1ST YEAR OF SCOREWATER

19 20

scorewater

INTRODUCTION

Fredrik Hallgren
PROJECT COORDINATOR OF
SCOREWATER IVL

This is an introduction to the SCOREwater project and what has happened during our first year. SCOREwater focuses on enhancing the resilience of cities against climate change and urbanization by enabling a water smart society powered by digitalization. The interest from our very dedicated stakeholders is what boosts us all to work towards our common goals!

MISSION

SCOREwater mission is to connect governments, universities, urban developers and technology professionals within the water society to develop and test water-smart digital solutions and best practices to strengthen cities' resilience.

VISION

SCOREwater vision is to link the physical and digital world for city water management solutions. To reach the ultimate goal to play a part in solution for climate change and urbanization, addressing several of the UN Sustainable Development Goals and the new Urban Water Directive.

PROJECT PARTNERS

SWEDEN
IVL
Talkpool AB
SWEHYDRO
CGEA
Universeum

SPAIN
ICRA
EURECAT
IERMB
SCAN
BCASA

THE NETHERLANDS
CIVITY BV
COA
Future City
HR

PROJECT ADVISORY BOARD

SISTER PROJECTS

Juanjo Hierro

Stanley Greenstein

Raymond Feron

Milo Fiasconaro

Antoni Rúbies

Christoph Ort

NAIADES

1) **NAIADES**
Smart water management for Sustainable Development Goals

FIWARE 4 WATER

2) **FIWARE4WATER**
Link the water sector to FIWARE

Digital Water.City

3) **DIGITAL-WATER.CITY PROJECT (DWC)**
Leading urban water management to its digital future

aqua3S

4) **AQUA3S**
Creating strategies and methods enabling water facilities to easily integrate solutions regarding water safety

INDEX

TIMELINE

"I am confident about the sustainability of the solutions after the end of the project's lifetime. I always say that Innovation projects is about setting up a new value chain that did not exist before. Hence the fact that beneficiaries are clustered around the 3 solutions plus located in the proximity of the corresponding demo-sites, is ideal for setting up and sustaining these new value chains supporting the individual solutions.

I am really excited to be appointed as a Project Advisor on behalf of EASME for this project. Let us try together to make the most out of this grant"

Sotirios Kanellopoulos
PROJECT ADVISOR EUROPEAN COMMISSION

TIMELINE

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Month	May	Jun	Jul	Aug	Sep	Okt	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Okt	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Okt	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Okt	Nov	Dec	Jan	Feb	Mar	Apr
Year	2019								2020												2021												2022												2023			
Total duration	48 months																																															
Milestones	1								2					3					4						5							6							7						8			

Platform Specification — Milestone 1
Prototype acceptance — Milestone 2
Lessons from testing — Milestones 3 & 4
Revision Evaluation — Milestones 5 & 6
Conclusions and beyond — Milestones 7 & 8

1 THREE CASE STUDIES

scoreWATER

INTRODUCTION TO THE CASES

Hanna Matschke Ekholm
PROJECT MANAGER IVL

SCOREwater focuses on enhancing the resilience of cities against climate change and urbanization. The three demonstration cities, with their varied climate and social conditions, cover most of the city typologies in Europe. Therefore, they are good places for the SCOREwater validation.

The demonstration cases address different challenges in different ways. Still, a lot brings them together. They are the showground where the action happens: it is here the field work is carried out, sensors are installed and deployed, techniques are implemented and tested, and stakeholders and partners meet.

The three cases in SCOREwater form clusters of partners, but they are also in sync with other parts of the project. We have regular meetings for the case leaders to make sure we are on the right track, to exchange experiences and learn from each other. For me, as coordinator of the cases, it is clear that they are the core of the project. The constant exchange of information, questions, data and dialogue is what takes the project forward.

Water runs literally through different sectors, processes and geographical areas and is managed by a variety of actors on different levels. This fact affects the

innovation potential. Therefore, we have included stakeholders with varied – and most likely conflicting – objectives in order to reach the needed innovation. This stakeholder forum of the three cases is worth highlighting.

