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Webinar Series

Smart Water Solutions for SDGs

DEC. 14, 2021
10-13.00 CET

ONLINE

Join Us!

MANDAT INTERNATIONAL

Jožef Stefan Institute

UDG Alliance

NAIADES Speakers

ivl Swedish Environmental Research Institute

eco logic

egm

External Speakers

Some info

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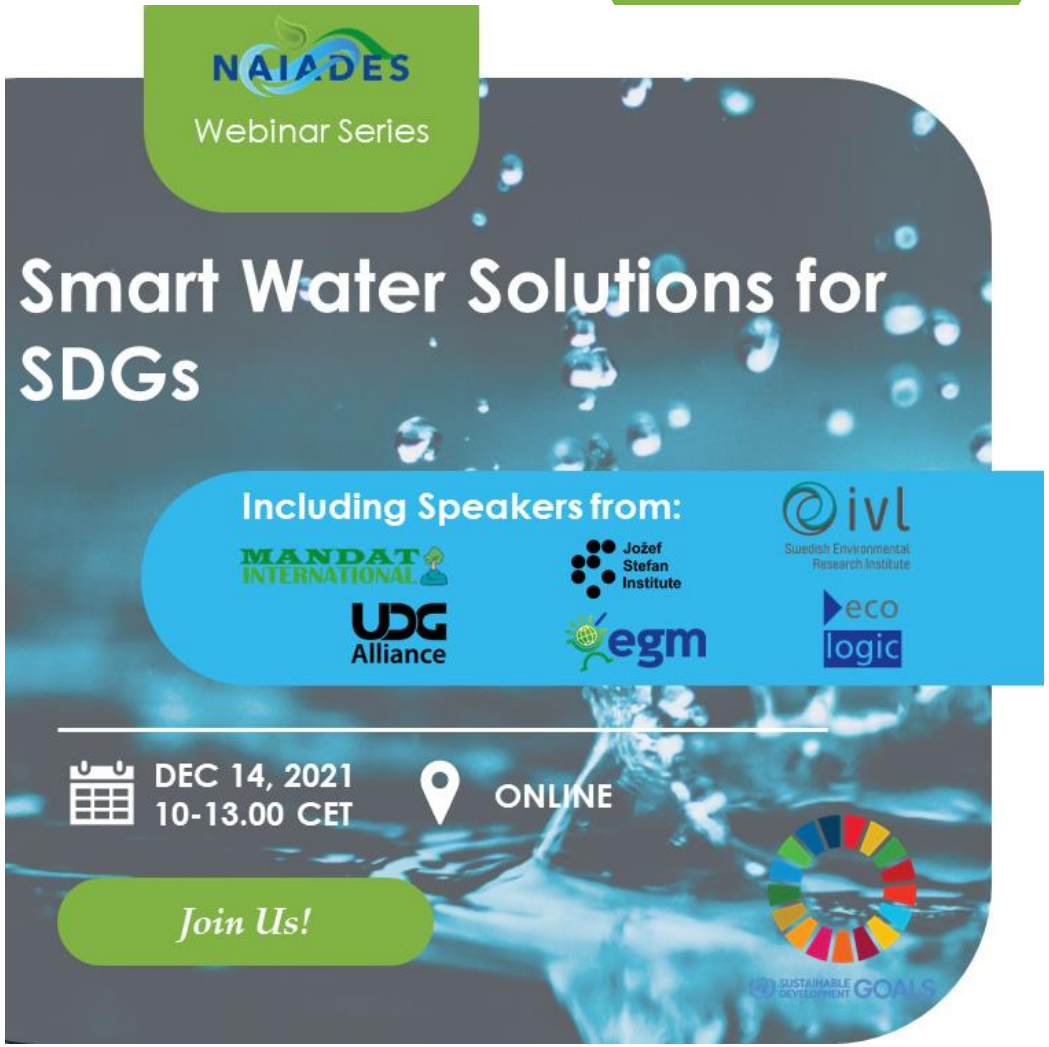
This session will be entirely recorded and published on the NAIADES channels.

Feel free to post your questions in the chat.

Please feel free to share your thoughts about the workshop on Twitter, via:

@naiadesproject, using #NAIADESwebinars



Speakers

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Moderation by: Eunah Kim, UDG Alliance

Eunah Kim
UDG Alliance

Joao Pita Costa
Jožef Stefan Institute & IRCAI

Anna Brékine
Mandat International

Speakers

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Franck Le Gall
EGM

Andreas Englund
IVL Swedish Environmental Institute

Benedict Bueb
Ecologic Institute

Ulf Stein
Ecologic Institute

Agenda

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SESSION 1 – Training Sessions

- **NAIADES Water Observatory:** Joao Pita Costa, *Jožef Stefan Institute & IRCAI*
- **IAM4SDG Methodology:** Anna Brékine, *Mandat International*

SESSION 2 – Thematic Presentations

- **Managing SDG KPIs though standardised data models and platforms:** Franck Le Gall, *EGM*
- **Challenges to monitor stormwater with IoT:** Andreas Englund, *IVL Swedish Environmental Institute*
- **Harnessing digital solutions for sustainable development: Examples from (urban) water management:** Ulf Stein, Benedict Bueb, *Ecologic Institute*

PANEL DISCUSSION & WRAP-UP

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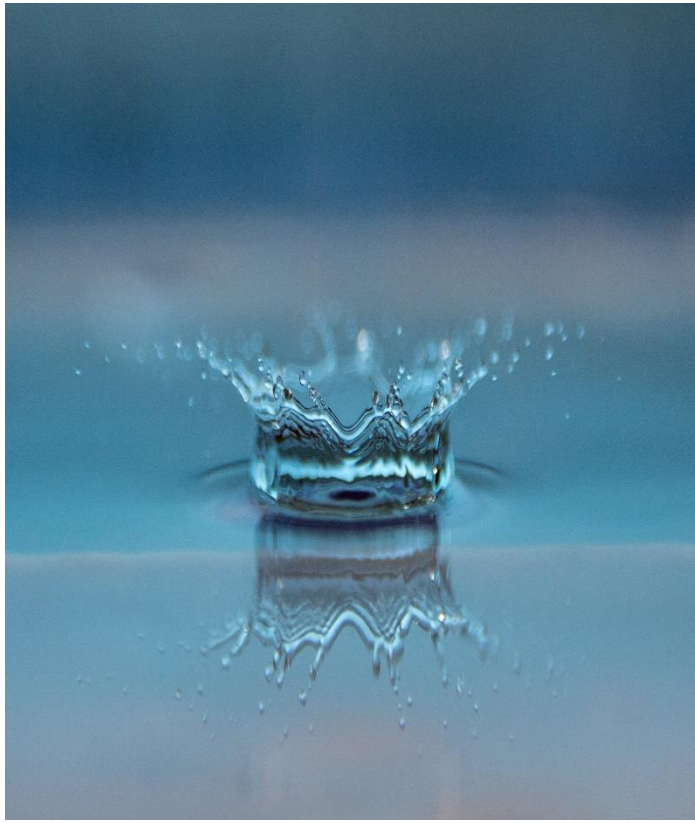
Session 1: Training Sessions



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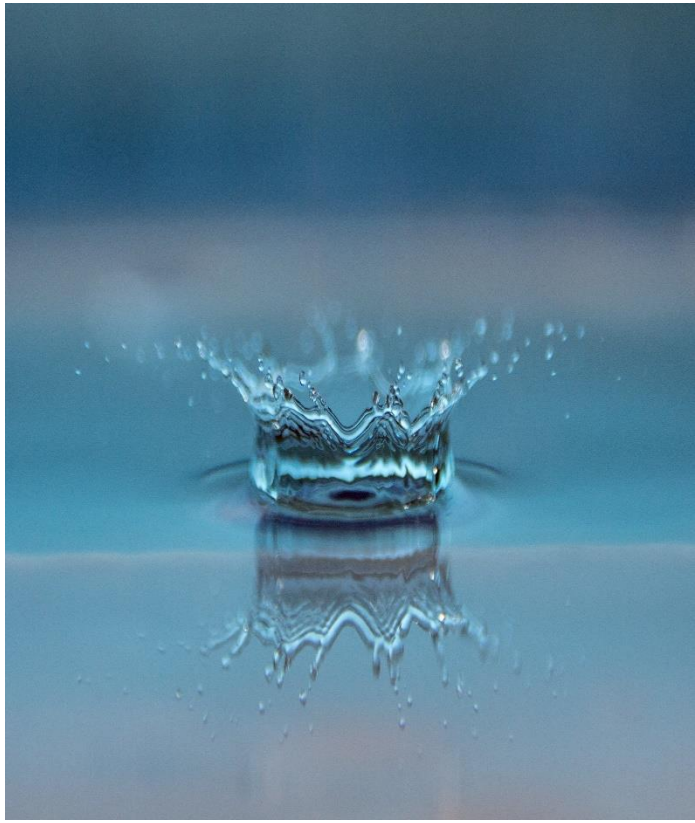
NAIADES Water Observatory

Joao Pita Costa, Jozef Stefan Institute & IRCAI



Water Observatory in a Nutshell

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NAIADES WATER OBSERVATORY

ABOUT FAQ

MONITORING WATER RELATED EVENTS TO EXPLORE RELEVANT WATER ISSUES

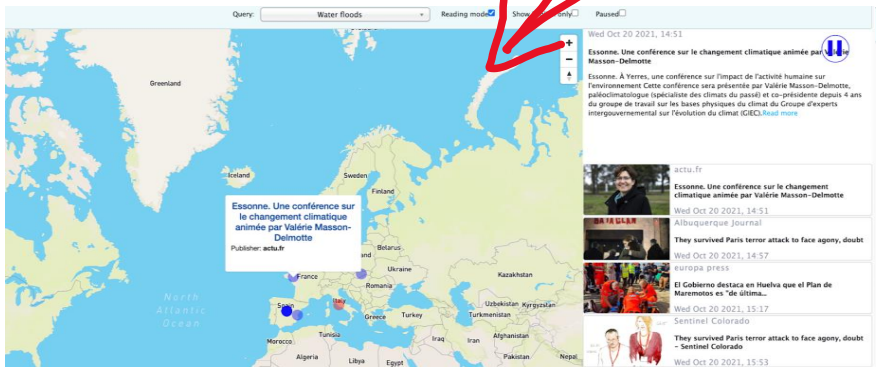
EXPLORE WATER EVENTS THROUGH AVAILABLE TOOLS

