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thinking resilience

> *A global crisis* Water crises rate among the most critical risks for the next 10 years. We examine one of today's most pressing environmental, business and humanitarian issues. Deborah Ritchie writes **p28**

> *Leaky logic* Phenomenal waste is leading to problems in meeting the growing demand for water. But there is enough to go round, so what are we doing wrong, and how can we remedy it? **p29**

Water scarcity and security

A global crisis

▾ **Water crises rate among the most critical risks for the next 10 years. We examine one of today's most pressing environmental, business and humanitarian issues. Deborah Ritchie writes**

Business and society depends on the proper functioning of essential sectors, including energy, transportation, telecoms, healthcare, and, of course, food and water – this latter impacting all the others. Water is needed for energy production, but based on current trends, the World Economic Forum (WEF) believes water demand is projected to exceed sustainable supply by 40 per cent in 2030.

Indeed, for the first time in a decade, environmental risk has topped the ranking of global risks with the greatest potential impact, according to its most recent Global Risks Report. "Climate change is exacerbating more risks than ever before in terms of water crises, food shortages, constrained economic growth, weaker societal cohesion and increased security risks," says chief risk officer of Zurich Insurance Group, Cecilia Reyes. Zurich Insurance is heavily involved in the ongoing efforts at the WEF to address global risks.

Challenges around water management are immense. At a global level, over a billion people lack access to improved water. Some 40 per cent of people suffer water shortages for at least a month each year. The Organisation for Economic Co-operation and Development estimates that 4 billion people could be living in water-scarce areas by 2050.

The WEF says global, regional and national governance lies at the heart of water management, but that some developed countries are failing to proactively address water vulnerabilities, instead reacting only after extreme weather events; and that in developing countries, the political challenges inherent in water infrastructure and conservation projects are exacerbated by greater financing challenges.

Business for the environment
Just last month, engineering giant Arup and Lloyd's Register Foundation announced the launch of a £10m resilience programme designed to help make infrastructure more resilient to shocks and stresses. Working with businesses, engineers and researchers, the programme will seek to develop standards and build networks of learning and best practice across essential sectors – food and water among them.

This is among a number of activities taking place to tackle the issue of infrastructure vulnerability and natural capital management. Back in summer, business group the Natural Capital Protocol was launched in London, its goal to help businesses assess and better manage their direct and indirect interactions with natural capital and provide guidance to help them measure their dependence and impact on natural assets such as freshwater, raw materials such as timber, and natural infrastructure such as floodplains.

The World Wildlife Fund is among the partners of the coalition that developed the protocol. WWF UK's chief adviser on economics and development, Karen Ellis, said the launch of the Natural Capital Protocol heralds "a new era" in the way that we maintain and enhance our planet's environment.

This month also saw a major piece of work announced by the UK government designed to tackle the impact of environmental issues, among them water shortages.

Ellis welcomed the Environmental Audit Committee's report 'Sustainability and HM Treasury'. "This report is a wake-up call to HM Treasury to future-proof our economy in the face of growing environmental risks, before it is too late. A healthy environment is the foundation of a productive and resilient economy, yet ongoing environmental damage is driving up costs from flooding, air pollution, soil erosion and water shortages. This will only be exacerbated under current growth and climate change trends, jeopardising our future economic prosperity."

Climate change as a wider issue is only exacerbating the problem. Adding to these pressures, agricultural production will have to increase in the coming decades to feed a growing population and a rising demand for meat. Unless current water management practices change significantly, many parts of the world may even start to face competition for water between agriculture, energy, industry and even cities – a potential precursor to tensions growing within countries, between rural and urban areas and even between poorer and richer areas. Interstate tensions over water access are already apparent in some parts of South Asia, and could impact the evolution of the international security landscape – demonstrating the breadth of the water scarcity issue.

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Leaky logic

☑ **Phenomenal waste is leading to problems in meeting the growing demand for water. But there is enough to go round, so what are we doing wrong, and how can we remedy it? We examine one of today's most pressing issues**

It is common knowledge that our earth is mostly comprised of water. It is a lesser known fact that only 2.5 per cent of this water is potable freshwater of which only a fraction is accessible to us – with the rest locked up in glaciers. In short, a mere 0.5 per cent of the world's water is at hand to sustain its seven billon inhabitants.