In order to achieve the project goals, it is necessary to be united and have common working methods. A vital part is therefore meetings and workshops for partners and stakeholders.

All cases have developed so called user stories, in order to help development of the digital platform. They have been the main focus for some workshops, a good way to create common engagement. All cases have also worked with business canvas methods in order to sort out business opportunities, user needs etc.

Last, but not least: What brings the cases together is the enormous ambition and commitment to make our cities a little bit more resilient, a little healthier, a little cleaner and a little more sustainable. That's what it's all about.

The city of Barcelona and its citizens envision the city to continue being a digital global benchmark to other cities by linking innovation to social and economic justice, solidarity, ethics and gender equality by promoting the interests of its citizens (*The Barcelona City Council Digital Plan*). Barcelona is part of the 100 Resilient Cities project and is currently shaping its strategy to enhance resilience through the Climate Plan of Barcelona. SCOREwater contributes to the enhancement of resilience by collecting new data which allows faster and better-informed decisions. The Barcelona case within SCOREwater will bring together technology and imagination to allow new means of decision making in cities.

The sewer system is an untapped source of information that could be exploited and the SCOREwater project aims at demonstrating benefits in exploiting this resource and at developing related workflows. Sewage contains valuable information about lifestyle habits and waste management practices of inhabitants. Amongst other things, this information can be used to: i) monitor at a fine spatial and temporal resolution the consumption pharmaceuticals, especially pertinent, is the consumption of antibiotics as it is linked to antibiotic resistance through overuse or misuse, ii) prevent discharges from households of wet wipes, oils and greases to the sewer system that damage the network and may cause blockages, and iii) decrease sewer maintenance costs by having

a well-monitored system that allows preventive maintenance to be carried out in order to reduce non-scheduled maintenance. The approach involves the deployment of monitoring stations in the sewer network. Online sensors will be installed to monitor water quality and flows, which can prevent the generation of bad odours and the corrosion of sewers network components.

In the case study of Barcelona, three neighbourhoods will be monitored over a whole year. Composite sewage samples will be collected and brought to the lab for chemical and microbiological analysis. These analyses can reveal new ways to plan public awareness campaigns. Through the SCOREwater project, a technical know how will be acquired in the realm of: i) engineering – the selection of sampling points, design of sampling stations and selection of sampling strategies, ii) chemistry – evaluation of target and non-target analytical methods, and iii) microbiology – how to obtain information from the sewage microbial communities and their

genetic material. All the analytical data will be analysed in tandem with information collected from health databases (on the pharmaceuticals prescribed, lifestyle habits and health status), with information on the socio-economic status of the inhabitants and with information obtained from a telephone survey.

The Barcelona case is engaging stakeholders through a series of workshops; the ultimate applicability of the approach needs the support from public water and wastewater sectors, health agencies and companies in charge of managing sewers. The stakeholders in the Barcelona-case include i) public bodies and associations dealing with the operation and maintenance of sewer systems, ii) public health organizations in charge of defining public awareness campaigns on health issues, iii) associations in charge of defining new strategies and policies for proper disposal of waste material, iv) companies that provide services and equipment related to the operation of sewer systems and v) research centres on health issues.

The wide spectra of stakeholders within the case study of Barcelona provide different points of view and widen the possible future applications of using sewer systems as a source of data.

