

Scotland: The Hydro Nation Annual Report 2020

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In This Report

Developing the Water Economy Vision	3
Thanks to the Hydro Nation Forum	4
National: Supporting Communities and Scotland’s Water Economy	5
International – Reaching Out to the World	9
Knowledge Sharing and Capacity Building Activity	14
Promoting Growth and Innovation in the Water Sector	21
Looking Ahead – 2021 and Beyond	26
Structures of Governance	27
Hydro Nation Forum Members	31
Hydro Nation Scholars	32

Further information on the issues raised in this report can be found at:

Scottish Government www.gov.scot

Scottish Water www.scottishwater.co.uk

Water Industry Commission for Scotland
www.watercommission.co.uk

Drinking Water Quality Regulator
www.dwqr.scot

Citizens Advice Scotland
www.cas.org.uk

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Developing the Water Economy Vision

Introduction by Roseanna Cunningham MSP, Cabinet Secretary for the Environment, Climate Change and Land Reform



I am very pleased to introduce this seventh annual report to the Scottish Parliament on progress in delivering on our vision of Scotland as a Hydro Nation. It goes without saying that 2020 has been an extraordinary year, raising many serious challenges in every aspect of our lives. The water sector is of course not immune to the pressures caused by the global Covid-19 pandemic. Indeed, perhaps more than ever, the importance of water has been heightened in the public mind. The importance of access to safe, reliable sanitation and hygiene has never been clearer and has been illustrated by the role of hand-washing in our fight against the spread of Covid-19.

Scottish Water has again shown that it is a robust and resilient organisation, seamlessly continuing to deliver the essential water services on which we all rely. Elsewhere in the sector, businesses have also stepped up to the challenge, with some even changing their processes to enable or increase production of hand sanitiser when it was most needed. All are playing their part as we stand together, as we must, to defeat the virus.

And of course, the other great challenges of our times haven't gone away; Climate Change remains a significant threat. In August 2020, Scottish Water published its net-zero carbon route-map, setting out the actions it will take across every aspect of its operations to reduce emissions to zero by 2040 and committing to go beyond even that. This is a huge commitment and we should be proud to see Scottish Water setting the bar as a public-sector exemplar.

There are many other excellent examples in this report of how all across Scotland there is action to drive forward the Hydro Nation agenda. No one doubts the value of water to Scotland and we are making good progress to increase that value. I am proud that, in a year of such adversity, the water sector not only continues to flourish but is playing such a significant role in ensuring our future is green, just and sustainable.

Thanks to the Hydro Nation Forum

The Hydro Nation Forum continues to provide guidance and advice on activity across the Hydro Nation agenda. With the Forum's help we are currently reviewing our overarching strategy to make it easier to follow and track and to align more appropriately with the Sector Vision and the Net Zero agenda. The aim is to ensure the Hydro Nation programme remains fit for purpose, and is working to support the sector's needs as we also seek to respond to the challenges of the pandemic and contribute to a green recovery. For the purposes of this Report however, we continue to use the familiar themes of the current strategy, under which, despite the extraordinary circumstances engendered by the pandemic, an impressive range of activity and progress has been delivered.

National: Supporting Communities and Scotland's Water Economy

Scotland is a Hydro Nation, one that views and manages its water resources responsibly, and views our relationship, and the ways we work, with the water environment and industry as inextricably linked to our national identity.

Our water sector, including Scottish Water, is worth an estimated £1.7 billion¹ to the Scottish Economy. We are committed to the sector's growing success and will work with our enterprise agencies and Scotland Development International to support our businesses into new markets. The examples below help to underline how the Hydro Nation agenda is delivering in Scotland, and for Scotland.

Scottish Water: Delivering for You

Scottish Water continues to invest and deliver infrastructure that is fit for communities throughout the country now and for decades to come through its £3.9 billion capital programme for the 2015-21 period.

Virtual Inspections: In response to the Covid-19 pandemic, Scottish Water's Field Response teams started using WhatsApp to connect with customers in self-isolation in April 2020. Every day, Field Response teams are out supporting customers and resolving issues such as loss of normal supply or low water pressure. However, as the country entered lockdown, and many people self-isolated due to Covid-19 symptoms, carrying out normal face-to-face visits became trickier for frontline staff. As a solution, some Network Service Operators (NSOs) began diagnosing customer problems via WhatsApp video calls - to help keep staff, and customers, safer.



Using WhatsApp also benefited Scottish Water because some workers were among those self-isolating or lived with someone who was, but were still able to work. In addition, the move helped gain an understanding of how virtual appointments could be used moving forward, with benefits in terms of the carbon footprint reduction they will deliver.

Earthworms treating waste water in innovation research project: Scottish Water is using earthworms and water fleas to treat waste water as part of an innovative international study which aims to protect and improve water resources around the world. The project measures the effectiveness of earthworms, water fleas and microalgae as a carbon-neutral method of treating waste water and is taking place in the small rural community of Littlemill in Nairnshire. It runs alongside the existing treatment plant to make sure the local environment continues to be protected.

The technology replicates a process which happens naturally within soil but is being tested to clean waste water. The first stage of treatment involves a tank filled with earthworms – the worms eat the larger particles of organic matter in the waste water,

¹ Figures from The water sector in Scotland: market size research – turnover, jobs, exports and gross value added report. Available at <http://www.evaluationsonline.org.uk/evaluations/Search.do?ui=basic&action=show&id=691>

before it is added to a second tank containing water fleas and microalgae which remove the finer bits of organic matter. At this stage, the water should be in a condition that would allow it to be returned to the natural environment.

The objective of the project is to provide a decentralised, ecological waste water treatment for use in rural communities like Littlemill, as well as industries such as agriculture and aquaculture. The project directly supports Scottish Water's Sustainable Rural Communities Research Programme aimed at demonstrating low-cost, sustainable, biologically-based waste water treatment for small-size housing units in extreme weather conditions.



Scottish Water have a high proportion of rural works across the country and developing a sustainable, local approach to water use, treatment and sludge recycling is an ongoing challenge. This project aims to pull together an exciting mix of ecological technologies for sustainable wastewater treatment which can be developed for use in the future.



Surfboard becomes state-of-the-art inspection device: A simple surfboard has been turned into a state-of-the-art automated inspection device to gather information on the condition of infrastructure vital to the supply of Edinburgh's drinking water. Scottish Water worked with partners to develop the unique device to

make it significantly safer, quicker, easier, and cheaper to detect and analyse cracks and other faults in hard-to-reach assets.

The Platypus was developed using a standard surfboard as a platform to support specialist recording equipment. High-definition cameras and lighting were fitted along with sensors which steer it along a pre-programmed alignment and redirect it around obstacles.

The Platypus uses sonar, gathering data below water level and a remote sensing method that uses light in the form of a pulsed laser to measure ranges above water level. The data generates three-dimensional models of the internal surface which is recorded on the device. The footage is then passed through software which cleans up the images and is then able to identify and categorise defects within the asset. Once detected, engineers can carry out more detailed inspections and necessary repairs in these areas.

Video Call Commissioning Completes Renewal of Lairg’s Water Supply: A new state-of-the-art water treatment works is now serving Scottish Water customers in Lairg, after an innovative approach to commissioning enabled the new plant to be brought online during the coronavirus pandemic. Usually, commissioning would require a number of people from Scottish Water and its supply chain to be present on site, but to comply with social distancing and keep staff as safe as possible, one engineer from contractor RSE (Ross-shire Engineering) carried out the necessary tests while other members of the Scottish Water team observed via video call and monitored telemetry data.



A new approach to training for the team who will be running the site was also required, with initial familiarisation carried out via videos and training manuals, followed by socially distanced one-to-one training on site.

Community Engagement – ‘Engaging hearts and minds’

Following joint research between Citizens Advice Scotland (CAS), Scottish Water and the Customer Forum, CAS produced an insight report and a ‘community engagement good practice toolkit’. This reflected the essential components of community engagement that should be at the centre of organisations.

The research² identified four key factors to successful community engagement:

- Better results will be achieved by both communities and service providers working together to identify and achieve shared interests and outcomes;
- Community engagement needs to be supported by the right methods, and given sufficient time and resources to be successful;
- Community engagement by service providers is often the catalyst for bringing a community together over a shared purpose and leaving a legacy of change;
- Community engagement should be evaluated to identify lessons learned and improve on experience.

Additionally, Scottish Water has committed to ‘Empowering customers and communities’ under the principle of community engagement being ‘built in, not bolted on’. This is a very welcome development which will provide direction to move towards a more active relationship with communities and will be tested by Scottish Water as part of a series of community engagement pilots.

North Glasgow Integrated Water Management System (NGIWMS)

Construction of the “Smart Canal” works infrastructure was completed late in 2019, with the system going into a semi-automatic ‘live’ phase in the spring of 2020. A launch event was planned to coincide with World Water Day 2020, unfortunately one of the many cancelled events of 2020.

