Synergy Group DigitalWater2020

Report on synergetic activities inside the portfolio of SC05-11-2018 projects

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Executive Summary

This document presents the synergies and common activities of five H2020 projects that started in the summer of 2019: digital-water.city, Score Water, Fiware4Water, Naiades and aqua3S. The first four were funded by the SC5-11-2018 call and the latter by the H2020-SU-SEC-2018-DRS-03. All these five projects have a common theme: Digital Water, with a variety of case studies and approaches, but also with several similarities in challenges, scope and goals.

This deliverable builds on a previous report delivered in May 2020 (Synergies inside the portfolio of SC05-11-2018 projects). This report 1) identified potential synergies between the sister projects, 2) highlighted common scope of work and complementarities and 3) presented the structure of the Synergy group **DigitalWater2020 (DW2020).**

DW2020 is an operational working group between five H2020 projects aiming at addressing synergies, helping each other and fostering collaborations on common topic. DW2020 is organised along five thematic areas/task forces: Task Force 1: Ontologies, Task Force 2: Sensors demonstration, Task Force 3: Business models, Task Force 4: Communication and Task Force 5: Policy, each with its own task force leader. Additionally a sixth task force (Task Force 0: Management) has been created, to coordinate the efforts and activities overall.

Building on the previous deliverable, this report gives 1) a detailed description of the activities carried out and 2) presents the main outcomes of the synergetic activities. It also 3) outlines the next steps for each task force and how the synergetic activities might be continued at the end of the projects.

Document Information

Programme	**H2020 – SC05-11-2018**
Project Acronym	**digital-water.city, Fiware4Water, Naiades, ScoreWater, aqua3S (common deliverable from all these projects)**
Deliverable 5.8	D7.5: Report on synergetic activities inside the portfolio of SC05-11-2018 projects, digital-water.city D5.7: Synergies with the SC05-11-2018 cluster, Fiware4Water D9.14: Plan of potential synergies between the other projects of the SC05-11-2018 portfolio, Naiades D8.7: Synergetic activities and their outcomes, ScoreWater For aqua3S this is not a GA Compulsory Deliverable
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Version	Date	Author(s)/Contributor(s)	Notes
V1	24.04.2022	Amorsi, Anzaldua, Hallgren, Le Gall, Stein	Task force update
V2	25.04.2022	Nicolas Caradot	Task force 0 + summary + intro + review
Vf	23.05.2022	Vamvakeridou-Lyroudia	Conclusions+ Review

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List of Acronyms/Glossary

DW2020	Synergy Group DigitalWater2020
DWC	digital-water.city project
F4W	Fiware4Water project
NGI	Next Generation Internet *The Next Generation Internet (NGI) initiative, launched by the European Commission in the autumn of 2016, aims to shape the future internet as an interoperable platform ecosystem that embodies the values that Europe holds dear: openness, inclusivity, transparency, privacy, cooperation, and protection of data.*
TF	Task Force
TFL	Task Force Leader
WPL	Work Packages Leaders
GA	Grant Agreement

I. Introduction

The EU H2020 call SC5-11-2018 was entitled: « Digital solutions for water: linking the physical and digital world for water solutions ». Four projects were funded out of this: digital-water.city, ScoreWater, Fiware4Water and Naiades. Given the theme of the call, it was expected that the four projects had a lot in common in their scope, goals and innovation content. All the above four projects started at the same time, in June 2019.

During the preparation of the Grant Agreement (GA), EASME suggested that these four projects should team up and develop synergies and common activities, so as to facilitate cooperation and enhance the impact of each project. This suggestion was included as contractual obligation for the four projects, i.e. that there would be two common deliverables, describing the synergies and cooperation of this group.

At the same time, another EU call, namely H2020-SU-SEC-2018-DRS-03 “Pre-normative research and demonstration for disaster-resilient societies” supported the funding of the project aqua3S. Given the thematic proximity between the two calls, it was suggested to “adopt” aqua3S as standalone project into the group of the four sister projects. Thus the group increased in size, comprising now five projects (4+1), with interests and activities in common around “digital water” themes and organized itself as the DigitalWater2020 (DW2020) group.

DW2020 is organized along five thematic areas / Task Forces (TF): Ontologies, Sensors demonstration, Business models, Communication and Policy, each with its own Task Force leader. Additionally a sixth task force (Task Force 0: Management) has been created, to coordinate the efforts and activities overall. Participation in the task forces is voluntary for the partners and researchers involved in the five projects, based on their interests and the specific tasks they are involved in their respective projects. The goal of the task forces is to do “real” work, with several regular teleconferences, investigating common problems and approaches, helping each other, exchanging knowledge to avoid “re-inventing the wheel” for specific challenges. Consequently several early career researchers are actively involved, together with more experienced older researchers, benefiting all from the knowledge exchange that takes place on a regular basis.

A first deliverable submitted in May 2020 (Synergies inside the portfolio of SC05-11-2018 projects) presented the scope and ambition of the group. The report 1) identified potential synergies between the above mentioned projects, 2) highlighted common scope of work and complementarities and 3) presented the structure of the Synergy group DW2020.

Building on the previous deliverable, this second report aims at presenting the concrete activities of the task forces as well as summarizing the main outcomes obtained in the frame of the collaboration. Finally, it outlines the next steps for each task force and how the synergetic activities might be continued at the end of the projects.

II. Task forces progress and accomplishment

II.1. Task force 0 : Management

Description of the activities carried out since the beginning of task force

The management task force is led by Nico Caradot (coordinator of DWC). It is mainly composed of the project coordinators and managers of the cluster and of the task force leaders. Task Force 0 is the unique general task force of DW2020, the other four being thematic. Its main objective is to manage the work done in the four thematic task forces and to ensure that the action plan is implemented. Its missions are to:

- manage the whole task forces and decide the addition or the remove of a task force,
- ensure that the work plan is implemented,
- support thematic task force leaders in their mission,
- decide collectively the acceptance or rejection of new members,
- organise common events,
- prepare common reports, notably the two deliverables
- work in close collaboration with EC and with the ICT4Water cluster action groups.