The project outcome is a smart water management system embedded into the SCOREwater platform of Barcelona. In more detail we will obtain the following outcomes: i) a systematic manner for processing water quality and water quantity information to elucidate population habits; ii) extending existing water quality sensors to monitor oils and greases from domestic wastewater; iii) an innovative service to design health and environmental awareness campaigns; iv) a data driven model for sewer maintenance which uses citizen science.
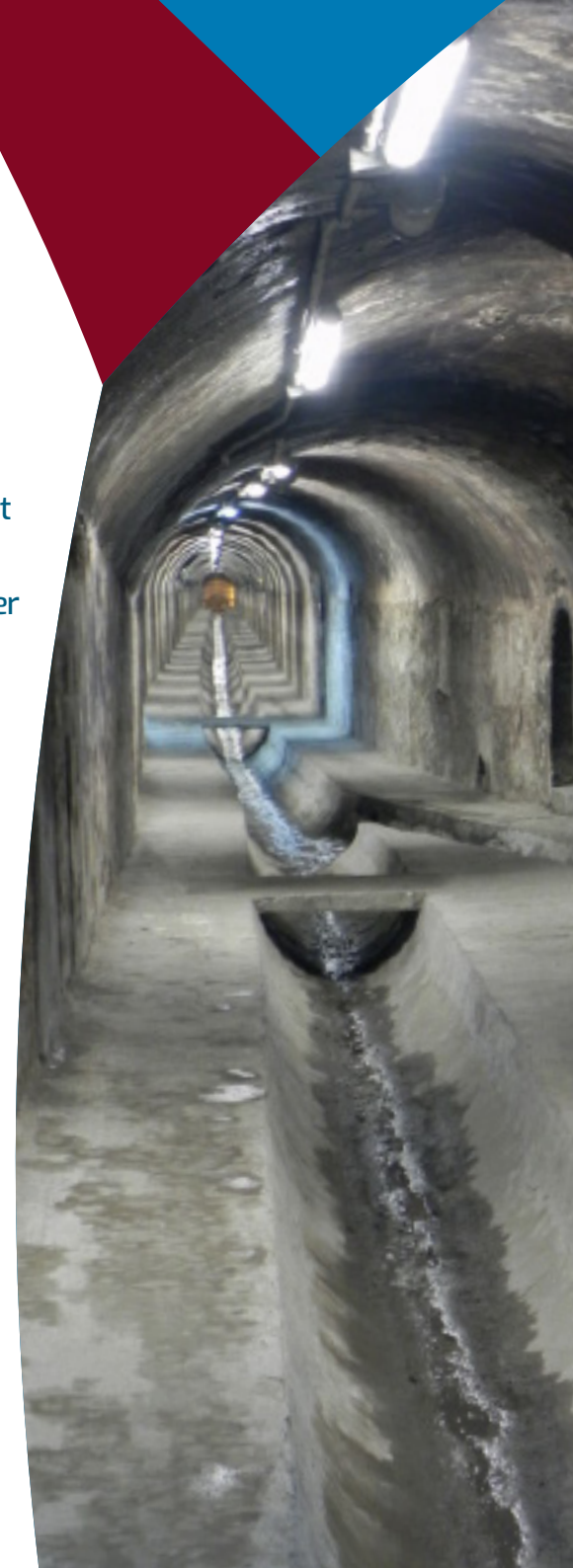
ACHIEVEMENTS

ACHIEVEMENTS YEAR 1:

- Stakeholders engagement started from the very beginning of the project. The first stakeholder workshop brought together 23 participants from 13 different organizations.
- Three sampling points representing the collection of sewage from approximately 40,000 inhabitants; each of the sampling points represents a neighbourhood with different socioeconomic status.
- The requirements needed to be met by the sampling stations have been defined and are the basis of the sampling stations to be constructed. These monitoring stations will include online sensors from scan Iberia and tailor-made autosamplers. Preliminary feasibility testing of the pumping capacity to lift wastewater from the sewer to the stations (at the ground level) was carried out.
- Analytical methods to analyse pharmaceuticals from sewage samples were fine-tuned.
- First iteration of the sewer maintenance model based on Artificial Intelligence completed.

EXPECTED TO ACHIEVE FOR YEAR 2:

- In September the custommade sampling stations will be deployed. In an automated fashion they will be able to sample wastewater proportionality to the flow and store the sample in a refrigerated unit until collected for analysis.
- Online sensors will be connected to the SCOREwater platform to allow real time monitoring and the start generated data that will be used to predict subsequent problems.
- Sewage information mining will get started. The samples collected from the sampling stations will be processed at the labs of ICRA and data on pharmaceutical consumption of the inhabitants produced.
- The telephone survey will be designed and executed to gather the responses from the inhabitants of the three neighbourhoods selected.
- User stories and business models will be defined.

