

world water

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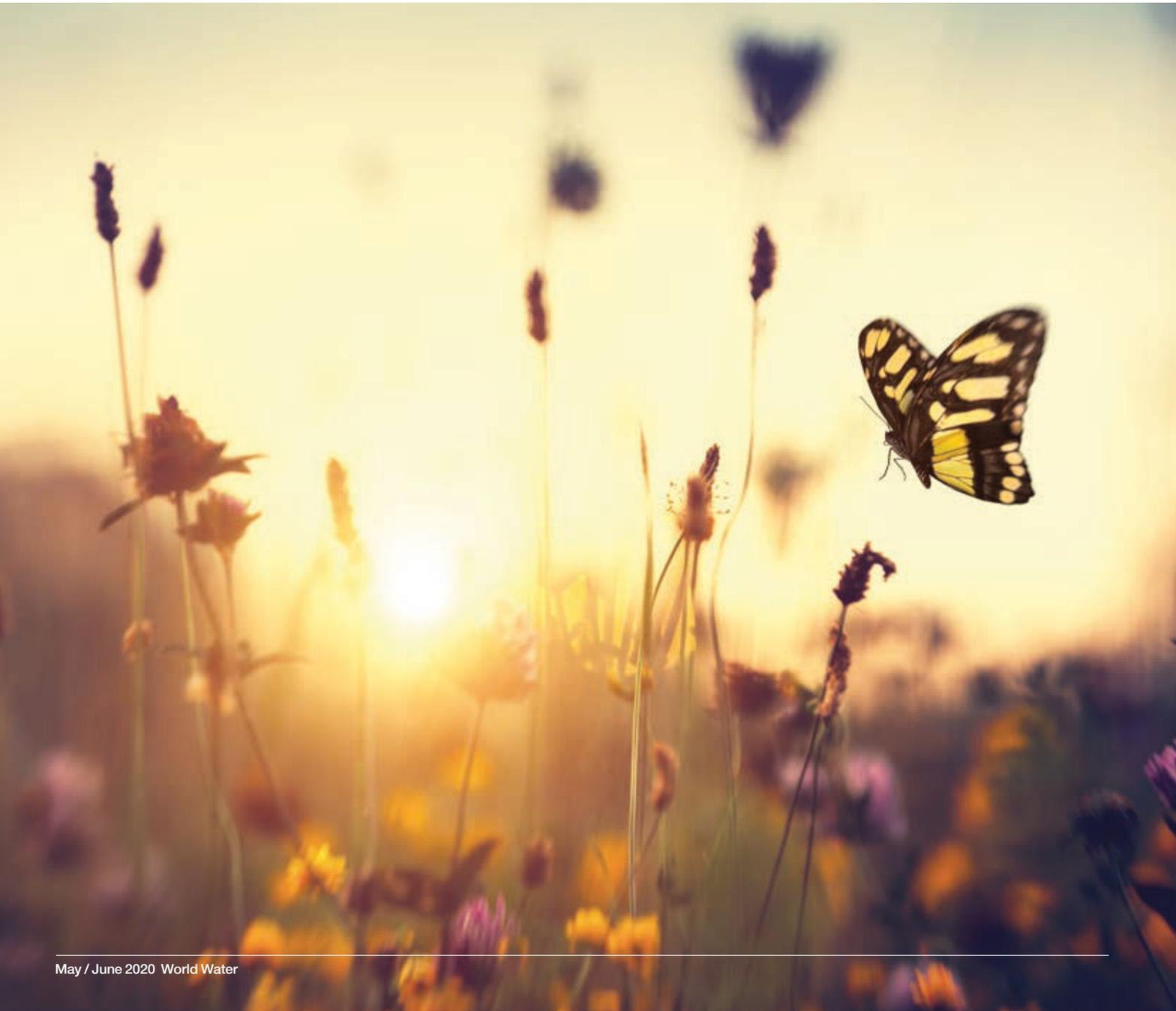
Beyond sustainability

Resilience and rewilding
critical to reshape future

Stantec Senior Vice President of Strategy **David Smith** and Chief Executive Officer of the United Kingdom's (UK) Southern Water **Ian McAulay** review the journey from “sustainability to resilience to action” in their respective companies and why they want to inspire others to make this the decade of resilience and “rewilding.”

