UNESCO IHE DELFT

IHE Delft and the Sustainable Development Goals

Through our overarching work on capacity development, IHE Delft aims to make a tangible contribution to achieving all Sustainable Development Goals in which water is key, including SDG 6: Clean Water and Sanitation.

SUSTAINABLE DEVELOPMENT GOALS

Dear reader,

The United Nations' 2030 deadline for achieving the Sustainable Development Goals (SDGs) is approaching rapidly. In the coming decade we will need to bring about significant change if we are to get close to these targets. Moreover, it's not only about reaching targets - but about doing so in a sustainable manner. This means that the solutions and innovations that we collectively introduce now must be durable and flexible enough to work under rapidly changing conditions of population growth, urbanization and climate change.

Within the wider SDG context, the water sector itself equally needs solutions, innovations and investments, alongside an ability to develop capacity. We must equip our future leaders with the skills, not only to introduce, operate and maintain these innovations, but also to lead the development of new ideas to overcome upcoming challenges.

IHE Delft aims to make a tangible contribution to achieving all Sustainable Development Goals in which water is key, including SDG 6: 'Clean Water and Sanitation'. We believe that through creating synergies in education, applied research and institutional strengthening we can do so. Our commitment, together with our international partners, is to provide mutual learning and strengthened capacity development for the water sector, especially – though not exclusively – in the Global South. You can find out more, in this brief guide, about how we do this, through our work in education, research and institutional strengthening, and by consistently applying our expertise in linking social sciences to technical knowledge.

We hope that you will enjoy finding out more about how we work on the SDGs, and we look forward to working with you on how best to meet these critical and ambitious global goals moving forwards.

Professor Eddy Moors
Rector

2 ZERO HUNGER

2.4

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain eco-systems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

Integrated land and water management is essential to achieving SDG 2.4, and at IHE Delft we emphasise the nexus between water, food and the environment. Our Masters programme in Land and Water Development for Food Security deals with the linkages between water management and food production.
In the context of an increasing world population, the impacts on water availability of climate change and land degradation make it harder to achieve food security and increase the need for improved water-use efficiency.

Nature-based water infrastructures for #GlobalGoals (NaBWIG)

NaBWIG is a research project focused on improving the resilience of smallholder farmers in semi-arid Africa. As smallholders face growing water shortages, linked largely to increased climate variability, NaBWIG is developing innovative and environmentally sound nature-based water storage solutions that combine surface water, groundwater and soil moisture. This unique water storage method can maintain the ecosystem, while buffering erratic rainfall, and offers smallholders access to a reliable fresh water supply for crops and livestock throughout the dry season.

Building on our longstanding multi- and trans-disciplinary expertise, NaBWIG seeks to bridge the traditional gap between science and society, emphasising both the co-development of new knowledge and the co-formulation of adaptive investment pathways. This is achieved through working jointly with stakeholders at local and national level to promote the sustainable use of shallow aquifers to improve livelihoods and increase food production.

Funding: Netherlands Organization for Scientific Research
Programme: Foundation for Scientific Research of the Tropics and Developing Countries

Building on the foundation of the 2015 Millennial Development Goals (MDGs) around water, sanitation and hygiene (WASH), the SDGs expand on the earlier vision of sustainable access, to one of equitable and sustainable management. At IHE Delft we have expanded our research, education and capacity programmes in line with this, and we now offer two Masters programmes in this field. Urban Water and Sanitation (largely sewered sanitation) and Sanitation (largely non-sewered) are both strongly focused on developing capacity to achieve the WASH related SDGs, through closely combining technological, managerial, and policy-related perspectives.

6 CLEAN WATER AND SANITATION

6.1

By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

SMALL

Project SMALL is part of the IHE Delft Partnership Programme for Water and Development (DUPC). This innovative, interdisciplinary research project focuses on water and sanitation management in small towns of Sub-Saharan Africa. Its goal is to develop suitable and sustainable provision models in towns which are at the intersection between urban and rural settings. Often, existing provision of basic public services is lagging behind and concrete actions must be taken urgently if SDG 6 is to be achieved.

Project SMALL assesses the extent to which current infrastructural and management models for providing water and sanitation reflect the specificities of small towns. The project ultimately seeks to understand how every element composing the service modality (infrastructure, management and finance) influences service levels (accessibility, affordability, availability and quality). The better understanding of needs and characteristics of small towns is crucial to achieving water and sanitation for all.

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"We have been aware for long time of the challenges associated to the typology of contracts used in water utilities management in small towns, but project SMALL provided us the platform to discuss with key stake-holders with actual data at hand."
Pedro Cardoso, private operator

HIGLIGHTED PROJECT FOR GOAL 6.1

Project SMALL focuses on documenting the main processes affecting the quality and quantity of water supplied to local populations in selected small towns in Mozambique and Uganda. It has identified the challenges of implementing 'known' utility management practices in the specific settings of small towns, where technical and financial resources are not always sufficient to meet national service level targets. In a bid to support measures that may lead to improved drinking water quality, the project has prioritized the implementation of Water Safety Plans and sanitary inspections as risk management tools. Additionally, SMALL has researched the effects of different operational strategies (such as chlorination regimes) in an intermittent supply system to optimize the use of chemicals and manpower in Moamba, Mozambique.

One issue emerging as particularly important is in the implementation of standard public-private partnership agreements. A review of the current contracting arrangements regulating relationships between local operators and asset holders reveals that this requires a robust (local) private sector that can take on such contracting arrangements.

Also critical is that, in terms of financial sustainability, the standards against which the performance of these systems and operators is measured do not lead local operators or water utilities to prioritize universal access. This has emerged from the project's documentation of the effects of the commercializing (public) services on the users in small towns, and their strategies to access water, including tinkering with the available infrastructure.