² <https://www.cas.org.uk/publications/engaging-hearts-and-minds-study-conducting-successful-engagement-communities-and>

The system has now moved into the operational phase, with remote data access and operation being enabled and the data being used to inform canal operations. Significant development has taken place within the five connecting developments, with the first connection to be completed in autumn 2020. Further opportunities are now progressing to utilise the system further to deliver flood alleviation interventions.

The project has received international recognition with interest in the approach coming from countries including Australia, Vietnam and the Netherlands. A number of visits have been offered to date including a field trip for the SNIFFER Flood Risk Management 2020 Conference in January 2020.

Water Resilient Places - A Policy Framework for Surface Water Management and Blue-Green Cities

Over the last 12 months we have been looking into how we can improve surface water management in our towns and cities. We have been considering policy improvements that will reduce pressure on drainage systems, lessen the impact of floods and increase the uptake of blue-green actions.

This is in support of the Programme for Government: *Protecting Scotland's Future - The Government's Programme for Scotland 2019-20* commitments to work together to increase Scotland's use of blue-green infrastructure for drainage and flood management and to review our approach to blue-green cities and bring forward proposals by the end of 2020.

Success in managing our future flooding and drainage challenges will require changing our approach and gaining support beyond the organisations currently responsible for managing these issues.

The proposed policy framework is centred on place-making as a means of encouraging a wider range of players to adapt their actions to contribute to water resilience. The aim of the work is to support the transition to water resilient places where communities can continue to thrive as climate change impacts play-out over the coming decades.

In August 2020, Hydro Nation Forum members commented on the draft vision for water resilient places.

International – Reaching Out to the World

The Hydro Nation Strategy outlines our intent to deploy the potential of Scotland's knowledge and innovation in a global context. Hydro Nation International (HNI) describes our activity to co-ordinate and harness a range of international water-related activities across Scottish public bodies, universities and non-Governmental organisations that contribute not only to the Hydro Nation agenda but also to the United Nation's Sustainable Development Goals; in particular Sustainable Development Goal 6 (Ensure availability and sustainable management of water and sanitation for all by 2030). Activities completed as part of this agenda in 2019/20 include:

Hydro Nation International Centre

Announced by the Scottish Cabinet Secretary Roseanna Cunningham on World Water Day 2019 (<https://www.hutton.ac.uk/news/james-hutton-institute-unveils-hydro-nation-international-centre>) the Hydro Nation International Centre has been established by the James Hutton Institute (<https://www.hnic.scot/>), and brings together a critical mass of the Scottish water research community focussed on developing talent, promoting innovation, supporting expertise and maximising research outcomes that can be applied in any global context.

One of the largest interdisciplinary centres of its kind, the Hydro Nation International Centre provides a translational hub for the water community-of-practice. By helping commissioners and stakeholders/users of research to access the correct expertise and talent it supports innovation and impact, to the benefit of all.

It links industry, policy, research, and agencies to support economic development and good stewardship of water resources and to share best practices around the world.

Scotland/Malawi

The Scottish Government is committed to support work in Malawi, with the aim of making Sustainable Development Goal 6 in respect of water and wastewater provision a reality. Hydro Nation support is delivered through the programme's contribution to the Climate Justice Fund – the Malawi Water Futures programme led by the University of Strathclyde and also through the Hydro Nation International Centre who support the Malawi Scotland Regulatory Partnership (MSRP) led by the Scottish Environment Protection Agency (SEPA) with a range of Scottish and Malawian partner organisations.

Climate Justice Fund (CJF) Water Futures Programme: During the past year the CJF Water Futures Programme in Malawi continued to support the Government of Malawi to achieve Sustainable Development Goal 6 (SDG6) through four main work streams;

- (1) Rural Water Asset Analysis and new Urban and Peri-Urban Asset Analysis,
- (2) Policy Support (NWRA),
- (3) Capacity Building (mWater Training) and
- (4) Research and Knowledge Exchange (SDG6 Indicators).

Working together with implementation partners BASEflow, BAWI, United Purpose, CACECOM, World Vision, and CARE, the programme continues to work within all 28 Districts in Malawi and with the Ministry of Agriculture, Irrigation and Water Development where over 300 Government of Malawi staff are involved in the collection and interpretation of data to underpin SDG6.



Collection of Rural Water Supply Asset Information Across Malawi (Known as the [mWater system](#)): In December 2019 the CJF Programme completed the first National Dataset for Rural Water Supplies in Malawi and in January 2020 began the same data collection for all Urban and Peri-Urban waterpoints not managed by Malawi Water Boards. (Note: Unfortunately the completion was delayed by Covid-19 and will now be complete before end December 2020). At the National Stakeholder meeting in Malawi (photo above) Ministry staff from across Malawi and major stakeholders came together to plan the use of this first ever national asset register to support SDG6 and water resources planning.

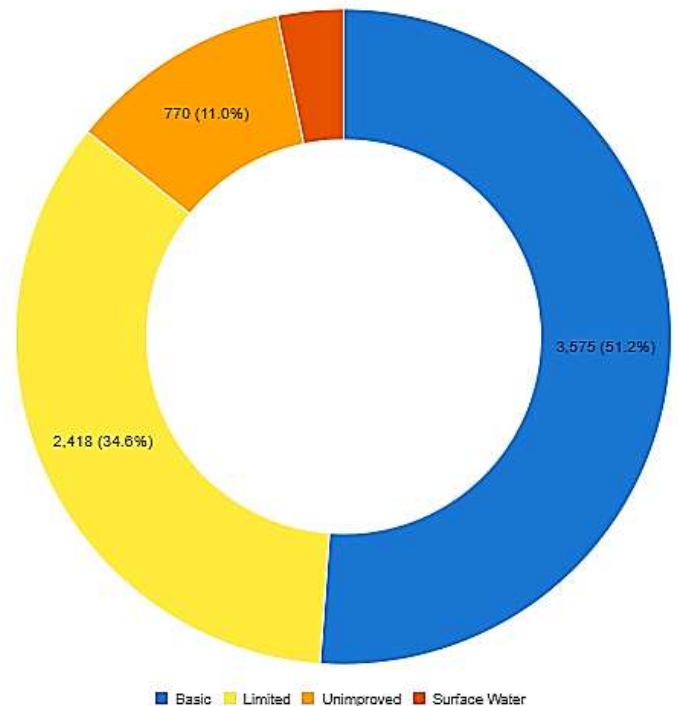
High-Level Outcomes: Stakeholders across Malawi are gaining access to training that enables them to use the mWater Management Information System (MIS) in which a total of 120,989 unique rural water points have been identified (of which 100,240 are improved water points with asset registry data). A total of 287,052 sanitation facilities that are co-located with these water points have been mapped as potential risks of contamination (sources). A total of 10,363 co-located solid waste sites have been mapped as potential risks of contamination (sources).

The Government of Malawi mWater Task Force presented to the Joint Sector Review on the progress of a 5 year strategy to adopt the asset management approach which was developed by the CJF Programme as a new National Management Information System - including how it will be used for Water Resource Planning, regulation and enforcement.

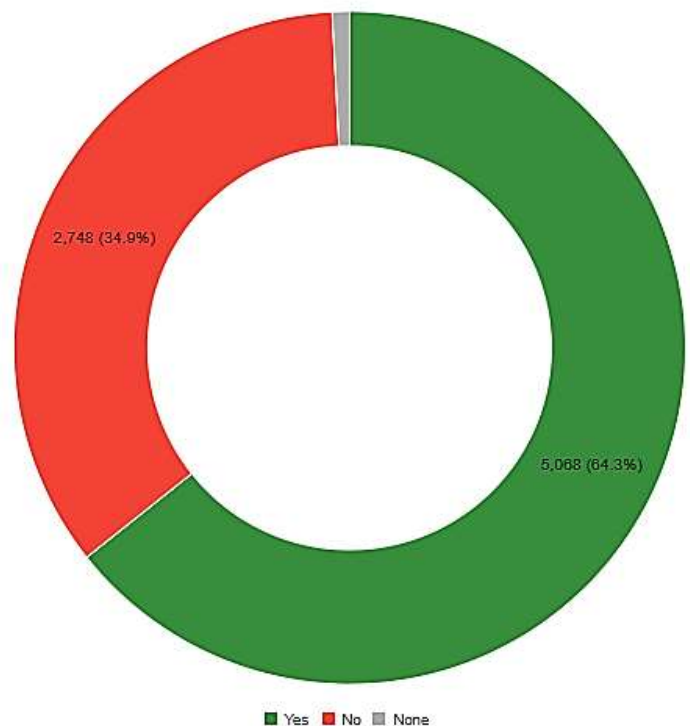
Advancing Research and Knowledge Exchange – Automated mWater SDG6 Indicators:

The Sustainable Development goals have specific indicators that provide information on the progress towards meeting each of the Global Goals.