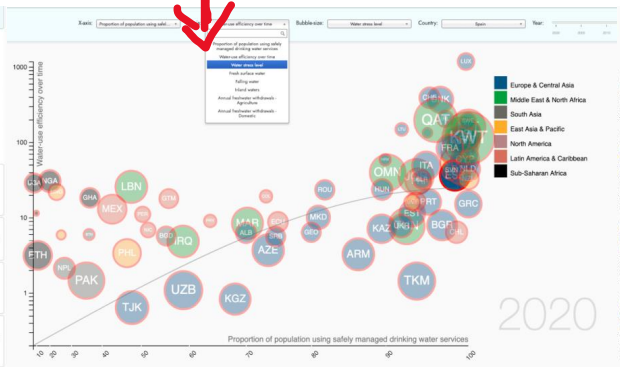
INDICATORS

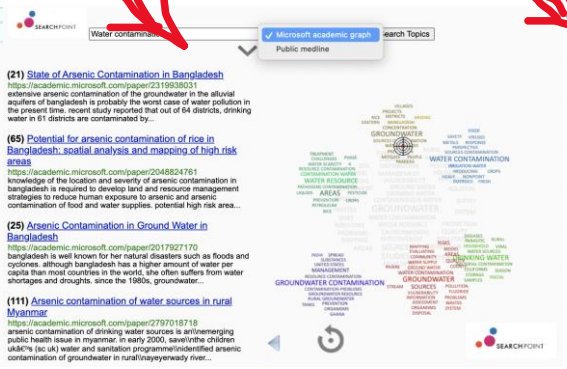
MEDIA

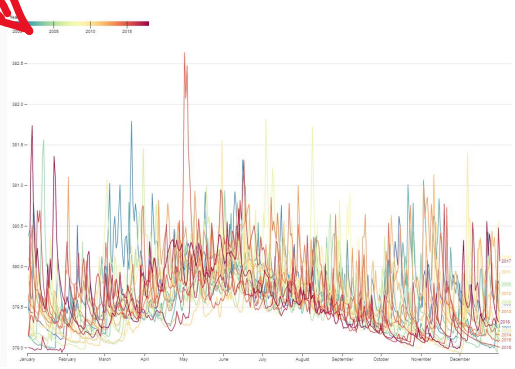
RESEARCH

RESOURCES

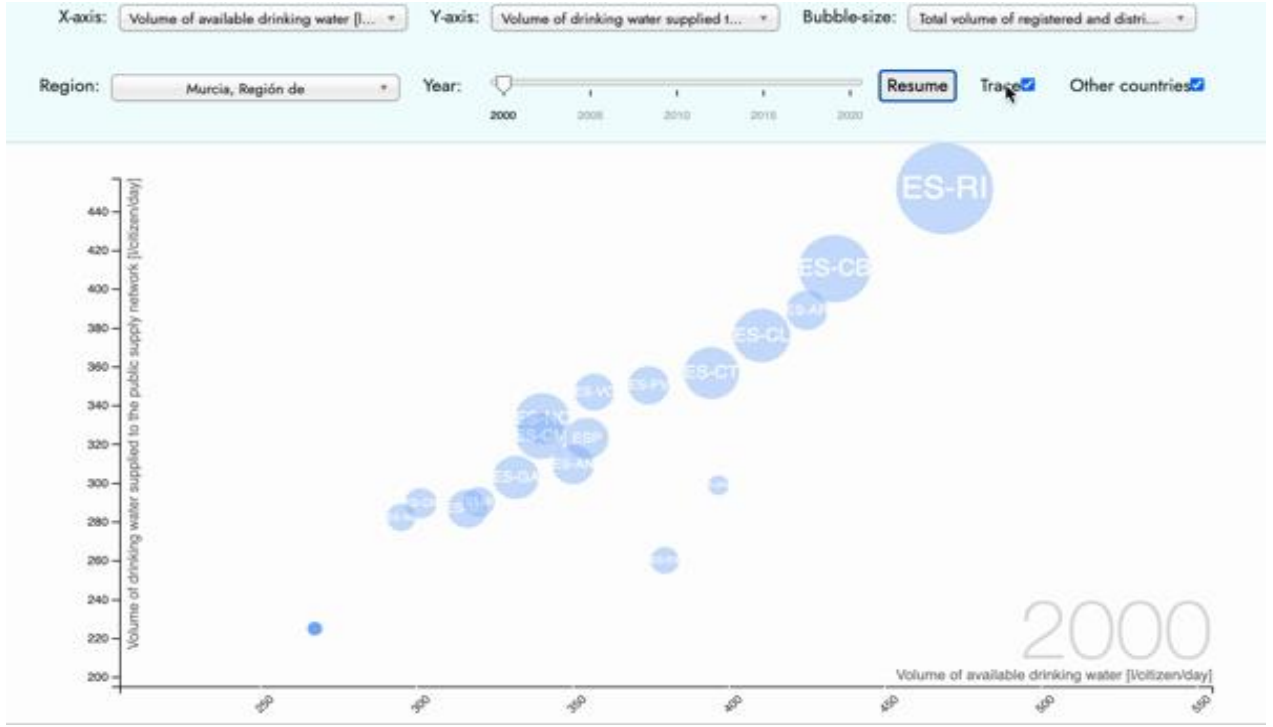






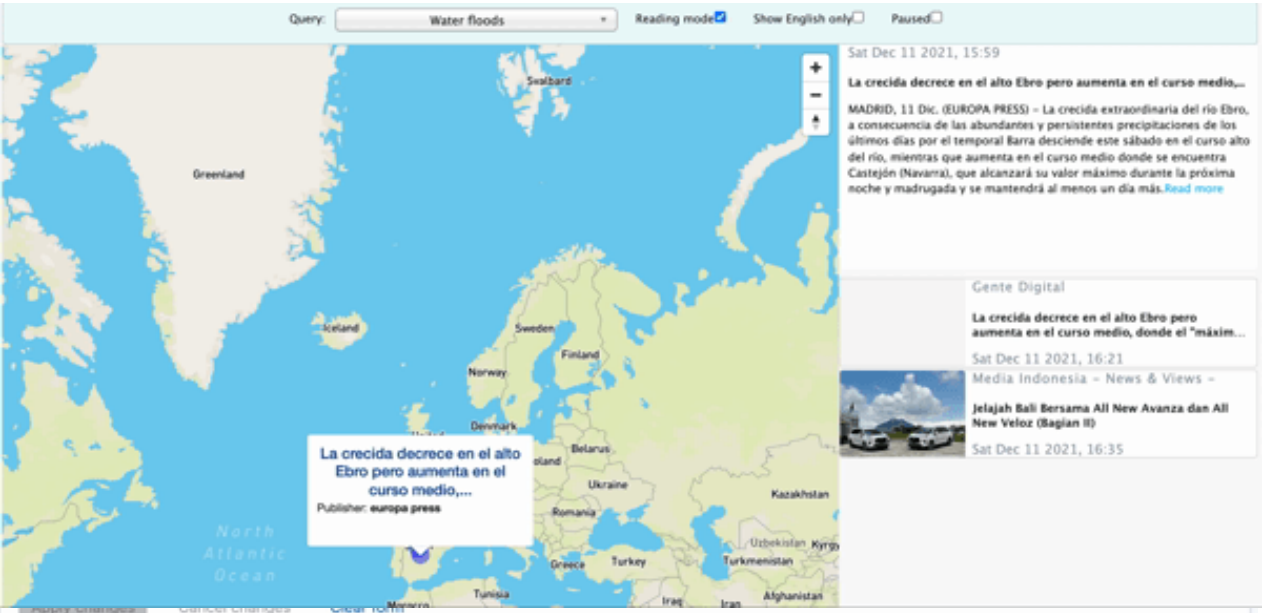


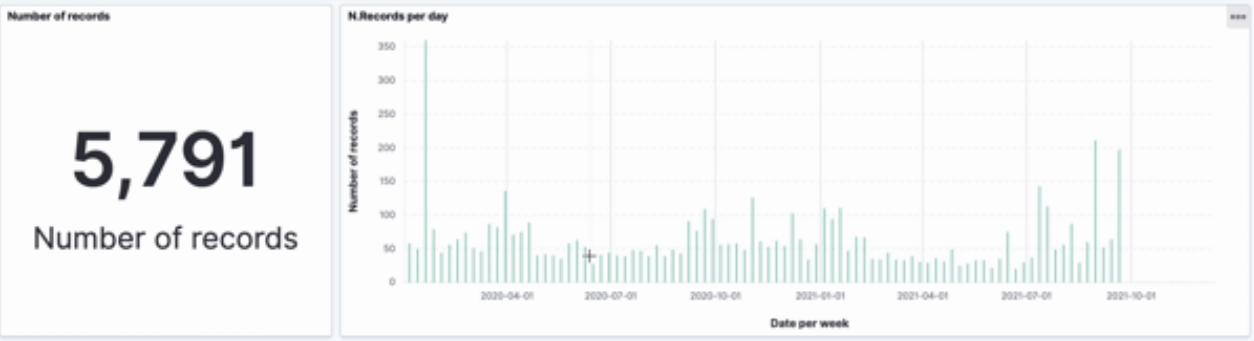
NWO Indicators View



- Identifying relevant datasets to clean & ingest into the system
- Understanding what indicators matter

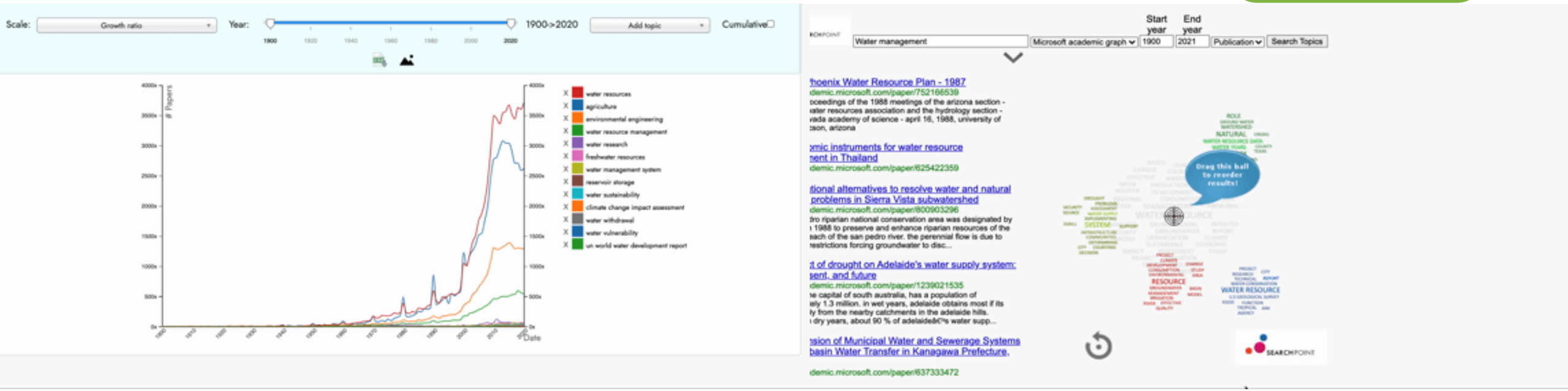
NWO Media View





- News stream filtered to use case priorities on water events
- Twitter dashboard with data viz modules for research (to explore what is useful to show)
- Efficient review of topics in news and tweets for content exploration
- Adding intensity of sentiment based on Tweets count (intensity)

NWO Research View



- Visualisation of research trends in relation to main topics
- Explore published knowledge from Microsoft Academic (126M articles and patents) and MEDLINE (28M biomed labelled) articles differentiating articles and patents
- Potential to use complex queries to review in depth a water topic

NWO Resources View

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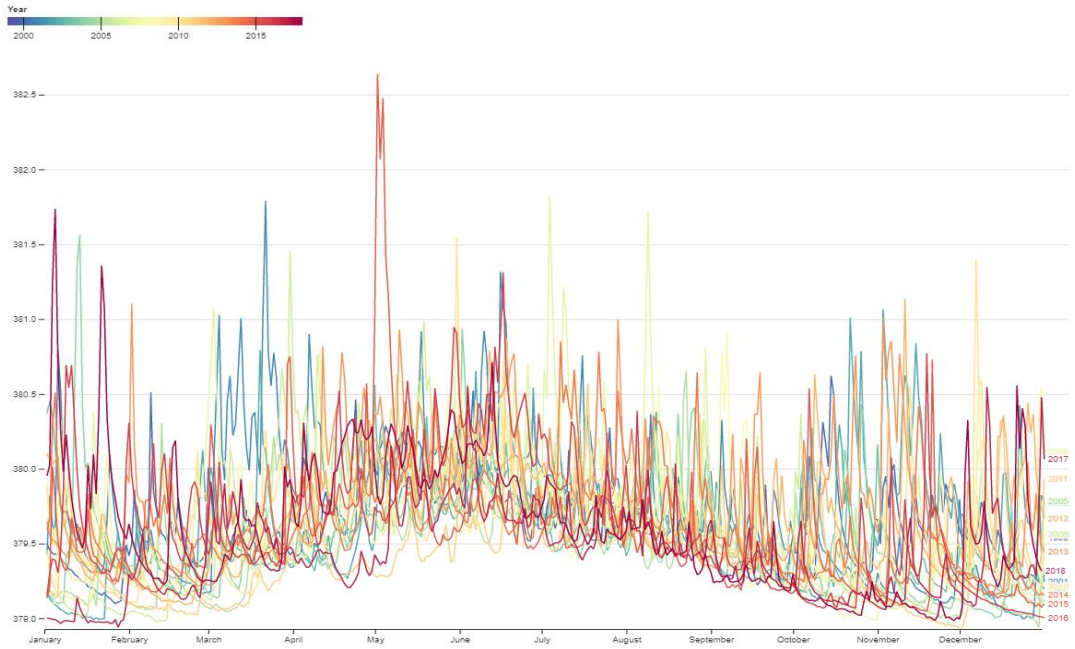

- Focus on exploration of trends in resource availability based on weather and water levels
- Long-term (10y) forecast data visualisation (how does winter look like 10y from now?)
- Explore water resources over relation between states
- Causality between resource indicators

Learn from Best Practices with the NWO

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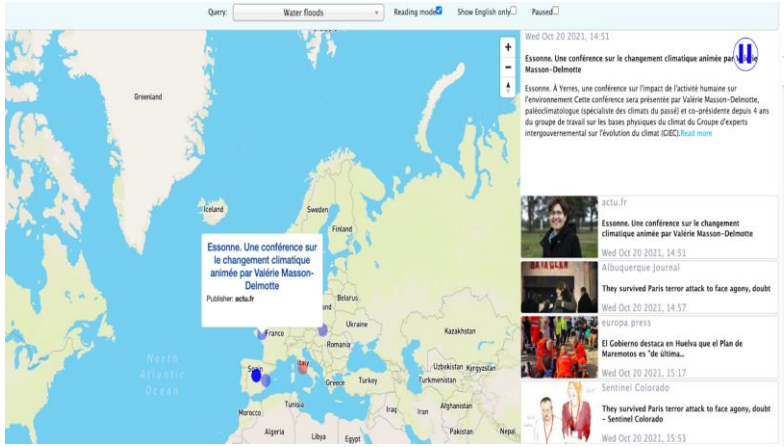
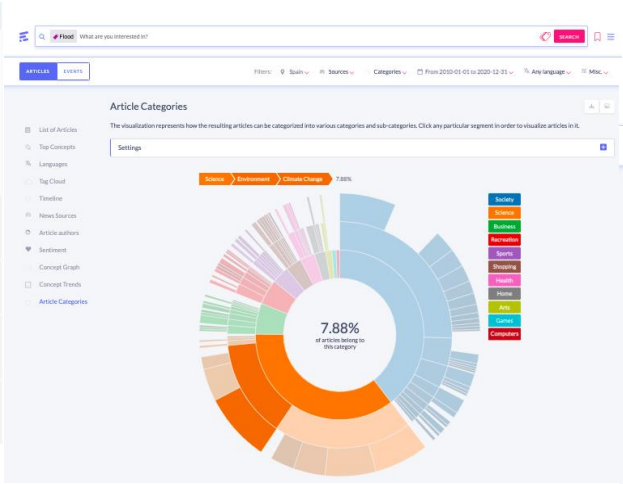
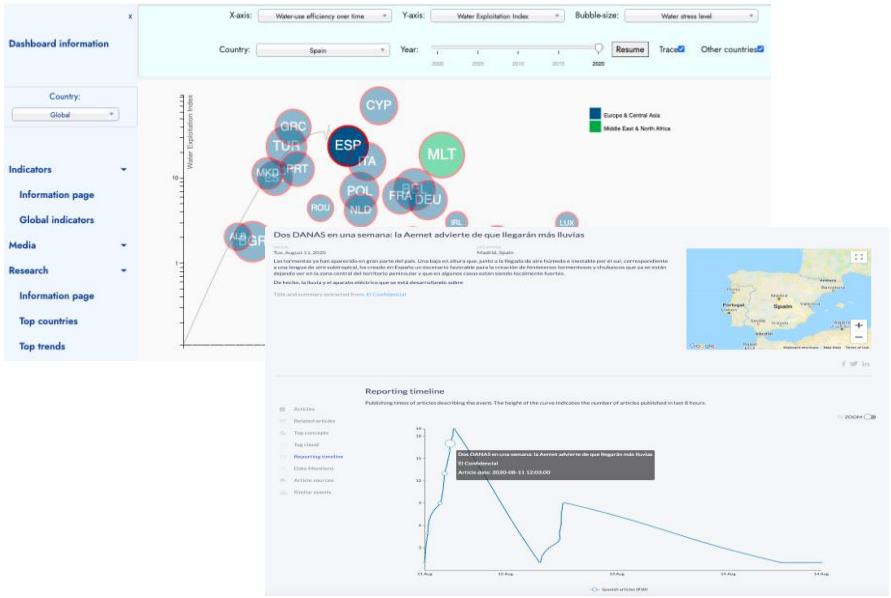
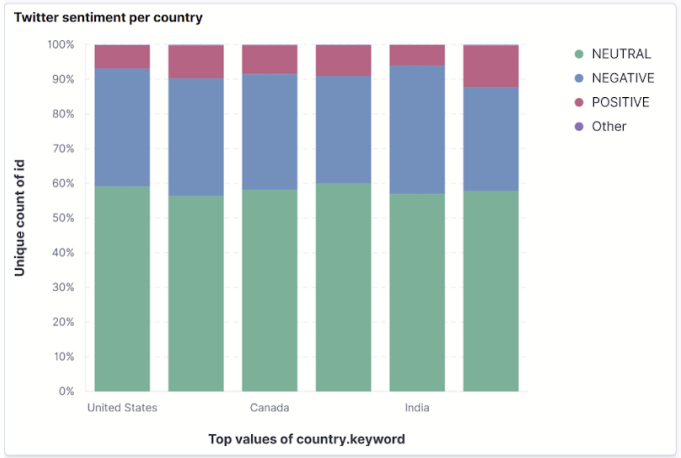