The task force met approximately every two months (12 meetings between June 2020 and May 2022).

Presentation of the outcomes of the activities

The main outcomes of the task force can be summarized as follows.

- acceptance of aqua3S as the 5th sister project, because this project was not already clustered, this project has common partners with F4W and NAIADES, this project has started at the same time as the other four sister projects so the temporality is relevant and this project is willing to use FIWARE platform,
- definition of the cluster work structure (see Figure 1) and appointment of task force leaders, on a voluntary basis. Identification of the people from the five sister projects willing to participate in the task forces. This figure has evolved with the creation of a new task force on policy in December 2021,
- creation of a dedicated workplace for the cluster in the open source cloud solution Nextcloud used by DWC (possibility to upload files in a folder hierarchy based on the cluster structure and possibility to work in common documents).
- Conception and redaction of the two DW2020 deliverables (delivered in May 2020 and May 2022)
- Preparation of a common publication to highlight the benefits of digitalization for Springer handbook (more details in TF4)
- Organization of common events to promote the activities and outcomes of DW2020 projects (see more details in TF4)
- Organization of the DW2020 community of practice (see more details in TF4)
- Towards the end of the F4W project (December 2021) a special group was created to prepare the final policy brief for all the projects together. This was not a Task Force, because it did not function for the duration, but rather a group for a special deliverable. This policy group was led by Ulf Stein (DWC).

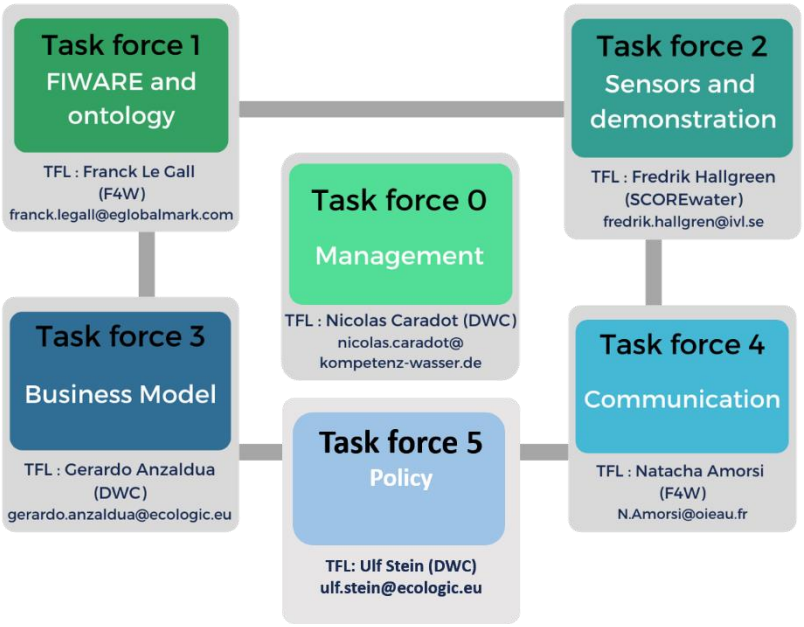


Figure 1. Structure of DW2020 group

Next step: what happens after the end of the task force

DW2020 is an operational working group which aims at fostering synergetic activities between the sister projects. The structure of DW2020 is now established and a series of activities presented in this deliverables are running in parallel under the leadership of each task force. DW2020 is contributing to the deployment of digital water, in full complementarity with other European organizations such as ICT4Water, Water Europe or standardization bodies such as ETSI or FIWARE. By the end of the sister projects, DW2020 will be dissolved and the activities, knowhow and expertise generated during its existence will be integrated into existing and permanent organizations.

In particular, the ICT4Water cluster, established in 2012 at the initiative of the European Commission, will play a key role to follow up the activities of the group. ICT4Water is acting as a hub for innovative activities related to digital water, disseminating key projects outcomes and ultimately contributing to EC strategic views and policies[1]. The missions of the ICT4Water cluster have been strongly supported by DW2020 through the cross-participation of DW2020 members in ICT4Water working groups. Since the creation of DW2020, bridges have been established with the ICT4Water cluster. The strong bindings between the two organizations will facilitate the transfer of the knowhow and ensure the continuity of the activities within the structure of ICT4Water. In particular, the following links have been established with the working groups of ICT4Water:

- Interoperability and Standardization (I&S); Aitor Corchero (Eurecat) is leading the group and also active in DW2020 TF1
- Data Sharing (DS); Pascale Rouault (KWB) is co-leading the group and aligning activities with Nico Caradot (KWB), coordinator of DW2020

[1] European Commission, Executive Agency for Small and Medium-sized Enterprises, Vamvakeridou-Lyroudia, L., ICT4WATER cluster : vision and showcases, Publications Office, 2021, https://data.europa.eu/doi/10.2826/258217

- Smart Water (SW); Franck Le Gall (e-Global Markets) is leading the group as well as DW2020 TF1
- Actor Awareness (AW); Natacha Amorsi (OIEAU/F4W) is leading the group as well as DW2020 TF4, replaced in September 2021 by Christos Makropoulos (NTUA/F4W)
- Policy (POL); Richard Elelman (Eurecat) and Albert Chen (University of Exeter) are leading the group and also active in DW2020 TF5.
- Business Models (BM) related to the digital transition of the water sector; Eva Martinez Diaz (Aqualia) and Francesco Fatone (Università Politecnica delle Marche) are leading the group and both active in DW2020 TF4. Gerardo is leader of DW2020 TF4 and also involved in the working group.

The following sections will present in detail the activities of the task forces and the specific strategies to consolidate DW2020 outcomes with external organizations by the end of the sister projects.

II.2. Task Force 1 : FIWARE & Ontologies

Description of the activities carried out since the beginning of task force

The scope of the Task Force 1 is to develop water data models, covering the water lifecycle, easily deployable at European level using NGSI-LD protocols and FIWARE.