As populations rise, and urbanisation trends continue, utility firms are finding it increasingly difficult to meet growing water demand. Our consumption has grown twice as fast as our global population during the last century. From 1950 to 1999, alone, consumption has quadrupled. Much of this is down to casual attitudes in European and American countries where water is mostly taken for granted owing to its ubiquity. Whilst we, quantitatively, do have the water resources to provide clean, drinking water to every human on the planet we are wasting our supply at a phenomenal rate.

The World Bank estimates that

more than US$14 billion worth of potable water is lost every year because of leakage, theft and unbilled usage. The UK is a remarkable example where every day some 3.4 billion litres of the nation's supply is lost through aged, leaking pipes. Mitigating this loss alone would provide 21.5 million people with potable water. Moreover, a reduction of half the current levels of losses in developing countries, where relative losses are highest, could generate an estimated US$2.9 billion in cash and serve an additional 90 million people.

Thus, the modern water crisis we face is not one of supply but of preservation. At a societal level,

education is required to alter attitudes to water. At a political level, intergovernmental co-operation is essential to responsibly manage the water available and the environment so as to ensure the continuation of the water cycle itself. But, at the level of enterprise, businesses must innovate with the most advanced, modern technologies to provide the solutions that humanity needs to preserve its most important resource. There have been shortcomings in all three of these regards but no more so than in the latter.

Despite the digital revolution which has so comprehensively altered every facet of our lives, some industries have failed to take advantage of the benefits technology has to offer. The risk assurance and energy sectors are notable cases where the scale of firms have been more of a hindrance than a benefit to infrastructure modernisation. In the UK, for example, we have simply accepted the daily loss of 25 per cent of supply for almost 30 years. This is leaky logic – it makes no business, humanitarian, or even political, sense to accept these monumental losses. It's time to change the way we think about water.

The first challenge for providers is to take control of their infrastructure and learn what is happening and where. A new philosophy of infrastructure management is needed which stresses the use of technology to make businesses pro-active instead of re-active by reducing the gap

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CIPPS technologies are protected by international patents. The system has been designed using embedded nanosensors within the pipeline, these sensors relay a number of metrics such as stress, flow and viscosity, to operators' servers for real-time processing. This enables the whole system to effectively come alive and drive the three-stage CIPPS Sense, Predict, Act protocol in the event of leakage. In such cases, the site of intrusion is instantly detected and protected by CIPPS' unique ZeroFail system, the entire infrastructure network becomes aware of the site(s) of leakage and flow is adjusted autonomously without operator intervention. The applicability of CIPPS in addressing the water crisis is as obvious as it is urgent. For this reason Datatecnics have engineered a proprietary system specifically for

the water market: CIPPS WX100. Its aim is to address three key markets: water pipeline interdiction and failure, pipeline maintenance, and pipeline compliance and regulation.

As CEO Mohammed Zulfiquar notes, "We live in an odd time where water scarcity is our most pressing concern despite our increased technological capacity to deliver it from reservoir to tap. Something has gone deeply wrong when almost a billion people continue to go without access to clean water, every day. There are levels of loss which operators can reasonably be expected to make but the quantity of water we waste, at present, is simply unacceptable.

"Our vision is to reduce the wastage of water from over 25 per cent to below two per cent per day. Working with our industry partners we believe that we can make this reality."

The invisible threat?
Digitisation is not without its threats, however.

In 2013, the US Department of Homeland Security issued an industry-wide alert about the growing threat of cyber attacks to the energy sector, after its incident response teams noticed an alarming trend of hackers breaching US energy companies in an effort to probe their networks and determine how to take control of key processing systems. This was just one caveat amongst many that, today, the primary challenge is not theft of trade and technology secrets but the need to actively prepare for a new wave of stealthy cyber attacks that could be used as a precursor to industrial control system (ICS) "probes" and physically disruptive attacks.

The issue is, our utilities' infrastructure systems were designed more than 50 years ago – well before the technological revolution, and,

> ### ▶ Water Vision 2030
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> At Datatecnics, we are long-term thinkers with a serious commitment to sustainability. This commitment has led to CIPPS receiving no less than five different industry awards in as many years. Industry leaders seem to be echoing our belief that CIPPS very much represents the world's first major scientific achievement for infrastructure connectivity since the invention of the microchip in March 1959 by Texas Instruments.
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> Our company's vision is to see every critical infrastructure across the world protected by CIPPS technologies within the next 20 years. Achieving a mere five per cent of this vision – aside from the economic benefit of billions of dollars in savings for states and the creation of many new supply lines and support services creating jobs and wealth – CIPPS might just end up being one of the most important means by which humans are able to secure their most vital resource.

thus, were never designed for cyber attacks. The first step in rethinking about infrastructure security investing in the education of employees' understanding of total cyber outage. To that end, it is important to understand that the first generation of cyber attacks were designed to be disruptive. Today's attacks, however, are classed as destructive: designed to cause maximum outage.