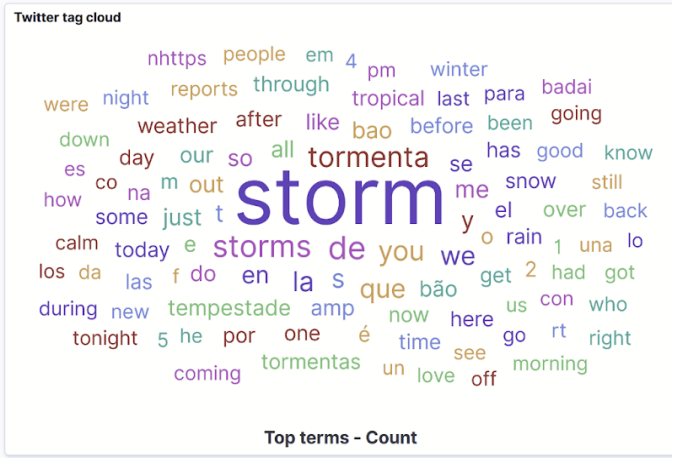


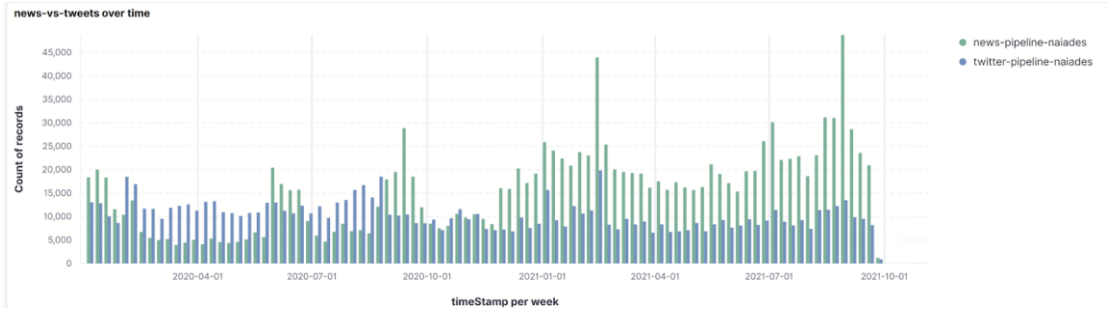


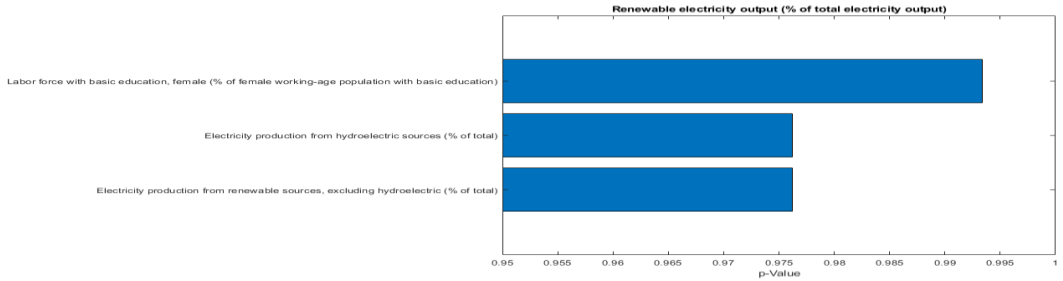
- Explore best practices from news and research worldwide using multilingual capabilities to learn from similar cases
- Using local indicators to complement the information with regional granularity
- Further exploration on News data visualisation modules

Nowcasting & Causality with NWO



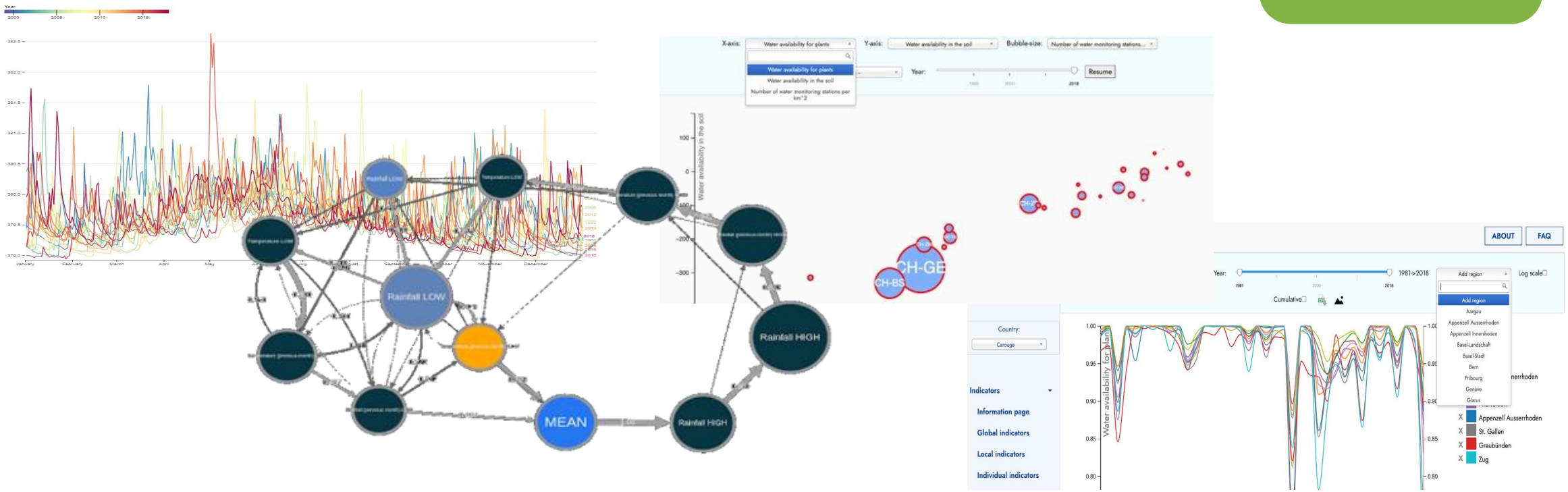






- Nowcasting from Twitter triggered by weather
- Potential to define alerts based on thresholds
- Utilize intensity of sentiment
- Relation between Twitter-News-weather to learn from historical events
- Causality from Twitter-News- weather on, e.g., car accidents

NWO on the Climate Change Impact



- Exploring trends and behaviour of seasons impacted by climate change based in the availability of resources
- Utilize complex datastreams visualisation to better understand relations between aspects of those resources (e.g., sub-seasonality and anomalies)
- Granger Causality between resource-related indicators

NWO for Water Education

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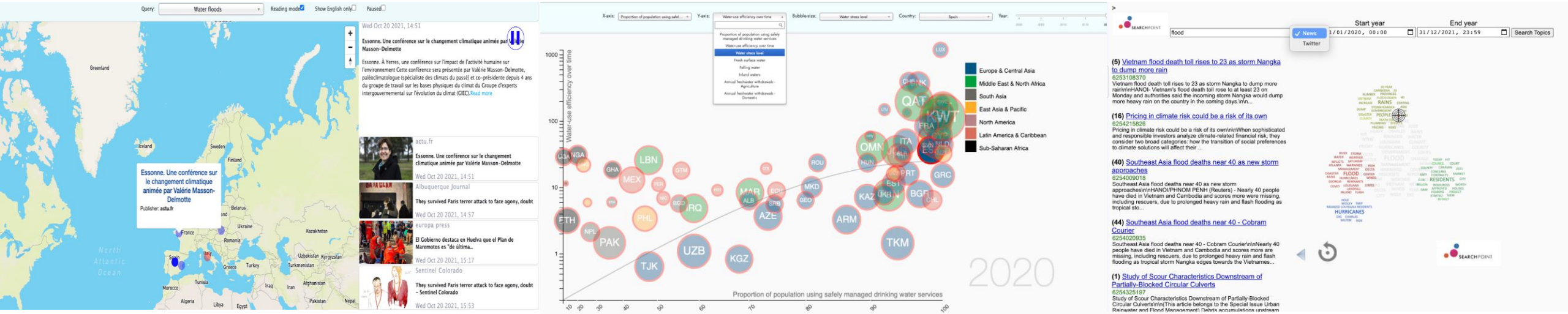

- The need for water sustainability awareness can be helped by providing better information to the general public
- These resourceful tools can be used in the classroom to discuss water topics from a global and a local point of view based on evidence
- The water resource utility customers can be served with further info on water events to show the commitment of stakeholders

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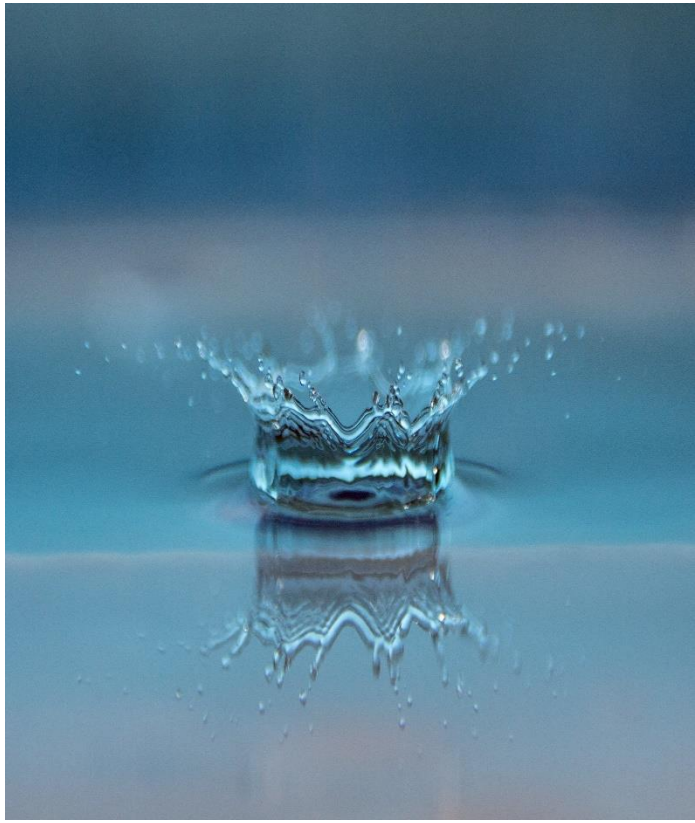
IAM4SDG methodology

Anna Brékine, Mandat International



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Contents

- Introduction SDGs
- IAM4SDG
- Methodology – Six Steps

The SDGs

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IAM4SDG

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IAM4SDG is an Impact Assessment for the SDGs that aims at providing a user-friendly and easily implementable methodology and tool to align any project, including research projects, pilots, public infrastructure and private investments with the 17 SDGs.

Dual approach:

1. Identify & mitigate potential **risks and negative impacts** of the assessed project on the 17 SDGs;
2. Identify & leverage potential of the project to maximise its **positive impact.**

IAM4SDG

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Why use IAM4SDG?

Similar benefits as EIA, with two additional advantages:

1. Considers *whole* set of SDGs
2. Identifies & considers both potential positive and negative impacts of the project

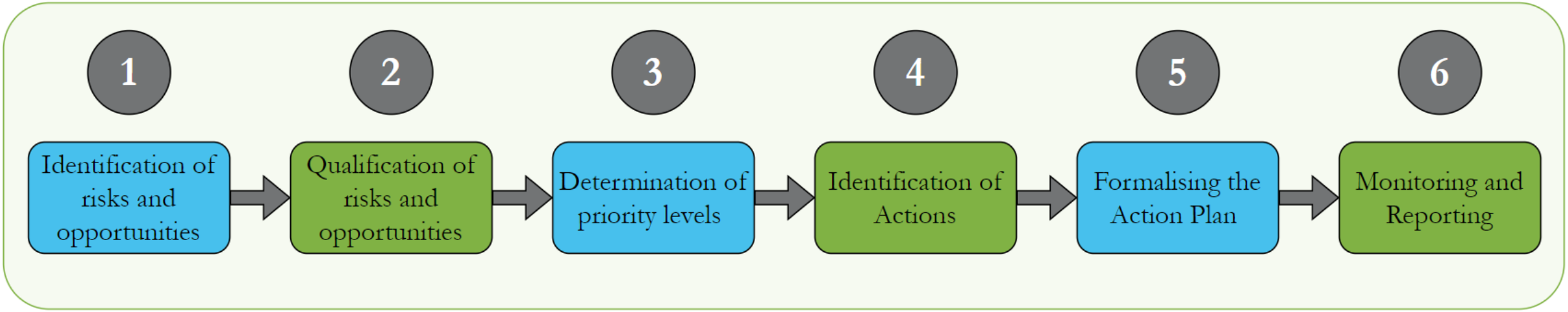
Who?

All actors who plan to launch or get involved into a new project (e.g., researchers, policy makers, project evaluators & project managers)

How to start?

1. Clearly determine the scope of the project
2. Appoint a Sustainable Development Officer (SDO) or SDG Officer. → will be responsible for leading the whole IAM4SDG process

Methodology: Six Steps



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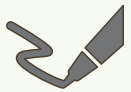
STEP 1
Identification of Risks and Opportunities

Identify any potential risks or opportunities within the project that could have a positive or negative impact on any of the 17 SDGs

Systematically analyse how the activities of the project influence the achievement of the 17 SDGs

- Carefully consider the objective and targets of each SDG
- Identify ***all*** risks and opportunities



Risks: Actual and potential negative impacts the project could have on the SDGs
Opportunities: Actual and potential positive impacts/contributions the project could have on the SDGs

SDG	Identified Risks / Negative Impacts	Impact			Likelihood			Identified Opportunities / Positive Impacts	Impact			Effort Required		
		small	medium	large	small	medium	large		small	medium	large	small	medium	large
1 No Poverty														
2 Zero Hunger														
3 Good Health and Well-Being														
4 Quality Education														
5 Gender Equality														
6 Clean Water and Sanitation														
7 Affordable and Clean Energy														
8 Decent Work and Economic Growth														
9 Industry Innovation and Infrastructure														
10 Reduced Inequalities														
11 Sustainable Cities and Communities														
12 Responsible Consumption and Production														
13 Climate Action														
14 Life below Water														
15 Life on Land														
16 Peace, Justice and Strong Institutions														
17 Partnership for the Goals														

