51 desalination plants. Only 17 are so far running at below full capacity and the rest are still to be commissioned. Demand is low as the final price of the water will be around 1.1 €/m3, higher than the 0.3 €/m3 that the agricultural sector can pay.”

Although the costs of desalination have fallen dramatically since the 1980s they are generally still high compared to natural fresh water. Most industry commentators believe costs will continue to fall steadily due to technological advances, improvements in energy efficiency and an increase in the lifetime of desalination plants. And as population growth continues and water availability declines, the price of fresh water will begin to rise, creating the potential for desalination to become more cost-competitive.

As water resources become even more stretched the applications of desalination are likely to increase rapidly. The main trend is the switch from municipal to industrial demand. This reflects, in part, the current high levels of investment going into the energy and mining sectors in regions with limited access to water resources, and water-intensive industries are investing in technologies that help them to use water more efficiently.

This fast-changing industry is continuously developing and current focuses are on reducing energy consumption and impact on the environment.

- **Over 300 million people** in 150 countries have some or all their daily water from desalination.
- **16,000 plants** produce 66.5 million cubic metres a day, 0.6% of global water supply.
- **Around 60% of plants treat seawater;** other feedwater is estuary water, groundwater and waste water.

International Desalination Association (IDA)
From compliance to performance

ALcontrol Laboratories’ senior management highlights the connection between strategic growth and certified management systems.
Since being certified to the Environment Management Standard (EMS) ISO 14001 in 2003, ALcontrol has put management systems at the heart of its organisation to drive competitive advantage, employee engagement and strategic performance.

ALcontrol Laboratories is an organisation that believes that thorough understanding of their strengths and weaknesses leads to the identification of potential areas for competitive advantage. This strategic approach to being a sustainable, successful business is underpinned through its reliance on certified management systems as a management tool.

Link to business objectives
ALcontrol management believes that there is a strong link between certified management systems and the achievement of strategic objectives. “Our objectives are firstly to increase business and profits but to do so our objectives also include making sure we have got environmental, quality and health and safety controls in place,” says General Manager of the Oil Testing Department, Bob Cutler. “Without having a management system, we could not monitor what we try to do and maintain our performance.”

Iain Swinton, Business Director (UK and Ireland) for Land, adds: “Obviously, as an environmental laboratory, we are heavily focused on the environmental aspects of our business and it is very important that we behave in an ethical manner when it comes to the environment. Our EMS enables us to do that, and ensures that we are able to give our customers confidence that they can rely on us and that our environmental credentials are spread across the group.”

A certified EMS is also a requirement of many of ALcontrol’s major clients. This is particularly important for Cutler, and his side of the business, oil testing. “Our clients – which include oil companies – require their suppliers to possess the same standards as themselves. So without a certified management system, we would not be able to win business from many of our major customers.”

Risk reduction is a strategic objective for most businesses and many of ALcontrol’s clients demand certification as a way of reducing risk in their supply chains. “Management systems are very important in risk control,” says Mike McCorkell, UK Managing Director Food & Water. “They ensure that risks are periodically reviewed with clear mitigation plans in place – any attempt to manage risks in an ad hoc manner would be a recipe for failure. Management systems provide a framework for addressing issues in a structured way, which helps in the identification of practical solutions to mitigate those risks, and thereby serves to build business resilience.”

Driving improved performance
There is a clear consensus among ALcontrol management that a strong link exists between management systems and improved performance, with all the ALcontrol executives referring to the benefits of monitoring and the continuous improvement that is driven by management systems. The company’s experience is summarised by Cutler: “Since implementing our EMS, we have seen a tremendous improvement in our performance. The managers and staff can now see what is going on and everybody knows what they are supposed to be doing and what impact their work has on the key metrics.

“With our management system, if our employees see any drop in performance, they automatically put things right without any need for management intervention.”

A key component of the services provided by ALcontrol’s assurance provider, LRQA, is ‘themed surveillance’ which describes the approach taken by assessors to identify the key strategic issues affecting an individual organisation and applying these as key targets to drive organisational compliance and performance.

The ALcontrol senior management team identified significant advantages from this approach because it helped them to drill down to the issues affecting the objectives of greatest importance. McCorkell reports: “Generally, the benefits we have enjoyed from themed surveillance have come from technique rather than technology. Sometimes, there is an assumption that change will require heavy investment in new technology. However, we have found that benefits have come from simple changes in technique; staff engagement has enabled us to change behaviour and deliver some pretty impressive improvements.”

Energy efficiency
Another example of how organisational performance can be driven through management systems is energy efficiency. The rising cost of energy combined with increased regulatory pressure (such as the CRC Energy Efficiency Scheme) and a desire among many organisations to reduce their carbon footprint, is driving a focus on energy use and ALcontrol is no exception. As part of its EMS, the company has been looking for ways to improve energy efficiency for over 10 years and David Doherty – Health Safety and Environment Manager believes that this is one of the ways in which management system certification has ‘provided a tenfold payback’.
ALcontrol, one of the world’s leading environment and food testing companies, provides analytical services to organisations around the world.

With around 1,500 employees working in 30 laboratories and service centres conducting millions of tests per year, ALcontrol offers testing and analytical services for soil, water, food and oil to help clients demonstrate compliance with regulations and achieve their health, safety and environmental goals. Through a network of laboratories in 11 European countries and providing support to customers globally, ALcontrol aims to be the leading environment and food testing group in Europe.

A common response by ALcontrol management was that the management systems appear to have ‘taken on a life of their own’. For example, McCorkell says: “Once our employees become fully engaged in issues such as energy efficiency, they start finding ways to improve performance that could never have been imagined at the outset.”

A number of initiatives have been introduced to reduce energy. For example: a traffic light system enables staff to identify which electrical equipment can be safely turned off; extraction systems are only operated when needed; and storage has been reorganised so that some walk-in cold stores could be decommissioned. These measures, combined with good servicing schedules and staff awareness of energy usage, saw a reduction in ALcontrol’s energy consumption by 17% equating to over 1.5 million kWh saved over two years, which is a cost saving of over £100,000.

Staff engagement

A significant part of ALcontrol’s business is conducted in the environmental sector, so the company’s employees already have a high level of environmental awareness. As a result, management firmly believes that employees are motivated by the company’s EMS certification. McCorkell draws a clear parallel with the personal lives of staff in which they seek to lower their own environmental impact. As a result he says: “They expect their employer to demonstrate the same values. At ALcontrol a number of champions for the environment have emerged within the company, and the system has become self-perpetuating as people look to achieve objectives that give them a real buzz. Staff engagement certainly takes a boost from people arriving at work knowing that their employer demonstrates their commitment to the environment by holding appropriate certification for the environmental management system.”