"This project will help us reduce pollution at source and minimizing the discharge of improper waste to the toilet. SCOREwater will allow better communication with stakeholders for the continuous improvement of the urban water cycle."

Maria Jose Chesa Marro
HEAD OF ENVIRONMENTAL AND EXTERNAL RELATIONS SERVICE // BARCELONA WATER CYCLE – BCASA

In the next 20 years, more than 100 billion Euros will be invested in construction, reconstruction, expanding and densifying the city of Göteborg. Case study Göteborg aims at potential environmental impact on water quality of constructing activities at and down-stream the construction sites.

Furthermore, the case will raise public awareness of urban surface water quality in general and promote "water-friendly" behaviour, thus fostering a water-responsible society.

The first big challenge has been to design a monitoring system for water quality at the railway tunnel construction site West link at the Central train station. Maps and GIS-layers were analysed to analyse the water flow from the construction site through the water purification treatment and storm water system to the recipient, Göta river. Specifications for the monitoring points were defined and several proposed monitoring point candidates were evaluated.

In this process, a group of stakeholders has been involved, not least through two meetings. The group covers a wide spectrum of interests: construction companies, construction consultants, authorities and representatives from the city.

The commitment of the stakeholders has provided many valuable contributions that have helped to include a wide range of interests when designing the water monitoring system.

At the end of the first year the field work with instrumentation started. The first water quality sensors were installed and the initial tests of the whole chain from raw sensor data to data transfer, quality control and data processing started. These efforts will continue and expand towards data delivery to several other parts of the SCOREwater project during later in 2020.

The case leader for the case study of Göteborg is Filip Moldan, IVL Swedish Environmental Research Institute.

ACHIEVEMENTS

ACHIEVEMENTS YEAR 1:

- To identify and engage a group of stakeholders from all major organizations relevant to the case study

- Set up several workshops with project partners and stakeholders regarding value chains, business opportunities and measuring resilience.

- Organize two stakeholder meetings to present and discuss the project

- Identify a monitoring system for measuring water quality in the storm water system

- To started instrumentation at the identified monitoring points

- To present the case and project at the fair Water and Waste in Mölndal, Sweden.

EXPECTED TO ACHIEVE FOR YEAR 2:

- To complete instrumentation of the monitoring system

- To start transferring data to SCOREwater platform

- To carry on two stakeholder meetings

"Gothenburg is a rapidly expanding coastal city. The SCOREwater project is interesting to us since it aims to reduce water pollution from construction sites by developing water-smart digital solutions for stormwater management and monitoring."

Josefine Evertsson
ENVIRONMENTAL ANALYST AT THE
UNIT OF URBAN ENVIRONMENT
CITY OF GOTHENBURG

AMERSFOORT CASE
FLOOD PREVENTION AND CLIMATE RESILIENCE

SUSTAINABLE DEVELOPMENT GOALS

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

Like many cities, the City of Amersfoort (COA) needs to take measures in its public space to cope with the effects of climate change. Within the SCOREwater project, COA intends to use data and technology to do so more effectively. The project focuses on issues related to groundwater, precipitation, soil moisture and (experienced) heat COA wishes to make sure that the city remains to be a city that is nice to live, work and recreate in.

Specifically, COA is expanding its current sensor network to gain more data and insight into (potential) problem areas surrounding the central railway area and the neighbourhood of Schothorst. By adding sensors on more locations and adding additional climate related indicators, a more detailed image of the current situation within the city will become available. This and additional information will be used in the development of two hydrological models, which will show which areas are vulnerable to water-related issues and what measures have to be taken to deal with these risks.

An important distinguishing feature of the COA case is that the city collaborates with the citizen science project Measure Your City (www.meetjestad.net). Within Measure Your City citizens make their own measurement plan, formulate their own hypotheses and build their own sensors. By working together with these residents, COA intends to collaborate towards a larger, sustainable measurement network with which all involved parties can get a detailed picture of the effects of climate change on and within the city. By doing so, awareness about climate change and the measures needed to make the city future-proof is stimulated.