STEP 2 Qualification of Risks and Opportunities

Determine the importance of the afore identified risks and opportunities

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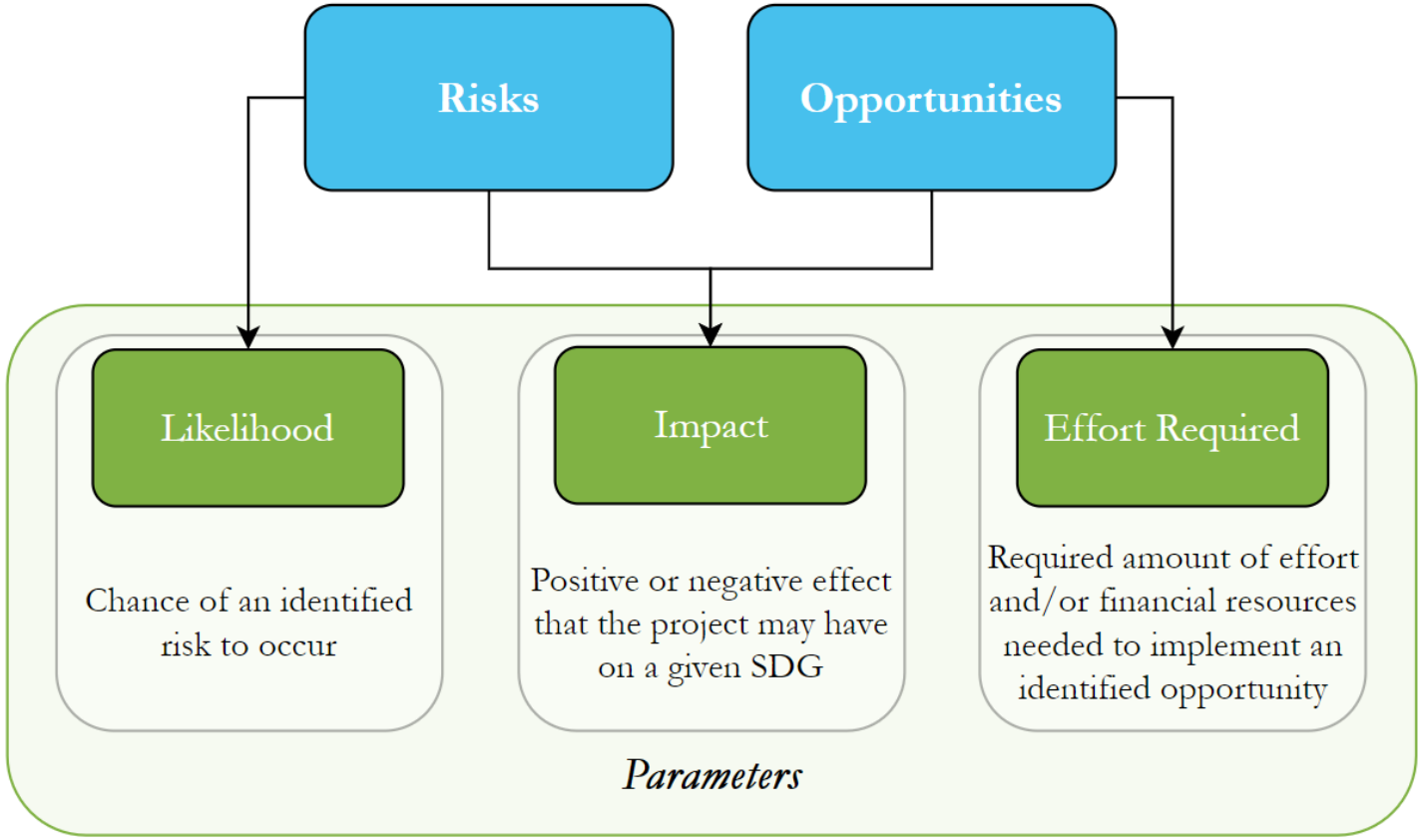

Qualification of Parameters

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Parameters Risks

Scale Level	Negative Impact	Likelihood
Small	Small negative impact on the SDGs	Will most likely not occur
Medium	Medium negative impact on the SDGs	Possible to occur
Large	Large negative impact on the SDGs	Likely to occur

Parameters Opportunities

Scale Level	Positive Impact
Small	Small positive impact on the SDGs
Medium	Medium positive impact on the SDGs
Large	Large positive impact on the SDGs

Scale Level	Effort Required
Small	Minor effort and cost
Medium	Medium effort or cost
Large	Major effort or cost

SDG	Identified Risks / Negative Impacts	Impact			Likelihood			Identified Opportunities / Positive Impacts	Impact			Effort Required		
		small	medium	large	small	medium	large		small	medium	large	small	medium	large
1 No Poverty														
2 Zero Hunger														
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12 Responsible Consumption and Production														
13 Climate Action														
14 Life below Water														
15 Life on Land														
16 Peace, Justice and Strong Institutions														
17 Partnership for the Goals														

Example: step 1 and 2

SDG	Identified Risks / Negative Impacts	Impact			Likelihood			Identified Opportunities / Positive Impacts	Impact			Effort		
		small	medium	large	small	medium	large		small	medium	large	small	medium	large
1 No Poverty														
2 Zero Hunger								Water scarcity and high water cost is a barrier for agriculture, so re-used water and reduced energy cost should have a positive impact on agriculture	X				X	
3 Good Health and Well-Being								Green areas in cities are directly related to health. Thanks to re-used water, the surface of green areas was improved and increased in Alicante. Most of the green areas are irrigated with recycled water.		X		X		
4 Quality Education								Water consumption awareness campaigns in Use-case 3. Will seek to increase the knowledge about water.	X			X		
5 Gender Equality	Gender equality is still pending, uneven distribution in the management positions, not specific action related to gender equality		X		X			Trying to use the Research and Innovation to promote gender equality within the company			X	X		
6 Clean Water and Sanitation	Change in water tariff that can affect the accessibility of water; Water transfer as a source of political conflict between regions in Spain. Part of the drinking water and for agriculture comes from water transfer from other	X			X			Economic balance of the project is positive; Ensuring the future sustainability of water resources in the region of water scarcity; Use-case 1 (water storage) and 2 (re-used water) have positive impact on water quality through optimisation.		X		X		
7 Affordable and Clean Energy								Use-case 1 optimises the energy use. Use-case 2 (saline intrusion) trying to reduce energy cost for the treatment required for water re-use		X			X	
8 Decent Work and Economic Growth	Replacing a worker with an automated process	X			X			Water scarcity and water cost (high) is a barrier for agriculture, so re-used water and reduced energy cost should have a local positive impact in terms of employment in the field of agriculture	X				X	
9 Industry Innovation and Infrastructure								Positive impact on local innovation capacity. Use-case 2 (saline intrusion) is aimed at diagnosis, so that more resilient infrastructure can be built. Improvement of innovation capacity.			X		X	
10 Reduced Inequalities	Not paying attention to the situation in other countries. Applying advanced technology solutions that could enlarge the gap in terms of progress between first world and developing countries.		X			X		Open-science can be accessed and some of the solutions are not very expensive, so could be partially implemented in low income countries. Improving availability of water resources in the Alicante region can reduce the inequalities.			X		X	
11 Sustainable Cities and Communities								(urban water management) Water availability and energy management have an impact for the community.			X		X	
12 Responsible Consumption and Production	Increasing the availability of re-used water can impact on the responsible consumption	X			X			Increasing awareness and responsible consumption (Use-case 3)			X	X		
13 Climate Action								Trying to sustain the availability of water resources is key for resilience.			X		X	

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STEP 3
Determination of Priority Levels

Use qualified parameters and matrix to determine priority levels

Risks

		Likelihood		
		Small	Medium	Large
Impact	Small	3	3	2
	Medium	3	2	1
	Large	2	1	1

Opportunities

		Effort Required		
		Small	Medium	Large
Impact	Small	2	3	3
	Medium	1	2	3
	Large	1	1	2

Priority Level: Quantitative scale to differentiate and prioritise the most relevant risks and opportunities in order to define actions and allocate resources in an impactful manner

Priority Level		SDG #	Risk / Opportunity	Identified Action	Leader	Deadline	Status	Remarks
Risks	1 (high)							
	2 (medium)							
	3 (low)							
Opportunities	1 (high)							
	2 (medium)							
	3 (low)							

STEP 4
Identification of Actions

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- Mitigating the identified risks

Mitigation option	Description	Remarks
Eliminate	Taking concrete and proactive measures to eliminate the risk and its possible side-effects.	A clear plan detailing the measures to eliminate the risk is required.
Prevent	Adjusting the project objectives or work plan to eliminate or reduce the risk.	This mitigation option could be accommodated by a change in funding, schedule, requirements.
Control	Enforcing actions to reduce the impact or likelihood of the risk.	
Transfer	Reassigning the organisational accountability and responsibility to another qualified stakeholder willing to accept to handle the risk.	
Accept	Recognising the existence of a risk and making a deliberate decision to assume it without taking special measures to control it.	The consent of all project partners is necessary.
Monitor	Monitoring the environment for changes that affect the nature and/or the impact of the risk.	

STEP 4
Identification of Actions

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- Implementing the identified opportunities

Implementation Option	Description	Remarks
Exploit	Raise the probability of an opportunity being achieved to 100%.	Should be reserved for the "golden opportunities" with high probability & high positive impact, which cannot be missed.
Share	Allocate ownership to a third party who is a better fit for handling the opportunity, by both maximising the probability of occurrence, as well as increasing the potential benefits should the opportunity occur.	It is reasonable to consider project stakeholders as potential owners.
Enhance	Increase the probability of an opportunity to be achieved by proactively targeting and reinforcing beneficial actions (increase the project's susceptibility to the opportunity)	It is recommended to implement generic enhancement strategies that contribute to the common cause. Indeed, if these actions prove to be successful, they will have a positive impact on more than one opportunity, increasing cost-effectiveness and the general benefits to the project.
Ignore	No special measures being taken to address the opportunities. This involves taking the risk of hoping to "get lucky" that an opportunity will occur nonetheless.	Appropriate contingency planning can be a way to include the opportunities in the project without defining specific actions.

STEP 4
Identification of Actions

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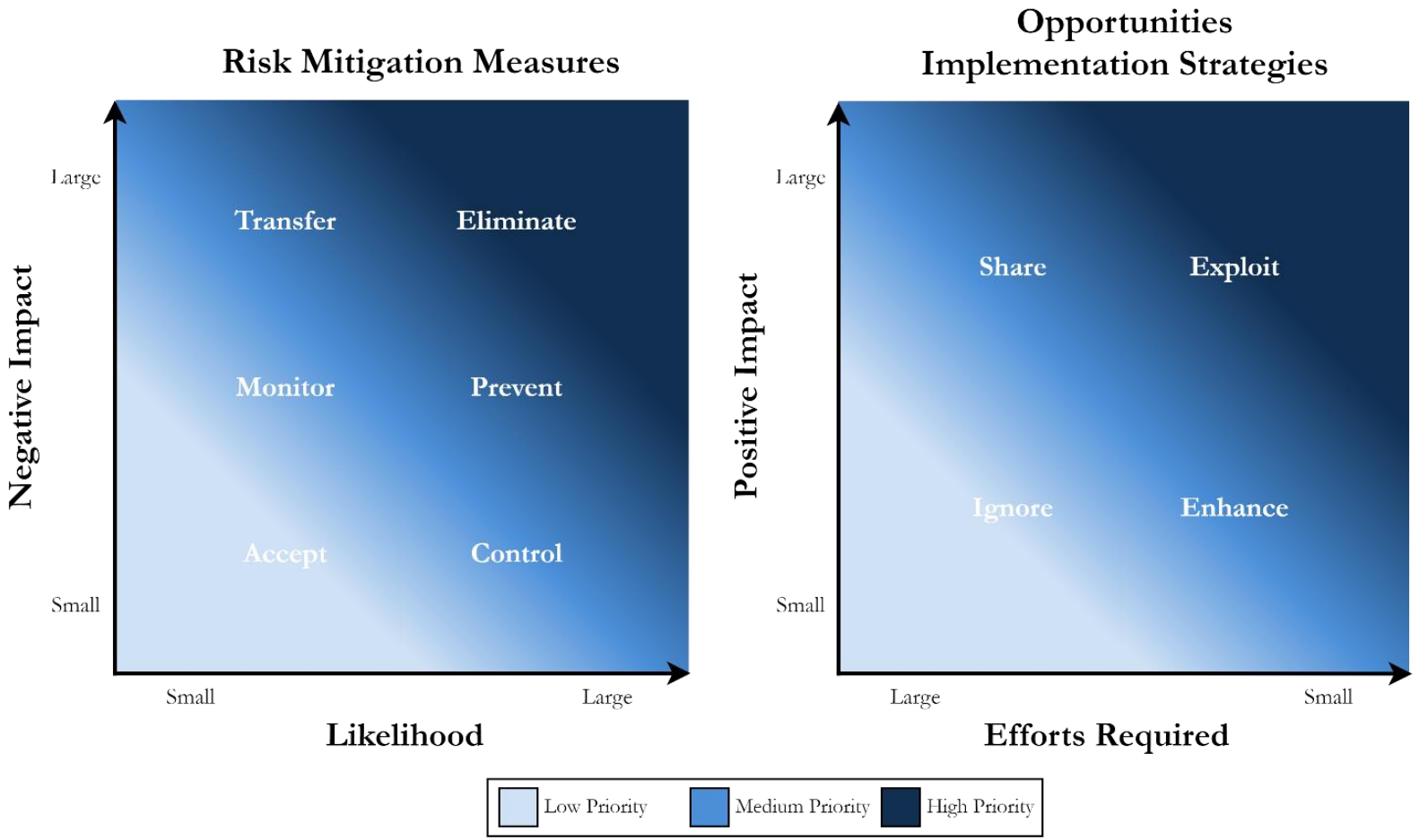

Risk mitigation and opportunities implementation strategies in function of the assessed parameters.

Priority Level		SDG #	Risk / Opportunity	Identified Action	Leader	Deadline	Status	Remarks
Risks	1 (high)							
	2 (medium)							
	3 (low)							
Opportunities	1 (high)							
	2 (medium)							
	3 (low)							

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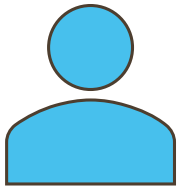
STEP 5
Formalising the Action Plan



Define

Set

Add relevant remarks

Priority Level		SDG #	Risk / Opportunity	Identified Action	Leader	Deadline	Status	Remarks
Risks	1 (high)							
	2 (medium)							
	3 (low)							
Opportunities	1 (high)							
	2 (medium)							
	3 (low)							

Example step 3, 4, 5

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Priority Level	SDG #	Risk / Opportunity	Identified Action	Leader	Deadline	Status	Remarks
1 (high)	7	Using too much energy to monitor and improve the water use	Even when deeply involved in the day-to-day technical issues of the project, try to keep a positively critical attitude towards the technology we are using and their weight in terms of ecological impact, and never lose the general perspective and the main goals and impacts expected from the project. Discuss and raise the problem with partners if required.	Everyone should be involved. The pilot is perhaps in a good position to take the lead here, together with the technical director.	Throughout the whole project	ongoing	The deadline cannot be clearly identified. This is something that has to be adressed at all stages of the project, but of course the impact is greater during the initial steps.
	12	Detectors are not carbon-free, using components that are not bio-degradable and consume a lot of natural resources for their production	Keep into account the global lifecycle and ecological impact of the components we are using. Try to understand how the detectors are built and their impact on natural resources consumption. Include these parameters in the criteria that drive the choice of the sensors and/or their components. If necessary, work with partners so that they also take these criteria into account when engineering the solutions. Anticipate the fact that, beyond the project's lifespan, the solution must be competitive *also from an ecological point of view* even when mass-produced on a large scale. Prospect the marked for available existing products that fullfill the same tasks while consuming less ressources.	De facto, the pilot has been the leader here.	Throughout the whole project but particularly from the beginning and during the pre-engineering phase	mostly done	These consideraions have been one of the reasons leading to the testing of humidity sensors in Carouge.