Adding value

It is vitally important for the assurance provider to add value throughout the assessment and certification process. This is achieved in two ways. Firstly, reputation and credibility is important if current and future stakeholders – who often span multiple countries – are to be satisfied that the company’s certification is helping to build business resilience. Secondly, the technical expertise of the assessor who conducts the assessments must be high. This was highlighted by ALcontrol management who all commented on both the value of “an independent pair of eyes” and the advantages to be gained from an experienced LRQA assessor who understood their industry and was able to identify opportunities for improvement that would be of real value to the business.

Summarising, Swinton said: “By putting our management systems at the heart of our organisation, we are seeing tangible results which are helping to provide competitive advantage and business resilience; in today’s tough market, independent management systems certification remains a compelling proposition and is extremely valuable to the ongoing success of our organisation.”

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A very modern fleet

Polys Hajioannou, CEO of Safe Bulkers, is a modern Greek shipowner; an owner managing the challenges of today and tomorrow, but also a representative of the personal and ‘hands-on’ leadership that has characterised the legendary tradition of Greek shipping.
There are many shipowners of Greek nationality and they have many different approaches to business and differing personal styles. While modern Greek owners are perhaps less well known on the world stage than some famous names of the past, these are owners who are just as significant as their industry forebears. The shipowners of today must deal with a bigger and more complex industry and the current technological and investment dilemmas presented by high bunker fuel prices, emission regulations and requirements such as the new ballast water convention.

Today Safe Bulkers controls 21 dry cargo ships in a variety of classes: panamax, kamsarmax, post-panamax and capesize, with a combined deadweight tonnage of nearly two million tonnes. Eight more ships will be delivered by 2014. Safe Bulkers is a public company, listed on the New York Stock Exchange.

Lloyd’s Register spoke to Safe Bulker’s CEO, Polys Hajoannou in the Athens seaside suburb of Voula, where the company occupies a modern office. We asked him about the challenges his company faces – particularly high energy prices and strict environmental regulations.

“Shipping is an ever evolving and dynamic industry which over the years has faced plentiful regulatory changes for safety and environmental purposes which ultimately affect the normal course of business,” Hajoannou commented. “Being focused on repeatedly ordering newbuild ships of the latest designs and technologies allows us to feel comfortable in facing the new challenges of the market and to adjust to them smoothly.”

**High specification tonnage**

Indeed, the company has a very modern fleet. Its fleet averages some four years of age and one of the special characteristics is that the company has not bought any secondhand ships since 1986. Its approach is to acquire from leading Japanese shipyards the latest designs available and build them to its own specifications.

Safe Bulkers has been keen on building vessels with bigger and more efficient main engines, able to operate at lower RPM, providing better fuel economy and more flexibility to the charterers especially at present market conditions. Given current fuel oil prices, that decision is looking smart – saving well over US$2,000 per day. Nor does Hajoannou see fuel costs coming down. “This will not stop [rising bunker costs]. We would no longer be surprised to see HFO (heavy fuel oil) approaching US$1,000 per tonne at a certain point in the next three to five years, though we are hoping to be proved wrong.”

The company’s high specification tonnage has ensured that there is a ready second-hand market for its ships, when it is ready to sell them on, and this allows it to keep reinvesting in modern tonnage. This helped the company to sell 11 secondhand bulkers in the booming times of 2007–2008.

Safe Bulkers has incorporated other technical and operating practices to maximise efficiency: policies such as regular propeller cleaning and, when waiting for long periods at anchorages, arranging with charterers for a short steaming leg every two weeks to prevent the accumulation of marine growth on the underwater hull. “We clean our props and sea chests every six to nine months and with the paints that we are using, and by preventing growth at anchorage, we can avoid cleaning vessels’ hulls in European and Australian waters where environmental restrictions apply.”

Hajoannou sees the demand for eco-efficiency intensifying, with markets reducing the earning power of older, higher consumption ships. “Charterers will start to lease efficient ships more often and heavy consumption ships will struggle to find reasonable employment.”

The company approach of acquiring, ‘the best ships with the latest technology’, seems to be standing Safe Bulkers in good stead. We say goodbye and thank Hajoannou for his time. Night has fallen in Voula but the lights in the company’s building still burn brightly. Out at sea, in all the time zones of the world, Safe Bulkers ships are trading while, in Japan, dawn will soon break over the shipyards constructing the most modern ships – soon to join a very modern fleet.

**Safe Bulkers approach**

Safe Bulkers has looked to lead the way in fleet development by buying, between 2001 to 2007, high specification ships in a series of sisters. Tsuneishi shipyard built a total of 15 vessels both panamax (EURO TESS’76 – Tsuneishi Economical Standard Ship) and kamsarmax which were designed on the basis of Lloyd’s Register as the classification society and equipped with bigger main engine and diesel generators, ballast control console and extra mooring arrangement. The same philosophy has been followed for the five 87,000 dwt post-panamaxes Safe Bulkers has built, between 2006 and 2009, in the highly respected IHI yard in Japan.

In recent years Safe Bulkers has adopted strong commercial relations with another renowned Japanese yard, Imabari, a world leader in terms of design, quality and efficiency. Out of seven vessels ordered at Imabari, Safe Bulkers already has three in its fleet of the 95,000 dwt ‘Nexter’ type post-panamax vessels. These are considerably shallower at 14.45 metres scantling draft and at least five tonnes more economic in terms of fuel oil consumption in comparison with other post-panamaxes built in China.

Further orders include two 76,000 dwt panamax bulk carriers with electronic main engines and advanced fuel-saving devices expecting to bring down the fuel oil consumption below 25 tonnes per day at 13.5 knots laden speed. Following the owner’s strong recommendation, Imabari recently developed a new shallow drafted 80,000 dwt vessel with 35-metre beam, an in-between design of the modern 32-metre beam panamax and the 38-metre beam post-panamax, offering flexibility once the new Panama Canal opens.
Greek ships carrying grain, ore, crude oil and its products play a large role in keeping the engines of the world economy turning.

While the domestic problems and future of the Greek economy have been subjected to intense scrutiny and speculation, Greece’s shipping companies remain a key cornerstone of the most global of industries. Greek shipowners control 19% of the world fleet of bulk carriers and oil tankers.

Times are tough in shipping right now. Although the industry is still a growing sector and as important as ever, there is an over-supply of tonnage following exuberant ordering and a decade of huge increases in shipyard capacity – mainly in China. Now the rising cost of bunkers (ship’s fuel oil) combined with air emissions regulation is posing some tough questions: ‘Do I need to, can I, or should I build new, more efficient ships?’

And, so it was in June, with these questions heavy in the air, that the shipping world came to Greece – as it does every two years. This biannual pilgrimage is to attend Posidonia, a huge festival of shipping held in the Greek capital, named for the Greek god of the oceans. Relationships are vital in shipping and the many receptions for which Posidonia is renowned enable shipping friendships to be cemented and strengthened, networks built and maintained, and deals struck between the owners, ship managers, shipbrokers, shipbuilders, insurance chiefs, classification heads, bankers and many other marine stakeholders.