The CJF Water Futures Programme developed automated SDG6 indicator surveys and together with partners in Malawi are using the results to provide base-line data for communities (to household level). An area that included nearly 9,000 households located outside of Lilongwe has been fully evaluated for SDG6.1, SDG6.2a and SDG6.2b, along with detailed evaluation of the water supply service provided. There were no households with safely managed water supplies and just over half (51.2%) had basic water supplies; the remainder Limited, Unimproved or reliant on Surface Water.



Interestingly, when surveyed, the majority (64.3% in graph to the right) indicated they were willing to pay more for water charges if the service level was to be enhanced. This is an example of how the Water Point Data combined with detailed SDG6 information can inform donor investment strategies. There is a knowledge exchange focus to share and train other INGO's on the use and application of the methods developed at Strathclyde to target investment needs and strategies for those most at need and at risk.



Malawi Scotland Regulatory Partnership (MSRP): SEPA continues to work with Hydro Nation to support the Government of Malawi (GoM) as it looks to empower key regulatory institutions aiming to protect Malawi's water resources and environment.

Phase 1 of the MSRP is now complete and resulted in the development of a roadmap to operationalise Malawi's National Water Resources Authority (NWRA). Entering Phase 2, the MSRP has continued to evolve and develop a knowledge exchange, offering further opportunities for collaboration between Malawi and Scotland.

Phase 2 saw the welcome collaboration with the James Hutton Institute (JHI), bringing wider expertise in agriculture and land use/natural resource management to the Partnership. Throughout this phase, the JHI team engaged with Malawi's agricultural sector, helping contextualise key challenges facing the NWRA as it seeks to improve compliance with water laws among the agriculture stakeholder community.



SEPA training workshop with EAD, Lilongwe, March 2020

The MSRP is now working closely with the GoM's Environmental Affairs Department (EAD) to support the operationalising of the newly announced Malawi Environment Protection Authority (MEPA), nurturing the key links with the NWRA and promoting regulatory excellence and best practice towards improving environmental protection, water management and compliance.

In early 2020, SEPA representatives travelled to Malawi to deliver a series of sessions with the newly appointed non-executive Board of MEPA and senior officials from the EAD. These sessions covered the principles of transparent regulation and enforcement, policy requirements and good governance, and the visit provided the opportunity to build further relationships across the Partnership.

Economic Regulation support and engagement

The Scottish approach to regulation of a public-sector entity continues to be recognised as an innovative model by governments, companies, academics and other commentators in the rest of the UK and beyond.

Following a successful project to strengthen economic and environmental regulation in Romania, the Water Industry Commission for Scotland (WICS) has started a collaborative project with the New Zealand Government, and with two of the country's water companies – Wellington Water and Watercare (Auckland). As part of this work, the two companies asked WICS to explore the extent to which it would be possible to provide the requisite information to pursue effective reform of the industry. WICS provided strategic and analytical support, based on its own experience and the horizon scanning of best practice that it undertakes. WICS is building on this work with a further project to support the New Zealand Department of Internal Affairs to undertake a strategic analysis and estimation of the economic benefits from aggregation of water service delivery entities in New Zealand.

WICS is also acting as a secondary expert as part of a consortium that is providing support to strengthen economic regulation for the Romanian Public Services Regulatory Authority (ANRSC), with a project that is due to complete in 2021.

Scottish Water Horizons (SWH)

Scottish Water International is now fully integrated into Scottish Water Horizons. The primary purpose of Horizons' international activities is to develop business opportunities abroad in line with the Scottish Government's Hydro Nation ambitions. Key highlights include:

Australia: Horizons has been continuing to provide expert advice and support to South Australia (SA) Water. Horizons was successful in winning a long term Programme Management Advisory Service that will provide specialist support to SA Water via a joint venture between KBR and Aurecon to transform the delivery of their Capital Investment Programme. The programme started in July 2020 with the potential for an additional 4 years to June 2024. Over the past year, Horizons has assisted SA Water in transition planning between investment periods, developed a risk-management framework and supported recovery planning for COVID-19. In the coming year, Horizons will provide development of a Quality Management Plan.

New Zealand: In partnership with WICS, Scottish Water is providing advice into the Three Waters Reform Programme, a new drinking water regulatory framework, with oversight on other services.

Jersey Water: Horizons has assisted Jersey Water to ensure the safety of drinking water on the island by using a risk assessment and risk management approach through the provision of Scottish Water tools and knowledge on drinking water safety plans. The plans have been issued but the training of Jersey Water employees was delayed due to the pandemic.

Knowledge Sharing and Capacity Building Activity

Wastewater systems and SARS-CoV-2

2020 will be remembered for one thing – the COVID-19 pandemic caused by the rapid spread of the SARS-CoV-2 virus, which had only emerged in late 2019 in Wuhan, China. While this is a novel coronavirus, for which the important transmission dynamics were little understood, it is not the first coronavirus to emerge in recent times and therefore in the early days of the outbreak, approaches to these viruses (SARS, MERS) formed the basis for the initial advice and response.

A team at Heriot-Watt University, led by Hydro Nation Forum member Dr Michael Gormley, had entered this arena in 2003, with the forensic analysis of a significant cluster of cases (320) and deaths (42) in one building complex in Hong Kong. The analysis led to the conclusion that wastewater systems within buildings were a contributing factor to the spread of the virus in that building. Since then, the team have established the mechanisms for pathogen aerosolization and transmission through building wastewater systems and the potential for these to enter the interior of the building under defect conditions. A succinct summary of the work, its global significance and advice was published in March in the prestigious [Lancet Global Health](#). The work has led to the appointment of Dr Gormley to the Environmental Modelling Working Group (EMG) of the Scientific Advisory Group for Emergencies (SAGE) – advising the UK Government on transmission and modelling of SARS-CoV-2 spread.

The linkage between wastewater systems, modelling efforts and public health is of national and international importance and has led to three international patents since the early 2000s. This work will have profound implications for the design of wastewater systems within buildings in the post COVID world and places Scotland at the heart of the effort in this area. Further work has been undertaken by scientists at the Roslin Institute, Scottish Water and SEPA to develop robust methodologies for [detecting and measuring SARS-CoV-2 genetic material in wastewater](#).

Hydro Nation Scholars

The [Hydro Nation Scholars Programme](#) supports PhD student research on cutting-edge water challenges and aims to develop the water leaders of the future. These studies help to create new expertise within Scotland and build its international profile and global alumni.

Hydro Nation Scholars Programme PhD projects are highly relevant to the objective of the Hydro Nation Policy to develop the economic, environmental, and social value of Scotland's water resources. The PhD projects span industrial application, socio-economics and value, governance, climate change, resilience, rural economies and environmental, physical, ecological and hydrological mechanisms and impacts and innovation across the water sector (see Annex C).

In the reporting year 2019-2020, 23 Hydro Nation scholarships were in progress at eleven Scottish Universities by scholars of fifteen different nationalities, of which four scholars successfully completed and joined the growing Hydro Nation alumni (10 in total).

The most recent alumni include; Dr Fortune Gomo “Supporting better decisions across the nexus of the water-energy-food challenge” (University of Dundee & James Hutton

Institute), Dr Aaron Neill “Linking small-scale hydrological flow paths, connectivity and microbial transport to protect remote private water supplies” (University of Aberdeen), Dr Maricela Blair “Micro- and nano-plastics in wastewater treatment systems and receiving waters” (University of Glasgow), and Dr Robert Sakic Trogrlic “Community-based non-structural flood risk management for Malawi” (Heriot-Watt University).

There continues to be a close ongoing relationship between the Hydro Nation Scholars (and their academic supervisors) and external communities, including the wider water industry in Scotland and the key governmental institutions who have responsibility for aspects of water policy, regulation and governance. This involved scholar participation in Hydro Nation events, Hydro Nation Scholar Programme events and training sessions, UK and international conferences, industry events, field research trips and research collaborations.

The aquaNOW Audiences

Hydro Nation supports and collaborates in “aquaNOW Audiences”, a series of “Question Time” format panel live-streamed webinars consisting of Scottish water expertise (always including a Hydro Nation Scholar), and senior international participants in the world of water practice and thinking. International panellists have included individuals from the Stockholm International Water Institute; the Global Centre on Adaptation; the National University of Singapore; the Alliance for Water Stewardship; WWF; the Alliance for Global Water Adaptation.

Aims of “aquaNOW Audiences” are to demonstrate achievements, excellence and ambitions of Scotland in water governance, water technology, research, education, innovation, sustainability; engage with the people of Scotland and the wider world about water as a human and environmental resource; promote initiatives, in Scotland and internationally, including the Hydro Nation International Centre (HNIC) and the Hydro Nation Scholars programme; encourage cross-disciplinary attention to themes including “The Philosophy of a Hydro Nation”; “Green Meds for Blue Water”; “The Future of Water Stewardship”; “Water and Resilient Cities”; “Water and the Climate Crisis”. The events are produced by Scotland-based international water news publisher OOSKANews; video footage can be found at <https://vimeo.com/channels/aquanow>



As Scottish and international attention turns to the global climate conference (COP26, Glasgow, November 2021), future “aquaNOW Audiences” will have increasing focus on

the nexus between water and climate challenges, reinforcing Scotland's position as a Hydro Nation.