The models were identified after close consideration of the needs of every project involved (i.e., SCOREwater, NAIADES, aqua3S, F4W, DWC) with regard to the sources used and the data produced within the framework of each project. Therefore, the activities that were realized in relation to the target of TF1 are the following:

- Identification of the water specific and transversal data models needed for each project
- Identification of the persons leading and being involved in the development procedure
- Development of models by identifying the stakeholders need, the outcome of the modules by receiving support from FIWARE foundation and people with expertise on data modeling
- Presentation of models to a dedicated working group, reception of comments, updating of the model
- Publication of model to Smart Data Models github (https://github.com/smart-data-models)
- Validation of the models and corrective actions

Table 1 contains the models originally identified as to have a potential interest, and finally the ones that were selected based on the interest of the people in each project.

Table 1. Original list of data models identified and interest from each project.

		DWC	F4W	NAIADES	SCOREwater	aqua3S
Transversal data models	**IoT**	✓	✓	✓	✓	✓
	GIS/ INSPIRE	✓	✓	✓		✓
	Social network					✓
	Multimedia					✓
	Documents					✓
	Water management KPIs	✓	✓	✓	✓	

	Health & socio eco indicators			✓	✓	
	People & organisations		✓	✓		
	Risk Assessment & Mitigation	✓		✓		✓
	Call Centre / Complains /					✓
	Anomalies		✓			✓
Water specific data models	**Waste water treatment**	✓	✓	✓	✓	
	Waste water collection	✓	✓	✓	✓	
	Water consumption	✓	✓	✓		
	Open Channel Management					
	Water distribution (EPANET)	✓	✓			✓
	Water abstraction & treatment	✓				
	Source ecosystems	✓		✓		
	Water quality			✓	✓	

Presentation of the outcomes of the activities

By considering the above table and the needs of each project, eventually the following models were either updated or developed from scratch.

Table 2. Models developed during the collaboration

		Model name & Github URL
Transversal data models	**GIS/ INSPIRE**	**Name:** SatelliteImagery **URL:** https://github.com/smart-data-models/dataModel.SatelliteImagery
	Social network	**Name:** SocialMedia **URL:** https://github.com/smart-data-models/dataModel.SocialMedia
	Multimedia	**Name:** CCTV and UAV **URL:** *On going*
	Water management KPIs	**Name:** KeyPerformanceIndicator **URL:** https://github.com/smart-data-models/dataModel.KeyPerformanceIndicator
	Risk Assessment & Mitigation	**Name:** RiskManagement **URL:** https://github.com/smart-data-models/dataModel.RiskManagement
	Call Centre / Complains /	**Name:** CallComplaints **URL:** https://github.com/smart-data-models/dataModel.CallComplaints
	Anomalies	**Name:** Anomaly **URL:** https://github.com/smart-data-models/dataModel.Alert
	Waste water treatment	**Name:** WasteWater **URL:** https://github.com/smart-data-models/dataModel.WasteWater
Water specific data models	**Water consumption**	**Name:** WaterConsumption **URL:** https://github.com/smart-data-models/dataModel.WaterConsumption
	Open Channel Management	**Name:** OpenChannelManagement **URL:** https://github.com/smart-data-models/dataModel.OpenChannelManagement

	Water distribution (EPANET)	**Name:** WaterDistributionManagementEPANET **URL:** https://github.com/smart-data-models/dataModel.WaterDistributionManagementEPANET
	Water quality	**Name:** WaterQuality **URL:** https://github.com/smart-data-models/dataModel.WaterQuality

In the following, we briefly describe the scope of the main models.

SatelliteImagery*:* The development of the data model was based on the need for recording georeferenced satellite data, available from online data hubs, such as the Copernicus open source hub. Within the context of the project, georeferenced information from the Sentinel satellites is collected from open source hubs and analysed through analytical modules developed within the projects (e.g., in aqua3S for algae bloom detection).

SocialMedia*:* The model aimed to support the representation of social media posts, along with some information about the corresponding users, their location and the knowledge extracted by analysis techniques. The scope when creating this model was for it to be flexible enough to cover all social media data, deriving from any social media service, but also to be well-defined and unambiguous. In addition, the model is as compliant as possible to existing social media API models, so that the corresponding data from the APIs can be easily represented through the proposed FIWARE model.

RiskManagement*:* This model was developed to assess the risk generated by cyber-attacks (human-made threats) as well as physical threats caused by natural disasters. The Risk Management FIWARE model covers the preparedness (pre-crisis), response (during crisis) and mitigation (after crisis) phases in the Crisis Management process in Water Critical Infrastructures. Hence, it contains entities enable to store data for: (a) the representation of the results of the threat detection process, such as the *CyberAnalysis* (for cyber threats detection) and *Hazard* (for natural events detection) entities; (b) the monitoring a natural disaster and its consequences, such as the *Asset*, *Vulnerability* and *Exposure* entities, along with the entity to assess the *Risk*; (c) the mitigation and the adoption of the necessary countermeasures, such as *Mitigation* and *Measure* entities.

CallComplaints*:* The model supports the representation of water-related call complaints, since they have been added to the project as another crowdsourced information. The model was oriented towards covering the particular cases of specific end users that involve handling complaints in their operations, thus the model was significantly based on the information that is already provided to them when a complaint is submitted. Nevertheless, the model is rather flexible and can support complaints of other types too (not limited to water issues).

Anomaly*:* The model supports the system's ability to record when a device settings go out of a defined range. Anomalies deal with situations where a device goes out of a range defined through a model. It is diffrent to the **Alert** that deal with situations where a device goes out of a range defined by an operator. However, in both cases the data requirements and operational behaviours are very similar, in that each device has property that is read as part of the IoTAgent functionality. Anomaly processes will read that data at some point in the future and compare it with some setting data that stores the minimum and maximum values for that device (for under bottoming and overtopping respectively).

WaterDistributionManagementEPANET: Within aqua3S there is a clear requirements for a water network model, with initial work undertaken to build a set of Fiware models that closely mapped to an existing EPANET water supply model

CCTV and UAV: The development of these models is not finalized yet. In both cases, the models under development try to capture the objects detected in the images or videos provided by the cameras which are either located in fixed places or are mounted on a UAV.