While Posidonia has a substantial social side it is very much more. The Posidonia exhibition, housed this year in an excellent new venue, is a showcase for shipping service companies and shipyards. This year there were also a series of successful briefings, forums and conferences that examined the shipping issues of our times.

With fuel efficiency a priority, the shipyards were in Greece to try and sell new ‘eco’ designs together with new paints, new engines and other equipment that are on offer and that they hope they can sell to support the new generation of efficient ships that the yards are marketing.

And the main questions in the forums and conferences were whether existing ships would be made obsolete by new ships and to what extent anticipation is justified that new ships will increasingly outperform existing tonnage.

There are two perspectives here.

It is natural to expect those with large existing fleets to defend values of ships bought at high levels compared to today’s newbuilding prices. They have their interests to protect and this can only be expected and the majority of owners would rather that the existing state of over-supply is not exacerbated by new orders.

On the other hand, charterers, the companies that employ the ships, would like to reduce their fuel bills and so are extremely interested in more efficient designs. They would happily see more choice and the balance between supply and demand tilted in their favour.

However at present there are few new, demonstrably more efficient ships available for charter. Although this looks set to change, it may some time before the ship performance status quo is heavily challenged. In the meantime the industry will be examining with great interest opportunities to improve the performance of existing tonnage.

Nick Brown asks whether the time is right to build the next generation of ships.

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Temperatures plummeted. Snowflakes became snow blizzards. As 2011 drew to a close, many European countries experienced the bleakest December for a century. While consumers shivered and turned up the heating, utilities shook their heads and turned to the problem of renewable energy: how do you store it until people need it?

“We all know the weather is unpredictable and has a significant impact on the cost for wind and solar energy installations,” says Sean Cuthbert, Lloyd’s Register ODS’s Energy Sustainability Adviser.

“It is hard to say when the wind will blow or the sun will shine. Couple this basic fact with the complex task of storing energy and you can begin to feel the industry’s headache.”

It is a frustrating problem considering many of our daily needs are met by a commonplace object: a battery. Yet to date, attempts to evolve conventional batteries to serve grid-sized applications have proved unsuccessful. The reason is partly because batteries are not good at dispatching electricity at high voltages, and high-voltage transmission is the most efficient way to transport electricity over distances. It is also about scalability and size of the power output and the total energy stored. With the right conditions, the biggest offshore wind farms can produce 400MW of power, but the largest sets of conventional chemical batteries can only store...
a few megajoules at a time. As the Financial Times put it: we waste a huge amount of the renewable energy we do produce and we have to keep expensive fossil fuel stations on standby for when the weather fails to deliver.

**Safe, reliable, affordable storage**

American energy analyst, Lux Research, estimates that global demand for grid storage will increase from US$50 billion today to US$113 billion in 2017.

So what are the approaches? “The first is long term to take advantage of daily, weekly and seasonal variations in renewable energy,” says Cuthbert. “Short-term storage is equally important. From milliseconds to minutes, utility providers need to handle rapid energy surges and drops of electricity supply across a grid while matching demand. If demand outstrips supply, electricity is dispersed too widely. The frequency falls. Lights dim. If supply outstrips demand, the frequency rises and electrical devices can be damaged.”

**Long-term thinking**

One method appears to be way in front. Pumped-storage hydroelectricity (PSH) accounts for a high percentage of the world’s electricity storage needs. It works by using electricity to pump water to a higher point when there is low-energy demand. When demand increases, water is released, powering generators as it gushes downwards.

The technology is estimated at 70% to 80% energy efficient, with the capability to store power for long periods and dispatch high-voltage power at a moment’s notice. The catch is geography. Setting up a PSH scheme requires hills and lakes and they are in limited supply. “The downside is that energy is not stored indefinitely,” says Cuthbert, “and in places such as Egypt, the US’s south west and China, evaporation losses are very significant which lowers the overall energy efficiency to around 50%.”

So new technologies and methods are being developed and tested. One approach has two shafts – one larger than the other – shifting water between the two. Surplus electricity pumps water down the smaller shaft to raise a weight in the larger shaft. When electricity is needed, the weight sinks, forcing water turbines to generate power. Another approach is the use of mine pits for underground PSH facilities.

Harnessing gas in place of water is also being explored, with excess electricity being used to cool and compress air which is stored underground. When power is needed, compressed air is released to turn turbines. New technologies are being looked at that also capture heat used in the process to boost the energy efficiency of the system.

“For large grid-scale power projects, engineers are testing how surplus electricity can be used to produce hydrogen from water, and where hydrogen can be stored in caverns or gas pipeline networks and used to fuel power stations when electricity is required,” says Cuthbert.

**Short-term answers**

To date, grid operators have relied on fossil-fuel plant to balance short-term energy demand with supply. Incorporating greater amounts of renewable energy into the mix makes the balancing act more difficult. The question is, what can smooth out the peaks and troughs in supply?

The flywheel and its physics are simple. Flywheels are suspended in a vacuum by electromagnetic forces, where they can spin at twice the speed of sound. Grid-scale flywheels can absorb or dispatch megawatts of energy at any time. Then there are ‘Powercubes’ (lead-acid batteries) that have added super-capacitors. These efficient hybrids are bundled into shipping containers for grid operators to use.

Utility suppliers are also turning their customers’ buildings into electricity storage units. Freezer units or ventilation systems can act as a type of storage and, by grabbing extra energy, participants in the scheme will need less later, meaning future demand can be released for other users. In the US, more than 30,000MW of electricity is controlled this way, with ‘demand-response’ customers receiving a discounted bill.

One of the most promising models is a centralised large-scale (utility-scale) electrochemical energy storage solution that is not dependent on geography and can also be scaled separately in terms of power delivered and energy stored. Such technology exists: the flow battery, currently the subject of research including a study sponsored by Lloyd’s Register.

**A European supergrid**

“Short-term storage is essentially grid management, so we can expect upgraded links and smarter systems,” says Cuthbert. “Look, for instance, at the interconnectors being built to serve a Europe-wide supergrid. France, Britain and the Netherlands are hooked up with a further nine European links planned. Tomorrow’s power may come thanks to the latest turbines being built off the wind-lashed Scottish coast and solar panels in southern Germany, Turkey and North Africa, or thanks to wave technology off the rolling European coastlines and hydropower from dams in Norway’s fjords and the Swiss Alps.”

Progress is, it seems, being made to bottle nature’s ‘free’ power.

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THE RETURN OF THE BLACK ROCK

It powered the Industrial Revolution. Will it fuel the future?