Alliance for Water Stewardship (AWS)

AWS is the custodian of the AWS Standard, a globally applicable framework for major water users to understand their water use and impacts, and to work collaboratively and transparently for sustainable water management within a catchment context.

On 12-13 November 2019, with support from the Scottish Government, AWS convened 150 water stewardship professionals from more than 25 countries in Edinburgh for the fourth [AWS Global Water Stewardship Forum](#). The objective of the Forum is threefold: to provide a peer learning and networking space for practitioners, to serve as an entry point for potential practitioners new to AWS and to provide input to the strategic direction of AWS in the coming twelve months. The Forum provides a valuable opportunity for the global water stewardship community to collaborate and learn from each other to build and strengthen water stewardship activities around the world.

In January 2020, Caithness General, in Wick, became the [first hospital in the world to be certified against the AWS Standard](#). NHS Highland achieved the award as a result of a multi-agency project designed to reduce the pollution caused by medicines emanating from the hospital. Other collaborators in the project include: Aurora Sustainability Group, Scottish Environment Protection Agency (SEPA), Scottish Water, Highlands and Islands Enterprise (HIE), and the University of the Highlands and Islands' Environmental Research Institute (ERI). The certification is a recognition of the ongoing initiative designed to make the healthcare provided at the hospital "greener" by reducing its environmental impact. The hospital is so far the only site of its kind in the United Kingdom to achieve AWS certification.

Local Water Solutions for Global Problems e-Learning programme reaches over 100 countries

Between 2015 and 2018 the Scottish Government, CIFAL Scotland, University of Strathclyde, CREW, Gaia Education and UNITAR developed a MOOC (Massive Online Open Course) on Local Water Solutions for Global Problems. The course covers a number of global water challenges including human development needs, water security, water quality, water availability, root causes of water scarcity, water distribution and equity, and the interactions between climate change and water, while providing innovative local solutions and showcasing some of the best practice of Scotland- the Hydro Nation.

The programme has a number of UN alignments. The course was launched internationally during World Water Day 2018, marking the launch of the UN International Decade for Action – Water for Sustainable Development (2018–2028). The content development and the consortium of partners are informed by the Sustainable Development Goal 6- Clean Water and Sanitation and its eight universally applicable targets, in particular by Target 6.a: expand international cooperation and capacity building.

Springing from Scotland but embracing and showcasing a myriad of localised water solutions in Malawi, Rwanda, India and other countries the programme has its unique contribution to the international water agenda and debates. It offers a comprehensive

overview of global water challenges and the means to identify local solutions while achieving pressing social, economic and environmental objectives.

Local Water Solutions has been conducted five times through the UNITAR virtual learning platform. The consortium of partners are pleased as the programme has been attracting a high number of professionals from over 100 countries who report a high rate of applicability of the course content in their professional fields.

Private Water Supplies – ‘Finding the right solution’

CAS, in partnership with DWQR, carried out further research to better understand the factors that influence choice for private water supply users or contractors when selecting water treatment solutions. Research findings³ highlighted that most unregulated supplies are not tested or treated and that those consuming the water are largely unaware of the risks of drinking untreated water. The management of private supplies are largely determined by differing attitudes, perceptions and assumptions rather than a scientific approach to managing risk. Supply owners take pride in their own inventiveness, self-sufficiency and understanding of what their supply requires in terms of treatment. Makeshift and remedial treatment systems, such as the use of surgical stockings, are frequently used to provide basic filtration and remove visible debris.

Annual testing of regulated supplies only really reflects a moment in time, and does not account for the variability of water quality during the rest of the year. Support for those responsible for private supplies is inconsistent and largely dependent on which local authority area the supply resides. Local authorities face the challenge of persuading supply owners that more needs to be done to treat a supply against long held views that the water is safe to drink because it is ‘pure and unadulterated’. Some owners perceive that local authorities will interfere unnecessarily and therefore ‘fly under the radar’ to protect their independence.

However, research also highlighted that some supply owners worry about the quality of their water and want mains connection but cannot afford it. For others, purchasing the right treatment to make their water safe to drink is unaffordable. Available grant funding is limited in terms of its amount and what it can be used for.

Lastly, research highlighted that in the event that a private supply runs out of water following extreme weather events, such as prolonged dry weather in 2018 and the spring of 2020, community members may have no alternative source. Research findings are being used to inform ongoing policy development as part of the Scottish Government’s Private Water Supply Working Group.

DWQR Private Water Supply Risk Assessment Tool

Scotland has in excess of 20,000 private water supplies (PWS) that are not supplied by Scottish Water. Compliance with water quality standards is poor, and the supplies are often poorly managed and maintained. Risk assessment by local authorities, who regulate PWS, is the primary way to understand and control the unique risks.

In order improve the rigour and consistency of the approach to risk assessments, and to provide support to local authorities, the DWQR has developed a web-based portal to enable local authorities to input and store risk assessments for their PWS. The secure

³ <https://www.cas.org.uk/publications/finding-right-solution>

portal leads authorities through the risk assessment process to ensure they are completed correctly and enables them to store information and documents relevant to the supply. For DWQR, the portal means that information on PWS risks can be collected centrally, providing a national picture of risks for the first time.

The risk assessment portal was developed in full collaboration with local authorities to ensure that it met both their needs and those of DWQR. The intention was to create something that was intuitive to use, but that ensured five-yearly risk assessments were completed thoroughly and to the same standard across Scotland. The portal was rolled out with a series of training sessions held in local areas. This also provided an opportunity to deliver technical training on PWS treatment and to discuss PWS regulation in general.

The screenshot displays the 'Private Water Supply Risk Assessment' portal for 'Mingulay'. At the top, it shows the user 'Matthew.Bowor@gov.scot'. The main header includes the local authority name and an 'Edit supply' button. Below this, a summary table lists: Supply number (25), Sources (1), Tanks (2), and Properties (3). The 'Risk assessments' section contains a table with columns for 'Submitted', 'Submitted by', and 'Due', showing two entries. The 'Risk scores' section features a table with columns for 'Centralised Treatment', 'Distribution and Management', 'Property', 'Source', and 'Tank', with rows for 'Highest Unmitigated Risk Score' and 'Highest Mitigated Risk Score'. A 'Map' section shows a geographical map with a legend for Source, Tank, Property, Point of interest, Pipe, and Unknown pipe. The 'Images' section at the bottom contains four photos: 'Centralised UV treatment', 'Treated water tank', 'St Columba Burn', and 'Centralised cartridge filter and UV treatment'.

World Water Day – 22 March 2020

It was with deep regret that this year's World Water Day event at Dynamic Earth, Edinburgh was cancelled because of the unfolding concerns around the Covid-19 pandemic. This year's topic of "Water and the Climate Crisis" was a precursor event to the also postponed COP26 in Glasgow. The day was planned to examine how Scotland's water research, industry, regulation, policy and public sectors are addressing

this shared challenge. The World Water Day 2019 Reports (Exploring Scotland's Resilience to Drought and Low Flow Conditions) were launched and are available [here](#).

Centre of Expertise for Waters

The Centre for Expertise for Waters (CREW), supported by the Rural and Environment Science and Analytical Services Division (RESAS) of Scottish Government, delivers research and expert opinion to support the Government and its partners in the development and implementation of water policy. The principal policy areas include Flooding and Coastal Erosion; Water Quality; Catchment Management; and Sustainable Communities, along with a broader engagement supporting the Hydro Nation agenda, biodiversity and climate crises and the recent COVID-19 pandemic.

Delivering research to address policy needs:

CREW has supported policy teams responsible for the Flood Risk Management Act (Scotland) 2009 ([Impacts of Flooding in North-east Scotland](#); [Communities at Risk of Flooding and their Attitudes towards Natural Flood Management \(NFM\)](#); [Quantifying rates of urban creep in Scotland](#)). Coastal erosion continues to be a policy priority and significant progress towards [Phase 2 of Scotland's Coastal Change Assessment \(NCCA2\)](#) has enhanced the evidence base of coastal change; produced mitigation, adaptation and resilience plans at key sites; increased adaptation awareness and assessed social vulnerability to coastal erosion. More specifically NCCA2 supported the delivery of the Adaptation Sub-Committee of the Climate Change Committee report and Scotland's obligations under multiple aspects of the Climate Change Adaptation Programme, Flood Risk Management Act, Community Resilience Strategy, Scottish Planning Policy, National Marine Plan, Historic Environment Scotland's Climate Change Action Plan, Land Use Strategy and Scottish Biodiversity Strategy.