During the DW2020 the data models are linked to the other FIWARE data models, which are available through the FIWARE platform.

Next step: what happens after the end of the task force

The task force is continuing its work by inviting partners from other projects, i.e., the PathoCERT and AQUASPICE Horizon 2020 projects are to state their needs and continue with the development new or improvement of existing models in order to cover them.

Moreover the FIWARE community has included these data models to their catalogue. In this way they can be used further by any other project related to the water and IoT domain.

The data models are also supported by the ICT4WATER cluster and the work in Action Group 1 (Standardisation/Interoperability) which is continuing after the end of all 5 projects.

II.3. Task force 2 : Sensors and Demonstration

Description of the activities carried out since the beginning of task force

The scope of the task force is to share best practices linked to the technical development of new sensors, the establishment of communication protocols, the validation of the measurement accuracy and the optimization of maintenance and operations.

The driving forces for contributing to the Sensor and Demonstrator Task Force are to: avoid reinventing, sharing approaches, sharing good examples of integration, sharing software development to reduce development time, and speed up implementation time. New innovations, upscaling, potential replication and real impact are the higher goals of collaboration between our projects.

The collaboration has focused on sharing knowledge and allowing insight in our respective projects. This was done through 5 meetings with around 30 participants with expert knowledge contributing with presentations and discussion. A slack channel was setup and merged with Task Force 1 and a Github was shared on sensor diagnostics and validation, https://github.com/IVL-Research/Open-Waters

Presentation of the outcomes of the activities

A shared document has been produced, to make it easier for us to get an overview on sensors, case studies and applications, see Appendix 2. The document includes:

- A list of new sensors being developed or validated in our projects. The table contains the type of application, the measurement principle, expected costs for the end product and how the sensor is installed in a real environment.
- Overview of our demonstration sites and what will be measured in them and for what purpose

The 5 meetings' main focus is presented below.

2020-09-16 First meeting with introduction of all 5 projects on two main topics

Sensors deployments and FIWARE integration.

Sensor diagnostics, calibration and validation.

2020-12-16 Fiware4Water presents their approach to FIWARE integration

Sensors deployments and FIWARE integration by Siddharth Seshan from Fiware4Water with focus on Waste Water Treatment Plants (WWTP) and what they do with regards to data model for WWTP measurements, architecture of the FIWARE deployment, development of soft sensors:

- Correlations and predictive analytics
- GHG measurement and carbon footprint

2021-03-11 Feedback from EASME, water knowledge forum and project reviews

Sediment Level Prediction of a Combined Sewer System Using Spatial Features, presentation from Marc Ribalta (Eurecat)

2021-05-12 New innovative sensors used in the projects

The ALERT System is a new sensor for real-time bacterial measurements presented by Dan Angelescu from Fluidion.
Low-cost temperature sensors for real-time combined sewer overflow (CSO) and flood monitoring presented by Oriol Gutierrez from ICRA.

Updates and new results regarding the RI sensor developed within aqua3S presented by Stefania Giannikou

The Turbinator developed by IVL for measuring particles and water level were presented by Fredrik Hallgren from IVL.

2021-09-21 AI/ML model validation and evaluation

Jens Wilhelmsson from IVL in the project SCOREwater first briefly introduced three AI models that are used in three case studies of the project. Then, for the "already trained" AI models, we plan to go into more details regarding:

- predicting the water level/risk of flooding in a stormwater system.
- predicting the sediment level at various locations of the sewer system.

From DWC, Mathias Riechel shortly presented some ideas and discuss "Approaches for feature selection and validation of ML models for rehabilitation planning of drinking water wells and sewer pipes"

Next step: what happens after the end of the task force

Future collaboration has not been discussed yet in this TF but will be on the agenda during next meeting.

II.4. Task force 3 : Business model

Description of the activities carried out since the beginning of task force

The scope of Task Force 3 is to identify plausible pathways for DW2020's solutions to reach the market and to highlight the barriers that obstruct them. The group carried out two main practical actions to work toward this. The first one was to produce a list of all the commercial exploitation tasks planned within each of the five projects and map them along a common timeline. This was a means to visualize complementarities, opportunities and relevant dates and to coordinate a more targeted sharing of information across the sister projects. The second main action was to create a "DW2020 Digital Solutions Matrix" to collect specific information on all the products and services developed within the

sister projects. The intention was to compile a catalogue that could facilitate later actions like matching the solutions with specific market needs and relevant policy targets, and aid in the identification of potential project impacts. These actions were coordinated via four teleconferences where all sister projects were represented (July and September 2020 and April and June 2021) and bilateral exchanges between the task force leader and individual partners during Summer 2021 to follow up the work on the Digital Solutions Matrix. In addition, the work of Task Force 3 was presented to participants of Digital Water City's 3rd Community of Practice in April 2021 and to members of the Business Models Action Group of the ICT4Water Cluster during their meeting in September 2021.

Presentation of the outcomes of the activities

An excerpt of the list of commercial exploitation tasks of the five projects is shown in Figure 2. Apart from project affiliation and a brief description of each task, the list contains information on the involved partners, the planned inputs and foreseen outputs (and their dissemination level), and relevant dates.

As this list was populated, it allowed the task force members to review the entries and identify opportunities for punctual exchange and contribution based on their concrete needs and interests.

The task force 3 members were encouraged to exchange their relevant project outputs (DWC's quadruple helix brief, Aqua3S's second market analysis report and NAIADES's exploitation and dissemination plan were made available to the whole group). Further, during the group discussions several members pointed the group to useful references they used as input materials for their work (e.g. assessment reports for the water solutions market, specialized literature on innovation management, and relevant events). These items could be incorporated into project tasks that came later (e.g. the second draft of the exploitation plan of DWC). More concretely, for DW2020 as a whole, a review of the shared project outputs and other publicly available project materials yielded the following overview of market needs in European cities:

- Monitoring of reservoirs
- Prevention of floods and detection of flash floods
- Reduction of water losses in the distribution network
- Definition of a reference model for water management processes using IoT, AI and Blockchain
- Monitoring of water quality in fountains
- Optimization of wastewater treatment for reuse
- Balancing water availability and demand
- Maximizing efficiency of water use
- Ensuring water service continuity
- Management of strategic infrastructure
- Monitoring the safety and security of water supply systems, including aqueducts
- Smart metering and citizen engagement
- Intelligent control for wastewater
- Optimisation of raw water supply
- Managing water pollution in the industrial sector
- Adhering to the targets of SDG

Figure 2 : List of commercial exploitation tasks of the DW2020 projects (excerpt).