The world needs a steady supply of base-load energy. Yet again, coal appears to be providing the only real answer, especially for the emerging economies, reports Jason Knights.
mitting twice as much carbon dioxide as natural gas, coal seems an odd choice as a ‘fuel of the future’. The black sedimentary rock conjures up images from the past – of steam ships, locomotives and factory furnaces. Indeed, for much of the 20th century, coal appeared to be on its way out. By the mid 1960s, oil had overtaken coal as the world’s most used energy source. Add growing fears over climate change since the end of the last century and the ‘black rock’ of fossil fuels seemed bound for the annals of energy history. But while a number of old coal-fired plant are heading for decommissioning or busy reinventing themselves, this is far from the complete picture. Taking the world as a whole, coal has not become less popular in recent years: its use is on the rise. According to the BP Statistical Review of World Energy June 2012, coal’s total share of the world’s energy consumption is estimated at 30.3%, the highest since 1969. By contrast, oil’s share of global energy use peaked at 48.5% in 1973. It has now slipped back to 33.1%.

Coal’s main strengths are threefold. It is cheap. No other fuel aside from US shale gas can beat its price per unit of energy produced. It is abundant, with possibly enough coal left in the ground to supply current energy demands for over 120 years. Moreover, coal is well dispersed. Importers are less worried about security of supply or having to deal with cartels than with other fossil fuels.

Coal fired in Asia
As China’s economy has grown, energy demand has soared. China has overtaken the US as the largest global energy consumer. Unworried by European regulations or strong environmental opposition, it has opted for the cheapest, most reliable source of energy it can find: coal. It also offers a secure supply. China has vast coal reserves, as does neighbouring Mongolia.

In the last eight years, China’s coal use has doubled, and it is estimated that half of the coal burned in the world is now burned in China. The country’s miners work hard to deliver three billion tonnes of coal a year, making China the world’s largest coal producer. Yet its demand for energy is so great that, last year, it overtook Japan to become the world’s biggest importer of coal too. The country might be heading for an economic slowdown, but in the longer run its energy demand will continue to grow, even if it is at a slower rate than recent times.

India’s coal use is growing fast too, almost doubling in 12 years. It also has huge domestic reserves – the fifth biggest in the world – and is the world’s third-largest producer. But with one third of households not having enough electricity to power a light bulb, India is desperate for more electricity. We have seen how India’s energy crisis spread to more than half the country after its eastern, northern and north-eastern electricity grids collapsed, leaving more than 600 million people across 13 states without power. Energy supply is critical. While India is expected to triple the number of coal-fired plants over the next decade, it has also cut coal import tariffs, opening up a potentially valuable new market for producers. Look wider afield across Asia and you will see a similar picture of more coal-fired power plants.

Not just the emerging markets
While the new growth in coal use is coming from the emerging markets, the developed world is proving reluctant to give up this fossil fuel. The US, for example, relies on coal for approximately a third of its electricity demand. And even if utilities want to switch from coal to gas much depends on the infrastructure and capability of the power grid.

Economics may also come into play to reduce the rate of switchover. The current low natural gas prices are likely to rise when liquefied natural gas (LNG) export terminals are built. New facilities will allow US LNG producers to sell to Asia – where gas is five times more expensive. In this new market landscape, coal will become increasingly competitive as an alternative fuel.

A German energy study even concluded that coal plant will enjoy an upswing in Europe.

Germany’s decision to close down its nuclear reactors by 2020 will create an energy supply shortage. That gap could be made worse by lower subsidies for renewable energy sources, combined with volatile gas prices. Enter 50GW of new European coal plant, which could potentially be built between now and 2020.

For a sustainable energy future, coal’s environmental impact should be reduced – more than 70% of CO₂ emissions arise from coal-fired power generation, according to the International Energy Association. Using coal more efficiently, coupled with carbon capture and storage will be important steps.

What of the alternatives?
Looking at other energy sources, solar and wind power have made huge advances in the last 10 years, but currently provide less than 2% of the world’s total energy supply. While these power generation technologies need to be a part of the energy mix of the future, their energy is intermittent and climate-dependent. Improvements in electricity storage would help, but renewable energy still needs to be backed by plant that can satisfy ‘on-demand’ power.

Is coal the solution here? Oil is becoming expensive with harder-to-reach and deeper exploration. Natural gas has potential and production will no doubt boom, but it is unlikely to supplant coal. And the shale gas revolution sparked by advanced techniques in drilling, has yet to catch on in Europe and Asia. As for nuclear, the fuel source, uranium, is extremely cheap but nuclear plant are expensive to build (accounting for some 60% of the total cost of power produced, compared to about 14% for a gas plant). Over a long life, nuclear plant can often prove cost-effective, but the investment upfront is a challenge to heavily debt-burdened economies in the West. So it comes back to satisfying base-load power supply which means coal is likely to be with us as part of the energy mix solution for some time.

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How has the industry responded in the wake of the *Concordia* incident?

Over the past several decades, the cruise industry has continually reviewed best practices and developed innovative technologies to further strengthen its safety record.

In the immediate aftermath of *Concordia*, CLIA, speaking on behalf of the global cruise industry, launched the ongoing Cruise Industry Operational Safety Review, which was announced publicly on 27 January 2012. The review is a comprehensive assessment of the critical human factors and operational aspects of maritime safety and began with an internal review by CLIA members of their own operational safety practices and procedures concerning issues of navigation, evacuation, emergency training, and related practices and procedures.

The review is guided by a third-party panel of experts whose role is to provide an impartial assessment of the recommendations developed by the review. Each panel member brings in-depth experience in the maritime, regulatory and accident investigation fields, with panel members balanced geographically with equal representation from the US and Europe.

In 2011 worldwide, a record 16.3 million passengers went on a cruise.

To date, CLIA and the European Cruise Council have announced six new policies as part of the review that have been adopted by their member cruise lines. All policies exceed current international regulatory requirements and pertain to a wide range of issues. These policies have been or will be submitted to the International Maritime Organization (IMO) for industry-wide implementation to further improve safety on board cruise ships.

We are taking a holistic look at safety, as evidenced by the breadth and scope of the numerous policies that have been
developed and adopted as part of the Review. Details on all policies are available online at www.cruising.org.

What is the cruise industry doing to reduce its impact on the environment?

Our industry has a vested interest in protecting the global ocean environment, not only because it is the responsible thing to do – but also because clean oceans and beaches are essential to the cruise experience.

We follow environmental stewardship practices that seek to fully protect the communities, ports, and waters wherever we operate. I am extremely proud that our industry has been at the forefront of waste water treatment, emissions reduction and developing innovative technologies to reduce the environmental impact of cruising.

CLIA members currently employ waste water management practices and procedures that are substantially more protective of the environment than are required by regulation. Our members are investing hundreds of millions of dollars in technologies to further reduce the impact of cruise ships on the world’s oceans and ecosystems.