The European Commission welcomed the provisional agreement on the 'recast' Drinking Water Directive in December 2019, however, the proposed deadline for completing the Directive review was October 2020 (delayed due to Covid-19). Until this key legislation is complete, CREW has focussed on delivering a cohort of drinking water related projects (including a [Reviewing best practice in the delivery of good drinking water quality using a prevention-led approach](#); [A review of investment decisions at small drinking water supply systems](#) and [Natural sources of phenols and mitigation measures to reduce their release into the water environment](#) and a cross-thematic project on 'Climate Change and Private Water Supplies'.

CREW continues to deliver evidence on the effectiveness of the River Basin Management Plan (2016-21), currently in its fourth year of implementation, and has contributed advice and recommendations to SEPA to inform the completion of the 3rd River Basin Management Plan. Similarly CREW outputs have been used to help inform SEPA reviews of the EU Water Framework and Bathing Waters Directives in 2019 and 2020 respectively, and associated monitoring strategies through the delivery of projects such as [Review of monitoring techniques and sampling strategies to identify the most significant sources of FIO within a catchment](#). CREW projects and their outputs have also informed the development of SEPA's [sector plans](#) to support delivery of [SEPA's regulatory strategy- One Planet Prosperity](#).

As the Covid-19 pandemic took hold in spring 2020, CREW commissioned a collaborative rapid response project to determine whether SARS-CoV-2 viral RNA could be detected in municipal wastewater as part of a national surveillance initiative.

Promoting Growth and Innovation in the Water Sector

Innovation is critical to the health of our water industry and the contribution it makes to the overall economy, driving down costs for consumers and helping to differentiate businesses by developing new processes, technology or materials that are more efficient, effective and cheaper than those they replace. Supporting innovation is a major focus of the Hydro Nation agenda and detailed below are examples of this in practice.

Smart Water Foresighting

Scottish Enterprise is carrying out foresighting research into the opportunities in water technology for Scottish companies in the next ten-years. The research focuses on 'smart water' – the digitalisation of the water industry.

Smart water has been identified as a rapidly growing opportunity which could have a significant impact in Scotland and globally. It covers developments in instrumentation, networks and data analytics to tackle water industry challenges and support net zero carbon.

Smart water solutions are already being deployed in a variety of situations such as remote monitoring, customer engagement, smart meters and digital twinning. Other examples include the use of smart water in monitoring for Covid-19 in the wastewater network to allow for early monitoring of outbreaks.

Current water industry challenges such as leak detection, security of supply and flood forecasting and reducing energy usage all have the potential to be addressed. This latest water industry revolution, water 4.0, is set to be worth an estimated \$30bn globally [UK Water Partnership]. Scottish companies from both the water and digital sectors can benefit from this emerging sector.

Through desk-based research and interviews with stakeholders, the Foresighting discussion paper will take a broad look at the Scottish water sector where digitalisation is already occurring and where it has the potential to have an impact. The report should be of benefit to any company interested in the opportunities arising from digital water.

Food waste recycling – 10 year anniversary

Over one million tonnes of food are thrown out in Scotland each year. Whilst some of this waste is unavoidable, it can be effectively tackled by recycling it into sustainable new products to help fight against climate change. Scottish Water Horizon's food waste recycling facility at Deerdykes, near Cumbernauld, is capturing some of this waste to generate green energy and produce a natural fertiliser.

Since commissioning in September 2010, the facility has recycled over 155,000 tonnes of food waste from local authorities and commercial producers into green electricity, helping to divert waste from landfill where it produces harmful greenhouse gases.

Over the past 10 years the plant has generated 38 GWh of green electricity, and offset 96,700 tonnes of carbon emissions – the equivalent of powering over 10,000 homes.

Low Carbon Infrastructure Transition Programme

Scottish Enterprise (SE) is a partner in the SG led [Low Carbon Infrastructure Transition Programme](#) (LCITP). There have been several examples of deployment of water and wastewater as the energy source for large-scale district heating projects across Scotland. Examples include:

Queens Quay, West Dunbartonshire – This project features the first large-scale deployment of water-source heat pumps in Scotland. The project will extract heat from the River Clyde to supply a district heat network that will provide heat to the Queens Quay development and potentially beyond in future years. The project received £6m in funding from the Low Carbon Infrastructure Transition Project with the balance funded by West Dunbartonshire Council.

Stirling District Heating Scheme – Stirling Council and Scottish Water Horizons have collaborated to create, develop and deliver a low carbon infrastructure project to the benefit of the Stirling area. The project involves harnessing energy from wastewater and carbon neutral biogas to deliver affordable, low carbon heat to the Forthside area of the city. The total project cost was some £6.2m with funding from Stirling Council and Scottish Water Horizons supported by LCITP.

Advanced Manufacturing Innovation District Scotland (AMIDS), Renfrewshire Council – SE is working closely with Renfrewshire Council, supported by LCITP, to investigate and scope the potential for a district heat network to supply the AMIDS development at Renfrew. An initial feasibility study has identified scope to develop a heat network supplied by extraction of heat from the outfall from the adjacent wastewater treatment works. The project is being developed in collaboration with Scottish Water Horizons.

Xylem Partnership - world's first waste water pump system with integrated intelligence

Scottish Water Horizons and Xylem Water Solutions, a world leading water technology company, have announced an exciting new partnership that will help housing developers improve efficiency and reduce their carbon footprint. They have developed the world's first innovative wastewater pump system with integrated intelligence, Xylem's Flygt Concertor system. The system's smart technology can sense environmental operating conditions and adapt the pump's performance to ensure they always operate at the optimum level whilst providing intelligent feedback to station operators. Compared to traditional pumps, the Flygt Concertor offers up to a 70 per cent saving on energy consumption, drastically reducing carbon and running costs. This will make the vesting process easier for Developers which in turn helps meet growing demand for new housing with a greener carbon footprint.

Water Test Network

Over the past year the Water Test Network, an INTERREG North-West European funded programme led by Scottish Water Horizons, has successfully helped a number of small-medium enterprises (SMEs) to access test facilities and funding support to drive innovation across the water sector.

Already the Water Test Network has experienced strong demand for the service – with 80 applications received from SMEs across Europe including Austria, Belgium, Finland, Sweden, France, Germany, the Netherlands and the UK since its creation in December

2018. More recently the Water Test Network formed a partnership with the US-based Water Council to help members accelerate the commercialisation of new innovations.

Scottish Water Development Centres

The creation of Scottish Water's Development Centre at Gorthleck in 2015 was in direct response to the identified need for businesses and researchers to have access to a water treatment facility to enable testing and development of new technologies on an industrial scale. Since commissioning, the Development Centre has hosted a number of trials including the testing of new nanomembrane technology, alternative processes for chlorine disinfection, and point of use equipment to provide sustainable clean drinking water for rural areas.

To increase flexibility and widen scope, the centre is now undergoing a further upgrade in the form of a training hub for the operation of nanofiltration tubular membrane technology. Presently there is no such facility within the UK or beyond that can offer an off-grid training facility whereby operatives from the utility, academic and industrial sectors can be trained how to operate membrane plants under live conditions in a large scale environment.



The provision of a demonstrative membrane facility such as that at Gorthleck would enable such training to take place in a safe and secure environment, support consistency and foster a culture of knowledge sharing and collaboration. As well as classroom based learning in the newly refurbished meeting room,

operatives will have the opportunity for hands on operational training within the testing hall including plant operation and maintenance, and simulations to enable fault finding and troubleshooting.

The introduction of the new facility will also increase opportunities to develop new membrane technologies to ensure the highest water quality standards - both at home and abroad. The project is currently in the design phase with the successful contractor Commissioning Solutions Scotland. Completion of construction and commissioning is anticipated by early 2021.

Solar Photovoltaic (PV) Schemes

By September 2020, Scottish Water Horizons had delivered a total of 47 solar PV schemes on Scottish Water assets, helping to offset electricity consumption, lower emissions and keep household customer bills low. Combined, these schemes currently generate around 7.2 GWh of renewable energy annually, enough to power over 1,900 homes each year.

Horizons most recent solar installation is at a Water Treatment Works at Loch Ashie which serves Inverness city and the surrounding area. With a £450,000 investment, over 1,300 ground mounted solar panels are now generating green power, helping customers enjoy fresh, clean water with a lower carbon footprint. The site also hosts an electric vehicle charging point to support the roll-out of Scottish Water's electric fleet.