Sustainability to resilience to action

Why this decade is critical, and why
we can't afford to get it wrong



Lecture series presents new resilience approaches

Today, the word “sustainability” is part of everyone’s vocabulary and every company’s strategy. This wasn’t the case in early 2000, when Ian McAulay, then managing director of MWH Global in the UK, formed a nonprofit joint-venture consultancy company called SISTech Solutions with Professor Paul Jowett of Heriot-Watt University in Scotland, and later David Smith at Stantec who joined the Board.

SISTech recognized that while the need for greater sustainability was becoming better understood, people and companies did not really know how to implement it or incorporate it into their plans. For more than 10 years SISTech provided

consultancy, research, and knowledge-sharing in sustainability practices and resilience to help governments, communities, and businesses understand why it needed to be central to their plans.

However, in 2014 evolving global environmental changes fueled SISTech’s decision to change course and refocus on communicating the urgency of moving from sustainability to resilience strategies in order to address the emerging multisector challenges. This resulted in a series of lectures on resilience in conjunction with the UK Institution of Civil Engineers, Heriot-Watt University, and Stantec. Over the past six years, these annual lectures have tackled six different topics

by showcasing new resilience thinking in relation to infrastructure and communities including flooding, energy, and urban areas. They communicated to a wide audience that conventional strategies can no longer guarantee resilience and highlighted a range of innovative new approaches.

The recent 2019 lecture clearly outlined that everyone needs to implement resilience plans to deal with the rapidly different future we now face (in other words: sustainability to resilience to action) – with a final message that action is needed now to create a resilient, sustainable future and prevent further and possibly irredeemable destruction to our environment.

We are at a turning point

Cities and communities worldwide face unprecedented challenges. They range from growth and densification, aging infrastructure, climate issues, and the impacts from drought and severe storms, to social issues like affordable housing and income disparity. Not to mention the current global COVID-19 crisis, which will have serious and lasting implications for all. At the same time, there are immense opportunities for positive change through new technologies, ecosystem regeneration, and holistic collaboration by city and community leaders.

Like many of the utilities, the global water industry is at a turning point and must deal with exceptional changes. The variables it faces include global climate and environment change at one extreme to the introduction of new forms of regional governance, new technologies, radical innovation, and “ecosystems thinking” such as regeneration of the natural environment. To succeed both globally and locally, business and community strategies must be characterized by increasing overlaps and interconnections. Operating in isolation will not work. Today’s world is deeply interconnected across water, energy, and agriculture as well as communications, transport, urban development, infrastructure, and wider economic, health care, social systems, and public services. This is not simply because of the increasingly volatile climate but is also due to increased demands for cost-effective services, environmental security, and long-term sustainability.

The time for talking is over. If this is not sorted in the next decade, the next generation will face the consequences. Stakeholders and communities must work together, as individual organizations could not succeed by acting alone.

Is it all about climate change?

Extreme weather is becoming the new normal. Globally, the last two years have been marked by record-breaking hurricanes, floods, and heatwaves. Hurricanes in the Gulf of Mexico, bushfires in Australia, drought in South Africa, and in the UK water shortages alternating with repeated episodes of severe and frequent flooding have resulted in increasing coastal and general soil erosion and massive damage to the natural environment and built infrastructure.

The environment and climate are changing faster than anyone ever anticipated. This winter, the UK experienced three huge storms on successive weekends. Each would have been significant but manageable, but collectively they caused massive flooding and serious problems for communities and their infrastructure.

Communities must adapt as flooding is not going to go away. And building a way out of this is not going to work. Hard defences like dams and levees only protect up to a point and when they are breached, the results – as seen in the United States (US) in the state of Louisiana and the Gulf of Mexico – can be catastrophic. Communities need to restore and protect natural processes to regenerate the environment. They can learn how to incorporate nature into the built environment by using land to store or redirect flooding. For example: parks and ponds can be created to double up as places to collect water. This type of sustainable urban drainage or (SuDs), manages stormwater locally by managing the flood and pollution risks resulting from urban runoff and contributes wherever possible to environmental enhancement of the urban environment. But this is not all about water – these issues are multisector and interdependent. They affect all infrastructure, as well as many (if not all) the stakeholders in communities.

Climate change is one critical factor, but environmental pollution, habitat, and biodiversity loss is also a crucial issue – together with changing social values, the opportunities afforded by technological advances, and the digital revolution. In combination, all these factors are reshaping the world.