As more fuel-efficient ships have come into service, CLIA members have been systematically reducing air emissions. The industry has invested significantly over the last decade to develop and implement new technologies that help to reduce air emissions, including utilising exhaust gas scrubbers, developing engines that run more efficiently and using shore power.

I’d also point out that cruise lines have a variety of environmentally innovative programmes in place that help ships conserve energy, from switching to low energy LED lights, using recycled hot water to heat passenger cabins, and using special window tinting that keeps passageways cooler, which requires less air conditioning.

Are there any industry trends you’d like to highlight?

In the last five years, the globalisation of cruising has been one of the dominant themes in the industry, with particularly strong growth in Europe. We are seeing growing interest in cruising to exotic regions of the world. CLIA member lines are providing more choice in itineraries, price, and length of cruise. There’s an even greater choice in shipboard activities and amenities, notably new dining experiences. I would also note that we are seeing increasing popularity of shorter cruises across all price categories. Other strong areas of growth for our industry are in the luxury cruise market and the river cruise market.

Final words?

I think it’s important for people to know that cruising is one of the safest, affordable and enjoyable vacation experiences available today. In fact, cruises have a higher percentage of satisfied customers than any other vacation experience.

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About CLIA

The nonprofit Cruise Lines International Association (CLIA) is the largest global cruise industry organisation. CLIA represents the interests of 26 member lines, 15,000 travel agents, and 120 executive partners before regulatory and legislative policy makers, supporting measures that foster a safe, secure and healthy cruise ship environment.

www.cruising.org
The World Ocean Council has a vision: a healthy and productive global ocean and its sustainable use, development and stewardship by a responsible ocean business community.
Paul Holthus, the Council’s Executive Director talked to Nick Brown about bringing together the ocean business community to collaborate on stewardship of the seas.

Paul Holthus, Executive Director of the World Ocean Council (WOC), regularly circles the globe to be in contact with leading ocean industry companies. A wide range of industries have an interest in ocean resources: shipping, oil and gas, fisheries, aquaculture, tourism, renewable energy (wind, wave, tidal), ports, dredging, cables and pipelines, carbon capture and storage, as well as the maritime legal, financial and insurance communities.

Holthus is focused on developing collaboration across sectors by bringing together the ocean business sustainability leaders who are driving change. He is seeking to understand and harness the power of corporate decision-makers to tackle the environmental issues that are challenging continued access to ocean space and resources by responsible business.

“Leadership companies are making good progress but we need a broad range of ocean industries, well beyond merchant shipping, working together if the diverse ocean business community is going to secure the future for ocean health, productivity and sustainable use.” But while so much of the focus in shipping has been on emissions from merchant ships: “WOC is trying to look at the whole picture across the ocean user spectrum and the broad range of ocean issues, from international policy to practical, operational issues.”

Holthus is positive about the International Maritime Organization’s (IMO) role. “The IMO is a leader in how UN agencies need to take on global challenges and develop solutions in partnership with industry,” says Holthus. “IMO is showing the way in tackling the international ocean challenges at a global scale and developing enforceable regulations.”

And the WOC was invited by the UN to help develop an Oceans Compact for consideration by the world’s governments at the Rio+20 summit on sustainable development. “The work of the progressive companies in the shipping industry and IMO provided important input to this,” says Holthus. In August, the UN Secretary-General, Ban Ki-moon, launched the Oceans Compact which aims to bring together all parts of the UN system to improve the co-ordination and effectiveness of the work of the UN on oceans.

For Holthus, high seas governance and biodiversity impacts are some of the next big things that ocean industries need to know are on the horizon. It is particularly vital that the shipping industry understands the important implications of these developments to maritime transport, and that shipping cannot solve these issues on its own. “Shipping needs to engage with the other ocean users to tackle these ocean-scale sustainability challenges in ways that work for the business community. The WOC is there creating the eyes, ears and voice for shipping and other industries in these cross-cutting ocean discussions.”

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The WOC rationale

Although the ocean covers 71% of the earth’s surface, it is an increasingly crowded place. Ocean industries of all kinds are expanding rapidly and impacts on the marine environment are growing at an ever increasing rate and global scale – affecting endangered species, ecosystem health, critical habitats and coastal communities that depend on marine areas for food and livelihood. Conflicts in the use of ocean space and resources are on the rise among industries, and with other ocean stakeholders.

Ocean industries are being held accountable for their impacts by government, inter-governmental and non-governmental stakeholders who are pursuing increased marine environmental regulation. Private sector access to ocean resources, services and space is increasingly at risk due to the loss of the ‘license’ to operate and the emerging ocean governance regimes. Unfortunately, there has been little or no interaction among like-minded responsible companies across the sectors to develop leadership and collaboration on ocean sustainability and engage in systematic, co-ordinated involvement with other ocean stakeholders.

The private sector is the primary ocean user and is best placed to develop and implement the practices needed to ensure marine ecosystem use is sustainable. An increasing number of companies and industry associations are tackling the environmental effects of their ocean activities. However, in a global, interconnected ocean ‘commons’, the actions of one company or even an entire sector are not enough to address cumulative impacts of growing ocean use by a diverse range of industries. There is clearly a need for ocean industries to collaborate within and across sectors to address impacts, reduce conflicts, develop proactive ocean sustainability leadership and constructively engage other stakeholders.

SOS 2013
The WOC will hold its second Sustainable Ocean Summit in 2013 and hopes to build on the success of the event, first held in Belfast in 2010. This is the only international, ‘cross-sectoral’ ocean sustainability conference designed for and by the private sector.
Value generator

From his corner office in a tower block overlooking Utrecht Central Station, Professor Leo van Dongen can oversee all the comings and goings at one of the Netherlands’ busiest stations.
Professor Leo van Dongen talks to Andrew Foulkes about the importance of professional asset maintenance in the rail industry

It is a vista that would be cherished by any rail enthusiast, but Van Dongen has more reason than most to value this particular vantage point: it is his job to ensure that commuters here in Utrecht, and elsewhere across the country, will be getting home that evening.

As Director of Fleet Services for NedTrain, Van Dongen is, in effect, the nation’s train engineer-in-chief, responsible for the maintenance of the 2,900 carriages that serve the national network. Day in, day out, it is his team’s responsibility to manage the fleet’s repair and refurbishment programmes without any impact on the clockwork nature of the Dutch rail timetable.

It’s a complex logistical exercise with little margin for error. And, with almost 30 years in the business, it is not surprising that Van Dongen has strong views about the role of the maintenance profession within a successful rail business and is embarking on a project to raise its academic standing and pass on the core skills to similar industries that are so dependent upon their capital assets.

Dutch masters

The Dutch expect a great deal from their railway, which is understandable given the country’s physical and economic geography could not be more suitable.

