Water Climate Discussion

NATURE BASED SOLUTIONS

Report from the discussion held on 10 June 2021

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organised by:

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Welcome

The Water Climate Discussion series is creating a space to come together and help the water sector build its leading role addressing the climate crisis.

The series is the result of close collaboration between water institutions who have come together recognising climate change as an existential threat and wish to have a voice promoting a key message: water is climate.

This report has been produced based on the recorded discussion lead by Katharine Cross of IWA, Samuel Larson of Water UK and the participants' interaction during the second discussion of the series: Nature Based Solutions, on Thursday, 10 June 2021. Video segments were also shared by The Nature Conservancy, Jacobs and Severn Trent Water.

Photo by Laura Currie/andeye

Katharine Cross

Katharine has experience in water resources and environmental management from global to local scale and is currently working with a number of organisations including the International Water Association on climate-smart utilities, water wise cities and digital water, as a senior advisor for Water-Cities, supporting the transition of cities towards sustainable water management, and the Australian Water Partnership in the Mekong region.

Samuel Larsen

Samuel joined Water UK in 2017, having previously worked in a variety of strategy, policy and transformation roles across consultant, water company, and government organisations. He is currently leading the delivery of the UK water industry's Net Zero 2030 Routemap – the world's first detailed plan to reach net zero operational emissions on a sector-wide basis by 2030.

Q&A

1 **Stakeholders:** What role do different stakeholders have in enabling Nature Based Solutions (NBS)?

2 **Co-benefits:** What additional co-benefits from NBS can also improve climate resilience?

3 **Evidence:** What evidence is needed to select NBS for integration into water and sanitation services?

4 **Solutions:** As net zero shapes future policies, what are the nature-based solutions we should aim see more of?

5 **Enablers:** How can regulation be made "NBS-ready", so they become the default solution?

Vertical gardens on the Bosco Verticale buildings in Milan. Photo by Gábor Molnár/Unsplash

“Nature-based solutions use plants, soil and bacteria and other natural elements and processes to remove pollutants in water and wastewater.”

The global picture was presented by **Katharine Cross from IWA**, outlining the wide range of NBS currently in use with water utilities around the world.

These include reforestation and forest conservation, riparian buffers, wetlands, flood by-passes and green infrastructure for flow regulation, urban green infrastructure (Figure 1) and targeted land protection and management.

These can give multiple benefits not only in the reduction of chemical and energy use, but also by reducing floods, water supply scarcity and degradation of water quality.

Katharine noted that water utilities are often seen as providers rather than protectors, though those that use NBS can perform better overall.

Regarding NBS benefits for water supplies, Katharine mentioned the recent publication from The International Water

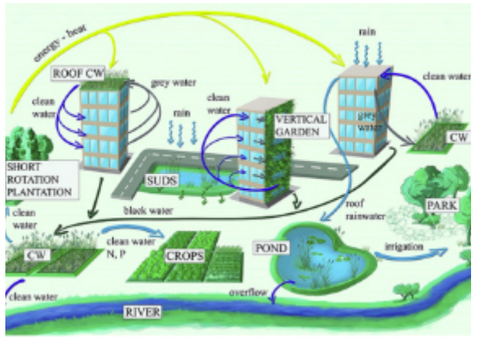

Figure 1 - Masi, Fabio & Rizzo, Anacleto & Regelsberger, Martin. (2017). The role of constructed wetlands in a new circular economy, resource oriented, and ecosystem services paradigm. Journal of Environmental Management. 216. 275-284. 10.1016/j.jenvman.2017.11.086.

Association (IWA) and The Nature Conservancy (TNC) entitled Nature for Water: A series of utility spotlights [1]. Katharine highlighted the role of partnerships and stakeholders such as utilities and regulators in implementing NBS.

As examples, two case studies were presented:

- The Quito Water Conservation Fund together with a video from The Nature Conservancy explaining the importance of the Water Funds and their implementation strategies
- The case study of the municipality of Skanderborg, aiming to enable climate adaptation in Denmark.