STEP 6 Monitoring and Reporting

Responsibilities of the SDO

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Monitor the implementation of the Action Plan

Review

Update

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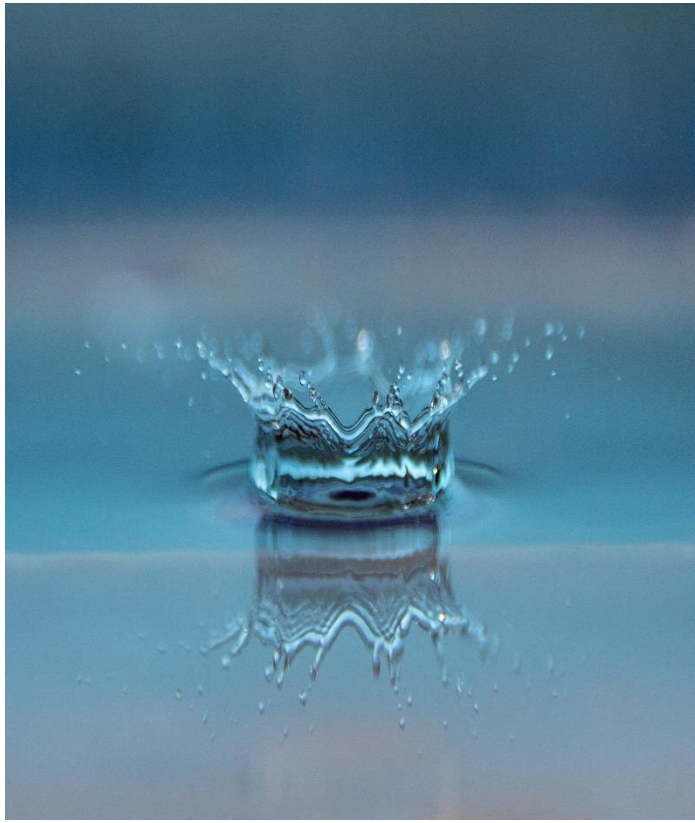
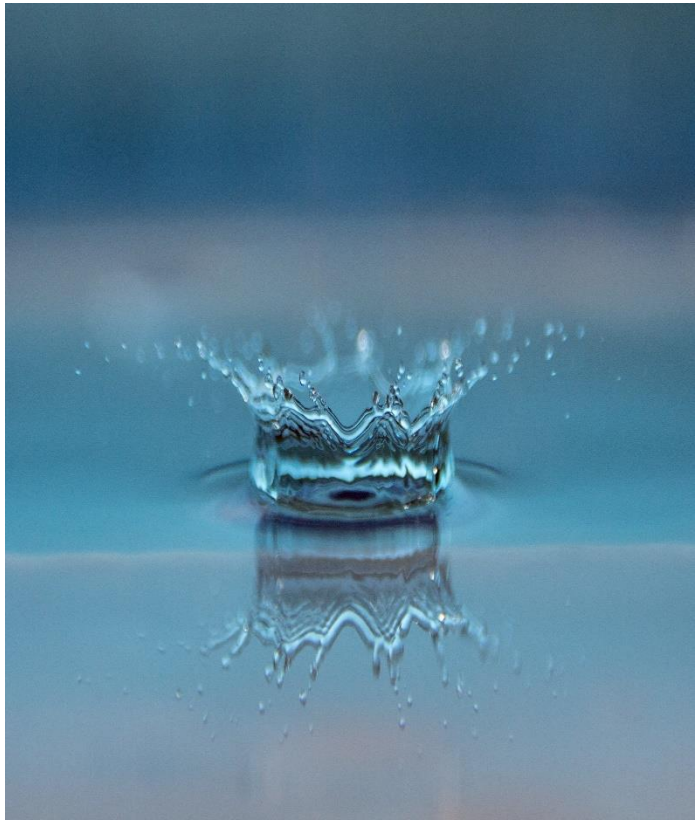
Session 2: Thematic presentations



Managing SDG KPIs though standardised data models and platforms

Franck Le Gall, EGM



In a nutshell

- Fiware4Water consortium led by the International Office for Water (OiEau) gathers 14 partners across Europe proposing altogether a pluri-disciplinary team with expertise in different domains.Consortium

14 PARTNERS
Experts in ICT, water and social sciences, coordinated by the International Office for Water

OUTCOMES
- Smart applications for raw water supply
- Smart applications for water supply
- Smart applications for water treatment
- Smart applications customers

FUNDING AND COORDINATION
Fiware4Water is a 3 years project (2019-2022) funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036 coordinated by the International Office for Water

4 DEMO CASES
- Athens Water supply and sewerage (GR)
- Cannes Improving the water supply system (FR)
- Amsterdam Wastewater treatment (NL)
- Great Torrington Smart metering (UK)

3 DEMO NETWORKS
- Municipalities
- Water authorities
- Technology providers

- This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821036.

What is this project about?

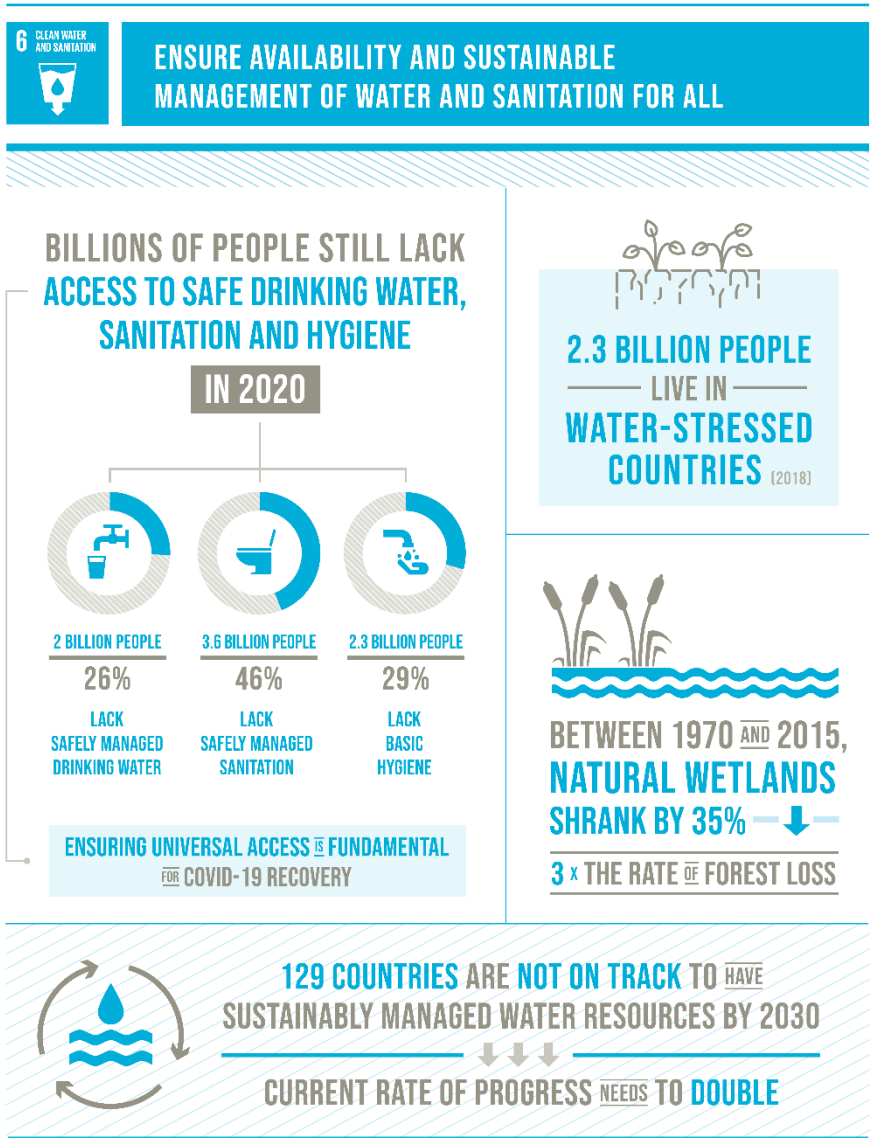
- **Main goals:** Link the water sector to FIWARE, an open and License free smart solution platform by
  - showing the potential of its interoperable and standardized interfaces
  - demonstrating a series of complementary and exemplary paradigms (4 DC)
  - promoting an EU and global wide network of users (3DN + SMEs Challenges)

In fine: create the **Fiware4Water ecosystem** and prove its innovative potential (technical, social and business)

- **Useful for who?**
  - Water sector end-users: cities, water utilities, water authorities, citizens and consumers
  - Solutions providers: private utilities, SMEs, developers

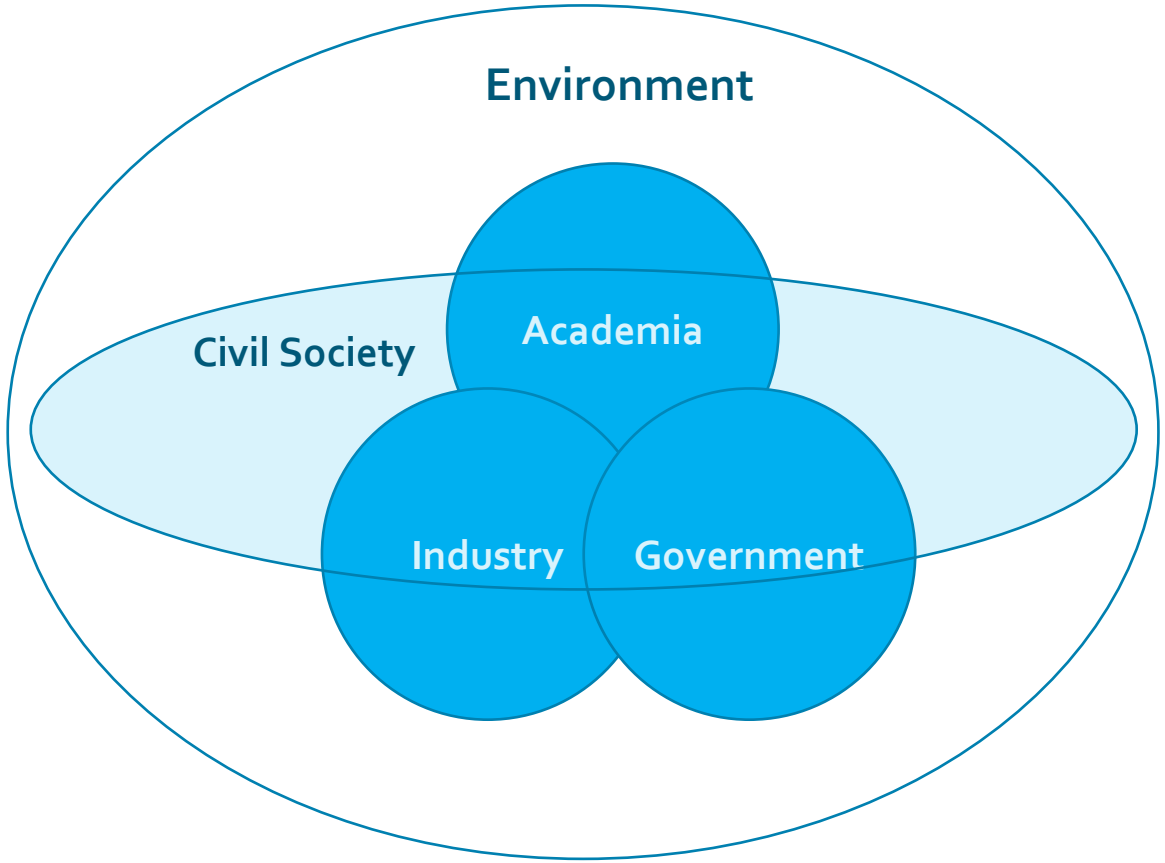
- **Concretely**
  - Modular and open APIs will be built to address water management challenges, with a seamless integration with existing legacy systems
  - Technologies will be dev., tested and deployed (multi-parameter sensors)
  - A community of adopters will be created
  - The potential of the Fiware4Water solution will be showcased

SDG Focus : 6


6 CLEAN WATER AND SANITATION
ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL
BILLIONS OF PEOPLE STILL LACK ACCESS TO SAFE DRINKING WATER, SANITATION AND HYGIENE IN 2020
2 BILLION PEOPLE
26%
LACK SAFELY MANAGED DRINKING WATER
3.6 BILLION PEOPLE
46%
LACK SAFELY MANAGED SANITATION
2.3 BILLION PEOPLE
29%
LACK BASIC HYGIENE
ENSURING UNIVERSAL ACCESS IS FUNDAMENTAL FOR COVID-19 RECOVERY
2.3 BILLION PEOPLE LIVE IN WATER-STRESSED COUNTRIES (2018)
BETWEEN 1970 AND 2015, NATURAL WETLANDS SHRANK BY 35%
3 X THE RATE OF FOREST LOSS
129 COUNTRIES ARE NOT ON TRACK TO HAVE SUSTAINABLY MANAGED WATER RESOURCES BY 2030
CURRENT RATE OF PROGRESS NEEDS TO DOUBLE
THE SUSTAINABLE DEVELOPMENT GOALS REPORT 2021: UNSTATS.UN.ORG/SDGS/REPORT/2021/

SDG 6 project contributions

Local Water forum



- Local water forums created
  - Great Torrington, Athens, Amsterdam… Cannes, Timisoara
- 26th now. : members + counter parts in Africa & South America
- Provide Citizen engagement mechanisms
- Collaboration : UN environment, JRC, Worldbank

Demo Case #1: raw water supply optimization in Athens (GR)

FIWARE 4 WATER

egm

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6 CLEAN WATER AND SANITATION