Project	WP no. & title	Task Title	Task Lead	Contributors	Planned Inputs	**Foreseen Outputs**	Relevant Dates	Dissemination Level
DWC	WP5 – Transfer and exploitation of DWC solutions	Assessment of the market for digital water solutions	ECOLOGIC	KWB, Aqualia (external reviewer)	Literature review (academic, grey and industry literature + press releases);	Brief general reference report (Deliverable)	December 2019 (Submission of final	Public
DWC	WP5 – Transfer and exploitation of DWC solutions	Segmentation, appraisal and sizing of target markets for the DWC solutions	ECOLOGIC	Fluidion, Vragments, Kando, DHI, IOTsens, Partners4UrbanWate	MAF+ portal for online collaboration on business development;	Synthesis report detailing results of the market analysis and business model	November 2020 (preliminary results),	Confidential
NAIADES	WP9 – Raising Awareness, Standardisation and Exploitation Roadmap	Dissemination & Exploitation Strategy & NAIADES Business Plan	ADVANTICSYS	CERTH, KT,MI, UDGA, AIMEN, ICCS, SIVECO, DISY, IBA, GT, VUB, EUT	Initial analysis of key exploitable results by each partner, including value	Exploitation Plan for the project	April 2020 (submission of first draft); May 2022	Public
NAIADES	WP9 – Raising Awareness, Standardisation and Exploitation Roadmap	Dissemination & Exploitation Strategy & NAIADES Business Plan	ADVANTICSYS	CERTH, KT,MI, UDGA, AIMEN, ICCS, SIVECO, DISY, IBA, GT, VUB, EUT	Interviews with involved partners and external advisory board	Market Analysis	May 2022	Public
SCOREWATER	WP6 – Exploitation and replicability	End user uptake (incl. handbook and replication plan)	Talkpool	HR, CIV, SCAN, SHS, TP, FC, IVL, EUT, IERMB, UNI, ICRA, COA	External advisory board	D6.2 Market, value chain, and stakeholders description; D6.4	D6.2 October 2020; D6.4 October 2021; D6.6	Confidential and Public
SCOREWATER	WP6 – Exploitation and replicability	Replication of case studies (incl. strategy to demonstrate replicability)	Talkpool	HR, CIV, SCAN, SHS, TP, FC, IVL, EUT, IERMB, UNI, ICRA, COA	Market analysis via literature review, material on the webb and PatSnap patent	-	-	Confidential and Public
aqua3S	WP10 – Impact Creation, Dissemination and Exploitation	Market analysis, industrial requirements and business models	DRAXIS	MIRS, EGM, EVERIS, EYATH, SOFYSKA, 3S, AAA, TRI, WssTP	-	Market Analysis Report (Deliverable)	August 2020 – Submission of updated report April	Public
aqua3S	WP10 – Impact Creation, Dissemination and Exploitation	Exploitation plan and Intellectual Property (IP) protection for the proposed solutions	DRAXIS	MIRS, EGM, EVERIS, EYATH, SOFYSKA, 3S, AAA, TRI, WssTP	-	Exploitation Plan and Intellectual Property Report	Jun 2021 – July 2021	Confidential and Public
FIWARE4Water	WP5 – Socio-political impact, end-user engagement and economic	Fiware4Water Economic Impact and Exploitation Plan	OiEau	BDG	Partners interviews (done); External interviews to better identify the demand	Business and exploitation plan	May 2022	Confidential

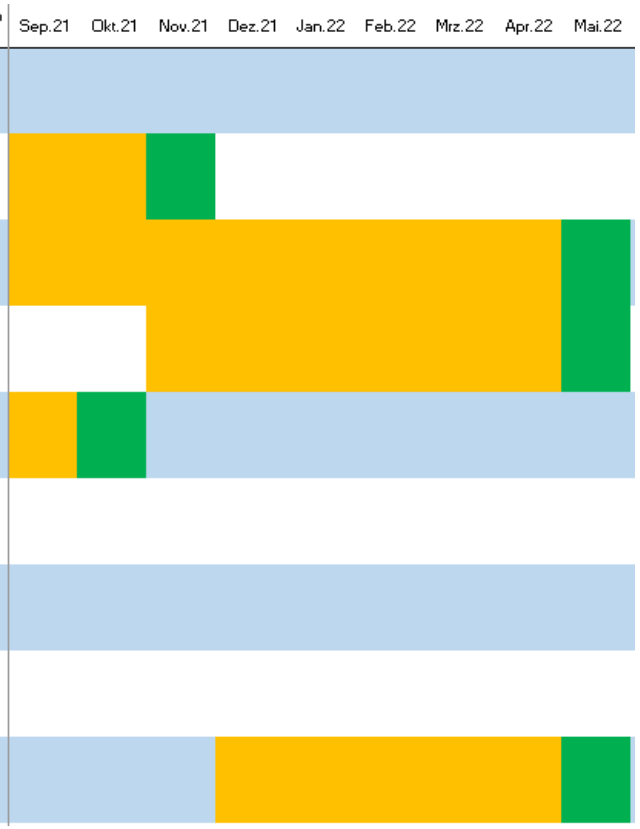


Figure 3 : DW2020 Digital Solutions Matrix (excerpt).