Regarding NBS uses for wastewater treatment, she mentioned the co-benefits that NBS can provide to people and ecosystems. Katharine described some examples such as the operation of willow systems (Figure 2) including its implementation in Denmark, the vertical flow treatment wetlands (Figure 3) with its use in China and the slow-rate soil infiltration applied in Texas, USA.

A new IWA publication [2] will be available from 15 July 2021 and a web-based tool produced by ICRA [3].

Katharine advised that “These provide an evidence base of technical references and guidance drawn from case studies and the scientific literature enabling communities to assess what NBS methods would be suitable for their local circumstances, their costs, design needs and what the co-benefits would be, including climate resilience.”

References

- [1] Nature for Water: A Series of Utility Spotlights - https://www.iwapublishing.com/books/9781789060812/nature-water-series-utility-spotlights
- [2] Nature Based Solutions for Wastewater Treatment (upcoming) - https://www.iwapublishing.com/books/9781789062250/nature-based-solutions-wastewater-treatment
- [3] :: ICRA :: - https://www.icra.cat/index.php?lang=3

Other Resources

- Wetland Technology: Practical Information on the Design and Application of Treatment Wetlands - https://iwaponline.com/ebooks/book/780/Wetland-Technology-Practical-Information-on-the
- Nature Based Solutions and Regulators - https://iwa-network.org/wp-content/uploads/2021/02/TO-USE-NBS_Regulators-calibri_web.pdf

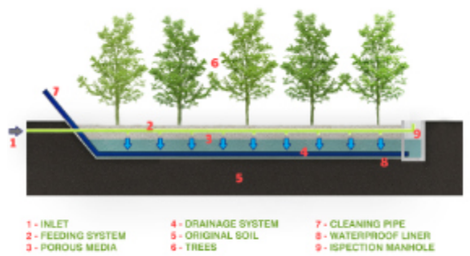

Figure 2 - Willow System - Sketch by IRIDRA

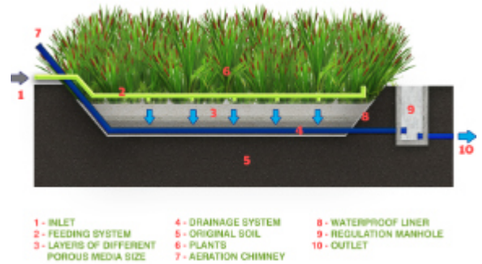

Figure 3 - Vertical Flow Treatment Wetlands - Sketch by IRIDRA

Amanda Lake, Regional Solutions Lead - Wastewater Europe - from Jacobs, shared a brief video about the role of Treatment Wetlands in NBS. This was focused on treatment marshes - large scale free water surface treatment wetlands - and their co-benefits.

Jacobs's Global Technology Lead, David Austin, defined Treatment Marshes and some of the design challenges for these systems.

Amanda covered examples of treatment marshes and their wider benefits - including the 4G Wetlands in Florida, the largest groundwater recharge wetland in the world, and the Huie Wetlands in Georgia, which discharges highly treated used water to a drinking water reservoir.

These systems can meet stringent nutrient standards, whilst providing wider social and environmental benefits - and in particular solutions for climate mitigation.

Samuel Larson from Water UK introduced this section, which focussed on the UK wastewater sector, by highlighting five UK specific factors driving the development of NBS:

- Upward demands on treatment due to upward trends in population and environmental standards
- Biodiversity crisis
- OfWat's (economic regulator) view that NBS should become the default position to manage pollution at source rather than end of pipe solutions, as the best outcome for customers
- Environment Agency (EA), Natural England and Forestry Commission have agreed to work together to promote NBS
- UK Government's commitment to achieve net zero carbon emissions by 2050

If nothing changes, the growing population and demand for ever increasing treatment standards together will drive to higher energy demand and more chemical use. For example, chemicals used to treat phosphate emissions could double by 2025.

Sam suggested that in future, society should make additional use of NBS to avoid these consequences and obtain potential synergies and co-benefits in responding to the challenge of net zero. Sam referred to the detailed Water UK route map with three pathways to net zero by 2030 for the UK water industry.

This route map highlights the need to plan for and invest in nature based solutions and particularly their opportunities for increasing carbon sinks through carbon sequestration.