Lastly, COA is examining whether a digital twin of the city can help in urban planning. Specifically, a digital twin can support decision making by not only visually showing proposed changes, but also calculating the expected effects these changes have on climate related indicators. Whether or not this will actually be successful is one of the key questions for the COA case in year 2.

ACHIEVEMENTS

ACHIEVEMENTS YEAR 1:

- Several workshops were organized with collaborating parties, among others attended by representatives of Measure Your City, the Water Authority Vallei en Veluwe and the University of Applied Sciences of Amsterdam.

- The internal project plan was finalized.

- A workshop was organized with colleagues from the City of Amersfoort to discuss the opportunities and risks related to digital twins;

- The project was presented at the Get Connected Conference in October, a regional conference at which developments within the Utrecht region are presented and debated;

EXPECTED TO ACHIEVE FOR YEAR 2:

- Instalment of additional sensors in both geographical areas included in the project; the data gathered by these sensors will be published as open data on the open data platform.

- Completion of both hydrological models.

- Testing of the citizen science sensors 'in the field'.

- Organizing workshops with residents to proactively involve them in the project.

Huug Meijer
PROJECT LEADER AMERSFOORT CASE
MUNICIPALITY AMERSFOORT

2 GATHERING THE DATA

scoreWATER

SENSORS

*Interview
with Jordi Raich
MANAGING DIRECTOR S::CAN IBERIA*

HOW TO CHOOSE WHICH SENSOR TO USE?

It starts with listening to the wishes of the client Jordi Raich, the Managing Director of s::can Iberia explains. S::can is one of the 14 project partners in the SCOREwater project, and they develop the sensors used in the Barcelona case study. "It's not only the sensor itself that is important". Mr. Raich continues, the sensor needs to come with the correct algorithm to be able to function as accurate as possible and on top of that there is a software layer that processes the gathered data.

WHAT'S SO SPECIAL WITH THE BARCELONA CASE?

The fact that these sensors will be used in the sewers is already a special feat on it's own. Monitoring sewers is difficult due to the (possible) toxic environment and the challenge to keep the sensor clean. Furthermore it's difficult to install these sensors in sewers and it requires other equipment like pumps to be able to gather the measurements. The lessons learned from this process can be used in future projects.

HOW MANY RESEARCH SITES ARE THERE?

For now there are three test sites that are carefully selected, based on certain socioeconomic aspects, by the parties active in the Barcelona case. These test sites are located in three different neighbourhoods and won't be disclosed to prevent manipulation of the research data.

HOW MANY SENSORS ARE DEPLOYED?

There have been tests, but due to the COVID-19 pandemic there are some delays in the placement of the sensors, but it won't take long before they are up and running.