Donor: Dutch Ministry of Foreign Affairs

6 CLEAN WATER AND SANITATION

6.2
By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

eSOS Smart Toilet

Disaster areas where many people live together in poor conditions, can be prone to disease. Sanitation plays an important role, as managing waste flows effectively can reduce health risks and improve quality of life. To address this issue, IHE Delft and partners have designed the eSOS Smart Toilet, which is both hygienic, safe and affordable, and serves as a critical information source. The easy-to-maintain toilet is equipped with sensors that monitor relevant data on usage to improve the operation and maintenance of toilets.

The Smart Toilet also has an emergency button and emits a bright light, which together especially allow women and girls to feel safer to use the toilet after dark. Its second prototype has been developed and was successfully tested in a slum area in Nairobi, Kenya in June 2019.

Donor: Dutch Ministry of Foreign Affairs

6 CLEAN WATER AND SANITATION

6.3
By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

Issues related to water quality are becoming increasingly pressing globally as more and more conventional and emerging pollutants are discharged into the world's freshwater and marine systems. IHE Delft offers specific Masters programmes in Sanitary Engineering and Water Quality Management, while our research includes a focus on Pollution Prevention and Resource Recovery. Issues we include in our research and education relate to both emerging pollutants, and the principles to reduce, recycle and reuse.
We also focus on where water quality is especially crucial, such as in emergency situations, where poor water quality has an immediate impact on public health. As necessary we also run specific programmes addressing emergencies, including in collaboration with external agencies such as the Red Cross.

PAVITRA GANGA: Wastewater treatment, water re-use and resource recovery opportunities for urban and peri-urban areas in India

India's water resources are under severe stress as a result of overexploitation and pollution. In line with achieving the SDGs the Indian government has initiated the Namami Gange programme, which includes the goal of improving wastewater treatment.

PAVITRA GANGA is an H2020-funded Research and Innovation Action that links directly to this flagship programme and builds on existing cooperation between EU and India, with support from the national governments.
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HIGLIGHTED PROJECT FOR GOAL 6.3

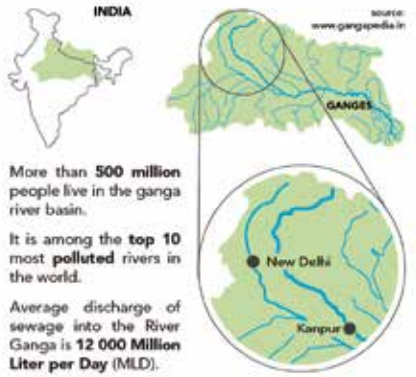
The objective of PAVITRA GANGA is to achieve SDG 6 by unlocking the environmental and economic potential of municipal wastewater treatment and reuse solutions for urban and peri-urban areas in India. By focusing on three key pillars the goal is to achieve maximum impact through:

- **People:** social awareness is created through a participatory monitoring approach. Socially vulnerable groups are invited to join by providing treatment solutions for open drains, while a community of practitioners is created by establishing open innovation test sites alongside a training and learning network.
- **Planet**: the focus is on rejuvenating the river by removing the organic pollution, heavy metals and emerging compounds that have the biggest impact on Indian streams. Technology innovations are provided by IHE Delft to upgrade existing wastewater infrastructure and to add treatment systems to open drains, resulting in improved quality of receiving rivers.
- **Profit:** the principles of the Circular Economy are applied to exploit the economic opportunities of waste-to-energy, water reuse and resource recovery. Solutions are cost-efficient and require limited investment, making them particularly suited for the Indian market.

In collaboration with local stakeholders, and supported by industrial partners, two pilot sites will be set up at the Barapullah Drain (New Delhi) and the Jajmau plant (Kanpur). The dynamics of a business and technology platform, combined with a learning network, will develop strong Indian water professionals in line with Skill India, while also training EU experts in understanding Indian challenges. This will accelerate the transition to a level EU-India playing field.

Donor: H2020 European Commission – Research Executive Agency

SCOPE: THE GANGA RIVER BASIN



6 CLEAN WATER AND SANITATION

6.4

By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

In many places around the world rapid urbanization, climate change and increased population are exacerbating the availability of good quality water when and where it is needed. We offer advanced training and education through our educational programmes, to improve understanding of these issues and learn how to protect and manage water resources. These programmes incorporate the use of tools and models for better decision-making, including water accounting and serious gaming. Technologies to address water scarcity are part of our Water Science and Engineering programmes, as well as our Masters programme in Water Management.

Water accounting and water productivity

The water accounting group at IHE Delft uses its work on water accounting, water productivity and remote sensing to support the monitoring of progress towards SDG 6.4 on water use and scarcity. The Water Accounting Plus framework, developed in collaboration with our partners, FAO and International Water Management Institute (IWMI), assesses water availability in a river basin compared to water withdrawals and use, with a view to monitoring Target 6.4.2 on water stress.