Sam also noted that UK water companies were already committed to planting 11M optimally placed trees and also highlighted opportunities for restoration of peatland and grassland which provide key nature based solutions.

There is also the opportunity for companies to implement treatment wetlands to address pressing problems of flood risk management, nutrients and other aspects of water quality whilst reducing chemical and energy use needs.

The Water UK developing vision for the investment period 2025-2030 as detailed by Sam incorporates:

- Exploring the "new" art of the possible
- Analysing multiple challenges that the sector faces
- Honing in on strategic responses needed for 2025

The current UK regulatory frameworks, described by Sam, bake in many more traditional, energy-intensive, engineering solutions, as the solutions, their costs and performance metrics are well understood and have higher certainty than NBS, which makes them appropriate for modelling etc.

There is also a positive focus on the value of physical assets rather than the ability to manage pollution at source, all of which promotes more energy intensive solutions rather than NBS.

Jodie Rettino from Severn Trent Water delivered a segment outlining the approach taken by Severn Trent Water in Catchment Management and NBS, to address the twin threats of climate change and loss of nature.

Where possible, Severn Trent Water are choosing to move away from high power and high chemical consumption processes in favour of NBS, working collaboratively with organisations like White Peak Farmers, to deliver environmental benefits by managing pollution at source e.g. Phosphate "socks" to deliver 99% removal in phosphate run-off from farmland, and protecting groundwater abstraction resources.

Photo by Storm Media/Shutterstock.com

Q&A

During the discussion, Katharine posed three questions to the participants:

1. Stakeholders: What role do different stakeholders have in enabling NBS?
2. Co-benefits : What additional co-benefits from NBS can also improve climate resilience?
3. Evidence : What evidence is needed to select NBS for integration into water and sanitation services?

Sam posed two questions to the participants:

4. Solutions: As net zero shapes future policies, what are the nature-based solutions we should aim to see more of?
5. Enablers: How can regulation be made “NBS-ready”, so they become the default solution?

Throughout the discussion, Katharine and Sam asked 5 questions of the participants. Their online responses were collated and their views are shown in the following sections 1-5.

Photo by @art_maltsev/Unsplash

1. Stakeholders

What role do different stakeholders have in enabling NBS?

Collaboration and engagement were the most popular participant suggestions of how to help implement nature-based solutions, as shown in Figure 4.

Participants suggested that the collaboration network should include water companies, regulators, NGOs/charities, diverse sectors and institutions that can engage with customers and society in general, but particularly with indigenous people, landowners or stewards and local communities. Understanding their motivations, needs and actions is very important to harness the full potential of these solutions.

As Wendy Pring noted: “The role different stakeholders have is to come from a position of trust and collaboration and form new helix partnerships that work within catchment areas to co-create the solutions.”

Conversely, several participants identified a need for stakeholders to shift priorities, to put a higher value on NBS benefits, (as many are not the lowest capital cost, in purely financial terms), to keep in mind the bigger picture, and legacy, rather than

Stakeholder roles in enabling nature based solutions

Figure 4 - Proportional word cloud of participants’ responses to Question 1 - Stakeholders

upfront capital cost.

Moreover, a focus on resources and development is also necessary. Rosa Busquets points out that more effort is necessary to identify the NBS with highest potential, develop them further to increase their Technology Readiness Level (TRL), and reach their full potential.

Likewise, collaborative research and development should be in place to identify, fund and deliver case studies to promote the use of NBS.

An evaluation of the permits and regulatory framework would also support the increased use of nature-based solutions. This assessment must be based on scientific evidence, taking into account benefits for the short, medium and long term and even a comparison with their CO2 intensive counterparts.

Rowan Pearce believes that this will allow us to build resilient and future-proof solutions that take into account potential risks and adaptations for climate change.

Finally, resources such as land, design and management expertise, education and skills and match funding among others, are all well-known tools that will help with the application of NBS and make a systematic change towards NBS.

> “The role different stakeholders have is to come from a position of trust and collaboration and form new helix partnerships that work within catchment areas to co-create the solutions.”

2. Co-benefits

What additional co-benefits from NBS can also improve climate resilience?