This decade is critical – we can’t afford to get it wrong

The case for practical action is compelling. Like many companies, Stantec and Southern Water have initiated a range of new approaches to help ensure long-term resilience thinking and action.

Stantec, as a global infrastructure company, is focusing on areas where they can make a difference for people, businesses, and their communities – including urban areas and smart cities, with coastal resilience, energy remix, and ecosystem regeneration.

City communities bear the brunt of the impacts of change. However, they also have

Better use of technology and planning for resource conservation

In 2016 Saadiyat Island in the Middle East was relying on desalinated water for its irrigation demands, which was energy-intensive and not sustainable. To align with national targets for 95-percent reuse of wastewater, a water source switch was needed.

With its small population, Saadiyat Island doesn’t have a lot of wastewater to recycle, and it needs up to 25 million liters a day to irrigate its green spaces. The original solution was to bring recycled water from a separate source 50 kilometers (km) away, but by partnering with government and private developers, Stantec was able to investigate the water balances of the surrounding communities and found just what was needed. Yas Island, located nearby, had water to spare, so a new water main conveyance system was completed in December 2019.

the opportunity to do things differently and make integrated changes. For example, changes can be found in the way they plan the urban landscape, use radical transport innovation, create and conserve energy, and their approach to water and wastewater. Better use of technology and planning can relieve pressure on cities, increase energy and resource conservation as well as improve the health and wellbeing of the population. In the US after Hurricane Harvey, to help design a more resilient Houston, Texas, Stantec brought together more than 50 local and national experts, stakeholders, and community members in a resiliency innovation workshop, which helped address climate change impacts, social inequity, and environmental degradation while advancing the community’s overall economic competitiveness.

Opposite: Incorporating native habitat benefits declining pollinator species. Credit: Stantec



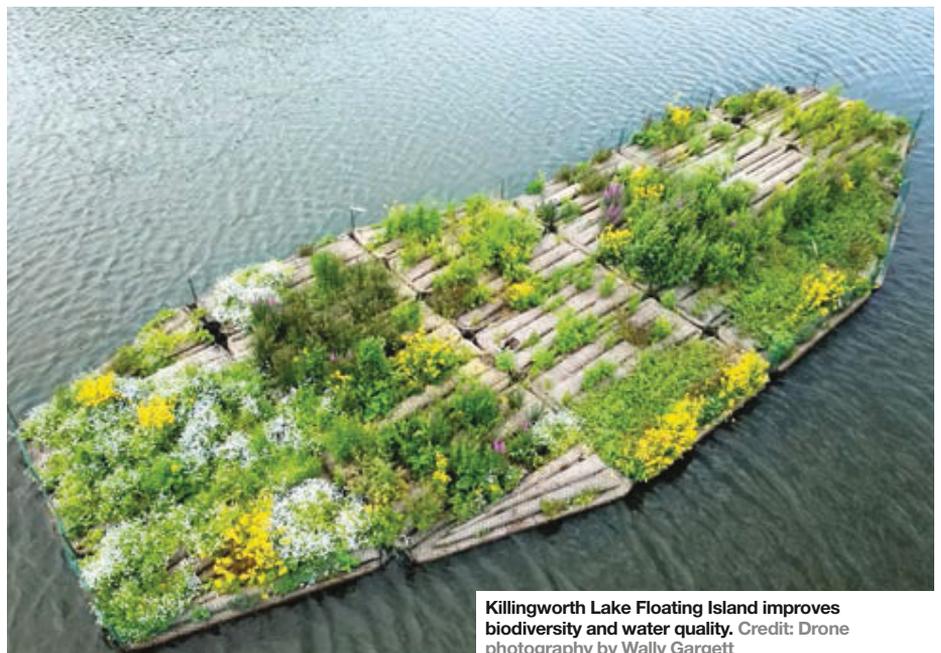
Saadiyat Island draws on surrounding communities to meet its irrigation needs. Credit: Stantec

A successful approach to resource conservation and sustainable water management can be found in L'INNESTO, Milan. This social housing project recently won the global competition C40 Reinventing Cities, organized by the world's megacities committed to addressing climate change by driving carbon-neutral and resilient urban regeneration.