.4

6 CLEAN WATER AND SANITATION

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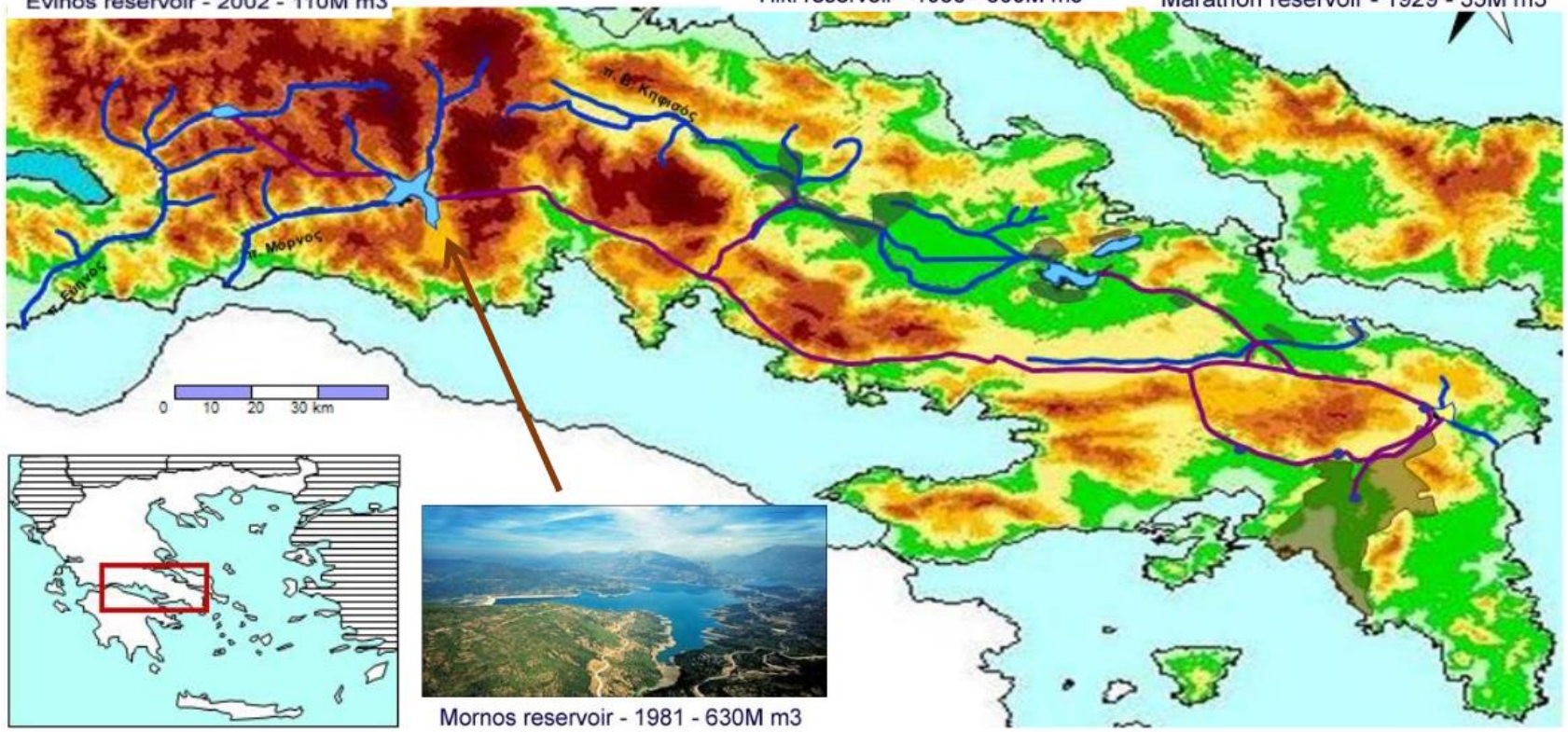
Evinos reservoir - 2002 - 110M m3

Yliki reservoir - 1956 - 600M m3

Marathon reservoir - 1929 - 35M m3



Mornos reservoir - 1981 - 630M m3

Demo Case #2: Water distribution system management in Cannes (FR)

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6 CLEAN WATER AND SANITATION .4

6 CLEAN WATER AND SANITATION .5

Demo Case #3: Intelligent control of WWT in Amsterdam (NL)

FIWARE 4 WATER

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6 CLEAN WATER AND SANITATION

-3

6 CLEAN WATER AND SANITATION

-5

Demo Case #4: Smart metering & citizen engagement in UK

FIWARE 4 WATER

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Technical approach

Evaluating SDG indicators

FIWARE 4 WATER

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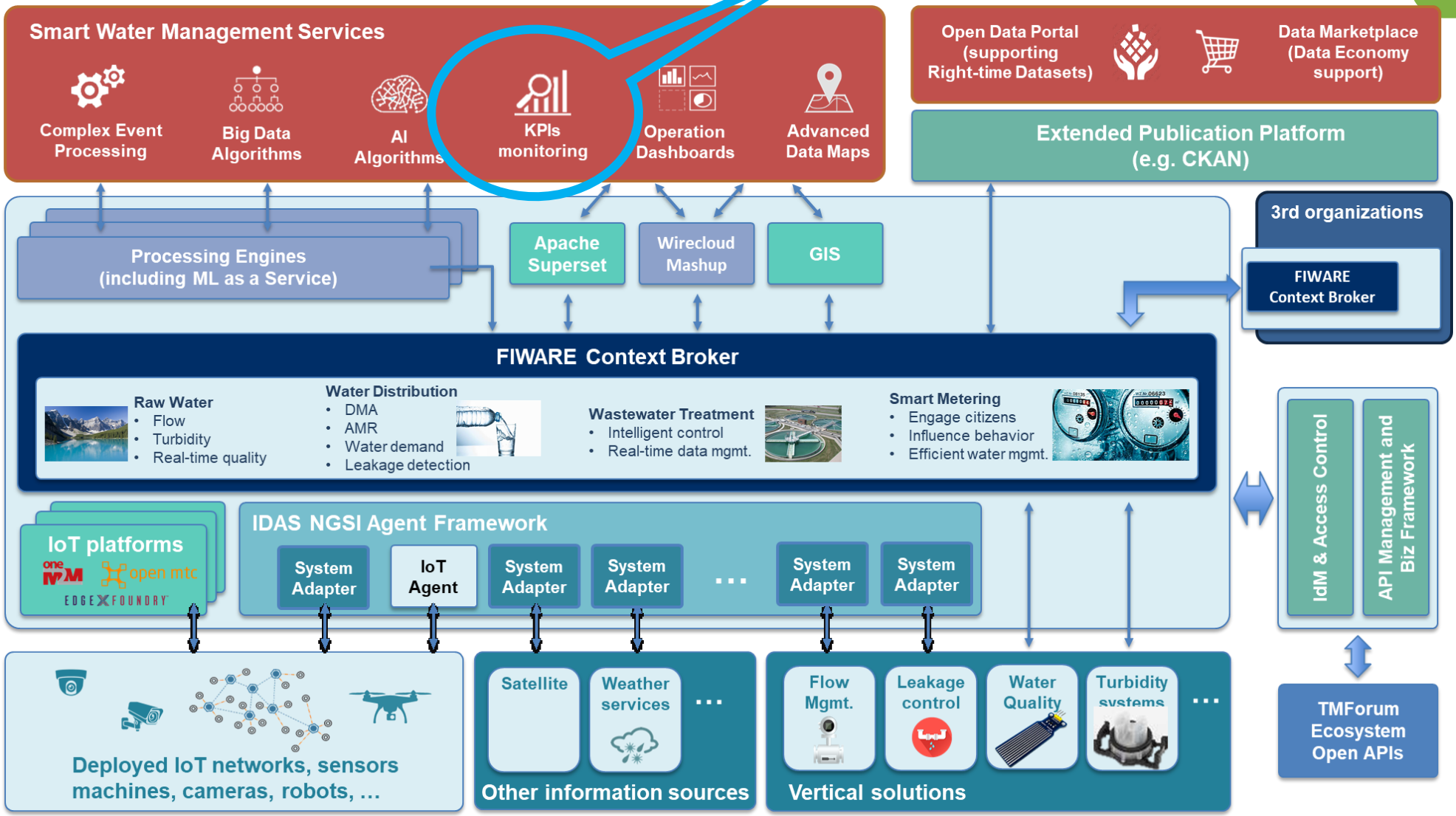
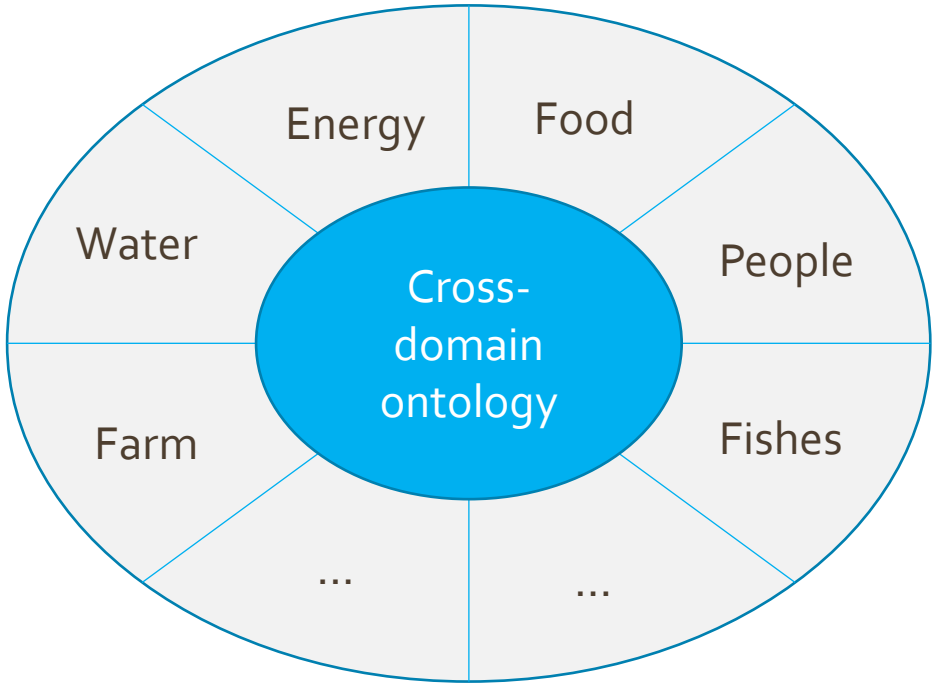


Modular approach

- Open-source
- Large Community
- European standard

Open-standards as a basis

- **One interface to connect all components**
  - Based on standardised data exchange interfaces
    - Restful API
  - **Cross domain capabilities of the data model**



NGSI-LD

- **Open-source ecosystem**

https://www.fiware.org/wp-content/uploads/FF_PositionPaper_FIWARE4DigitalTwins.pdf

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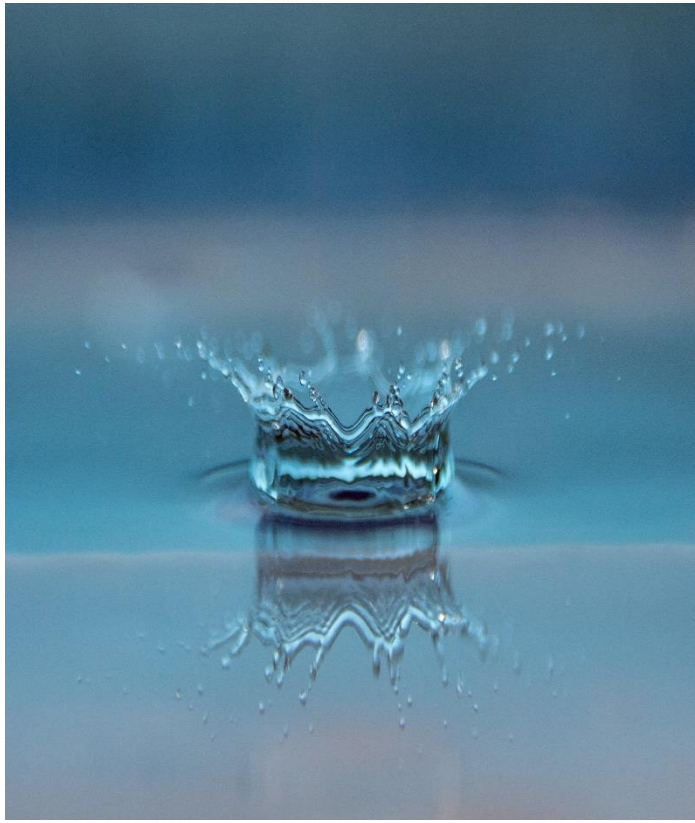
Challenges to monitor stormwater with IoT

Andreas Englund, IVL Swedish Environmental Institute



Background

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- Climate change and urbanization have increased cities' challenges for managing wastewater, stormwater and flooding events.

- How can cities handle these in a cost-effective way, while addressing UN Development Goals, EU policies and directives, engaging citizens in sustainable water management as well as contribute to a growing market for water-related SMEs?

- That is the central question within the Horizon 2020 SCOREwater Innovation project. SCOREwater ensures the resilience of European cities.

Project partners

SWEDEN
IVL
Talkpool AB
SWEHYDRO
CGEA
Universeum

SPAIN
ICRA
EURECAT
IERMB
SCAN
BCASA

THE NETHERLANDS
CIVITY BV
COA
Future City
HR

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@SCOREwaterEU

SCOREwaterEU

Focus and goal

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The goal of SCOREwater is to develop, collect data and test water-smart digital solutions and best practices to strengthen cities' resilience focusing on wastewater, flooding and stormwater monitoring and management.

- Amersfoort - Flood prevention and climate resilience
- Barcelona - Resilient sewer systems and sewer sociology
- Göteborg - Water-safe infrastructure projects

Needs of the cities

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- The cities have a large infrastructure of wastewater systems (sewage, stormwater and combined sewage and stormwater) to regulate and oversee.
- One of the main pains for the cities is the maintenance and environmental monitoring of the system.
- There is therefore a need of monitoring systems based on sensors for predictive maintenance and environmental monitoring of wastewater systems.
- The monitoring system needs to be low cost, low maintenance and easy to expand.
- The sensor elements need to be robust and have a multiple year maintenance free lifetime, to ensure that the operational costs don't get too high.
- This means that the sensor elements need to withstand the wastewater environment and have a long operational life length.
- Also, they need to be put into a system where a network of many sensors can produce data that could be analyzed by AI to find relevant patterns that assist predictive maintenance in the whole system.