Multiple benefits were mentioned by the participants including benefits to the wider society and communities such as:

- Health and wellbeing
- Natural landscapes
- Environmental awareness
- Increased social and environmental reputation
- Job creation
- Financial (some NBS can be lower cost)

Also, many benefits from a technical point of view:

- Renewable fuels and biomass
- Improvement of air quality
- Flood risk management
- Increasing biodiversity
- Heat regulation
- Circular economy
- Less dependency on supply chains for chemicals
- Neutral/negative carbon footprint
- Overall reduction in pollution
- High versatility and resilience, e.g. ability to cope with large flow ranges

Simon Guerrero, PhD, effectively summarised the general theme of the responses:

"When incorporated into the urban landscape or any landscape (urban being more difficult) they will also provide aesthetic benefits, well-being, greener living areas, create jobs and enable the reconciliation of society and nature. Convert urban concrete jungles into more nature-integrating environments: heat regulation, and even mood change of people!"

"…they will also provide aesthetic benefits, well-being, greener living areas, create jobs and enable the reconciliation of society and nature."

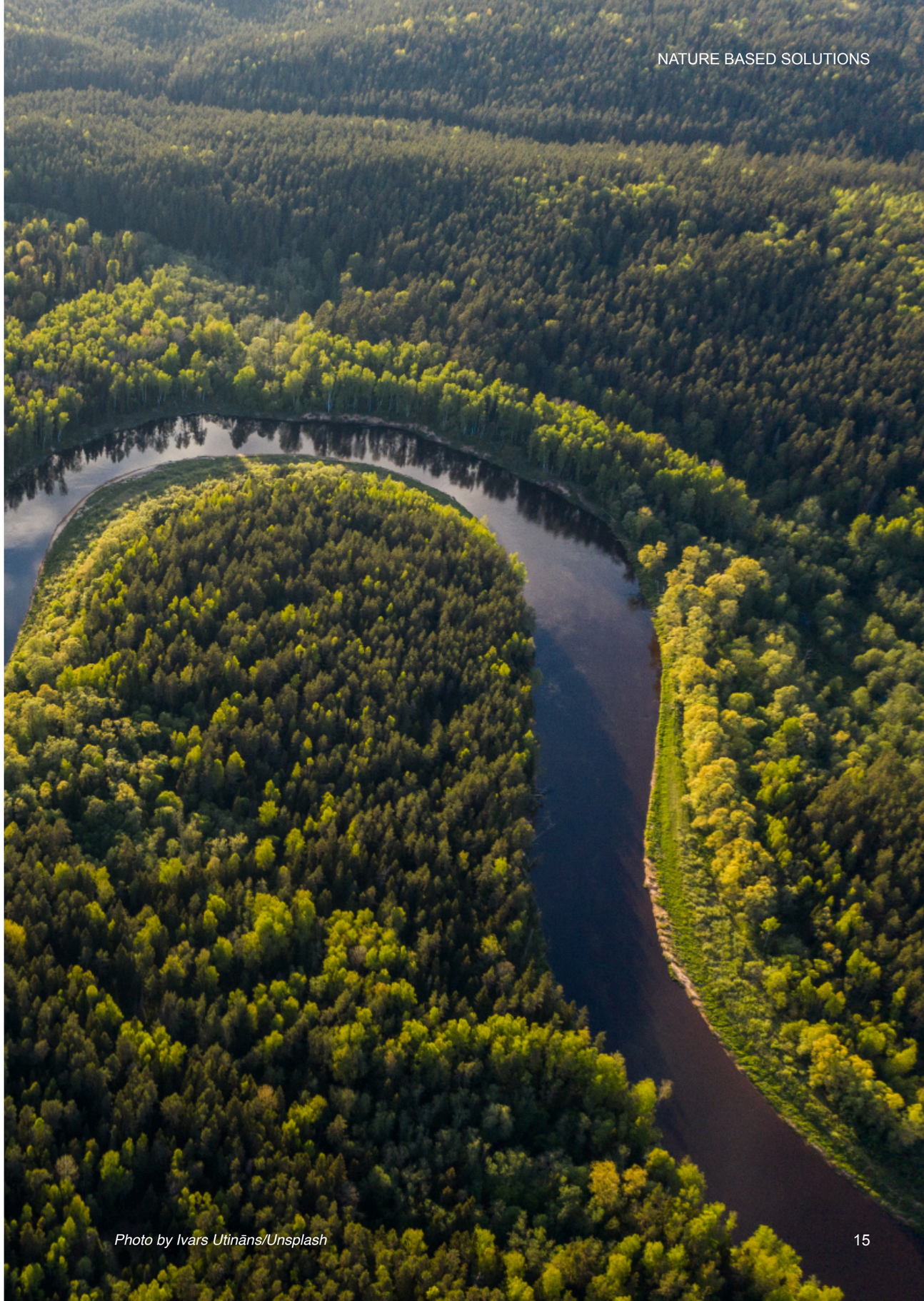

Photo by Ivars Utināns/Unsplash

3. Evidence

What evidence is needed to select NBS for integration into water and sanitation services?

Participants identified several recurring 'themes' for evidence required, with almost 50% highlighting aspects of performance, as shown in Figure 5.

Within that theme the most common aspect was technical performance relating to water quality (including with respect to metals, micro-pollutants, and the contribution of the microbial community to the system performance).