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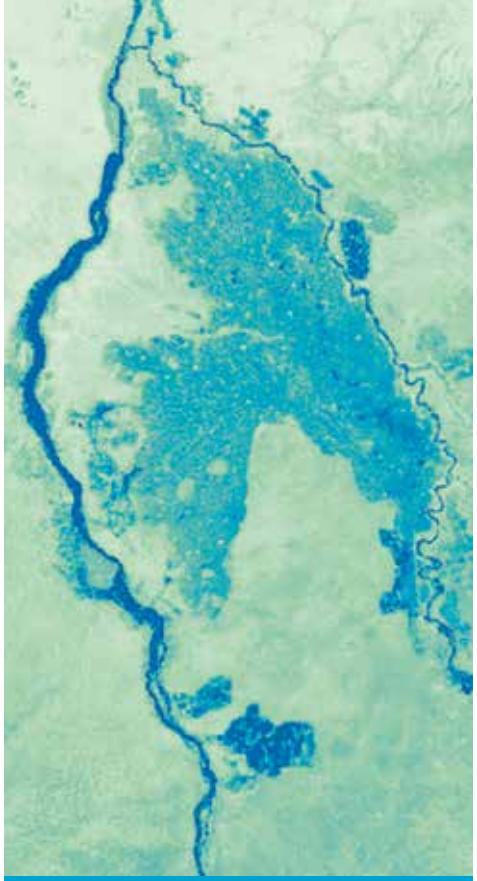
HIGLIGHTED PROJECT FOR GOAL 6.4



Meanwhile our water productivity studies analyze water consumption and production in rainfed and irrigated water systems to assess Target 6.4.1 on water use efficiency. This work also contributes to the Dutch Government's target of improving agricultural water productivity by 25% in DGIS (Dutch Ministry of Foreign Affairs) target countries.

Our water accounting and productivity studies, implemented in various countries across Asia and Africa, use freely available data sources. These include open-source earth observation products, such as the recently launched FAO-WaPOR database for both water accounting and productivity studies. In addition to developing the framework and tools, IHE Delft supports capacity development of local governments to use the Water Accounting and Water Productivity frameworks for decision making.

Donor: UN Food and Agriculture Organization, ADB

Agenda 2030 key statistics

During an historic UN Summit in 2015, world leaders formally adopted a new set of 17 measurable Sustainable Development Goals (SDGs), plus 169 associated targets, to *end poverty, protect the planet and ensure prosperity for all (Figure 1).*

Figure 1: Sustainable Development Goals at a glance (Source: United Nations)

Although the SDGs are not legally binding, they provide a framework within which all countries are expected to take ownership: it is a social pact between governments and their people. Countries have the primary responsibility for follow-up and review of the progress made in implementing the Goals and are encouraged to conduct voluntary national reviews on a regular basis.

The SDGs build on the actions under the Millennium Development Goals and go further, covering the three dimensions of sustainable development: *economic growth, social inclusion and environmental protection (Figure 2).*

The SDGs call for action by all countries - poor, rich and middle-income - to promote inclusive prosperity, while protecting the planet. They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, equality, health, and job opportunities, while tackling climate change and environmental protection.

Figure 2: dimensions of SDGs (Source: Stockholm Resilience Centre)

SDG 6 of the 2030 Agenda ("Clean Water and Sanitation"), along with its 8 targets, considers the water cycle as a whole, from the water quality of rivers and efficient use of water, to the health of water-related ecosystems and the treatment and use of wastewater; and from better water management, to better water governance, stakeholder participation and capacity development.

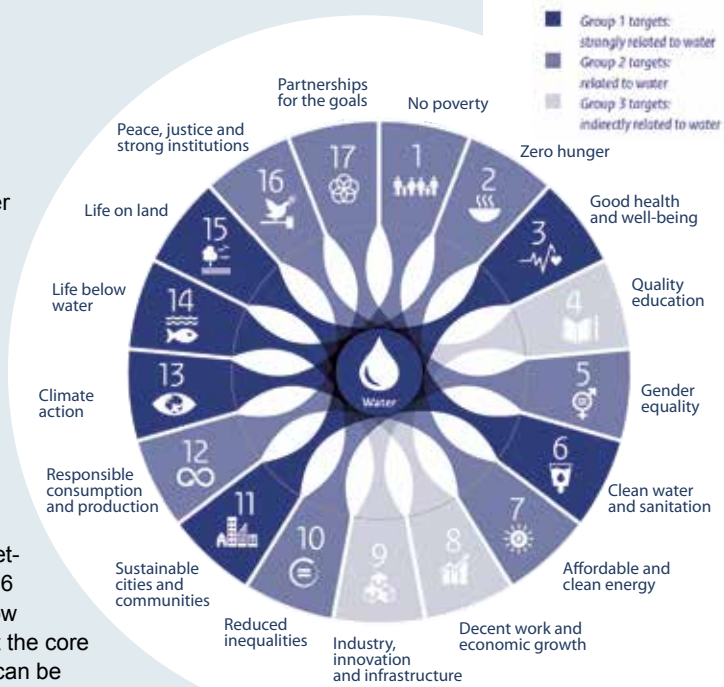


Figure 3: Importance of Water in 2030 Agenda (Source: Ligtvoet W. et al. (2018), The Geography of Future Water Challenges: PBL Netherlands)

Water-related issues however extend beyond the range of SDG 6, supporting the achievement of other goals, and highlighting the need for an integrated approach to implementing the 2030 Agenda *(Figure 3)*. The UN-Water report "Water and sanitation interlinkages across the 2030 Agenda for Sustainable Development" intricately describes the target-level linkages between SDG 6 and other SDGs, showing how global policies and actions at the core of sustainable development can be strengthened (or compromised) through water.

A number of international and high-level initiatives, in the follow-up to the 2030 Agenda, have highlighted and reinforced the importance of water in the whole sustainable development agenda. For example, the High Level Panel on Water & Peace highlights the strong linkage between lack of |water security, conflict generation and migration, as well as the role of women both as providers of water and in decision-making processes. Equally, the High Level Panel on Water, highlights an urgent need to start properly valuing water, while the High Level Panel on Water and Disasters, flags the importance of proper water management for better prepared, more resilient societies.