With no truly large cities, but around 50 major urban centres, the country’s network operates on something more akin to a large-scale metro system, with the main towns connected by a strict timetable that sees intercity services running at 15-minute intervals. No more so than in the region known as the ‘Randstad’, the densely populated area formed by the country’s four largest cities – Amsterdam, Rotterdam, Utrecht and The Hague – where almost half of the country’s 17 million inhabitants live.

The Dutch rail network has always been much admired – ask any visitor to Schipol Airport about the ease at which they can connect to any main business centre – and is regarded as one of the most efficient in Europe. But at the turn of the millennium performance was hardly five star. Almost one in six cars were stuck in the maintenance queue and engineers were struggling to obtain the necessary parts, all of which contributed to a shortage of available rolling stock. Punctuality was down to 79%.

It was a period, says Van Dongen, during which one could also sense an industry that had started to lose its technical knowledge. “Historically, like many train operators, when procuring new vehicles we would literally specify our own trains. This meant the design and build of our fleet would be informed by our own experiences and our own technical demands. In turn we continually built up our own internal technical competencies.”

However, changes in the market meant that vehicles became less bespoke and more ‘off the shelf’, with the manufacturers themselves setting the technical capabilities for their various models. As a consequence, says Van Dongen: “we [the railway industry] forgot the knowledge we needed to manage our own maintenance processes”. This was a symptom of the change that swept through European networks during the 1990s when it became a requirement of EU member states that the organisations operating the infrastructure (track, signalling etc) were separated from those who ran commercial services.

Nederlandse Spoorwegen (NS), the Dutch railways, began the necessary restructuring in 1994 and, today, its infrastructure is maintained by ProRail, while NS operates the vast majority of national services (with a few regional lines run by private interests). NedTrain is a full subsidiary of the NS group, maintaining the vehicles that enable NS to operate the 4,800 services that each day carry over a million passengers across one of the world’s highest density rail networks. While the NS fleet is its main responsibility, NedTrain is free to compete for non-NS business.

However, it was during this period when the engineering trade within the rail industry found itself taking a background role as privatisation, shareholder value and outsourcing became the boardroom buzzwords.

“At that time, managers, engineers and operators were not co-operating in the development of the innovation chain of product, process and technology. There was no open interaction between these disciplines.”

“We have a better balance now between business execution and maintenance concepts”

Back in charge

Yet, today, punctuality is back to 95%. So what changed?

“We’ve got control again,” says Van Dongen, “technology is back on the agenda and maintenance processes are no longer seen as a cost but, instead, something to be invested in and integrated within business strategy.”

Some high-level, basic facts underline his point. As a rough guide, procuring 100 carriages as part of the annual renewal programme would cost an operator approximately €200 million. But the cost of maintenance over their 30-year lifespan, at current prices, will be more than double that – broadly €300 million for general ongoing year-round maintenance and €100 million for a full refurbishment around the halfway point of its lifecycle.

“In any sector, over the course of an asset’s lifetime, a business can find itself spending several times its initial investment on cyclical maintenance, modernisation and life extension.” Yet too often in industry the lifetime maintenance costs are left as an afterthought.
Furthermore, given that fleet managers must also live in a profit and loss world, they are acutely aware that careful investment and management of the resources at their disposal can also deliver quantifiable benefits. For example, when in-service trains report a fault the issue will typically be something routine, a faulty pantograph or a set of malfunctioning doors. Repairing such faults in the workshop may require just an hour, but it can take a day either side to move the vehicle to and from the depot, meaning the train is withdrawn from service for more than 48 hours.

Which explains NedTrain’s decision to invest in new Technical Centres (small workshops) in specific locations across the network. The quicker turnaround of vehicles works out equivalent to having an extra 25 to 30 carriages in service at any given time – extra stock that would otherwise cost around €50 million to buy.

Furthermore, the diagnostic equipment carried on board today’s modern fleets allow maintenance teams, through remote condition monitoring, to anticipate faults before they even occur and to organise resources accordingly. A rolling stock engineer – who these days is as likely to work with a laptop rather than a toolbox – could have already diagnosed the problem and be fully prepared with necessary equipment before the train is even summoned to the workshop.

To Van Dongen, rather than being seen as a necessary evil comprised of teams working through the night with ‘open-ended spanners and greasy hands’, maintenance should be respected as a discipline that sits at the interface between asset owners and suppliers, ensuring that maintenance planning is fully integrated in operational decisions, from the initial business case through to procurement, delivery, service and eventual decommissioning.

“It is not just about repairs, it is a profession that involves technical, administrative and management responsibilities,” he says. “It is not a cost, but more of a value generator.”

That is the change in culture that took place in NedTrain: “We have a better balance now between business execution and maintenance concepts”.

Supporting the next generation
In addition to his duties at NedTrain, Van Dongen is also working with a triumvirate of Dutch universities to promote the academic standing of the profession and encourage further research into maintenance processes. This September sees the launch of new post-graduate qualifications in maintenance management with the first 16 participants starting under his tutelage at the University of Twente.

The research is funded by The Lloyd’s Register Educational Trust (The LRET), with Van Dongen heading one of The LRET’s 27 research centres of excellence around the world. Each plays a vital role in fulfilling The LRET’s aim to support education, training and research programmes in transportation, science, engineering, technology and the safety of life, worldwide, for the benefit of all.

It is something about which he is clearly proud. “There will be increasing demand across all sectors for young engineers who are able to make their presence known. It is our responsibility to make sure that the next generation are ready and able to make further progress in terms of uniting technology, knowledge and operational management.”

No compromise on safety
Back in his office it is late Friday afternoon and Utrecht Central Station is gearing up for one of the busiest times of the week. Leo van Dongen has seen enough Friday getaways pass quietly by to expect anything different today. So what keeps an experienced fleet manager like himself up at night?

“Safety,” he responds without any hesitation. “It’s my role. It’s the most important thing, more important than reliability. No compromises.”

In an industry that has undergone so much restructuring and finds itself under increasing pressure to increase capacity while cutting costs, it is reassuring to know that the industry’s engineers have rediscovered their voice.

Andrew Foulkes is Lloyd’s Register’s Transportation Communications Manager.

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Exploring the value of independent third-party certification

As businesses around the world seek to improve competitiveness, lower risk and build resilience, Insight talks to two leading authorities in the field of independent certification.

Mike James is Managing Director of Lloyd’s Register Quality Assurance Ltd (LRQA) and Michael Toffel is Associate Professor of Business Administration at Harvard Business School. Toffel’s research seeks to identify which voluntary programmes and management system standards actually distinguish participating companies as having superior performance.

CEOs and managing directors worldwide are increasingly recognising the link between certified management systems and the success and survival of organisations. This senior engagement is not only unlocking the intrinsic value of certified management systems but is delivering a clear return on investment to organisations worldwide.