WHAT MAKES YOU PROUD

Proud for adapting the technology to the specific circumstances of the project. There are very ambitious parameters to monitor. Not only will the data help with maintaining the sewers, detecting blockages, but the data will also help to understand consumer habits better.
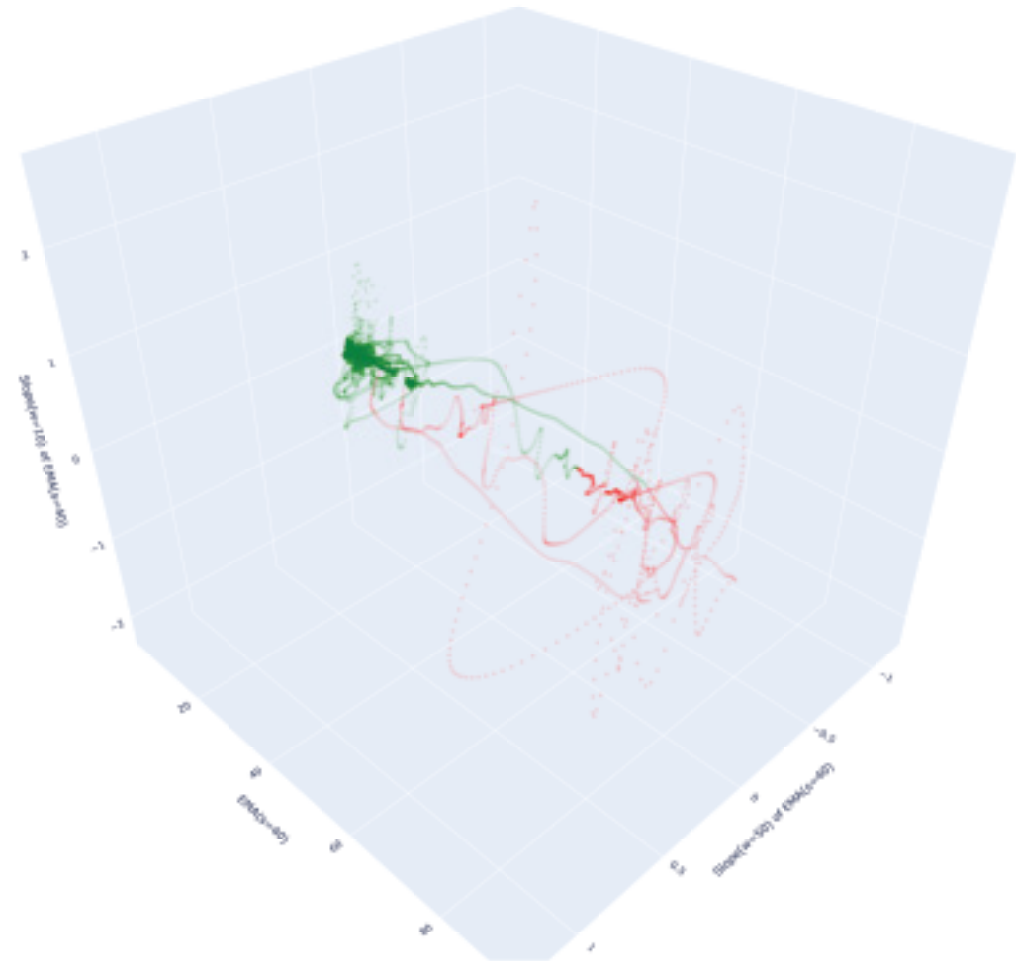
SENSOR VALIDATION

Edgar Rubión Soler
SENIOR RESEARCHER FUNDACIÓ EURECAT

The picture presents part of the analysis done during the Machine Learning process. It is used to visually validate that one hypothesis can be viable (checking visually that new features separate the classes)

HOW TO CHOOSE WHICH SENSOR TO USE?

Water urban environments may have hundreds or thousands of sensors which produces vast amounts of data. Nevertheless, if the data quality of a sensor is poor due to errors (for example, outliers, values out of range, flat values…), the data is rendered useless because it may lead to wrong decision-making. Therefore, an essential part of working with sensors is to apply methods to ensure the quality of raw data. AI techniques plays a vital role in this field contributing to more robust and accurate data. SCOREwater applies univariate and multivariate analysis based on Machine Learning and Data Science to pre-process RAW data ensuring data quality for future decision-making.

GENERATING VALUE FOR USERS

VALUE PROPOSITIONS

To assess the value for the stakeholders a process like the one described below is integrated within each case study.

1. Through means of a workshop or other modes of direct interaction with the stakeholders the value chain gets mapped.

2. With the gathered information a value proposition canvas is created, including the pains & gains.

3. The value proposition is pared with a market analysis.

4. Last but not least the business model is discussed, to ensure the continuation of the work being done within the SCOREwater project.

UNIQUENESS OF THE SCOREWATER PROJECT

· It gets a lot of different stakeholders around the table.

· Bridges are being built between the different stakeholders.

· The end goal is not abstract, concrete solutions are being developed within the three case studies.

· Woven into the structure of the project is the sharing of the lessons learned and the data gathered outside of the project itself, through the SCOREwater marketplace (currently under development).

*Stefan Lindgren
CTO TALKPOOL*

GENERATING VALUE FOR USERS

POSSIBLE USE CASES

We want to present a selection of the (possible) applications developments fostered within the SCOREwater project and the data that gets collected.

- On-site water treatment installations could integrate direct feedback. This could help them for example to protect their expensive filtration equipment.