Evidence of permit compliance was important. Several participants highlighted current uncertainty in aspects of operational risk management (such as persistent chemicals particularly pharmaceuticals, bioaccumulation risk, soil and groundwater contamination, and carcinogens linked to algal blooms).

One respondent noted the potential value of defining common reporting standards (which may well aid accessibility and transferability). Several participants identified evidence on maintenance as important, with the implication that inappropriate or lack of maintenance can impair performance, lead to excessive GHG emission and affect through life costs.

Several participants identified various aspects of economic performance including costs, life cycle analysis and monetary evaluation of benefits (both for primary and co-benefit performance).

There was a notable interaction between participants in relation to the perception that the space requirements of some forms of NBS could be prohibitive, particularly in urban environments.

Several participants observed there were forms of NBS which could be considered even in densely occupied urban areas where space is at a premium. Nonetheless, evidence on the space requirements of many forms of NBS, including non-urban, requires careful consideration.

The importance of ensuring evidence was kept up to date was highlighted through participants noting that some perceptions of unsuitability of NBS being due to early examples of solutions which had been inappropriately selected or whose technology has now been superseded.

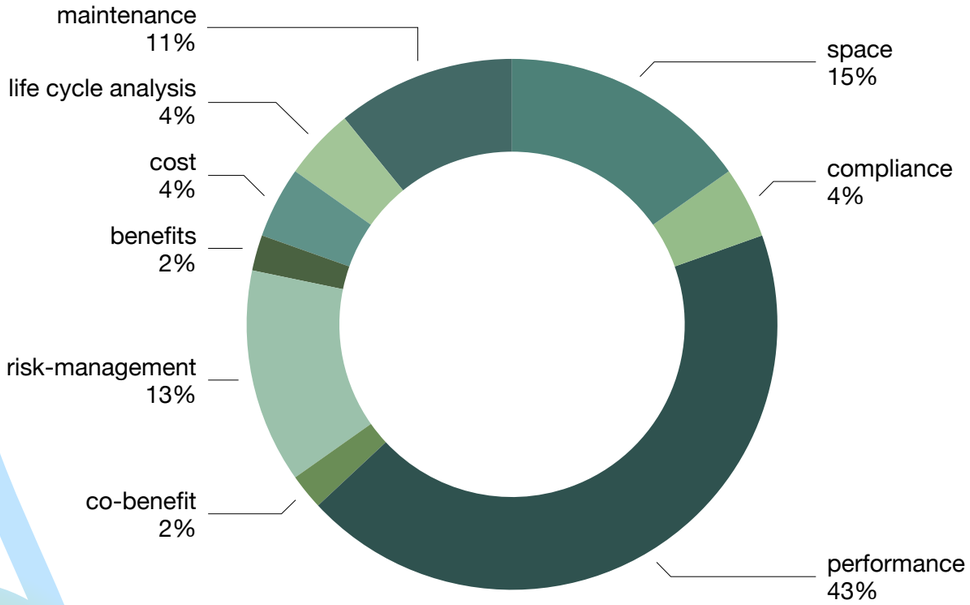

Figure 5 - Participants responses to Question 3 - Evidence needed

4. Solutions

As net zero shapes future policies, what are the nature-based solutions we should aim to see more of?