There is a growing awareness that water-related events such as disasters, disease and conflicts, cause more damage than other such events on a global scale *(Figure 4)*. This demonstrates the importance of proper water management and the need to increase attention on the impact of water within ongoing discussions on the world's future challenges.

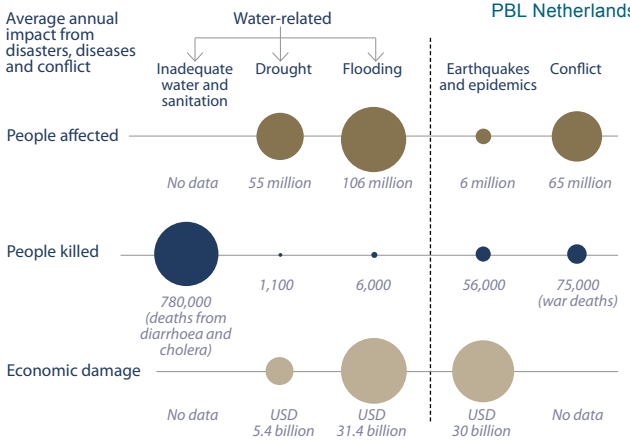


Figure 4: impact of water related events (Source: Ligtvoet W. et al. (2018), The Geography of Future Water Challenges: PBL Netherlands)

6 CLEAN WATER AND SANITATION

6.5
By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

At IHE Delft we have been at the forefront of adopting and mainstreaming the principles of Integrated Water Resources Management (IWRM) in our educational programmes. In particular our successful Masters in Water Management and Governance enables students to develop and apply an integrated and interdisciplinary approach to water, and particularly river basin, management. Issues of equitable and sustainable transboundary water cooperation are specifically addressed in both our joint Masters' programme in Water Cooperation and Diplomacy, and through our research and capacity development activities. These include initiatives developed with partners of the Universities' Partnership for Water Cooperation and Diplomacy.

Water Diplomacy

The water diplomacy programme of the Delft Partnership Programme for Water and Development (DUPC) aims to support fair, strong, inclusive, effective and efficient governance for sustainable, equitable and peaceful transboundary water resources management. As part of this initiative we work closely with core partners to strengthen water diplomacy capacities, for example, in supporting the University of Khartoum to conduct two workshops on water diplomacy for policy makers and engineers in the Nile Basin.

We have also organized training courses for government officials from various riparian countries. These include a training for Iranian and Afghani participants organized together with UNESCO and the Dutch and German governments. Through our annual Water and Peace Seminar, and our key role in the Universities' Partnership on Water Cooperation and Diplomacy (UPWCD), IHE Delft brings together scientists, practitioners and students to share expertise and co-develop new research and education tools.

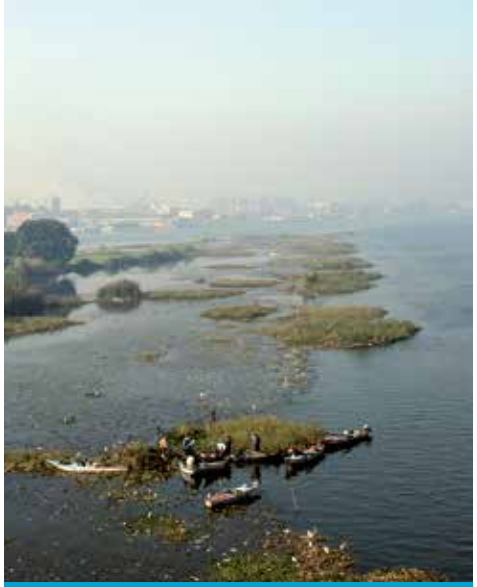
Donor: DUPC2, Dutch Ministry of Foreign Affairs

HIGLIGHTED PROJECTS FOR GOAL 6.5

Media, Science and Water Diplomacy in the Nile Basin

The Nile, particularly the Blue Nile shared by Egypt, Sudan and Ethiopia, is one of the international rivers usually described as on the verge of a 'water war', as a consequence of competing claims and concurrent water exploitation by the riparian countries.
The Open Water Diplomacy Lab aims to ameliorate this by boosting the role of science and communication as a catalyst for cooperation and peace. The project studies the role of the media and science in both transboundary water negotiations, and in building journalists' and researchers' capacities in science communication. Journalists and researchers from different Nile basin countries are trained together, and supported to co-produce original knowledge on Nile waters, in a way that facilitates mutual understanding and transboundary cooperation.

Listen to the podcast '*The Sources of the Nile*' on nilewaterlab.org



" I've always looked at the Nile from a Sudanese perspective and never thought of what it means to other people in Nile Basin countries. Coming together in Delft and meeting researchers and other journalists reporting, was a real eye-opener to me."
Lina Yassin, journalist from Sudan

" Studying Water Cooperation and Diplomacy at IHE Delft was not only about building my professional skills and expanding my knowledge, it was also about my inner transformation – learning how to think in win-win solutions, how to negotiate and better communicate. Coming from a region where water issues are highly politicized, my peers and I learnt that cooperation in managing joint waters is always bringing more benefits than rivalry and conflict."
Botagoz Sharipova, student Water Cooperation and Diplomacy, 2018-19

6 CLEAN WATER AND SANITATION

6.6

By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

At IHE Delft we fully embrace the concept of sustainable resource use and the objectives of the SDGs to support human development through sustainable and equitable use of natural resources. Underpinning these goals is the protection of prosperous planet and the knowledge and social structures required to provide this. These fundamental principles guide our Masters programme in Environmental Science, which offers a number of specializations, including aquatic ecology, environmental technology and environmental planning and management.