Drivers for certification

In the course of his research, Professor Toffel has found that the main driver for independent certification of quality management standards such as ISO 9001 (QMS) is meeting the requirements of current and potential customers. However, he says: “In comparison with the quality domain, companies more rarely require their suppliers to adopt international standards governing environmental management and labour conditions, which is one reason fewer companies have adopted them. This means that such standards offer greater opportunity for suppliers to differentiate themselves from their competitors.”
Continuous improvement is a key feature of internationally recognised business standards. Organisations are required to set objectives and targets and to measure and review progress against these targets. But it does not stop there. As Toffel says: “The whole idea is that as you achieve these targets, you set new ones. For example, the environmental management standard ISO 14001 (EMS) contains a lot of provisions to help organisations ensure that procedures are documented and that staff are well trained. But if that were all it had, then you wouldn’t necessarily expect improvement; targets that require periodic review and revision ensure a drive for continuous improvement.”

**What are the benefits of certification?**

Mike James believes that independent assessment and certification to internationally recognised standards inspires stakeholder confidence and drives organisational resilience, competitive advantage and growth.

Taking ISO 14001 as an example, this standard helps companies to organise environmental management processes within a plant or across an organisation. It requires the creation of an environmental policy and documentation of procedures such as training and internal quality audits.

“Many of LRQA’s clients have demonstrated that an EMS improves an organisation’s regulatory compliance in areas such as environmental emissions, energy efficiency and waste management and as such can offer opportunities for cost reduction,” says James. “The creation of an effective environmental management plan reduces risk, providing assurance to stakeholders and often delivering brand benefits.”

Summarising, Toffel says: “It’s a way of organising all of the organisation’s activities which might otherwise be conducted in a more ad hoc manner. It can also help organisations harmonise their approach across their various plants, which some managers have noted is particularly helpful after acquisitions. So, ISO 14001 can provide a consistent, structured approach to the management of environmental affairs.”

A further benefit of independent certification is compliance with customer-specified requirements: “Many companies now require independently approved certification to a number of different standards in order to lower risk and assure the resilience of their supply chains,” says James. The premise is that becoming certified to management systems standards yields superior performance through process control or product quality. In addition, some believe that adopting these standards can lead to fewer problems such as process disruptions or product defects.

If these standards cause organisations to create structured processes for employees to offer improvement suggestions to management, then the adoption of these standards could lead to improvements in employee engagement.

While all certification delivers a number of common benefits, each individual standard provides its own specific advantages. For example, Toffel says: “In terms of processes, a few academic studies have shown that EMS adopters experienced faster reductions in pollution and greater improvements in compliance with environmental regulations, compared to a similar set of non-adopters.”

In a different study, co-authored by University of California, Berkeley’s Professor David Levine, Toffel looked at ISO 9001 again comparing adopters with non-adopters over a period of time. The researchers looked at single plant firms in California and found that the QMS adopters realised faster sales growth and employment growth compared to a similar set of non-adopters, which served as the control group. They also found some evidence that QMS

“...The creation of an effective environmental management plan reduces risk, providing assurance to stakeholders and often delivering brand benefits.”
adopters were subsequently more likely to report zero injuries warranting workers’ compensation. This revealed that the adoption of the QMS appears to have some spillover benefits in terms of improving workplace safety.

The California study also found that QMS adopters were more likely to have survived several years later, compared to the non-adopters. Toffel believes that there are several possible explanations for this finding. “First, many believe that ISO 9001 is a proxy for other good management practices and that better run companies are more likely to survive. Second, because ISO 9001 is so often adopted to qualify for more tenders, one might expect sales to increase among adopters, thereby enhancing survival – which was also found in the study. But in either case, our results indicate that companies looking for long-term supplier relationships can use ISO 9001 as a useful predictor of supplier longevity.”

Who benefits most?
Professor Toffel’s work has demonstrated that in terms of sales and employment growth, smaller companies experience greater benefits from adopting ISO 9001 than larger companies. This could indicate that smaller firms learn more from adopting ISO 9001 or that the standard is particularly helpful in enabling smaller firms to focus on quality.

Toffel speculates that organisations in less regulated industries might gain more from adopting quality standards, compared to organisations in industries – such as pharmaceuticals – where quality is already heavily regulated by the government. “The benefits of adopting an EMS or QMS might be greater in countries with weaker regulatory enforcement because adopting standards to meet independent third-party certification could spark an investment in managerial attention that can substantially enhance operational effectiveness and efficiency”, Toffel noted.

The way ahead
Further research is necessary to better quantify the benefits of certification believes Toffel. “It’s interesting that despite the widespread worldwide adoption of ISO 9001 and other industry-specific standards, there is virtually no robust systematic evidence about the conditions under which these standards best deliver on their promise to ultimately deliver consistently high performance, whether it be for quality, environmental, or labour conditions. While academic researchers have the skills to conduct this analysis, they don’t have data on the relevant process and product metrics over time. I am seeking to work with organisations that are willing to share information on their own facilities or of their suppliers, over time, before and after these standards were adopted.”

As for the standards themselves, James says: “In order to remain a valuable business asset, ISO standards need to continue to evolve, ensuring that organisations of all sizes, complexities and location see a clear connection between their strategic objectives and their management systems. It is not just about meeting the requirements of a standard to achieve certification; robust systems and processes need to be embedded in everything that the organisation does.”

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The growth of carbon trading schemes in Asia

Governments across Asia are serious about reducing their industry’s contribution to climate change and increasingly are turning to market-based mechanisms to reduce emissions. But it will take time for these schemes to come into operation and grow the stakeholder confidence they need to build scale, says Robert Hansor.
Despite its imperfections, the EU’s Emissions Trading System (EU ETS) has inspired governments in Asia to develop trading schemes of their own. And, by 2020, when a new global agreement on climate change will be implemented, many businesses in Asia will already be operating national carbon markets.

There are already operating schemes in Japan and New Zealand. Australia’s carbon pricing mechanism began in July: still more systems are emerging in China, India and South Korea, among others. Clearly governments have found it easier to put in place legislation of their own at a domestic level, where they control the legislative process, rather than having to negotiate it on the international stage.

But it remains to be seen if these schemes will emerge as fully operational emissions trading programmes similar to the EU ETS and if they can be linked internationally. It will not be easy. Most of the host countries have significantly different priorities, let alone industrial, economic and institutional conditions; and disparate domestic stakeholders are pushing and pulling to form legislation in each market.

South Korea, for instance, issued its national green-growth strategy in 2008 but has faced difficult domestic opposition to its proposed ETS. As a stopgap measure, it implemented a greenhouse gas and energy target management system and was eventually able to pass its ETS legislation in May this year after several delays.