- Wastewater monitoring for predictive maintenance in sewers.

- Wastewater monitoring to monitor public health in selected neighborhoods.

- Pinpointing with greater accuracy sources of water pollution.

- Sensors could be deployed to gather data on temperature and on water-related indicators. The data coming from these sensors could be used in digital models to assess whether the city is and remains to be climate-resilient.

- A water monitoring and management system for assisting and ensuring legal compliance of the waste water quality.
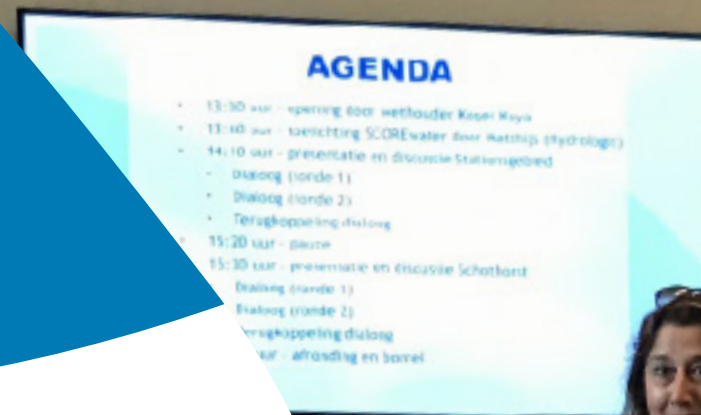
3 BUILDING THE PLATFORM

scoreWATER

BUILDING THE PLATFORM

Bas Vanmeulebrouk
SENIOR SOFTWARE ENGINEER/
ARCHITECT CIVITY

Data providers often publish their datasets using proprietary formats and API's whereas users want to combine datasets from different data providers using standardized formats and API's. That is where the SCOREwater platform comes into play: it will combine heterogeneous data from various sources into easy to use API's by harmonizing and standardizing the metadata and data, publishing them in an easy to use data market.

The SCOREwater platform consists of a number of components. The "Sensors and Data Sources" component collects metadata and data from sensors, 3rd party API's, static datasets and other sources. The SCOREwater Data Framework manages those metadata and data. The SCOREwater Intelligence Framework is used to run data driven models and the SCOREwater Data Market allows users to discover and subscribe to those metadata, data and models. As such, the SCOREwater platform acts as the linking pin between providers of data and models and users of those data and models.

Standardization and harmonization is achieved by applying the API's and data models provided by the FIWARE Foundation. FIWARE is a community driven framework of open source software, open standards and data models to facilitate development of smart IoT solutions.

4 YEAR 1
IN NUMBERS
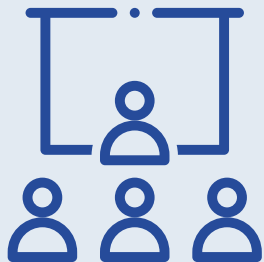
scoreWATER

14
consortium partners

60
persons working in the project (mix of researchers, city representatives, commercial)
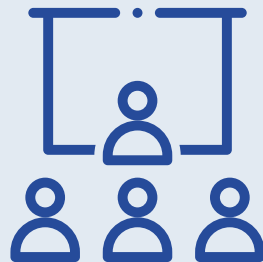
Gender distribution: 40% women, 60% men