RECONECT

RECONECT contributes to achieving many of the SDG targets through combining co-design, co-development and demonstration of innovative Nature-Based Solutions (NBS). These are solutions that are inspired and supported by nature to provide multiple environmental, social and economic benefits, and to help build resilience to hydro-metrological risks. The challenges that are tackled by NBS include issues such as climate change, water security, water pollution, food security, human health, and disaster risk management.

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Q&A with Zoran Vojinovic RECONECT Project Director

Why are Nature-Based Solutions so important to achieve the SDGs?

"We live in times where the best and worst results of our humanity can be observed simultaneously. On the one hand, material wealth and technological capabilities have advanced in many domains as never before, and on the other, there has been a rise in the significance of natural disasters, which is, to an ever increasing extent, directly attributable to the actions of human beings. This paradoxical situation is a result of disconnected thinking and working which underpins broader global environmental and sustainability problems. NBS offer the possibility to break away from traditional practices and to reconnect our land and water management practices with nature. They also require the shift from a fragmented, piecemeal approach to holistic, systemic solutions, which is altogether essential for achieving and advancing SDGs."

What does RECONECT aim to achieve?

"The EC funded H2020 RECONECT project aims to address some of these issues through co-design, co-development and demonstration of innovative NBS. The solutions that we are exploring and demonstrating are able to reduce hydro-meteorological risks and generate numerous co-benefits across social, economic and environmental sectors. Our demonstration sites cover a wide and diverse range of conditions and settings throughout Europe and internationally, to rapidly advance the knowledge of Nature Based Solutions (NBS) for hydro-meteorological risk reduction."

What is your progress to date?

"We are almost at the end of the first year and the project will run for another four years. During the first year we have been busy with the development of frameworks and indicators for monitoring effectiveness and documenting benefits and co-benefits of NBS in hydro-meteorological, ecological and social terms. We have also started with the development of the IT platform which will enable us to receive and publish real-time data and information about the performance of NBS. For some demonstration sites, design of NBS has been initiated and our first construction works will commence next year."

How does RECONECT contribute towards SDGs and particularly SDG 6?

"RECONECT advances the knowledge of NBS for hydro-meteorological risk reduction in different conditions and settings. For example, some of our demonstration sites are more concerned with provision of ecosystem services through green space, habitats and biodiversity (SDG 15), while others are more concerned with integration of climate adaptation measures through NBS into national policies, strategies and planning (SDG 13); enhancing ecosystem services, through green areas in cities (SDG 11); tackling poverty, by reducing the number of deaths and direct economic loss due to hazardous hydro-meteorological events (SDG 1); bringing nature to cities, landscapes and waterscapes (SGD 3); addressing hunger and food security, by reducing exposure of agricultural lands to hazardous hydro-meteorological events (SDG 2). In terms of SDG6, we have sites that are concerned with protection and conservation of water-related ecosystems that are needed for provision of clean water. We will be assessing the potential of NBS for treatment of pollutants (i.e., water quality and sanitation) that can benefit people as well as nature."

www.reconect.eu

Donor: H2020 European Commission – Research Executive Agency

6 CLEAN WATER AND SANITATION

Capacity Development – our core mission at IHE Delft – features strongly in the SDGs. The ability of people, communities, organizations and societies to address water-related challenges is fundamental to attaining several of the targets in SDG 6. In our work, we develop concepts to understand how the entire capacity system of a country or region can be strengthened, including through capacity development coordination frameworks.

6a

By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

SIDS programme

Our Small Islands Developing States (SIDS) fellowship programme aims to strengthen the capacity of professionals and decision makers in SIDS in order to improve water management and better address future challenges. The programme offers fellowships for Masters degrees at IHE Delft for mid-level and senior professionals working in the water sector. The SIDS programme is funded by the Dutch Ministry of Foreign Affairs through the DUPC programme.

Donor: DUPC2, Dutch Ministry of Foreign Affairs

36 participants on one of the Master programmes

17 SIDS

29 SIDS

71 participants on one of the short courses

" I have worked in the water sector for about five years now, mainly focusing on groundwater assessment and monitoring in the Pacific region. We need to look after the water in our region. The environment is changing and the sea level rising. It's time that we manage better what we have."
Amit Singh from Fiji, specialized in water resource management during his MSc studies at IHE Delft

There is more and more evidence that active participation of communities and citizens is instrumental in achieving the SDGs. New frontiers of research have highlighted how effective citizen participation and local community engagement can have increased (local) impact. At IHE Delft, we undertake Action Research on new forms of community participation and public engagement in water governance and sustainable water management. We study how effective and meaningful participation can be achieved through co-designing interventions, capacity development and joint data and knowledge co-creation *via* citizen science and community-based monitoring.

Ground Truth 2.0

The European project, Ground Truth 2.0, has successfully supported and strengthened participation by local communities in environmental monitoring, through setting up citizen observatories in the Netherlands, Belgium, Spain, Sweden, Kenya and Zambia. The citizen observatories in the Netherlands and Sweden gather data for the purpose of water management: the focus of the Swedish citizen observatory "VattenFokus" is water quality management, while the Dutch citizen observatory "Grip op Water Altena" focuses on weather and climate-proof water management. Municipalities, water authorities, citizens and farmers understand each others' interests and ways of working, and are together responsible for limiting the damage caused by pluvial flooding in urban and rural areas.

www.gt20.eu

Donor: H2020 European Commission – Research Executive Agency

6 CLEAN WATER AND SANITATION

6b

Support and strengthen the participation of local communities in improving water and sanitation management.