Pilots in China
The draft regulations for two of China’s seven regional pilot programmes have been issued, giving stakeholders an initial understanding of what could emerge. There is not much information about how a price will be formed but, with a national carbon market mooted for 2015/16, this ETS eventually could become the world’s largest.

But while China has a great track record for delivering on what appear to be ostentatious goals, many observers appear distracted by the scheme’s potential and are missing the enormous challenges that need to be overcome – chiefly that it is hard to say whether business will invest in cleaner technologies and processes for regional pilot schemes which may last just a few years. So the goal during the pilot stage should be to prepare participants for the conditions, standards and infrastructure that will govern China’s national ETS rather than to generate high volumes of trade. It will need to mature slowly over time.

Meanwhile, in Japan, turning two nuclear reactors back on to ease power supply problems, despite widely reported public concerns, highlights the energy dilemma facing the country after the Fukushima crisis last year. To meet its emissions reduction target, the use of international offsets may become greater than ever. Its proposed bilateral offset crediting mechanism hopes to generate many of these offset credits from developing countries to help achieve its target.

A similar concept to the UN’s Clean Development Mechanism, its creators hope that the simpler processes will mobilise greater levels of investment. Designed in part to boost export trade, the mechanism could be a boon for Japanese businesses.

Also, by potentially targeting large quantities of offsets under its own programme before any other country takes similar steps, Japan is securing a relatively cheap supply of credits. Initial projects have been identified, feasibility studies completed and capacity building projects under way. Once the rules are clarified, its environmental integrity and the impact it could have on the international carbon market will be better understood.

And with these multiple schemes in Asia emerging, with a variety of emission targets, standards and governance mechanisms, talk is starting of a regional carbon market being established. But without common standards and rules, it is difficult to see how units could be traded between the different programmes; the widely differing standards would make transactions complex and costly. If the fragmented voluntary market can be taken as a reasonable guide, high-quality credits will be difficult to identify and prices will vary widely.

A common understanding needed
Part of the problem is that these initiatives are emerging in countries with differing economic conditions and institutional capacities. If a common standard is too much to hope for in the short term, for future ease of integration and fungibility of credits, the emergence of a common understanding of the principles for monitoring, reporting and verification (MRV) are required. Simple but adaptive MRV regimes that build trust and confidence among participants will result in stronger mechanisms over time.

In a large part, this depends on the level of ambition among the different schemes’ proponents. If environmental effectiveness is the primary goal then, together with Asia’s commitment to a 2020 global scheme, there should be continued enthusiasm for national level regimes and also time and incentive for common standards and approaches to emerge.

One theme which runs through all of these efforts is the different experiences regulatory architects have had in trying to engage the private sector during the early stages of system design. Ultimately, Asian businesses – just like their colleagues elsewhere in the world – need a long-term price signal to begin the transition to using low-carbon technologies. In many cases, the creators of these new systems have been well served by soliciting high levels of involvement from business early on.

For emerging schemes, the short-term goal should be to achieve market readiness so their initiatives gain support from participants. Establishing common principles for MRV is one of the first important steps to providing the kind of consistency that breeds stakeholder confidence. Once is achieved, the long-term challenge is to set ambitious reduction targets that stimulate the demand for carbon credits and release greater levels of low-carbon investment.

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WEST Engineering Services joins Group

Lloyd’s Register has acquired Houston-based WEST Engineering Services in a move that secures the Group’s position as the premier independent risk management organisation supporting the global offshore drilling industry.

“The acquisition of WEST further expands the global portfolio of technical services we can offer to the drilling sector, building on the world-class support we already provide through our Energy team which includes the ModuSpec Group, ODS and the Scandpower Group,” said John Wishart, Lloyd’s Register’s Energy Director. “We are now, without question, the industry’s leading independent provider of technical support for safe and environmentally responsible drilling operations as the world continues its search for new energy resources.”

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Nuclear power expertise

A new appointment and acquisition in India illustrate Lloyd’s Register’s response to rising demand for technical assurance services in the nuclear power sector.

Mumbai-based nuclear risk specialists, Reltech Consulting, which provides safety management services to a multinational civil nuclear client base, have been transferred to the newly formed LR Scandpower Risk Consultancy Pvt. Ltd. “Building a stronger local presence gives us the additional manpower and technical resources we need to serve the expanding Indian market and our global nuclear clients,” said Bjorn Inge Bakken, Chief Executive of the Scandpower Group.

And we have appointed the internationally respected nuclear safety expert Professor Mamdouh El-Shanawany as Business Leader for New Nuclear Opportunities. He joins us from the International Atomic Energy Agency (IAEA), where he most recently was the agency’s Head of Safety Assessment for the Division of Nuclear Installations Safety. He was responsible for strengthening the ability of IAEA member states to assess the safety of their nuclear installations. The team were awarded the Nobel Prize for Peace in 2005.

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Ambrey Risk’s quality first

Ambrey Risk, the international maritime security specialist, has become the first to achieve certification to ISO 9001:2008 for the provision of maritime security services for vessels with LRQA. Commercial Director, Shaun Webber stated, “We want to set the benchmark for regulatory compliance and professionalism in maritime security, so LRQA with its strong maritime credentials as a subsidiary of Lloyd’s Register, was the obvious choice for us. We are therefore delighted to be the first in the industry to gain certification to ISO 9001 with them.”

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Groundbreaking rules for FLNG

Lloyd’s Register has used its technical knowledge and experience to publish the world’s most comprehensive rules to guide the design, construction and operation of floating liquefied natural gas (FLNG) facilities.

“Natural gas is a key ‘fuel for the future’ and its safe and economic production will become increasingly more important”

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London Crossrail role

The largest engineering project currently under construction anywhere in Europe, London’s Crossrail scheme, will involve Lloyd’s Register working on the central section of the scheme. Our role as the notified body extends across the design, construction, testing and commissioning of the section’s various structural subsystems, including the 21 kilometres of twin-bore tunnels that will stretch from the west of the city, through to Stratford in the east and south-east London.

European legislation requires that mainline rail developments, such as Crossrail, are constructed to common standards so promoting a single market by removing technical barriers to the supply of equipment and the running of trains between member states. As notified body we will help ensure the new central tunnel section will be compliant with this legislation concerning the interoperability of railway operations.

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Marine wind energy project

Lloyd’s Register has joined forces with Totempower Energy Systems and Zodiac Maritime Agencies to assess the potential of wind-generation devices onboard commercial ships as the maritime industry steps up its pursuit of viable carbon-alternate fuels.

A fully autonomous wind-monitoring system designed and assembled by Totempower has been installed on the Zodiac-managed bulk carrier Cape Flamingo. The project will identify and measure the potential generating capacity from wind power for the ship’s trading patterns. The data will be used to support the development of computational fluid dynamics-based simulation models that are suitable for predicting the potential energy yields on other Zodiac ships.

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