L'INNESTO is part of Milan's strategic plan to transform underused railway areas of the city on the site of a former freight terminal. It aims to achieve carbon neutrality in 30 years using a low-carbon district heat network, powered by onsite renewable sources that connect the neighborhood and lower emissions. It has a 60-percent green space target and an ambitious mobility strategy: limiting car parking spaces (only 100 spaces for 700 tenants), 1200 square meters (m²) of bike garages, 10 electric car charging terminals, and a shared neighborhood car fleet.

Stantec's work centered on L'INNESTO's design for sustainable water management and featured enhancing rainwater use, avoiding saturation of sewerage networks, and minimizing the consumption and waste of drinking water. Rainwater is 100 percent used, saving 30 percent on drinking water consumption, and 15 percent of wastewater is treated directly onsite.

Coastal resilience is a key issue. The major communities that reside in coastal zones face rising sea levels and extreme weather events, so collaboration with communities is vital as they devise infrastructure resilience plans. Stantec is currently working to develop resilient coastline infrastructure in the Gulf of Mexico, Florida, and other areas on the East Coast of the US in communities badly affected by hurricanes like New Orleans, Louisiana; Houston, Texas; and New York City, New York. One example with New York City Economic Development Corporation involves a Stantec-led design to raise the waterfront esplanade at Battery Park in Lower Manhattan. This project will protect



Killingworth Lake Floating Island improves biodiversity and water quality. Credit: Drone photography by Wally Gargett

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against rising tides and ensure usability over the next 80 years. The project is one of several underway or in planning to protect the park and nearby community, as the park currently sits at an elevation that will be submerged as sea levels rise.

It is vital to begin transitioning to alternative energy. As communities adapt to a low carbon future, they need help to embrace new technologies and sources of energy. Some interesting recent Stantec projects include helping the Istanbul Metropolitan Municipality to implement the first and largest energy-from-waste plant in Turkey using municipal waste. Upon completion, this plant will provide 1.5 million people with a sustainable, maximum-efficiency electricity source plus a 1-million-ton



Istanbul Waste Incineration and Power Plant will provide sustainable maximum efficiency electricity.
Credit: Stantec

reduction in carbon dioxide emissions while converting 15 percent of Istanbul's waste into energy.

Stantec also created a wind power program for the Galapagos Islands, which now supplies approximately 40 percent of the islands' electricity needs, significantly reducing reliance on diesel generators, maintaining the pristine nature of the island and protecting it from potential oil spills.

There is no such thing as doing nothing

Nature is always active. Because of this, communities should be active too. Communities need to protect, restore, monitor, and respond to biodiversity loss, climate change, and environmental degradation. For example, the concept of rewilding is a progressive approach to conservation, enabling natural processes to restore landscapes and repair ecosystems. The answer is found in infrastructure solutions that integrate both the natural and built environment. Some recent examples include: habitat restoration in the US, improving biodiversity and flood protection in the UK, and also Southern Water's example of collaboration with farmers in the south east of the UK.

Pollinator populations worldwide are in decline due to habitat loss. Stantec has worked with US energy clients for many years, incorporating native habitat on their transmission rights-of way (ROWs) to benefit declining pollinator species. Given restoration on a large scale can be costly and time-consuming, Stantec has helped clients explore strategic ways to improve the ROW in pollinator habitats by researching pollinator habitat requirements and building predictive geographic information system models. The resulting maps identify areas with the greatest potential for successful pollinator habitat enhancement, allowing clients to focus their budgets and restoration efforts where it would be most likely to succeed.

In the UK, a surface water separation scheme carried out by Northumbrian Water, North Tyneside Council, and the Environment Agency involved the installation of three floating island ecosystems by Biomatrix Water in Killingworth Lake, North Tyneside. This has improved the biodiversity and water quality and will provide natural habitat as part of a US\$7.5-million (£6 million) flood-reduction and surface-water improvement scheme designed and constructed by Esh-Stantec. The overall scheme not only provides flood protection to over 3500 homes, it provides amenity and biodiversity through the establishment of surface-water attenuation areas. Instead of flowing back to the sewerage system,

overflows from the lake will spill into natural grass-covered areas nearby and drain back to a local watercourse. Led by the Construction Industry Research and Information Association's Biodiversity Interest Group, this approach raises awareness of how biodiversity needs to become a key component within the construction and development industry, as an integrated part of planning and delivering projects.