Participants' responses to Question 4 are shown in Figure 6.

More than 60% of responses identified a specific technique that warranted more deployment. Of these almost a third highlighted a strategy of segregation (of wastewater types) combined with local NBS solutions contrasting with traditional approaches of mixed wastewater and centralised treatment. Use of types of wetland was also commonly suggested.

Several responses noted that the trend of increasing urbanisation warranted increased adoption of NBS tailored to urbanised environments. Other responses ranged in scale from use of beavers to recognition of the role of tropical forests in supplying water vapour to the atmosphere within the global water cycle.

One response suggested considering deployment of non-native species with desirable properties (e.g. trees introduced for carbon sequestration).

16% of responses identified desirable properties of NBS which may appeal to stakeholders. These included low carbon/low energy solutions, innovative solutions and those NBS with features readily understandable and tangible for stakeholders. One response identified those NBS that would attract applicability of sustainable financing.

A few responses highlighted the wider policy framework within which NBS would better sit, rather than relating to NBS directly. These included promoting balanced regional development in contrast with concentration in coastal urban locations, using charging mechanisms, promoting symbiotic water use and re-use relationships (circular economy) between users, and use of upstream solutions to avoid use of any form of treatment.

Finally, some responses identified target applications of NBS including production of drinking water and the ability for organic carbon sequestration through best use of digestate from anaerobic digestion or resource recovery from advanced thermal processes.

Nature based solutions we should aim to see more of

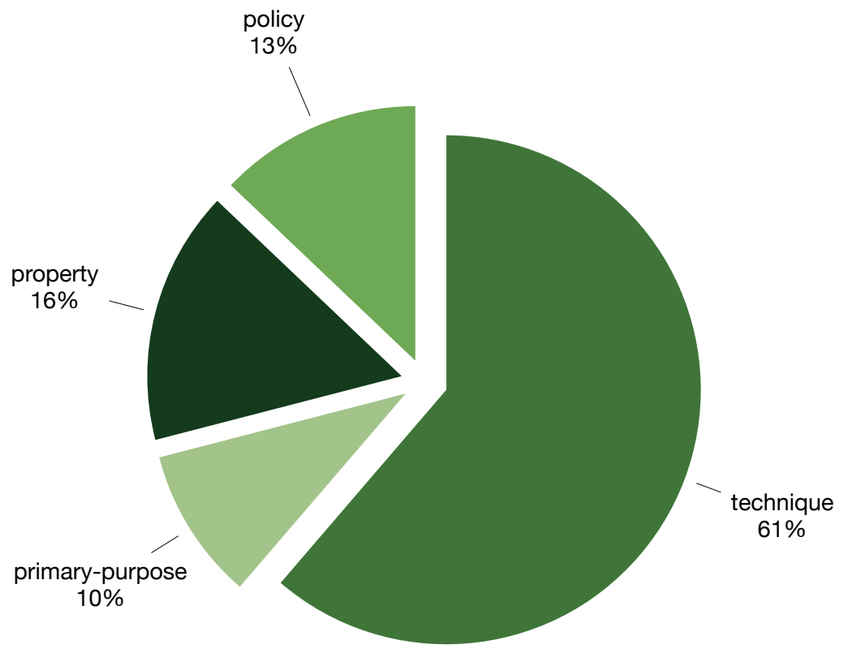

Figure 6 - Participants' responses to Question 4 - Solutions

5. Enablers

How can regulation be made “NBS-ready”, so they become the default solution?

There were five main themes in the responses to the question on how regulation can be made “NBS-ready”, so that they can become the default solution, shown in Figure 7.

Improvements to environmental permitting were suggested in 30% of responses. The predominant focus of environmental permitting is on the end of pipe quality, whereas a more holistic and flexible approach, which considers how that level of treatment is achieved, would be preferable to promote the use of NBS. Oliver Perkins proposed an alternative type of permit for wetlands rather than traditional treatment while Harriet Fletcher reflected that “the permits we are used to have no scope for balancing benefits against the environmental cost of achieving outcomes”. A more collaborative approach to permitting that recognises the wider environmental benefits of NBS would be welcomed by many.