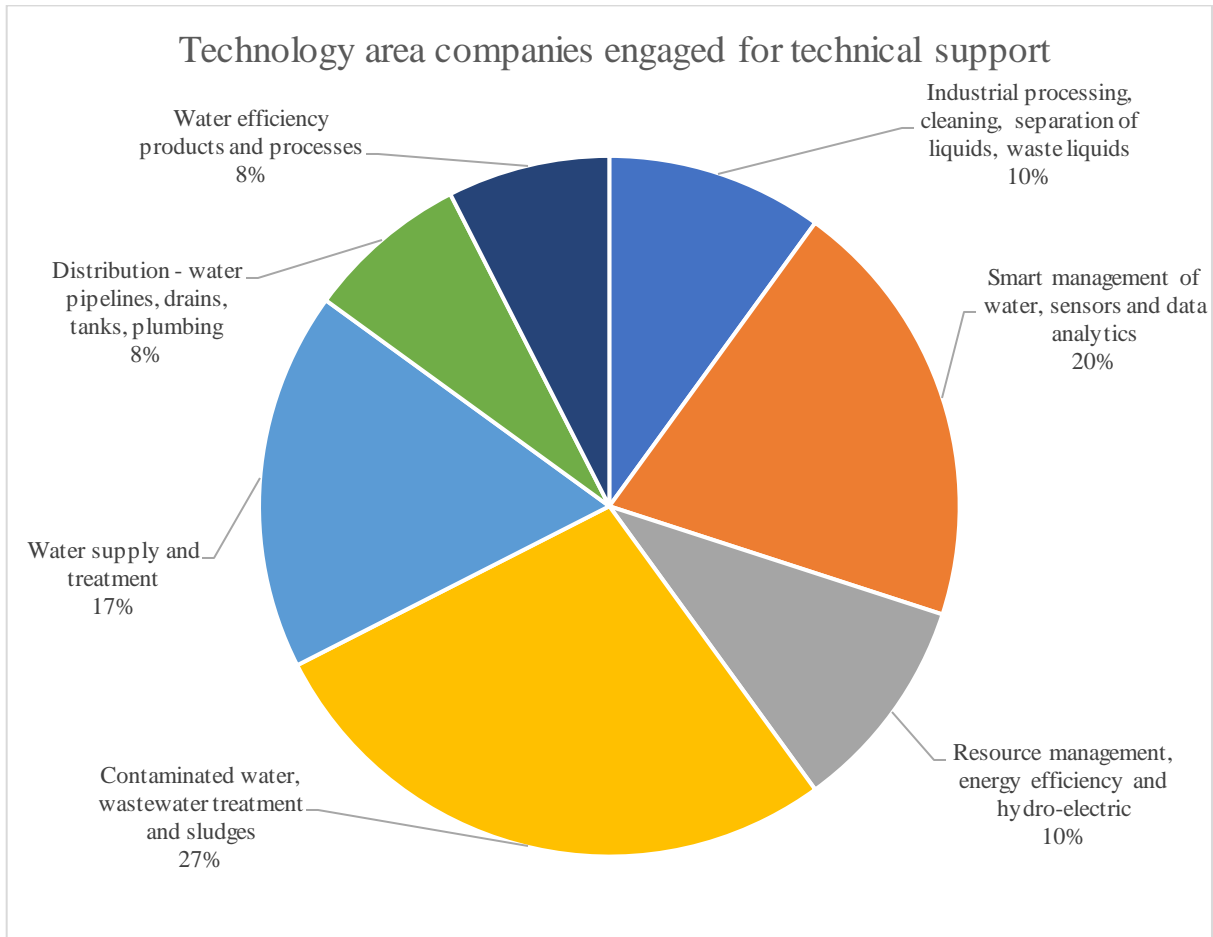


Hydro Nation Water Innovation Service (HNWIS): Supporting Innovation

HNWIS has entered the final year of the current service contract. In Year 2, HNWIS reported that the key target of engaging with 250 companies had already been achieved ahead of schedule and the service is on target with supporting companies who apply for technical support packages. Signposting, advice and/or guidance has been provided to over 100 companies.

In the last iteration of HNWIS there was a high level of demand for the service which resulted in diversion of resources away from cluster building to manage the demand from a wide range of applicants. In this iteration, we revised the approach to encompass earlier engagement and pre-screening of companies and products to ensure the service focusses on those which are more likely to achieve the primary aim of getting new innovative products or services to market more quickly. This has resulted in a higher proportion of applicants being referred to the specialist technical support packages.

Our Network Integrators (Arup) are actively engaging across the sector, providing a platform for Scottish companies to engage with other players in innovation including buyers. They are also bringing greater visibility to and engagement with UK-wide activities in innovation in the water sector. In the past year they have hosted/supported three Wet Networks events (where companies pitch to industry representatives), one of which was the first to be held in Scotland. They also hosted two Water Technology Drop-in days where companies had the opportunity to meet water specialists and three webinars held jointly with HIE and SE, one of which featured speakers addressing the impact of Covid-19 on the water sector.



Companies can access the service as follows:-

www.hnwis.scot

Email: info@hnwis.scot

Tel: 0141 202 7679

Follow on social media:

https://twitter.com/hnwis_scot

<https://www.linkedin.com/in/hnwis-scot/>

Looking Ahead – 2021 and Beyond

Scottish Water's Strategic Plan

Scottish Water's 25-year strategic plan – [Our Future Together](#) – was published in February 2020 and outlines the impact of the changing climate and how the organisation will reduce emissions to become [net zero by 2040](#).

The plan highlights how future investment in vital infrastructure and assets, which were not designed to cope with our changing climate, must combine with innovative and sustainable ways of dealing with climate change and supporting economic growth. Customers contributed their views through country-wide engagement, recognising the importance of Scottish Water and communities working together to manage one of our most valuable natural resources.

SURICATES Research Project

Scottish Canals continue to engage as a partner in the EU funded SURICATES (Sediment Uses as Resources In Circular And Territorial EconomieS) project. Three project pilot sites are now being developed, with work progressing at Bowling on the Forth and Clyde Canal, works planned for the winter on the Crinan Canal and Caledonian Canals to develop solutions that provide Net-Zero Carbon options for managing sediment and providing flood management across a range of sectors. The knowledge gained from the project will allow for innovative, sustainable solutions to be developed to create alternative re-use options for sediment which can be replicated at other locations.

Malawi-Scotland Regulatory Partnership

Looking ahead, the MSRP will continue to develop and deliver an effective programme of support for the NWRA and MEPA, fostering good relationships across the environmental and water management landscape. Through the combined strength of partnerships and expertise of Scotland and the Hydro Nation, the project is on track to empower effective environmental regulation and protection for the people of Malawi.

Hydro Nation Water Innovation Service

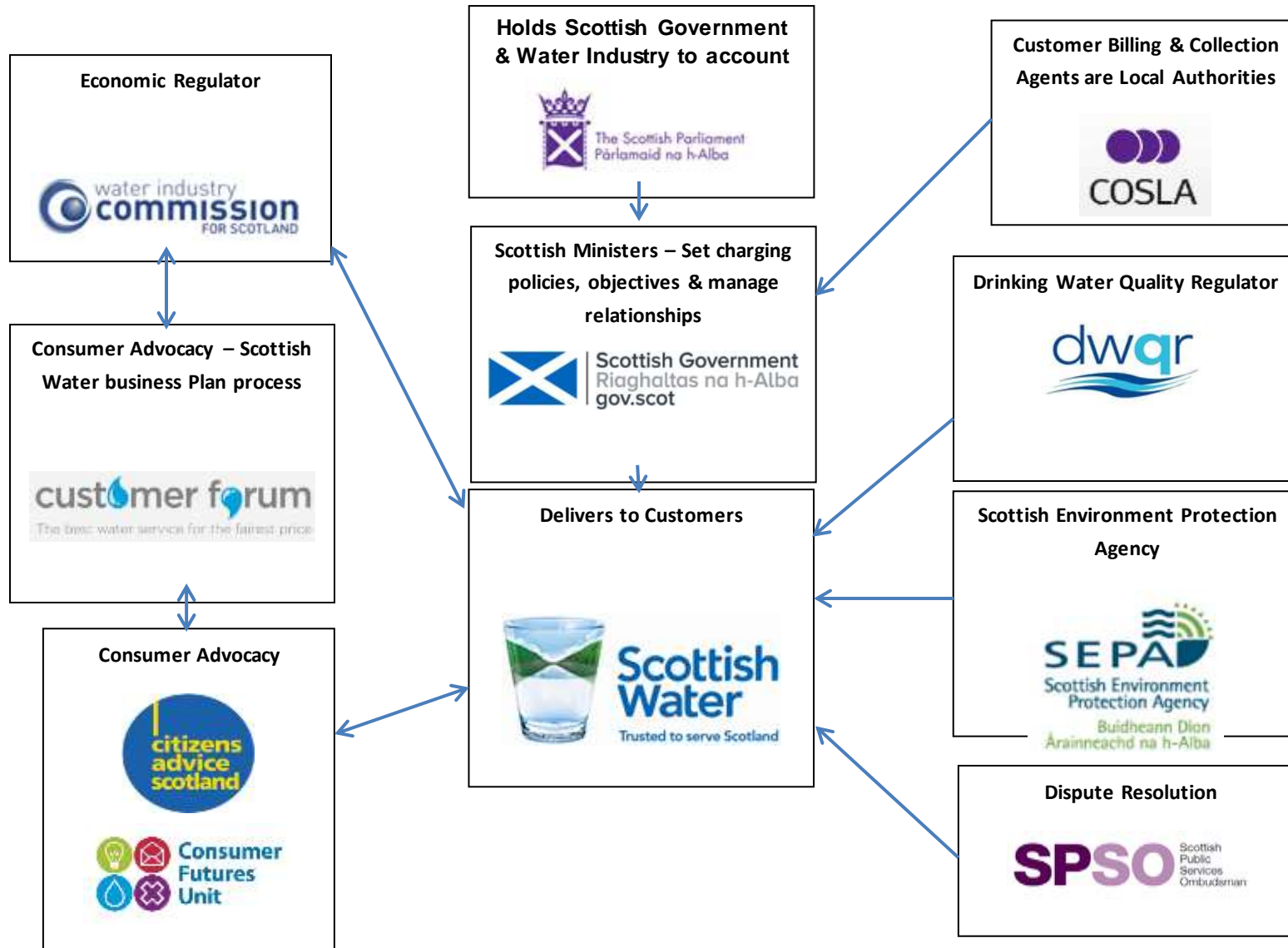
Over the next year, HNWIS will continue to actively engage across the sector, providing Scottish companies access to opportunities to collaborate and network with the wider ecosystem through collaboration with innovation centres, R&D institutions and industry organisations.