Meanwhile, in the south of the UK, Southern Water uses resilience strategies to address drought and flooding extremes as interconnected issues. It faces particular challenges from its geography with land at both sea level and adjacent steeply sloping hills (the South Downs) affecting water supplies and retention, soil erosion, and soil health. To address some of these aspects, it is taking innovative action in partnership with stakeholders across its region to enable them to adapt to a different future.

One approach in Southern Water's region that is showing early promise is in learning programs with farmers who are adopting regenerative and flexible farming techniques – such as keeping cattle in herds and changing grazing behavior. Because the cattle are less stressed, they are happier, healthier, stay warmer without being brought inside, and require fewer antibiotics or medicines. Managing livestock in this way also means they do not overgraze and still fertilize the soil, resulting in improved soil quality, better water retention, and higher-quality raw water.

Another Southern Water project encourages farmers to plant winter cover crops to remove nitrates and phosphates in the soil that would otherwise runoff into the water course. Similarly, the root formation of the crop binds the soil, helping to slow or prevent soil erosion by decreasing surface water runoff and ensuring higher-quality ground water. Meanwhile, the farmers get a winter crop that they can use to fertilize their soil and get better crop yields in the long term. Sustainable actions like these protect land from drought and soil erosion, reduce water pollution and flooding, and help farmers.

Regenerating and reclaiming the natural environment

Globally, work is underway to reverse environmental degradation and the loss of biodiversity, which is damaging economies and long-term survival. Infrastructure and solutions that embrace nature as an integral part of the solution need to be embedded. To offset carbon in its region, Southern Water originally considered more tree planting and it has recently planted 1,400 trees, including rare black poplars and willow to improve biodiversity at various

Natural defense against storms

The US south shore of the New York City borough of Staten Island has sustained decades of coastal erosion. Its condition, made worse by Superstorm Sandy, has left this community more vulnerable to the next coastal storm.

As part of its New York Rising Community Reconstruction Plans, the State of New York set up the Tottenville Shoreline Protection Project — a storm recovery and resilience initiative. The assignment called for the design and construction of a stone-core, sand-capped dune system that would reduce wave impact and coastal erosion along the shore. However, it became clear that the dune solution wouldn't be effective for the entire shoreline, so Stantec and Rebuild by Design created an onshore and offshore integrated system. They adopted a layered approach using a series of measures including wetland enhancement, eco-revetments, hardened dune systems, shoreline plantings, maritime forest restoration, and earthen berms. The system will provide a naturalized barrier protecting the community from wave action, the impacts of coastal flooding, and shoreline erosion by restoring and enhancing ecosystems and improving waterfront access.



Tottenville Shoreline Protection Project will provide a natural barrier to wave action. Credit: Stantec

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The major communities that reside in coastal zones face rising sea levels and extreme weather events, so collaboration with communities is vital as they devise infrastructure resilience plans.

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sites. However, Southern Water wanted to do more and decided to support a wide-ranging and interconnected program of natural regeneration.

One example is found in Southern Water's efforts to reestablish the area's rivers to their original course. In the past, rivers were straightened and lined with concrete, which changed their margins and access to natural floodplains. Yet, the natural curves of the river and adjacent land hold back water and provide areas to absorb floods. Similarly, farmers are being encouraged to manage their river margins without the use of chemicals to prevent water pollution and manage flow better.

Southern Water is also implementing a key strategy to make space for water upstream, by installing "rain gardens" and building a winter reservoir. Rain gardens manage rainwater runoff and flooding from hard surfaces after downpours and filter pollutants carried in runoff water by planting an attractive, low maintenance, wildlife-friendly space. Along with the municipal benefits and the conservation of a valuable natural resource, rain gardens also create excellent habitat for birds and butterflies. Southern Water will also participate in the first winter storage reservoir since the 1970s to make space for water when it is plentiful and provide a more resilient future for water in the south east of England.

The US\$128-million Havant Thicket Reservoir Resilience Project is a collaboration between Portsmouth Water and Southern Water, to provide resilient water supplies to the region. It supports reduced abstraction on chalk rivers, has an overall biodiversity net gain, and will provide a new community leisure facility for the area. The project's innovative approach to collaboration and water trading sets a precedent for the water industry. The reservoir is part of a twin-track approach as both companies have ambitious plans to reduce leakage, help customers use less water, and increase metering.