Zulfiquar believes the answer lies in designing all future infrastructure projects using digital architecture with inbuilt enterprise risk framework on a multi-layered security safeguards. In other words, construct all future infrastructure grids through the prism of modern risk management protocols: with automated, intelligent technologies capable of protecting assets from external digital and physical attacks. This is precisely what CIPPS WX100 achieves.
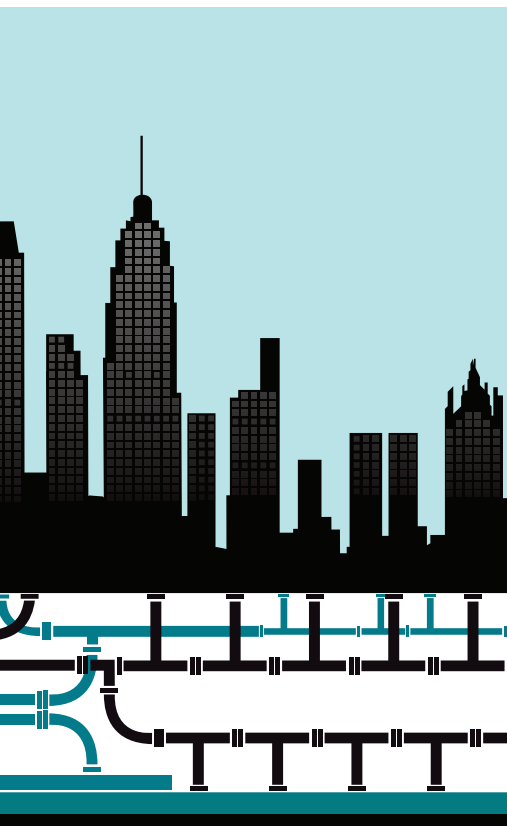
between knowledge and execution. This is the idea of predictive analytics.

Predictive analytic infrastructure management is not dissimilar to concepts such as the smart home, where embedded technologies in the property automate processes based on a number of variables such as temperature, humidity, light and time. The occupant of the property is thus saved the task of manually adjusting controls because of a digital system which is instantly able to respond to an environment constantly in flux.

Likewise, predictive analytics approaches must become an integral part of critical infrastructure management with a paradigmatic shift from inert, analogue networks to interconnected, real-time ones. Providers will need to harness smart technologies with embedded risk management protocols. Infrastructure

will need to be managed by a mix of technologies including M2M (machine-to-machine) and AI (artificial intelligence). The ultimate goal is to end up with zero fail pipelines that can predict pipeline failures months before outage.

There are, presently, no predictive, real-time systems in operation. However, one company may just have the solution governments and industry desperately need to secure the water supply.

The Datatecnics vision

In military, space and medical development, nanotechnologies have amassed a fundamental importance to their respective users. The versatility and microscopic accuracy of these technologies make them intrinsically valuable to those seeking new approaches to age-old problems. The

commercial sphere, however, has been especially slow in streamlining its processes with these advancements. It is in the spirit of addressing this shortcoming that Datatecnics, a UK-based firm leading the way in the use of nanotechnology for intelligent infrastructure applications, has set out to revolutionise the infrastructure and risk assurance markets.

Datatecnics' flagship line, the Critical Infrastructure Pipeline Protection Systems (CIPPS), is the world's first intelligent pipeline technology designed to deliver zero failure for the global water, oil and gas pipeline infrastructure – totally revolutionising pipeline delivery infrastructure.

By digitising the operation of infrastructure monitoring, CIPPS transmits the health data of the entire network to operators in real-time.