" The Maasai Mara Citizen Observatory has shown that great things can be done when stakeholders come together to solve problems."
Professor Thuo of Maasai Mara University, Kenya

7 AFFORDABLE AND CLEAN ENERGY

7.2

By 2030, increase substantially the share of renewable energy in the global energy mix.

Hydropower is an essential source of renewable energy. To optimize its potential contribution, within the global energy mix, we still need to identify the best configuration of hydropower investments, given the global geophysical, ecological, environmental, societal and climate context. Furthermore, the search for low-carbon and low-cost solutions to produce electricity, includes energy mining in existing water infrastructures and the development of low-impact small-scale decentralized renewable sources based on hydropower. The abstraction of water to produce energy should not conflict with the needs for supply, food production and the preservation of the planet.

S-MultiStor project

Storing water for irrigation, hydropower production, and flood and drought control using dams and reservoirs plays a major role in socioeconomic development. Yet some practices can lead to undesired environmental and social impacts. Thousands more dams and reservoirs are planned for construction in the next decades, mainly in Asia, Africa, and Latin America, and there is a threat that many of the negative impacts experienced in the past could be repeated in this new wave of dam construction.

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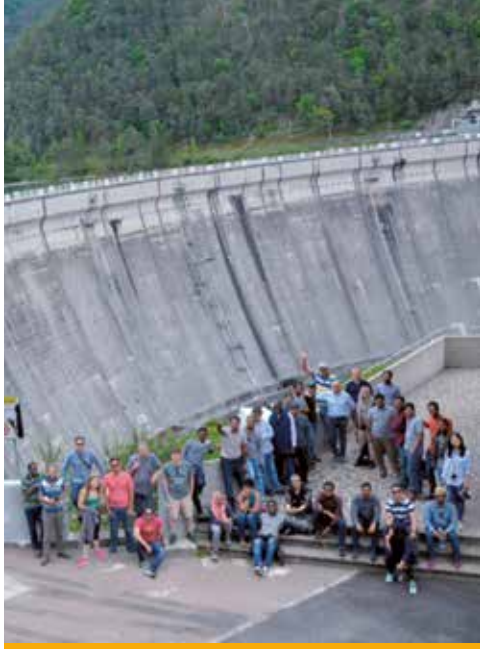
HIGLIGHTED PROJECT FOR GOAL 7.2



S-MultiStor is a 3-year initiative to investigate and demonstrate improved approaches to sustainable multi-purpose storage, with the aim of making a measurable impact on sustainable development. The initiative is global in scope but includes concentrated activities in the Zambezi Basin of southern Africa, the Magdalena Basin of Colombia, and the Irrawaddy Basin of Myanmar.

The S-MultiStor project is one of several initiatives at IHE Delft aimed at exploring the nexus between water, energy, food and ecosystems, with a view to providing solutions to these, often conflicting, demands. Our recent activities in this field range from publishing blogs and attending events, to organising sessions at academic and United Nations conferences. For example, the General Assembly of the European Geosciences Union, April 2019 in Vienna, and the 38th IAHR World Congress in September 2019 in Panama City.

Donor: DUPC2, Dutch Ministry of Foreign Affairs

11 SUSTAINABLE CITIES AND COMMUNITIES

11.5

By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.

The effects of climate change include devastating impacts of extreme events, especially in urban areas. Water-related events have been increasing in the past, and IHE Delft has reacted to the increasing need to adapt to, and prevent risk of, flood management, through providing educational programmes and *ad hoc* expertise. This is achieved through our programmes in Flood Risk Management and Urban Water Management as well as through decision support systems that can help to minimise risk. At IHE Delft we offer problem-based educational programmes using our extensive network of Open Urban Labs.

" We are developing an early warning system to prepare Alexandria for the effects of extreme rainfall. The system should be in place by the winter 2019. This is a unique project for Egypt and the lessons learned will be transferred to all cities at risk from flooding throughout the country."
Prof. Dr. Rifaat Wahaab, IHE Delft alumnus and National Coordinator of the project

HIGLIGHTED PROJECT FOR GOAL 11.5

Anticipatory Flood Management in Alexandria (AFMA)

Unlike cities which regularly endure floods due to tropical weather patterns, the city of Alexandria suffers from occasional floods, their irregularity meaning that there are no mechanisms in place for warning local authorities. This project aims to signficantly reduce the societal impact of climate change-related flooding, and in particular on the livelihoods of the poorest populations of Alexandria, Egypt. AFMA sets an example for other urban Egyptian / Arab areas and demonstrates "an innovative, no-regret approach". This combines low investment with large potential gains, and allows for both mitigation and reduction of the impacts of extreme weather-related flooding. Preparedness and adaptation will lead to increased flood resilience.

Donor: Netherlands Enterprise Agency

13 CLIMATE ACTION

13.3

Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

The World Water Council launched its 'Water Is Climate' initiative with the purpose of increasing awareness and attention paid to the interlinkage between water, climate change and variability – particularly with respect to adaptation. Adaptive capacity to climate-related events is particularly sensitive in coastal zone areas. IHE Delft has developed special educational and research programmes to address capacity needs at a global scale, to improve resilience of societies at large. We are now upscaling our educational programme in this area in cooperation with a number of agencies.

AfriAlliance

AfriAlliance is a 5-year project (2016-2021) that facilitates the collaboration of African and European stakeholders in the areas of water and climate innovation, research, policy and capacity development. By supporting knowledge sharing and solution transfer, AfriAlliance is raising awareness about the impacts of climate change on water resources in both offline and online environments. The project has launched 10 Action Groups, bringing together African and European peers with relevant knowledge and expertise to work jointly towards implementable solutions.