Prepared for Southern Water, a joint publication by David Smith and independent foresight expert Peter Kingsley, "Water Futures for the South East, Towards 2050" defines the key challenges and outlines new and more holistic responses. It underlines how Southeast UK – including water, wastewater, and all other core infrastructure and the environment – cannot

First-ever UK kelp rewilding initiative

Another example of regenerating the natural environment is Southern Water's support for the pioneering Help our Kelp campaign to reestablish the vast underwater kelp forest off the Sussex coast in the UK. Kelp once stretched along 70 km of the West Sussex coastline, forming an underwater forest that extended at least 4 km seaward. It provided a vital habitat and nursery for many types of fish. It captured and retained huge quantities of carbon, (more effectively than trees) and helped to fight climate change, improved water quality, and reduced coastal erosion by absorbing the power of ocean waves.

However, damage caused by drag trawling nets and the dumping of sediment spoils by dredgers in the late 1980s to early 1990s all but destroyed this amazing natural water asset. New bylaws, proposed in January 2020 by the Sussex Inshore Fisheries and Conservation Authority, would exclude inshore trawling in designated protection zones of Sussex coastline year-round. This brings the first-ever UK kelp rewilding initiative one step closer and aims to give the kelp the space needed to recover.

It is expected that this initiative will, in just a few years, make a big difference. It will improve the landscape and sustainability of the coastal area and help to mitigate the impacts of climate change. Alongside the new laws, the initiative will help restock the fishing grounds and restore marine wildlife. Additionally, it is expected to boost the local economy through tourism and potentially the reintroduction of kelp harvesting.



be viewed in isolation. The utilities should now see themselves as part of a "systems of systems" environment in which everything is connected at some level.

Energy services are major consumers of water and vice versa. Agriculture, the major driver of water demand from a global perspective is a key stakeholder in our communities and a source of "ecosystem services" such as production of food, wood, and fresh water, regulation of floods, soil formation and retention, nutrient and water cycling, provisioning of habitat and nonmaterial benefits including recreation and tourism. Estimates vary, but food production accounts for more than 70 percent of global water consumption. Electricity generation comes second, at about 16 percent, with domestic and industrial water consumption about 6 percent. Because water supplies are under growing

stress and projected to worsen even in the most favorable climate scenarios, Southern Water has committed to spend \$1-1.2 billion (£800 million-1 billion), putting sustainability into action over the next 10 years.

Common future

Another recent Stantec paper titled "Community Futures: think globally, act locally has never mattered more" highlights the challenges and opportunities in how communities operate. It notes the high level of uncertainty facing all communities and applies fresh thinking to the likely high-impact trends such as biosphere pollution and regeneration, as well as water, energy, and agriculture opportunities for transformation, while addressing how cities, communities, and government thinking globally but acting locally will make a significant difference for society.

Many water companies are progressing innovative ways to meet service outcomes by engaging in collaborative networks. Examples include collaboration with third parties to implement catchment-level rather than end-of-pipe solutions, and advanced technologies to recover increasing amounts of energy from wastewater. To maximize carbon reduction, they combine such approaches with greater material efficiency. For example, instead of building their way out of flood risk with more concrete flood walls or addressing water supply deficits with large transfer pipelines, they are devising leaner solutions by combining some construction with other smart measures. Water companies are just one of the key service providers to communities protecting public health by supplying drinking water and safely managing wastewater.

Communities will need more help, and this means that partners and stakeholders (despite holding different responsibilities) must integrate and work together. The goal is to provide a service to society while protecting, enhancing, and regenerating the environment and creating economic growth. It's about sustainability, resilience, and action. It's about making a difference now and over the next decade to reshape our future. To create a resilient, sustainable future and prevent further and possibly irredeemable destruction to the environment, action is needed now.

Authors' Note

Stantec Senior Vice President of Strategy David Smith has more than 30 years of experience and has led large-scale strategic consulting assignments and infrastructure delivery programs across the global business. Stantec collaborates across disciplines and industries in more than 400 locations in six continents on water and infrastructure projects.



Southern Water Chief Executive Officer Ian McAulay oversees many forward-thinking interconnected transformation projects using a natural capital-ecosystems approach and integrated water-cycle management to build a resilient water future for communities within its service area in the southeast region of the UK. The private utility company provides water and wastewater services for approximately 4.2 million customers.