Example of solution

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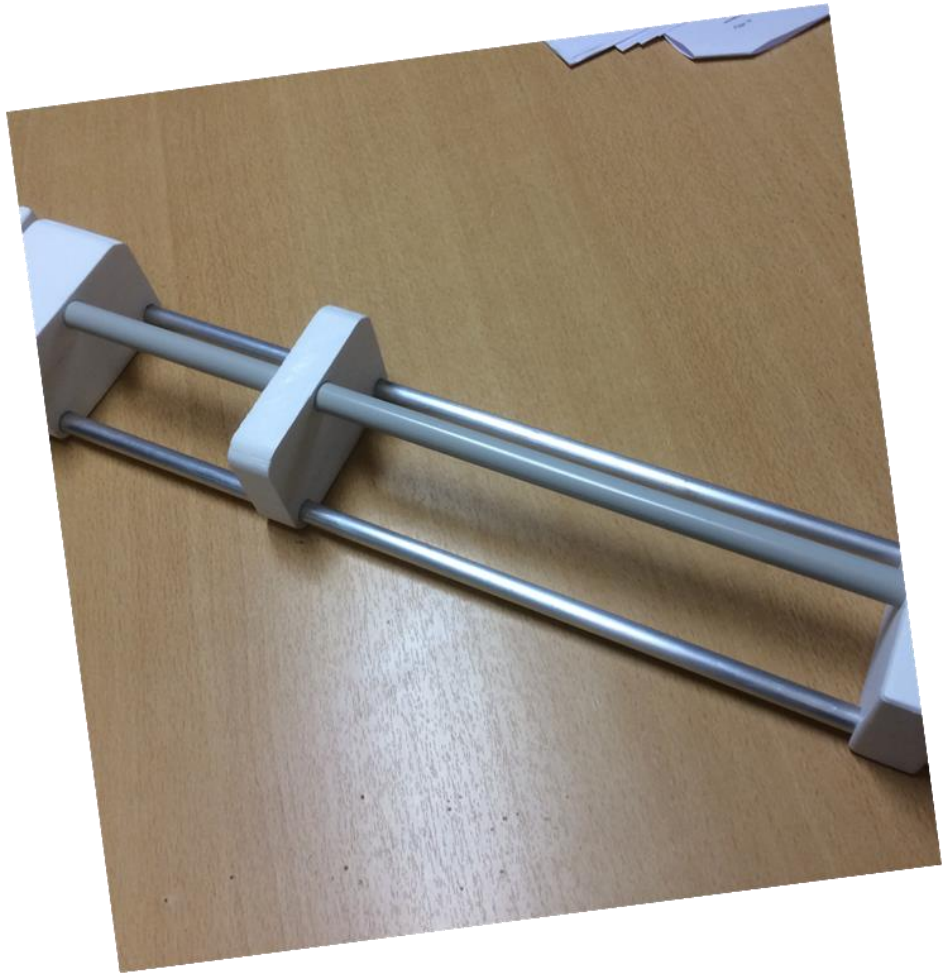
IVL Swedish Environmental Institute is developing **a patented turbidity and water level sensor**, called **"the Turbinator"** that meets the needs for a robust and connected sensor at low cost.

The Turbinator's can be used for **early warning** of pollutants or for **predictive maintenance** of a city's pipeline network for waste- and stormwater.

It is based on image processing and edge AI to predict turbidity and water level.



Innovative elements

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- **Low maintenance cost**, as it is mounted in a pipe close to the ground and placed above the water line/surface reducing the need for cleaning due e.g., to fouling
- **Low energy consumption** and fully powered by battery
- **Robust** and designed for monitoring wastewater in a dark environment

All together it **reduces the workload related to maintenance**, including cleaning the sensor as well as power supply preparations and mounting of sensors, significantly.

Benefits

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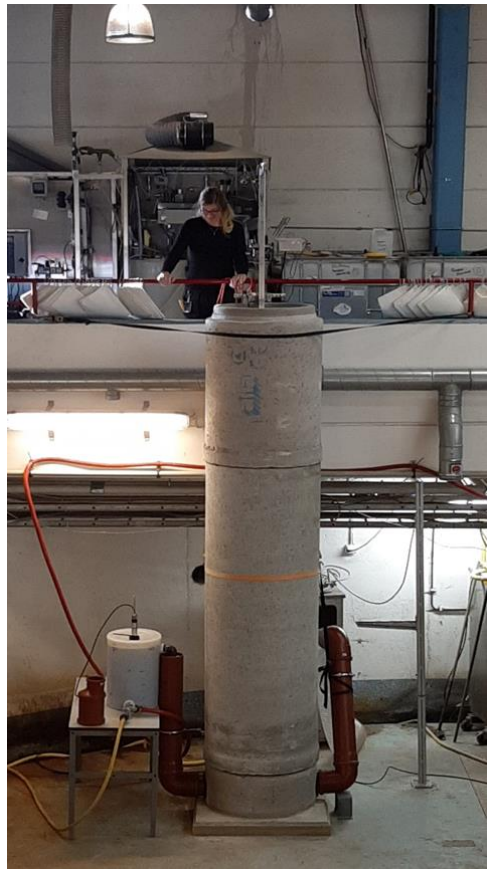
Main benefits with a connected, low cost, low maintenance turbidity sensor are:

- **Early warning of pollutants** in the waste- and stormwater system
- **Increased capacity** in the waste- and stormwater system, which leads to less environmental impact and fewer floods
- **Fewer manual inspections**, which saves time / travel and creates fewer traffic disruptions
- **Longer service life** on the pipe network, as measures such as flushing the system are taken only when needed

Leakage detection in the pipe network, by monitoring trends of turbidity in nearby sensors to distinguish local changes in sections of pipes.



Legislative obstacles

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- Online monitoring of pollutants from storm water and combined sewage and stormwater systems are usually not a legal requirement.
- There are therefore little incentives for utilities and other actors to invest in sensing technologies for water quality monitoring.
- It would therefore be beneficial to set legal requirements on online monitoring of pollutants from storm water and combined sewage and stormwater systems.
- One interesting area to start with could be environmental monitoring of storm water from all construction sites affecting water.

Stimulate upscaling

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- There are indications, that it is profitable to introduce sensing technologies in large scale to monitor wastewater systems (sewage, stormwater and combined sewage and stormwater).
- There are market-ready or near market-ready sensing technologies available.
- However, to make sensing technologies cost-effective the sensors must be produced in large scale.
- The water sector is economically a relatively small sector and it is difficult to create a volume market based on this sector.
- The water market is made up of numerous utilities of varying sizes, each with unique problems in need of tailor-made solutions.
- The digital solutions market is itself fragmented.
- Together, these divisions, coupled with a risk-averse culture, make adopting digital solutions a challenging task for many utilities and industry-wide standardization difficult to achieve.
- It is therefore essential to stimulate the creation of a volume market for sensing technologies. Since scale up on a fragmented market is a major barrier for many of the digital technologies in the water market policy needs to focus on this.

Conclusion

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If changes could be made in legislation and policy could focus on upscaling of IoT and digital solutions could contribute to fulfilling the SDGs.

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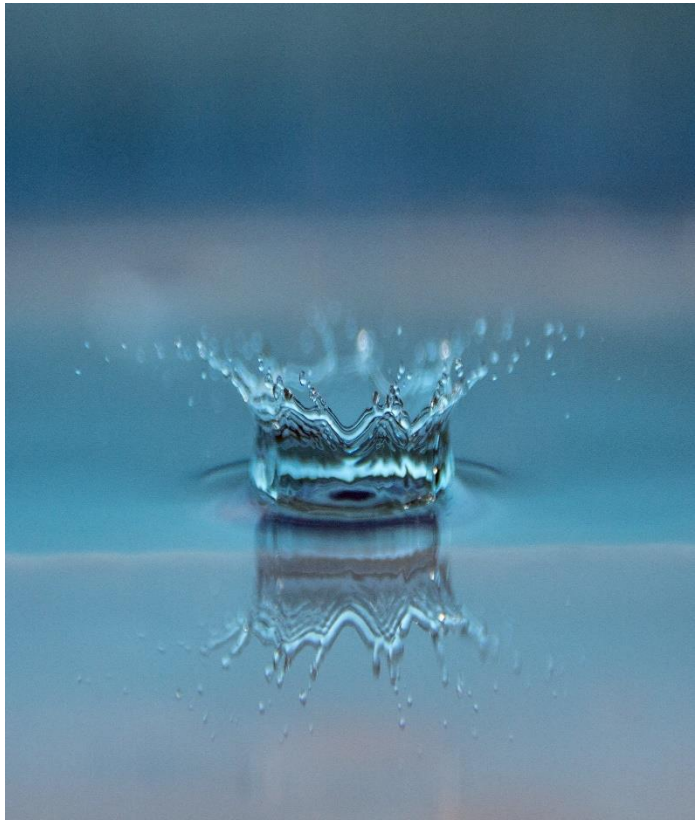
Harnessing digital solutions for sustainable development: Examples from (urban) water management

Ulf Stein and Benedict Bueb, Ecologic Institute



Digitalisation as cross-cutting topic in the SDGs

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Source: Mondejar et al. (2021)

Digitalisation and water in the SDGs

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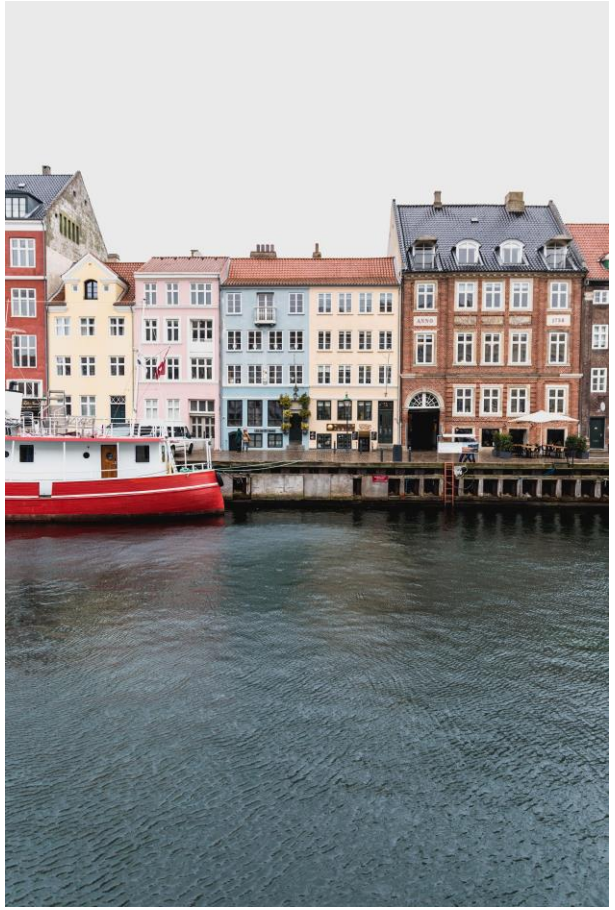
Potential of digitalisation to contribute to **SDG 6** **(and other SDGs)** by improving water infrastructure in many ways, including:

- collection,
- transport,
- cleaning,
- use,
- quality sensing

through artificial intelligence and data.



Guiding principles to harness digitalisation for sustainable development in the water sector

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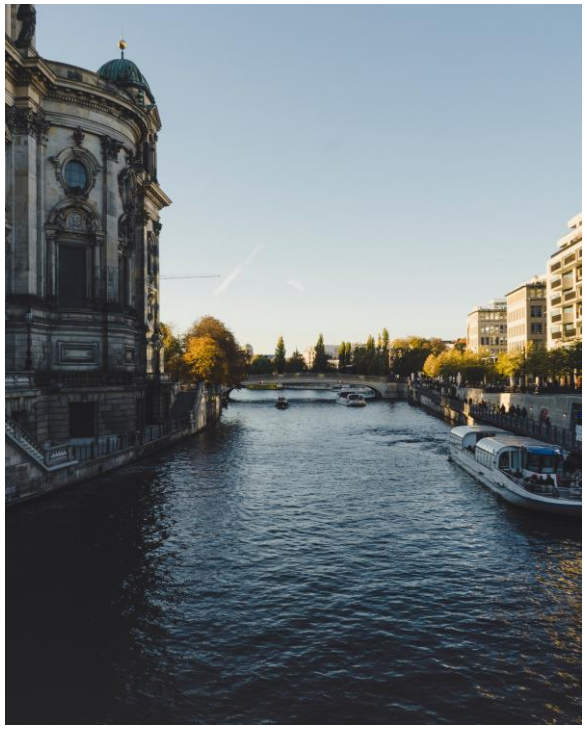
Monitor the contributions of digital technologies **holistically** by taking into account:

1. hydrological and environmental indicators (e.g. water quality);
2. societal indicators (e.g. changes in the access to water through digital means, data privacy issues, cyber security);
3. economic indicators (e.g. economic viability of digital solutions).



Such multi-dimensional assessments remain challenging and require:

1. adequate regulatory frameworks;
2. relevant personal and financial capacities;
3. digital solutions and literacy.

Governance is key!

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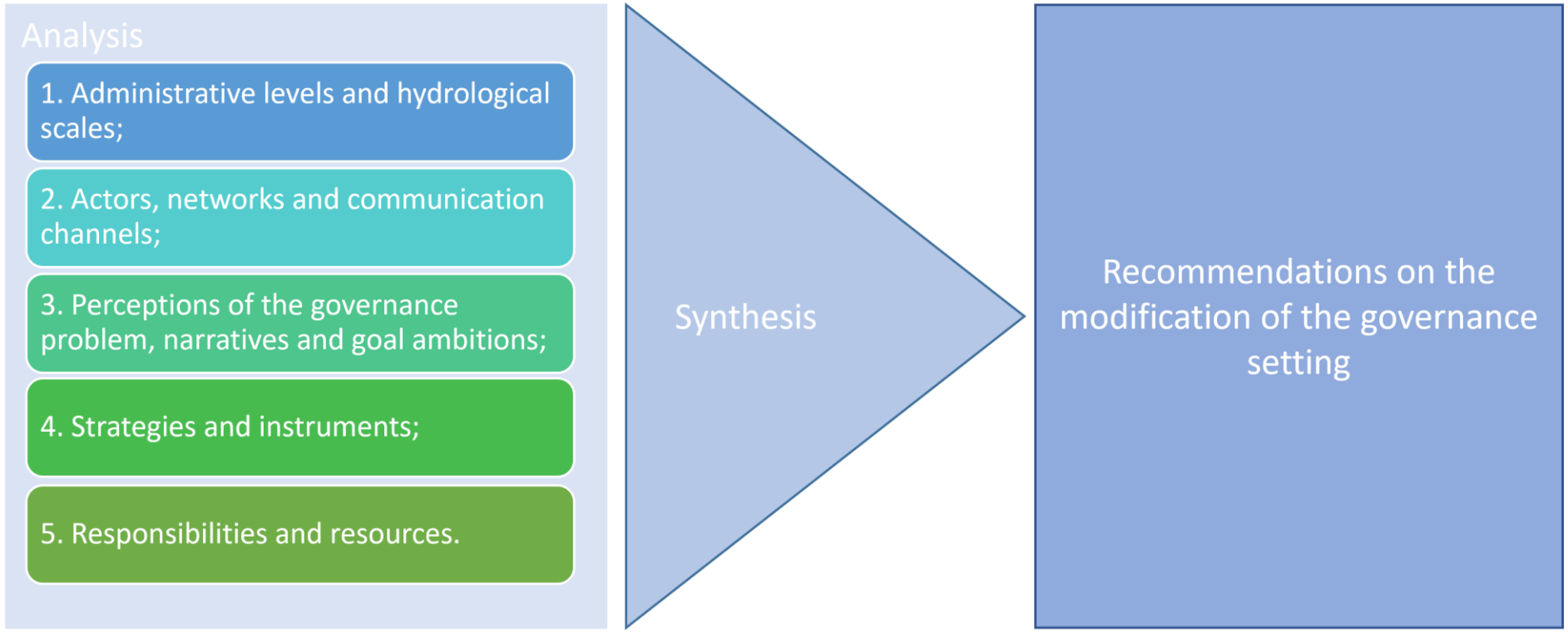
"Digital water governance is the social function that **regulates the management of water resources and provisions of water services** by the means of ICT solutions at different levels of society.