2
consortium meetings (including kick-off)
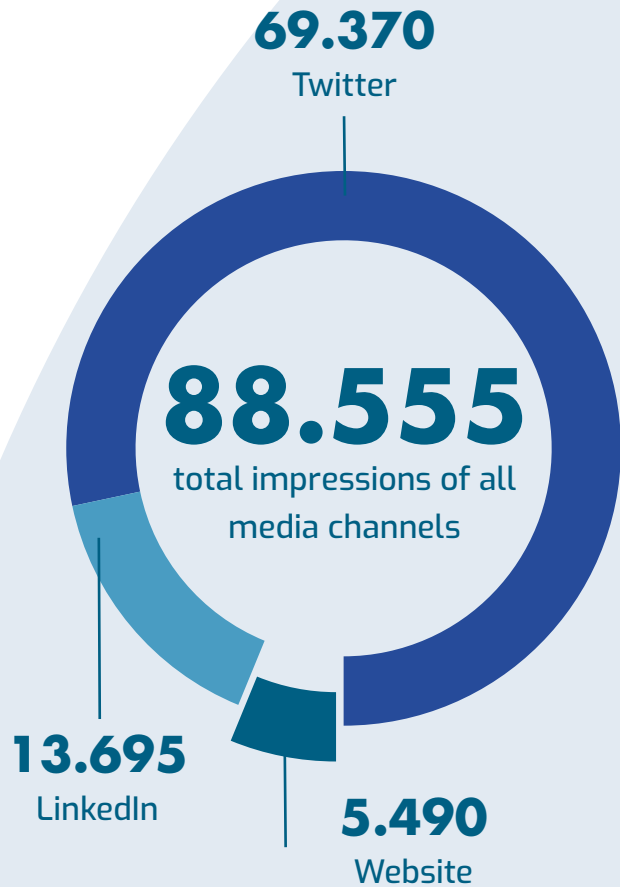
12
Scientific and Technical Committee meetings

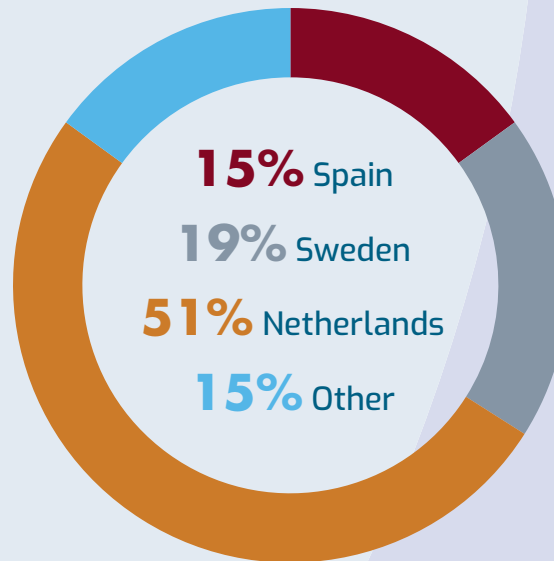**4**
case study stakeholder workshops

21
submitted deliverables

69.370
Twitter

88.555
total impressions of all media channels

13.695
LinkedIn

5.490
Website

650+
Monthly users

Locations of all our audiences combined
(Twitter, LinkedIn and website)

15% Spain
19% Sweden
51% Netherlands
15% Other

21
public releases

2 newsletters
2 papers
3 press releases
14 blogposts

Most viewed news article on the website.
Read here:

Recerca sobre pràctiques de sanejament a casa – Catalunya
24/04/2020

12

events in the last year
(until 30th of April 2020)

Mölndal
Göteborg

Amersfoort
Utrecht
Amsterdam

Berlin

Brussels

Barcelona

CONCLUSION

"By bringing together a team of experts highly qualified in their respective areas, SCOREwater is well equipped for taking on the challenges with digitalization in the city water domain."

The first year of SCOREwater has been a great success. We have both strengthened existing work relations and established new ones, while making good progress. Kicking-off with the **specification phase**, we round up the year with the **prototype phase**. This is a challenging project of high complexity. We are happy to see that the project participants are starting to reach a common understanding of the different activities across work packages and in the three case studies.

The world changed dramatically in the beginning of 2020 with the outbreak of COVID-19. Our thoughts are with all that have had a hard time. Although we had to adapt our way of work, we were able to reach the expected goals of the first year with only minor deviations.

LOOKING FORWARD

We know that the COVID-19 situation will have a bigger impact on the coming project work. Together we strive to mitigate those effects to have a fulfilling second year.

Looking ahead into the next phase, **Implementation**, there will be challenges but also exciting times when we start to see project results contributing to solve the stakeholders needs. We have good company in this quest to help the water sector make use of digitalization. Together with our sister projects we have started working on synergies for sensors and demonstration, how to use FIWARE, business models and communication.

Åsa Nilsson
PROJECT MANAGER IVL

scorewater