Digital Solution	IPR Holder	Project	Application	Technique	FIWARE compatible [Y/N]	Technology type [primary]	Part of the value chain [primary]	TRL
Machine-learning based Early Warning System for bathing water quality	KWB and SIAAP	DWC	This early warning system is an open source software interface that enables real-time bathing water quality assessment.	Machine learning and/or statistical modelling, prediction of bacterial concentration in specific river sections using a set of local data such as rainfall, river flow	Y	2	2	5
Mobile application for data collection of drinking water wells	BWB, KWB and Vragments	DWC	Software application that facilitates efficient data provision and collection in the field for drinking water well operation and maintenance.	Mobile app		2	3	7
Low-cost temperature sensors for real-time CSO and flooding monitoring	Iotsens and ICRA	DWC	CSO detection	Installed at CSO crest, measures CSO frequency and duration via shift in temperature		1	4	6
Refracitve Index Sensor	ICCS	aqua3S	Detects changes in water composition	The core of the RI sensor is the integrated on a single chip photonic structures based on asymmetric Mach Zehnder interferometers (aMZIs). Other important components are: light source, the photodetectors, the corresponding electronic controllers and the microfluidic	Y	1	3	8
Social Media Crawlers	CERTH	aqua3S	Identify events that are related to water quality or floods/ droughts by considering geolocation and timestamp of tweets.	The social media crawler collects Twitter posts in a real-time manner from citizen observations that are relevant to the subject of water safety and security, processes the posts and applies ?? detection method to identify events.	Y	3	2	7
aqua3S Ontology	CERTH	aqua3S	The aqua3S ontology semantically represents the knowledge produced within aqua3S.	It includes data from sensors, social media, drones, satellites, call complaints which are the sources of the information and data produced from aqua3S modules such as alerts	N	4	2	6

Similarly, the Digital Solutions Matrix has been filled by members of the task force to provide a detailed overview of 38 products and services that are being developed, tested and/or expanded within the DW2020 projects. For each digital solution, the matrix provides information on its developer (and Intellectual Property Rights holder/s when these differ), its application, technique employed, FIWARE compatibility, technology type, part of the value chain where it is implemented, Technology Readiness Level, and in some cases costs and price ranges. An excerpt of the matrix is shown in Figure 2.

Building the Digital Solutions Matrix has been useful as a means of mapping the five projects' marketable outputs and setting down initial grounds for linking them with the specific needs identified as part of the market research activities of the sister projects. It has also been proposed to the new Task Force on Policy for linking these project outputs to market needs emerging from specific policy targets.

Next step: what happens after the end of the task force

As the sister projects reach their end date sequentially in 2022, the plan for this task force until November is to exploit instances where the innovators from the DW2020 projects can link to potential clients. Events of the individual projects have been used for this in the past (e.g. the 3rdCoP of DWC in 2021) and the DW2020 Community of Practice event that took place in January 2022 is a good example of the type of interactions that we would like to build upon. Concretely, DWC is planning its 7th CoP to take place in Summer 2022. This CoP is being conceived as a marketplace or matchmaking event where the invited utilities and cities can engage in bilateral conversations with the developers of selected solutions from the DW2020 Digital Solutions Matrix. Other instances where such interactions could be promoted are being explored. Regarding the future use and potential for further development of the Digital Solutions Matrix, internal conversations have taken place that pointed to the option of transferring this collective output (following consent by the innovators) to the ICT4Water Cluster for its future hosting and maintenance. In addition, communication with the manager of the Digital Transformation Hub at IWA has been established in 2021 to explore potential ways of joining these initiatives. Both leads will be explored before the end of the task force's lifetime.

II.5. Task force 4 : Communication

Description of the activities carried out since the beginning of task force

Monthly teleconferences were organized to discuss the communication synergies among the 5 projects. The communication officer of each project attended. Dedicated shared documents were created and used to (i) list the different events the projects intended to participate-organize separately or as joined DW2020 events (ii) access the key points of all the meetings (iii) have a synopsis of the projects' communication strategy with the planning of the deliverables related to the communication.

Presentation of the outcomes of the activities

- A shared way to promote the projects' outcomes with cross participation of partners at events

  TF4 worked as a common pool of resources to promote the projects' events trough the social channels of the 5 projects. Each project benefited from the multiplier effect of reaching out the combined networks of the 5 projects.

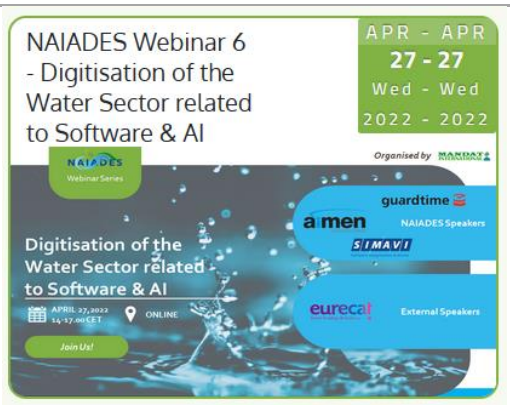
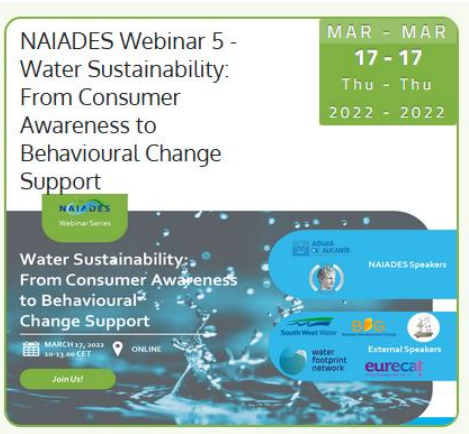
The mobilization of the scientific and social expertise worked the same way. According to the topics of the different projects' events, partners got involved as speakers. Almost all the webinars organized on behalf of one project involved experts from the other projects.