Recent activities include:

- Three policy briefs providing knowledge and recommendations on how to address SDGs and climate change, financing of local initiatives, and handling data collection and use.
- The first AfriAlliance MOOC "Water and Climate Change in Africa", launched in May 2019, attracted over 600 participants
- Upgraded AfriAlliance website. (www.afrialliance.org) serves as a platform both to share knowledge on, and raise awareness of, the impact of climate change on water resources.

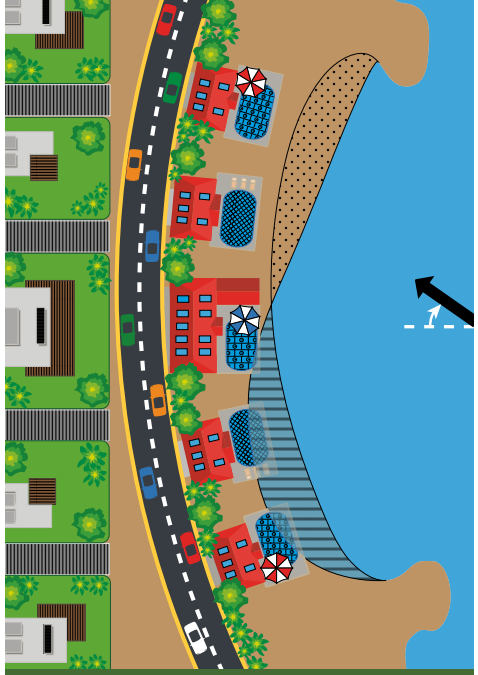
Donor: H2020 European Commission – Research Executive Agency

HIGLIGHTED PROJECTS FOR GOAL 13.3

AXA Chair in Climate Change Impacts and Coastal risk

The AXA Chair in Climate Change Impacts and Coastal Risk (CC& CR) at IHE Delft was launched with the granting of an endowed Chair by the AXA Research Fund. The programme has supported research into the impacts of climate change on the coasts through modelling of climate change-driven coastal hazards, and the development of innovative coastal risk assessment methods and tools. The goal is to provide efficient and effective cost-benefit assessments of both hard adaptation strategies, such as engineering structures; and also softer options, such as spatial planning, innovative architecture and construction. This will particularly benefit those countries where adaptive capacity is resource-constrained. Spanning the fields of coastal engineering, climate science, hydrology, ecology, applied mathematics, physical geography, risk modelling, oceanography and governance, this interdisciplinary programme represents a major advance in coastal risk mitigation. These outcomes will contribute to SDG 13.3 by improving education, raising awareness, increasing human and institutional capacity on climate change adaptation, impact reduction and early warning.

Donor: AXA Group



"Prof. Roshanka Ranasinghe's research programme at IHE Delft is one of the major projects supported by the AXA Research Fund, AXA Group's Scientific Funding initiative, in this aim of better understanding and mitigating the risks associated with climate-change driven coastal hazards. Through innovative methods and tools, Prof Ranasinghe's work can help strengthen the resilience of coastal zones and cities, and thereby protect vulnerable populations and economic assets."
Marie Bogataj, Head of AXA Research Fund

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

16.6
Develop effective, accountable and transparent institutions at all levels.

IHE Delft pays great attention to the linkages between water and peace, our research including work on the linkages between water-related insecurity and conflict, which aims to foster cooperation and peace at all levels. We have also initiated and developed a Masters programme in Water Conflict Management, which is jointly implemented with Oregon State University and the University of Peace, Costa Rica. We provide education on water and peace, with a particular emphasis on the role of institutions in both conflict prevention and mitigation, and peacebuilding. IHE Delft also provides the lead in the Dutch government-funded Water, Peace and Security partnership, which develops tools and approaches for identifying water-related risks to peace. The key goal is to address those risks for conflict prevention and mitigation in a timely and targeted manner.

Water, Peace and Security Partnership

The growing water crisis increasingly poses a threat to livelihoods, economies, and global security. Organizations, including the United Nations, the World Economic Forum and the High-Level Panel on Water have all added their voice to calls to urgently address the linkages between water scarcity, conflict, and human and political security. In response, the Water, Peace and Security partnership develops innovative tools and services that help identify and address water shortage-related security risks. In the short term these tools and services can flag water shortage changes and impacts and link them to social, political, economic, and hydrological factors. WPS promotes an integrated approach, in which the different tools go hand-in-hand, strengthening each other.

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HIGLIGHTED PROJECT FOR GOAL 16.6

The Water, Peace and Security partnership is a collaboration between organizations supported by the Netherlands Ministry of Foreign Affairs. Current partners include: IHE Delft (lead), World Resources Institute, Deltares, The Hague Centre for Strategic Studies, Wetlands International and International Alert.

Case studies 2019

Through Wetlands International and International Alert's ongoing programmes in Mali, the WPS partnership is piloting its approaches in Mali's Inner Niger Delta. Discussions have taken place with stakeholders at different levels on a model of the hydrological system and of the relation to livelihoods and conflict and on the WPS approaches. Further dialogue and training is taking place.

Collaboration between Deltares and the International Organization for Migration (IOM) in Iraq (Marshes in the South), has provided the opportunity to develop a model of the hydrological system and its relation to internal migration. WPS partners are looking at expanding this further within Iraq.

www.waterpeacesecurity.org

Donor: DUPC2, Dutch Ministry of Foreign Affairs

17 PARTNERSHIPS FOR THE GOALS

17.9

Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular.

Partnership building is at the core of IHE Delft's vision to help address water-related problems, particularly in low and middle income countries. We believe that bringing together knowledge and experience from different perspectives will help find effective local solutions and strengthen ongoing capacity development. Across our education and research activities, we collaborate closely with partners from academia, government, research, business and civil society. Moreover, our Masters students often carry out their field studies in their country of origin. This helps us to identify and implement activities that address local demands, are locally owned, and hence have a higher chance of success.