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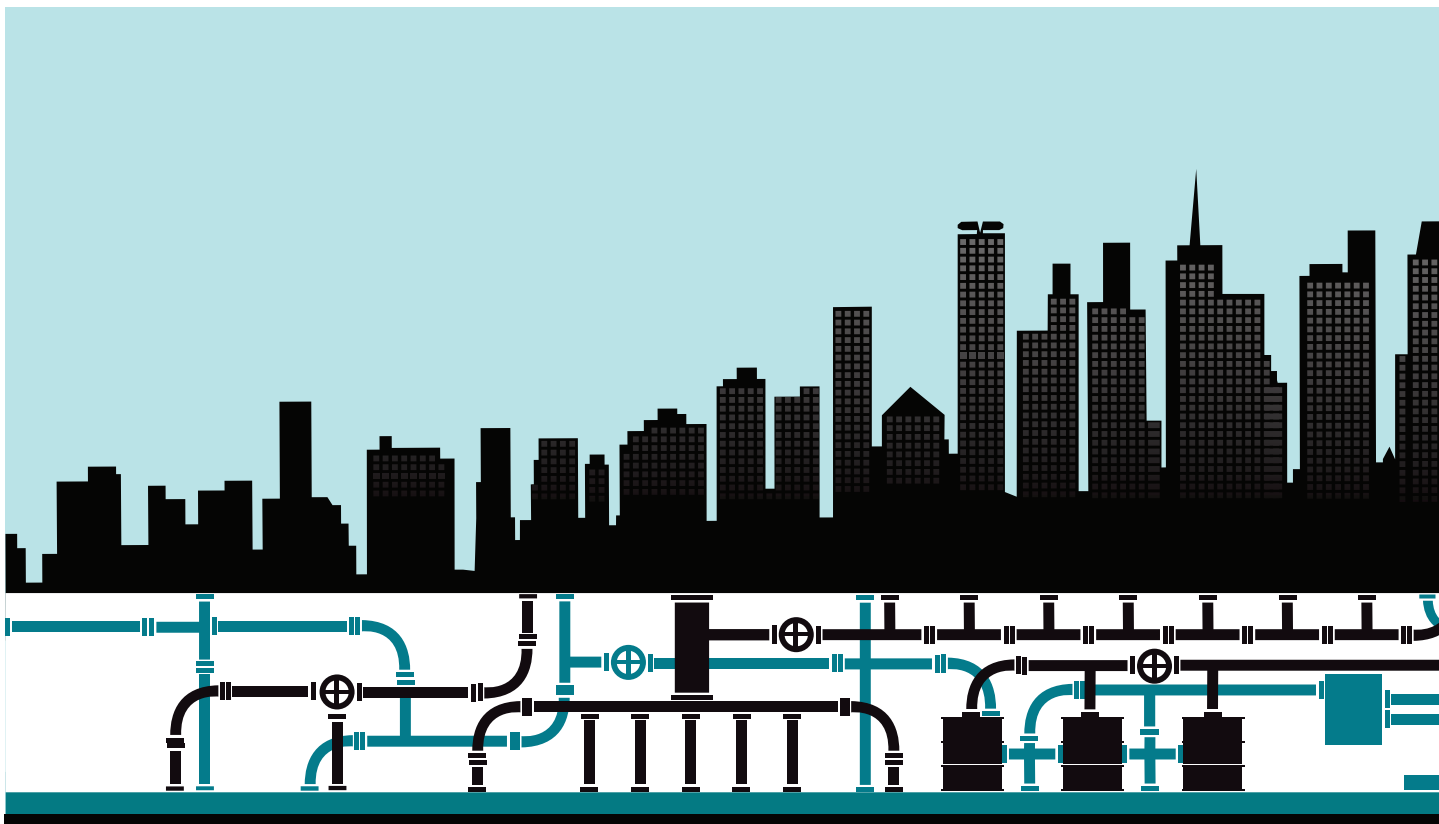
WE BUILD BRIDGES

Bridging the gap between our physical infrastructure and digital intelligence

Water pipeline networks in the UK currently lose 20% of potable water every day.
CIPPS™ WX100 pipeline protection technology is set to revolutionise and eliminate water distribution risk.

WINNERS 2015   *Best Use of Technology in Risk Management*   CIR Magazine Awards

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CIPPS™ WX100 is an award-winning intelligent pipeline protection system designed to transform the way the world secures its most vital resource by enabling 'dumb' surfaces to become smart, intelligent nano sensors that can communicate critical data to operators in real-time.

As an autonomous system, **CIPPS™** intelligently processes Big Data learned from its monitoring of the complete infrastructure network and predicts disaster before it strikes.

In the event of structural loss, **WX100** instantaneously detects the failure point with pin point accuracy and initiates 'Sense, Predict and Act' M2M (Machine to Machine) protocols. **WX100** ushers in a new age of asset protection for water operators.

CIPPS™ architecture is the greatest scientific progression since the invention of the microchip in 1959.

For operators, **WX100** redefines a once high risk operation into a rich revenue stream by recouping billions of pounds in recovered revenues.

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