It comprises all actors, processes, regulations, structures and ICT solutions involved."

Knoblauch et al. (2019)

Governance Assessment Framework



Knoblauch et al. (2019)

Untapped potential? Digital solutions for education and public participation in the water sector

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Through mobile apps, citizens can:

- learn about specific water-related issues;
- contribute data on water quality and quantity while also increasing their awareness and knowledge on these issues ("citizen science")

Contribution to **SDG Target 6b.** "Support and strengthen the participation of local communities in improving water and sanitation management"

Digital Water City: Digital Solutions

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01 Sensors for real-time in situ E.coli and enterococci measurements

02 Machine-learning based Early Warning System for bathing water quality

03 Early Warning System for safe reuse of treated wastewater for agricultural irrigation

04 WebGIS platform for improved decision making in water reuse

5.1 Active unmanned aerial vehicle for analysis of irrigation efficiency

5.2 Match making tool between water demand for irrigation and safe water availability

06 Serious game on the water reuse, carbon, energy, food and climatic nexus

07 Mobile application for asset management of drinking water wells

08 DTS sensor for tracking illicit sewer connections

09 Sensors and smart analytics for tracking illicit sewer connections hotspots

10 Augmented reality (AR) mobile application for groundwater visualisation

11 Sewer flow forecast toolbox

12 Interoperable Decision Support System (DSS) and real-time control algorithms for stormwater management

13 Web platform for integrated sewer and wastewater treatment plant control

14 Low-cost temperature sensors for real-time combined sewer overflow (CSO) and flood monitoring

15 Smart sewer cleaning system with HD camera and wireless communication

Main Links of DWC solutions to SDGs

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Example: Making groundwater visible

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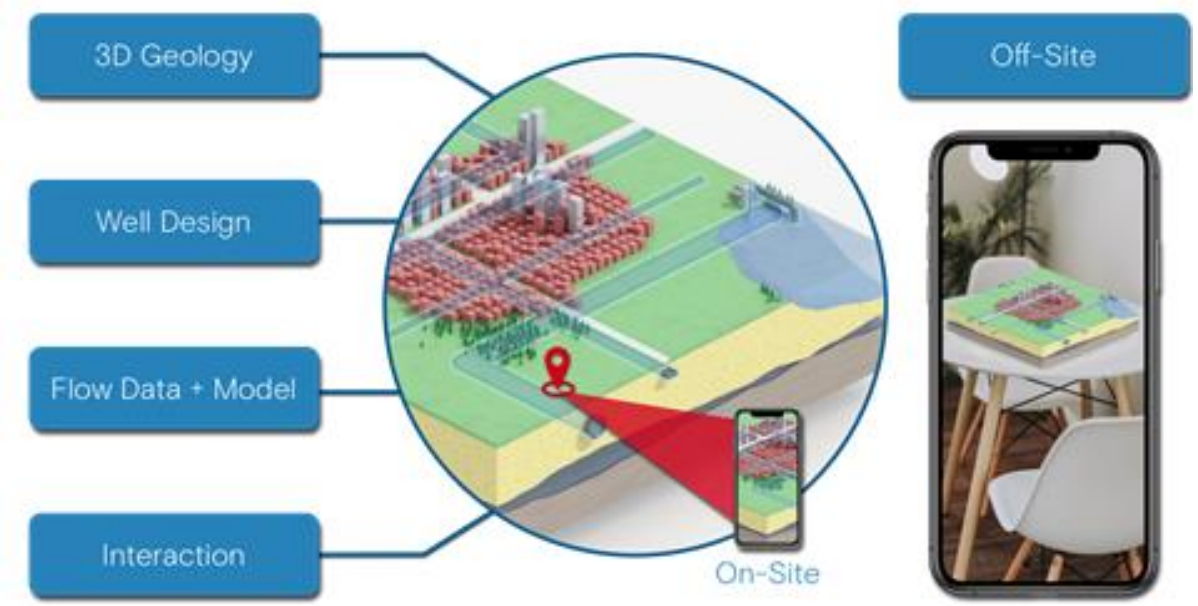
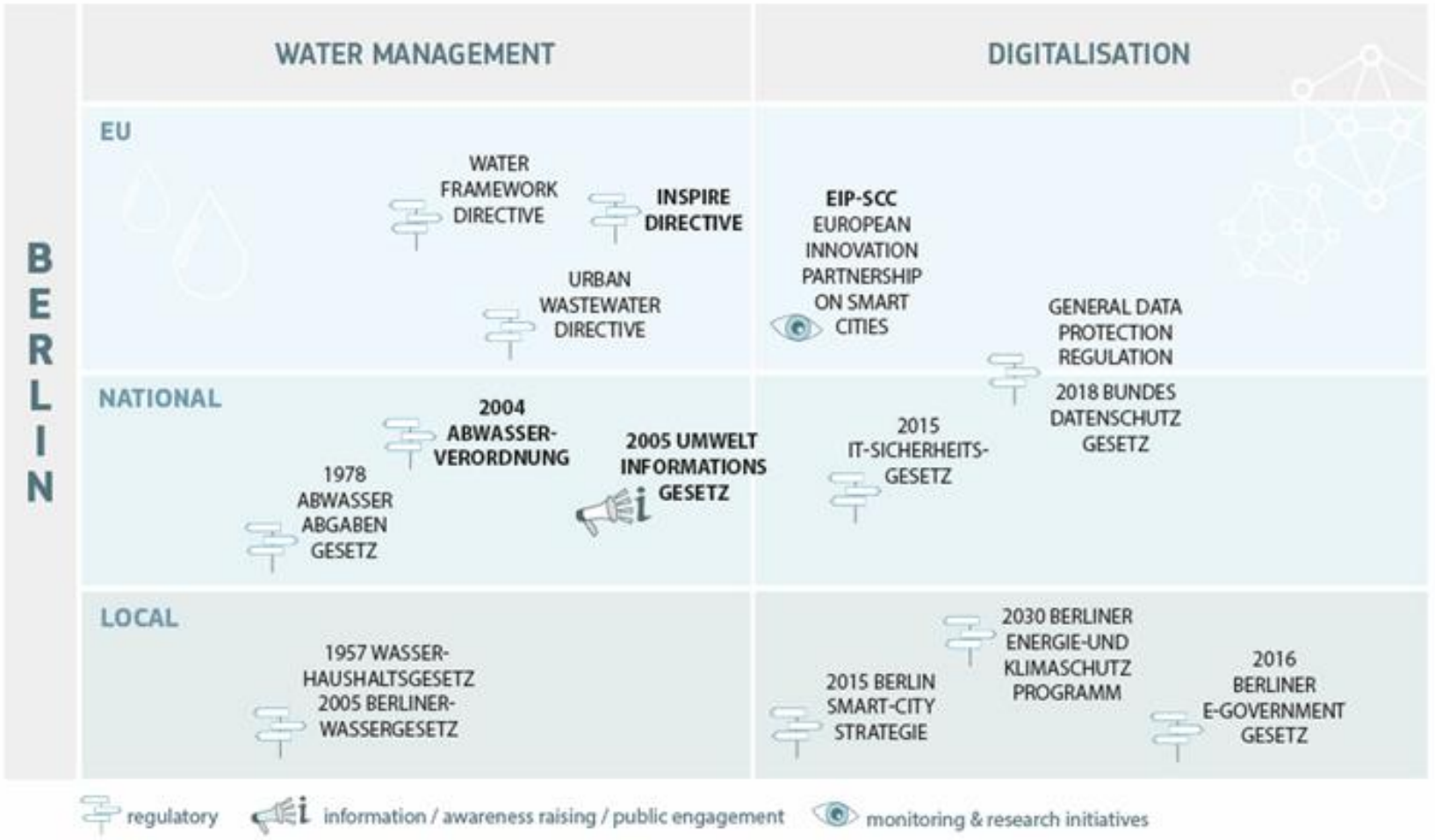
Augmented reality application to visualize challenges of groundwater management (AR4GW)



Policy Matrix – Berlin Case Study



Digital Water Governance in the EU

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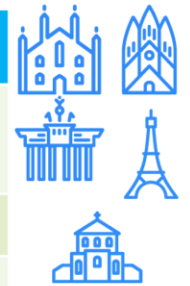
CHALLENGES	OPPORTUNITIES
EUROPEAN CITIES	
Digital water governance is still at the early stage	Crucial role of EU policies in enhancing smart water management
Lack of digital skills in the water sector	Increasing demand for smart solutions
Unsolved data protection and cybersecurity issues	Wide range of unexplored benefits
Increasingly high requirements of monitoring and reporting	
BERLIN	
Intersection between digital and water policies is still underdeveloped	EU Policies have been widely transposed
Few actors involved in digital water governance	Multiple action plans and strategies on digitalization
No binding provisions on digitalization	Opportunity for small-sized firms to be forerunners



Source: Knoblauch, Felicetti, Stein et al., 2020

Example: Groundwater Visibility App

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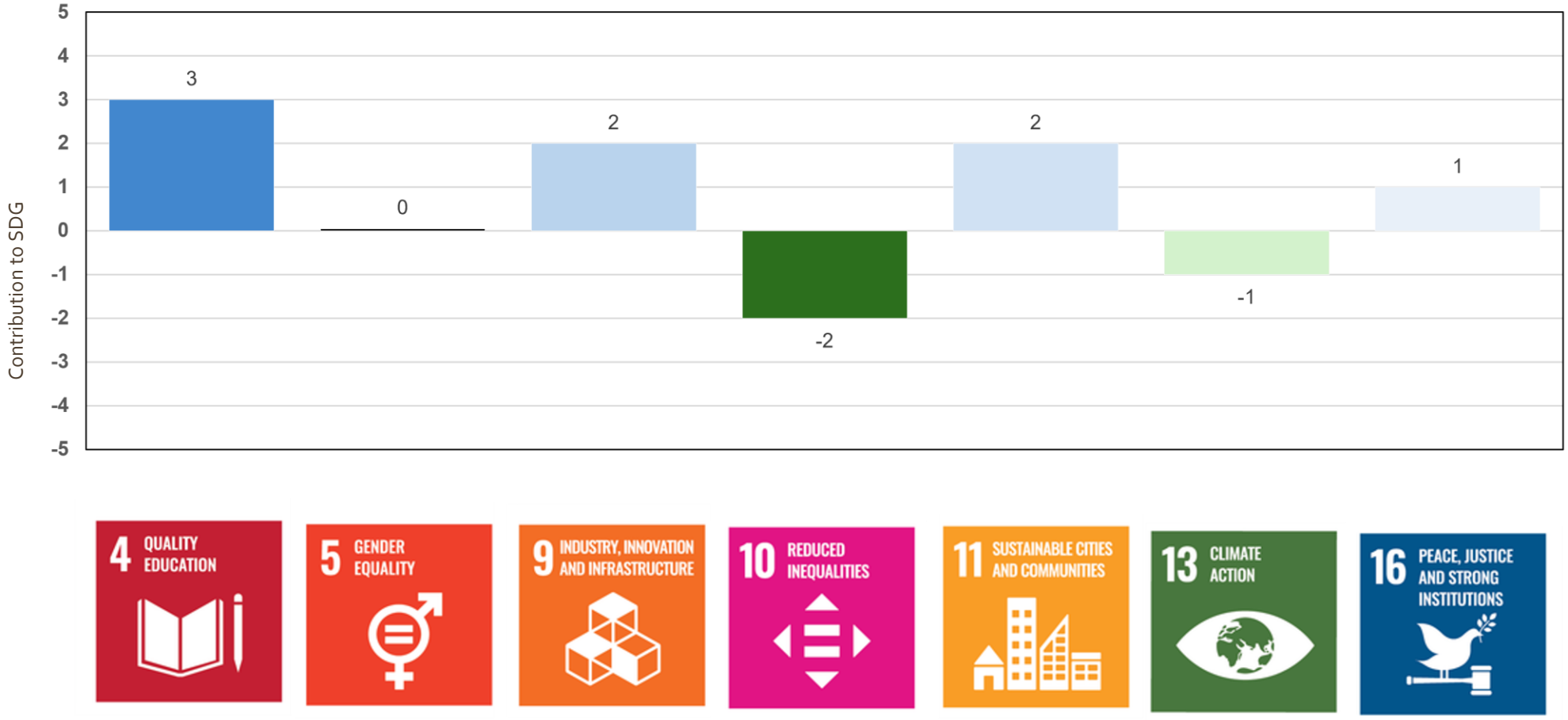

Take away messages

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1. Different digital solutions have distinct potential benefits and challenges re SDGs implementation. Some SDGs promises (e.g. Leave no one behind, social inclusiveness) are hard to tackle with digital solutions.
2. There is growing evidence of benefits enabled by digital solutions in water cycle operations (e.g. reductions in energy demand, improved control of emissions). However, these are often poorly communicated and wider social, environmental impacts are still not sufficiently explored. (Elelman et al., 2021)
3. Relevant digital and water regulations are changing currently. This moment of transition should be exploited to ensure a much better fit between technological advances and SDGs.

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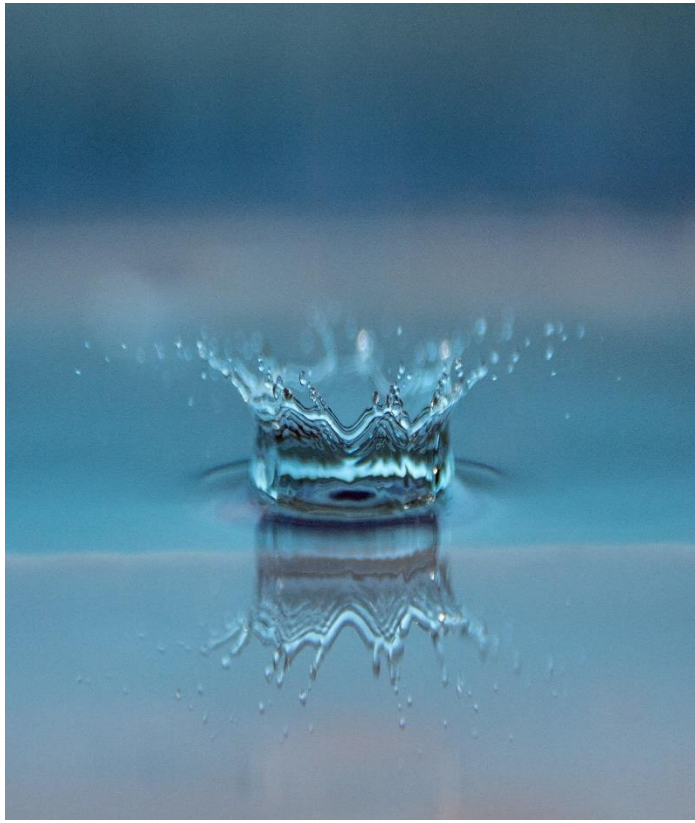
Panel discussion
&
wrap-up



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