As several SMEs have now benefitted from HNWIS Product Readiness Assessment support, over the next year the service will progress a number of these companies through Product Trial support as they continue along their journey from concept to commercialisation. At all stages, the service will continue to direct companies to the most relevant support to develop their products and services, whether that be through networking, signposting or technical support.

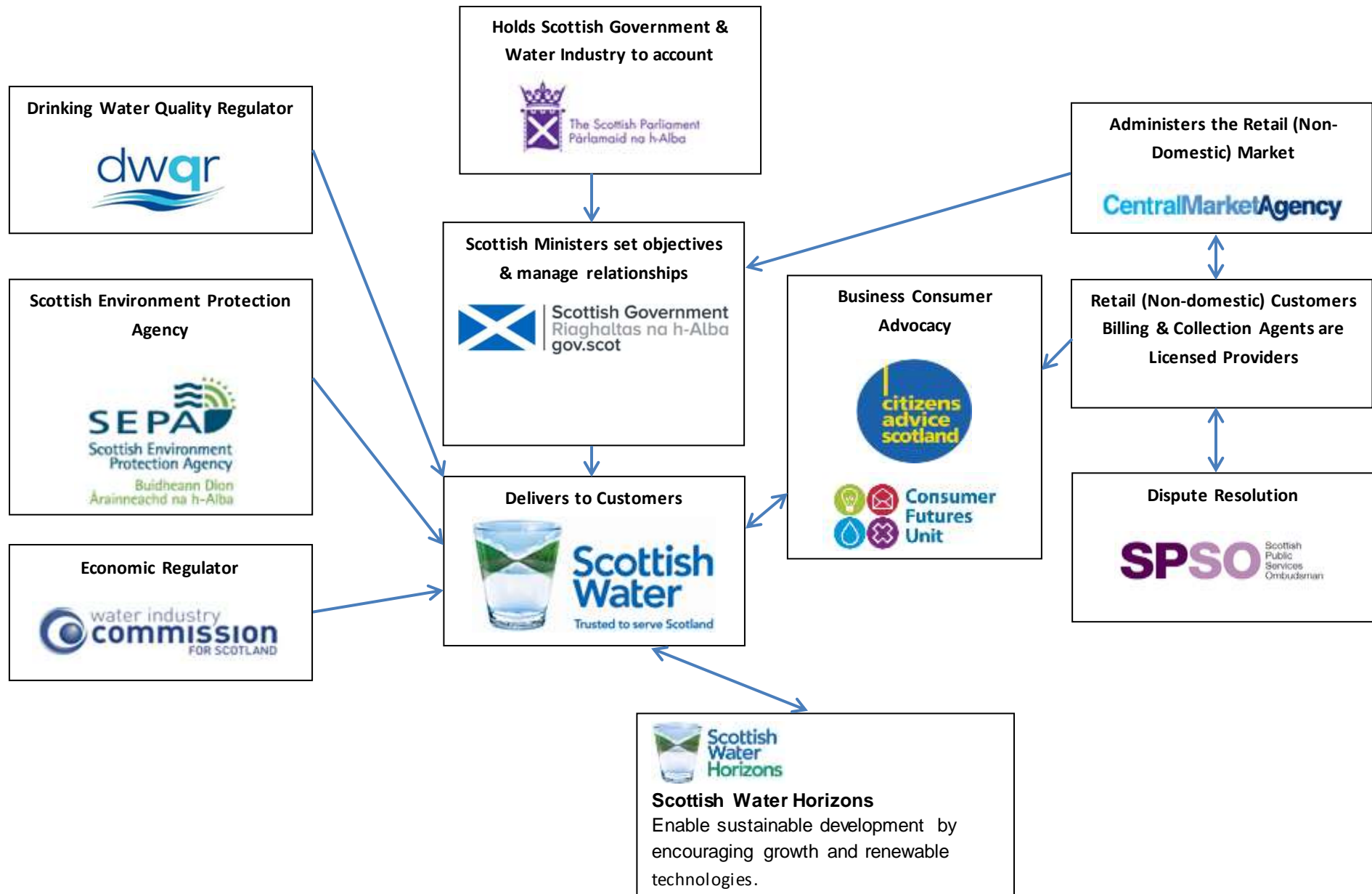
Structures of Governance

ANNEX A

Domestic Market



Retail (non-domestic) Market



Structures of Governance – Who Does What?

The Scottish Parliament scrutinises the work of the Scottish Government and its public bodies, and holds them to account. Both the Scottish Government and the Scottish Parliament are accountable to the people of Scotland.

The Scottish Government – Scottish Ministers and their officials manage the relationship with Scottish Water and its regulators within the statutory framework established under the Water Industry (Scotland) Act 2002. Scottish Ministers set the objectives for the industry (as set out in the Ministerial Directions available [here](#)) and the principles that should underpin charges (as set out in the Principles of Charging Statement available [here](#)).

The Water Industry Commission for Scotland (WICS) has the statutory duty to set price limits for Scottish Water based on the lowest overall reasonable cost of achieving Ministers' Objectives for the water industry.

Scottish Environment Protection Agency (SEPA) is responsible for ensuring that Scottish Water meets strict environmental requirements. SEPA also advises Ministers on the delivery of and the need for future investment in environmental improvements

The Drinking Water Quality Regulator (DWQR) is responsible for monitoring and confirming that the drinking water supplied by Scottish Water through the public water mains system meets the requirements of the drinking water quality regulations and is safe to drink. DWQR also advises Ministers on the delivery of and the need for future investment in drinking water quality.

The Scottish Public Services Ombudsman (SPSO) is the final stage for complaints about Local Authorities, most licensed providers, the Scottish Government and its agencies and departments.

Central Market Agency (CMA) – On 1 April 2008, competition was introduced into the water industry in Scotland for retail (non-domestic) customers. The CMA is the organisation that administers the retail market for water and waste water services in Scotland. They are a company limited by guarantee and owned by its members.

Key Sector Stakeholders

Scottish Water is a public corporation accountable to Scottish Ministers and through them to the Scottish Parliament. The service Scottish Water provides to 2.52 million households and 153,000 business premises is essential to daily life in Scotland. Every day, Scottish Water delivers 1.38 billion litres of clear, fresh drinking water and takes away 929 million litres of waste water that it treats and returns safely to the environment. With more than 60,000 miles of pipes and 2,000 treatment works, Scottish Water supports communities the length and breadth of Scotland every day. In providing these essential services to customers, Scottish Water recognises these activities and operations can be visible in the communities it serves. That is why Scottish Water works very hard to ensure it is responsive and sensitive to the needs of its customers in every corner of Scotland and aims to put communities at the heart of the business.

Scottish Water Horizons Ltd is a commercial subsidiary wholly owned by Scottish Water. The company plays a key role in supporting the development of Scotland's sustainable and circular economy by making the most of the public utility's vast array of assets. Drawing on the experience of Scottish Water's remarkable transformation in the water industry in Scotland, it also offers international services to utilities, governments and other clients from around the world.

Licensed Providers (LPs) – Retail (non-domestic) customers are able to choose who supplies their water and sewerage services. All water and sewerage service providers must be licensed by the Water Industry Commission for Scotland (WICS). WICS publishes a list of licensed providers and information on the retail market [here](#).

The Consumer Futures Unit (CFU) of Citizens Advice Scotland (CAS) represents water consumers, and is a key partner in many areas of policy development.

The Convention of Scottish Local Authorities (COSLA) is the representative voice of Scottish local government. Local Authorities provide the collection and billing for water and sewerage services on behalf of Scottish Water for all domestic (and non-metered) customers.