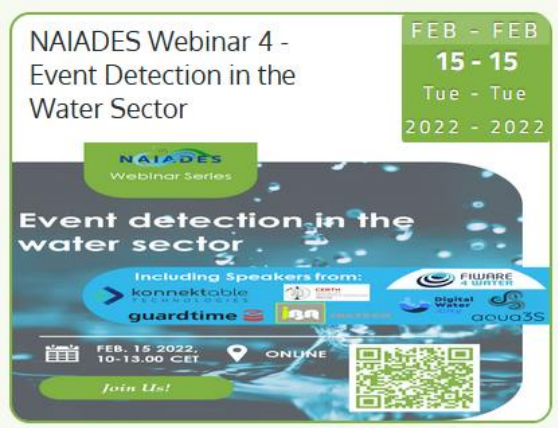
- DW2020 communication materials

Logo	Synergy Group DigitalWater2020
Poster	See appendix 1
Website pages	https://www.fiware4water.eu/digitalwater-2020/documents https://www.digital-water.city/news/synergy-group-digitalwater2020-launched/

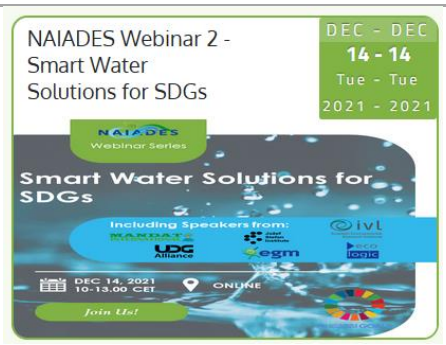
- Support from DW2020 to organize events and joined events

Date	Title	Lead	Format
19/05/22	**Digital water and EU policies** The final Fiware4Water on-line workshop dealt with digital water and EU policies. The workshop was organised by KWR and EURECAT on behalf of Fiware4Water EU project and is co-hosted by the DigitalWater2020 synergy group and the ICT4Water cluster. The aim of the workshop was to show how digital water solutions path the way towards the implementation of EU policies as well as provide evidence to support new policy recommendations. Link to the video: https://www.fiware4water.eu/deliverables#webinars 	F4W	On line WS4
27/04/22	**Digitisation of the Water Sector related to Software & AI Naiades** The webinar dealt with in the sustainable development and innovative solutions to support the SDGs. More information on: https://naiades-project.eu/node/242	Naiades	Webinar 6

			
17/03/22	**Water Sustainability: From Consumer Awareness to Behavioural Change Support** The webinar aimed at presenting Naiades software and AI solutions for the water sector. More information on: https://naiades-project.eu/node/240 	Naiades	Webinar 5
04/03/22	**How AI, ML, Water Data modelling could support smart management of water?** The workshop was organized by EURECAT and aimed at discussing (i) Why AI and data-driven solutions benefit water management, (ii) Smart applications to address the several challenges in the Fiware4Water demo cases and (iii) Performance and scalability assessment of the AI-powered solutions Link to the video: https://www.fiware4water.eu/deliverables#webinars 	F4W	On line WS3
03/03/22	Data models with the FIWARE platform for the water sector	DWC	Webinar
15/02/22	**Event Detection in the Water Sector**	Naiades	Webinar 4

	The webinar aimed at discussing (i) Data-driven weather forecasting (i) event detection interface in the water sector and (iii) NAIADES' smart solutions for chlorates prediction in water. More information on: https://naiades-project.eu/node/235 		
04/02/22	**Population of FIWARE platform on the water sector** The workshop was organized by FIWARE and aimed at discussing FIWARE possibilities to develop IT solutions for the water sector Link to the video: https://www.fiware4water.eu/deliverables#webinars 	F4W	On line WS2
28/01/22	**Smart Water Management in Cities** The webinar aimed at discussing (i) Smart water management through smarter, interoperable data - The NAIADES pilot in Carouge (ii) NAIADES' smart solutions for the urban water cycle of Alicante and (iii) Water Management in CUP Dunarea Braila. More information on: https://naiades-project.eu/node/232	Naiades	Webinar 3

			
20/01/22	**Community of Practice for the water sector** The event has been organized to gather all 21 utilities of the sister projects in order to promote DW2020 solutions to other utilities in Europe. The workshop was success with the active participation of >130 stakeholders. More information online: https://www.digital-water.city/news/dw2020-community-of-practice/ 	DWC	On-line
07/01/22	**Socio-political and citizen engagement on digital water** The workshop aimed at highlighting the necessity to engage with as broad a range of stakeholders at a local community level as possible and describe the advantages of such an approach for the professional water sector Link to the video: https://www.fiware4water.eu/deliverables#webinars 	F4W	On line WS1
14/12/21	**Smart Water Solutions for SDGs** The webinar proposed (i) a SDGs Training sessions and (ii) Thematic presentations. More information on: https://naiades-project.eu/node/226	Naiades	Webinar

			
09/12/21	**Demo Network 2 workshop "How digital solutions can contribute to the implementation of EU water policies?"** The workshop aimed for water managers to gather a common understanding of digital water and then address technological and non-technological dimensions of digital water in two working sessions. More information on: https://www.fiware4water.eu/demo-networks/international-network-basin-organisation 	F4W	On line workshop
16/11/22	**IoT Technologies for Smart Water Systems** The webinar aimed at presenting Data Models and Live Demo. More information on: https://naiades-project.eu/node/198 	Naiades	Webinar 1
03/03/21	**Data model with FIWARE platform for the water sector**	F4W	On line workshop
17/11/20	**Digitalizing the future of Water**	F4W	On-line workshop
10/11/20	**Demo Network 2, "How water digital innovations can benefit to River Basin Organisations? The on-going experience of Fiware4Water** The workshop aimed to highlight the necessity to engage with river basins organization to describe the advantages of digital water solutions for the water sector.	F4W	On line workshop

	Link to the video: https://www.youtube.com/watch?v=ZdAqfzA4Zg8  		

- Joined publications

DW2020 article in FIWARE booklet "*Let's do it together! Fighting climate change with FIWARE*" (2020), https://www.fiware.org/wp-content/uploads/FightingClimateChangeWithFIWARE.pdf, pp 47-48
Amorsi N., Brekine A., Caradot N., Fernandez J., Le Gall F., Lopez F., Schwarzmüller H., Segura A., (2022), Smart Water Management, Springer handbook, under review

- Support of activities

In May 2021, F4W under the lead of FIWARE and OiEau launched challenges. This competition was addressed to data scientists and data analysts to show how real time data can be used to support better water management services through the data generated by digital meters and providing feedback to consumers and water utilities. Evidence through data is critical to address the many challenges that the water sector is facing.