Another common theme, with 25% of responses, was the need to invest in innovation to identify, develop and share the best available technologies for NBS. This also includes trials, case studies and knowledge sharing to maximise benefits and mitigate risks with NBS and to understand

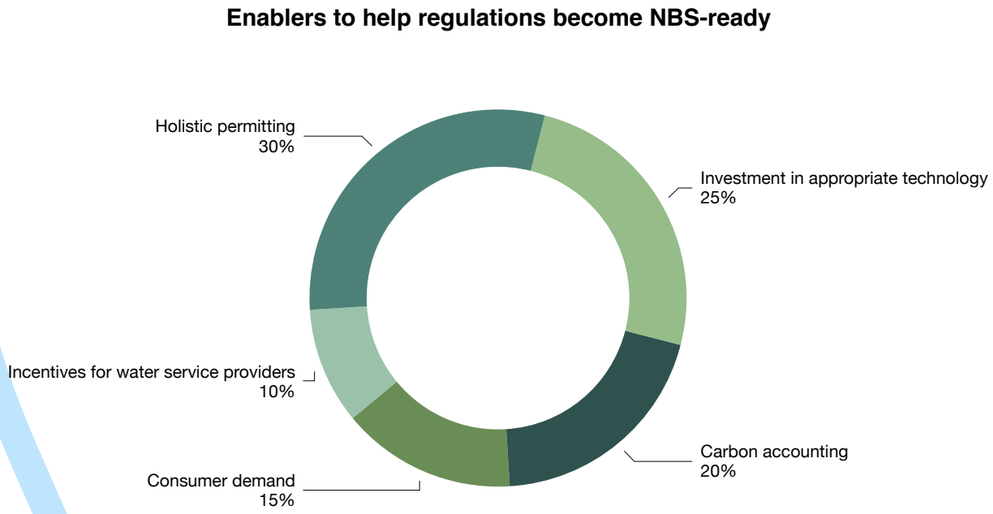

Figure 7 - Main themes of participants’ responses to Question 5 - Enablers

the role NBS could play in addressing emerging challenges.

The role that carbon accounting can play was identified in 20% of the responses, with the view from Ian Redmond that “calculating the value of natural capital and bringing that value into the national economy is essential” to promote NBS. It is only with the understanding that natural capital can be measured and valued, and can be part of the cost benefit calculation to enable investment in more NBS as opposed to higher carbon alternatives.

Consumer demand was identified as an enabler in 15% of responses, with Salman promoting the need to educate children in environmental sustainability and AMcginn identifying “customer buy in” as a means to drive change and the move towards NBS. The concept of customer willingness to pay has been used now for some time in England and Wales to ensure water companies investments are aligned with customer priorities for their area, so linking to this process can only support the transition to more NBS.

Finally, 10% of responses highlighted incentivisation of water companies as a means to increase investment in NBS. These solutions could take the form of financial or tax incentives according to MandaBauchop, while Martin Hogan identified a need for regulators and lawmakers “to work together to force incentivisation of best holistic solutions” to treat the problem rather than the symptom.

> “calculating the value of natural capital and bringing that value into the national economy is essential”

You can join the discussion
in the next of the

COP26
Water Climate Discussion Series

If you enjoyed this Nature Based Solutions discussion with IWA and Water UK, then join us for future events in the COP26: Water Climate Discussion Series:

Energy Transition
with Scottish Water Horizons and VCS Denmark on Thursday, 1 July 2021 from 9-10am BST

Further events based on the COP26 themes are planned as follows:

Clean Transport	**5 August 2021, 9-10am BST**
Finance	**2 September 2021, 9-10am**
Water Climate Discussion Conference	**7 October 2021, 9am-5pm**
Live from COP26	**TBC November 2021**
Conclusion and Next Steps	**1 December 2021**

Please register through any of our collaborators' links:

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We're looking forward to your input.

Let's change the world together.

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