IHE Delft partnership programme for water and development

Working with partners in the Global South is a key approach for IHE Delft to help solve water and development challenges. We believe that bringing together knowledge and experience from different perspectives will help find local solutions and strengthen capacities. The DUPC2 programme is funded by the Dutch Ministry of Foreign Affairs and supports a large number of partnership activities on education, training, research and innovation. We currently have some 63 projects running under the DUPC2 programme.

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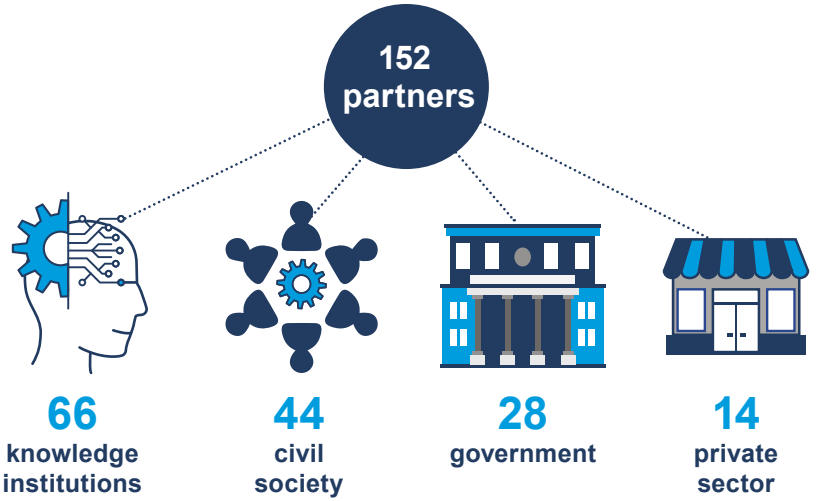
DUPC2 programme



The DUPC2 activities are jointly implemented with 152 partners, of which 106 are from 30 low and middle income countries.

While the majority of the DUPC partners are knowledge institutions, there is also substantial involvement from civil society, government and the private sector. Among these, around a third (59) are organizations with whom we have collaborated in the past, either through a joint educational programme or through research or other activities. Many of our new partners represent civil society, government and the private sector, allowing us to broaden our network beyond academic partners and increase our impact on the ground.

Photo captions and copyright

Cover *MSc students hold up SDG signs at the graduation ceremony held in April 2019.* Copyright: IHE Delft.

Target 2.4 *Orange farming, Limpopo River, Zimbabwe.* Photo by Annelieke Duker, IHE Delft Institute for Water Education (page 2).

Target 6.1 *Water supply system of Bushenyi, Uganda.* Photo by Giuliana Ferrero, IHE Delft (page 3).
Water supply system of Moamba, Mozambique. Photo by Giuliana Ferrero, IHE Delft (page 4).

Target 6.2 *First eSOS-toilet prototype tested in the Philippines.*

Target 6.3 *Industrial wastewater.* Stock photo (page 6).
Wastewater treatment plant. Stock photo (page 7).

Target 6.4 *An empty dam near Cape Town, South Africa.* Stock photo (page 8).
Detail of WaPOR Map "Actual Evapotranspiration and Interception 2018 - Gezira irrigation scheme, Sudan" (page 9).

Target 6.5 *Farmer on the cracked dry ground due to drought. Affected of global warming made climate change. Water shortage - drought and crisis environment concept.* Stockphoto from Shutterstock - seamind224 (page 12).
Fishermen working in the early morning on the Nile, Cairo. Copyright: Roger Anis (page 13).

Target 6.6 *Arial photo Seden Strand, Odense, Denmark.* Copyright: "Starling Air", Odense Kommune, RECONECT project.

Target 6A *Harbour Jamaica, SIDS.* Photo by Erik de Ruijter Steveninck, IHE Delft Institute for Water Education.

Target 6B *Citizen Observatory in Zambia.* Copyright: Ground Truth 2.0 project.

Target 7.2 *Small scale dam in Tete region, Mozambique.* Copyright: Mario Franca, IHE Delft (page 18).
Field trip IHE Delft MSc students (page 19).

Target 11.5 *Alexandria, Egypt.* Photo by Chris Zevenbergen, IHE Delft (page 20 and page 21).

Target 13.3 *Dry, cracked land.* Stock photo (page 22).
Graphic Climate Change Impacts on Coasts -.AXA research fund - IHE Delft. Illustration by Trang Duong (page 23).

Target 16.6 *Water, Peace and Security partnership workshop in Mali, July 2019.* Photo by Rozemarijn ter Horst, IHE Delft (page 24).
River in Mali. (page 25).

Target 17.9 *Participatory Planning NWO-UDW project funded by DUPC2 partnership programme.* (page 26).

United Nations
Educational, Scientific and
Cultural Organization

IHE DELFT

Institute for Water Education
under the auspices
of UNESCO

IHE Delft is the largest international graduate water education facility in the world and is based in Delft, the Netherlands. Since 1957 the Institute has provided water education and training to 23,000 professionals from over 190 countries, the vast majority from Africa, Asia and Latin America. Also, numerous research and institutional strengthening projects are carried out in partnership to strengthen capacity in the water sector worldwide. Through our overarching work on capacity development, IHE Delft aims to make a tangible contribution to achieving all Sustainable Development Goals in which water is key.

IHE Delft
Institute for Water Education

PO Box 3015
2601 DA Delft
The Netherlands

+31 15 215 1715
info@un-ihe.org

www.un-ihe.org

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