The Customer Forum is established to act as the principal means through which customer's views are incorporated into the Strategic Review Process, but not as being a 'representative body' of customer types. The Forum will be replaced by a customer group as the industry moves into the next regulatory period.

1. **Roseanna Cunningham MSP (Chair)**, Cabinet Secretary for Environment, Climate Change and Land Reform.
2. **Professor Bob Ferrier**, Director of Research Impact, James Hutton Institute.
3. **Chrysoula Pantsi**, Edinburgh Napier University School of Engineering and Built Environment.
4. **Dr Alan MacDonald**, Principal Hydrogeologist at the British Geological Survey.
5. **Terry A'Hearn**, Chief Executive of SEPA.
6. **Professor Robert Kalin**, Professor of Environmental Engineering for Sustainability at Strathclyde University.
7. **Richard Millar**, Chief Operating Officer, Scottish Canals.
8. **Peter Robinson**, Head of Engineering, Scottish Canals
9. **Alan Sutherland**, Chief Executive, Water Industry Commission Scotland.
10. **Neil Gordon**, Regional Manager (Edinburgh) & Principal Consultant, EnviroCentre.
11. **May East**, UNITAR Fellow.
12. **Galen Fulford**, Managing Partner of Biomatrix Water Technology.
13. **Dr Michael Gormley**, School of Built Environment, Heriot Watt University.
14. **Professor Simon Parsons**, Director of Strategic Customer Service Planning, Scottish Water.
15. **Gail Walker**, Water Policy Team Manager within the Consumer Futures Unit at Citizens Advice Scotland.
16. **Andrew Allan**, Interim Director, UNESCO Centre for Water Law, Policy and Science, University of Dundee.
17. **Nick Lyth**, Director, Green Angel Syndicate.
18. **Jan Reid**, Senior Manager, Low Carbon Technologies at Scottish Enterprise.
19. **Steven Hutcheon**, Head of Technology and Advanced Engineering at Highlands and Islands Enterprise.
20. **Jim Panton**, CEO Panton McLeod Ltd., and Chair Of institute of Water (Scotland).
21. **Hanna Peach**, Hydro Nation Scholar.
22. **Adrian Sym**, Chief Executive Officer, Alliance for Water Stewardship.
23. **Robert Orr**, Strategic Relations Manager, Skills Development Scotland.
24. **Sue Petch**, Drinking Water Quality Regulator for Scotland.

Scholar	Cohort	Project	University
Kathleen Stosch	2015-20	<p>Building Resilience to Respond to Future Environmental Change Across Scottish Catchments.</p> <p>Community Impact: Better understanding of the complex interactions in catchment management will contribute to strategies to improve resilience and reduce harmful outcomes impacting on those living in catchments.</p>	Stirling
Carolin Vorstius	2015-22 (p/t)	<p>Safeguarding and Improving Raw Water Quality by Increasing Catchment Resilience.</p> <p>Community Impact: Better integrated catchment resilience enhances environmental protection and reduces treatment costs resulting from compromised catchments.</p>	Dundee and James Hutton Institute

Scholar	Cohort	Project	University
Valerio Cappadona	2016-20	Can Waste Water Treatment Plants Cope with Future Nanoparticle Loading Scenarios? Community Impact: Improved understanding contributes to strategies to more efficient and effective treatment understanding the impact of nano-particles on treatment will help optimise plant efficiency, reduce costs and protect receiving waters thereby enhancing the natural environment for communities with receiving waters.	Strathclyde
Lydia Niemi	2016-20	Assessment of the Degradation Pathway, Persistence & Eco-Toxicological Impacts of Human Pharmaceuticals to the Aquatic Environment. Community Impact: efficient removal of pharmaceuticals reduces treatment cost to support improved environmental & public health & reduced impact on receiving waters.	Highlands & Islands
Kirsty Holstead	2016-20	Governing Water One Drop at a Time: Responses to, and Implications of, Community Water Management in Scotland & Beyond. Community Impact: will help optimise community engagement to protect and maintain raw water quality, improving quality of supply and reduce treatment in remote rural communities.	St Andrews and James Hutton Institute
Jonathan Fletcher	2016-22 (p/t)	Optimising Multi-Pollutant Phytoremediation Strategies to Sustainably Improve Raw Water Quality. Community Impact: Contribution to increased raw water security will develop more sustainable and innovative treatment options, reducing environmental impact and costs.	Stirling
Bhawana Gupta	2016-20	Tackling the challenge of the water, food, energy nexus in India & Scotland. Community Impact: Through improved understanding, project will contribute to better cross-sectoral approaches to improve the livelihood of rural communities.	Dundee and James Hutton Institute

Scholar	Cohort	Project	University
Sughayshinie Samba Sibam	2017-21	Epidemiology of Private Drinking Water Supplies in Scotland. Community Impact: The primary aim of this project is to have a better understanding on the relationship of water contamination by microbial pathogens in PWS, with the incidence of gastrointestinal diseases.	Aberdeen
Lucille Groult	2017-21	Socio-Legal Responses to the Challenges of Contaminants of Emerging Concern. Community Impact: The objective is to improve availability of “safer” products and assess feasibility of potential legal improvements. Furthermore, the project will look for ways to support consumers to make informed choices.	Dundee
Victoria Porley	2018-22	Water Purification in Rural India Using Sunlight and Low-Cost Materials. Community Impact: The objective will be proof-of-concept of a low-cost, solar photocatalytic materials and system, enabling future roll-out of the approach in rural India and in other developing countries with similar communities and climates.	Edinburgh
Craig McDougall	2018-22	The Role of Scotland's Inland Waters in Promoting Blue-Health of Rural Communities. Community Impact: The objective, through a programme of integrated natural and social science research, is to determine how future scenarios of land use and climate change might alter the blue health impacts (positive and negative) of inland waters for communities.	Stirling

Scholar	Cohort	Project	University
Kerr Adams	2018-22	The Scottish Water Landscape and Its Resilience to Change: An Assessment to Support Future Policy. Community Impact: The objective is to provide a systematic insight into the future of Scottish land use/management/industry and its relationship with water quality and quantity, and provide the necessary evidence (for national strategy, planning and policy) of the resilience of policy and management options to uncertain drivers of change.	Edinburgh
Elliot Hurst	2018-22	Adaptive Engineering Solutions to Water Abstraction and Control for Developing Countries. Community Impact: The objective is to provide solid evidence to support best practice guidance for rural communities on the application and adaptive needs of wetland treatment systems utilising different vegetation types, and how effectiveness may vary across wet and dry seasons.	Stirling and James Hutton Institute
Hanna Peach	2018-22	Optimising Microbial Communities for Removal of Priority Chemical from Water. Community Impact: The objective is to characterise in detail the degradation of the OMPs diclofenac and triclosan by microbial biofilter communities formed in a range of Scottish source waters. This information is an essential prerequisite for targeted design of biofilter microbial communities for OMP degradation.	Edinburgh and James Hutton Institute

Scholar	Cohort	Project	University
Sydney Byrns	2019-23	Co-developing strategies to promote inclusive water governance in Malawi Community Impact: Through cross-scale analysis of social network structure, dynamics, and beliefs, this project aims to strengthen national and institutional water policies together with the methods of providing feedback between water sector stakeholders, with the objective of this leading to more adaptive water governance in Malawi.	Stirling
Julius Cesar Alejandre	2019-23	Blue-green prescribing for a healthier population and a healthier water environment Community Impact: The study aims to investigate the feasibility of adopting a blue green prescribing strategy in local health boards by examining the components of existing models of prescribing green pharmaceuticals and blue space interventions; mapping out key stakeholders and policies that influence the uptake of pharmacological and non-pharmacological prescribing; and analysing viewpoints of stakeholders about blue green prescribing. This information is useful in the development of a bespoke blue green prescribing strategy that fits in the context of Scottish healthcare system and considers behavioural, environmental, social, and systemic facets of intervention adoption.	Glasgow Caledonian
Rita Noelle Moussa	2019-23	Conversion of wastewaters and organic waste into chemicals, energy, and organic fertiliser Community Impact: The objective is to establish an anaerobic digestion process for the bio-decomposition of wastewaters and organic waste to be able to provide cleaner and healthier water before being discharged into the environment. Moreover, the process will produce valuable chemicals such as ethanol, short chain organic acid for industrial use and hydrogen, methane for energy production (biofuel and electricity).	Aberdeen
Diana Souza Moura	2019-23	Microplastics as a vector for micropollutants in aquatic environments. Community Impact: Affect societal attitudes in respect of the use of plastics and provide tools to influence policies by understanding the mechanism of interaction between microplastics and natural toxins, such as microcystins, and pharmaceuticals, as well as the effect of microplastics loaded with micropollutants on aquatic biota in freshwater, and the potential dangers of underestimating these pollutants in drinking water as current water sampling protocols do not account for adsorbed pollutants.	Robert Gordons



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