DWC provided two challenges with the Milan (IT) and Sofia (BG) cities. F4W provided the third one with the demo case 4 of south west water in the UK.

All the project were involved in the preparation phase of the challenges until the challenges were selected.

Next step: what happens after the end of the task force?

The DW2020 synergy group will carry on until the end of all the projects; As Fiware4Water is finishing first, partners decided during the TF4 meeting hold on the 10 May that no lead would be taken. Nevertheless, the distribution email list will be used when needed to set joined events and support each project activities.

II.6. Task force 5 : Policy

Description of the activities carried out since the beginning of task force

The activities of this group started in December 2021. It is not considered a proper Task force, because it was organized for one output only, namely the common policy brief, towards the end of the F4W project. Monthly meetings were organized to discuss the policy synergies among the 5 projects. In most cases, the policy officer of each project attended. Dedicated shared documents were created and

used to (i) get an overview of the policy assessments of the 5 projects, (ii) exchange on project outcomes and sharing knowledge, (iii) discuss opportunities for joint action.

Lately, the collaboration has focused on preparing a joint DW2020 policy brief that summarizes key findings of the cluster projects.

Presentation of the outcomes of the activities

The outcome is a common policy brief, to be submitted at the end of May 2021.

- Joined events

19/05/22	Digital water contribution to EU policies under the lead of DWC	Online
11-15 /09/22 (not yet confirmed)	Workshop at IWA World Water Congress in Copenhagen on the topic»Can digital solutions enhance public involvement in urban water management?	Online/Presence

Next step: what happens after the end of the task force

Currently the first draft of the joint policy brief is being prepared (Lead Ecologic).

III. Next steps and perspectives

The creation and the activities of the DW2020 Synergy Group have demonstrated that a close collaboration among projects with common themes and topics is beneficial for the EC, the projects and ultimately for the wider public.

This collaboration led to some important outcomes, which are expected to have a wider impact than each project separately, as the outcomes of the Task Forces show.

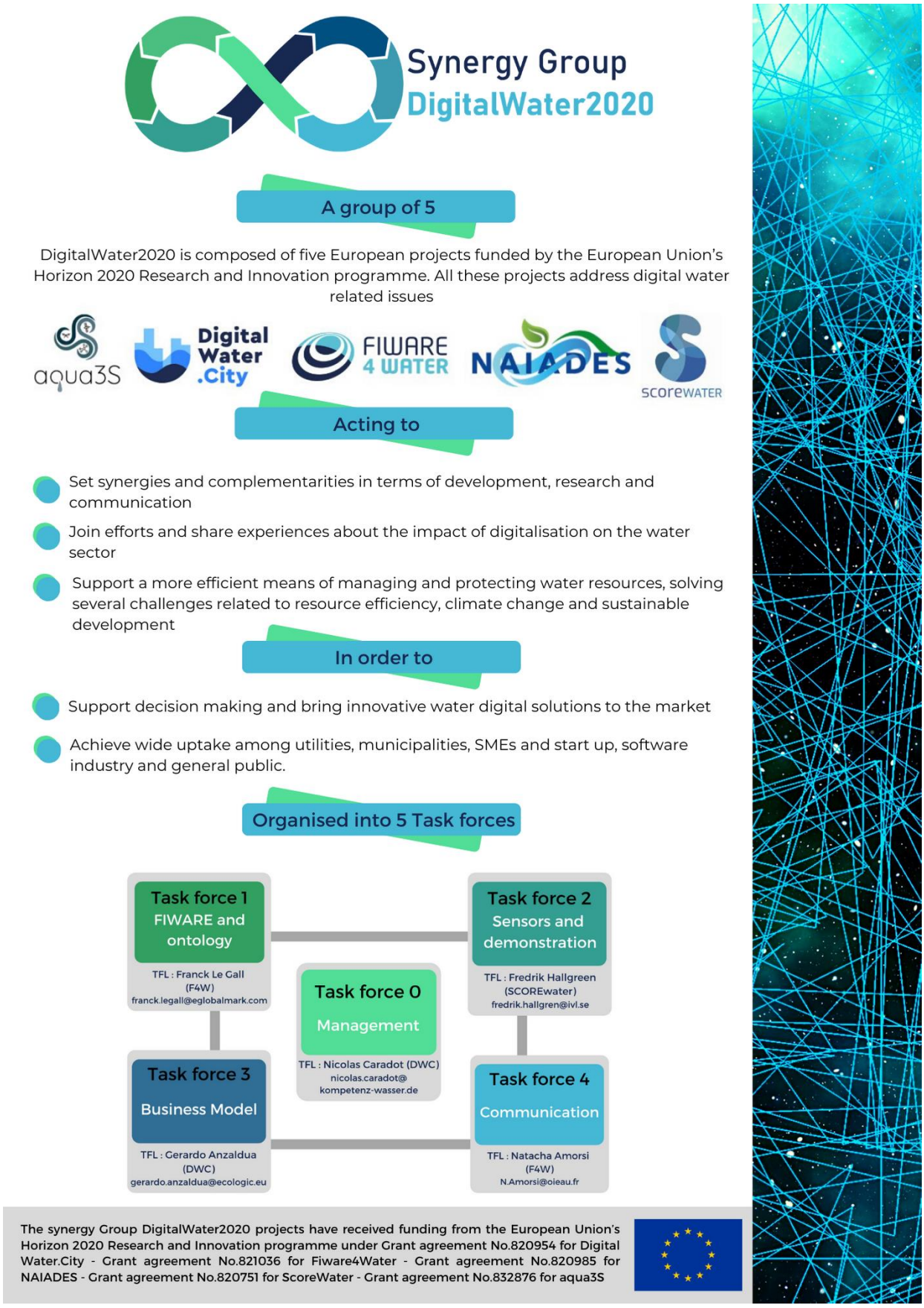
In particular the importance of the Data models created by the five projects together are expected to be useful and applicable by several other projects. They also leverage the use of IoT technologies for the water sector and contribute to the Digital Europe wider goals. They are an asset that could not have been produced by a single project, taking into account the wide spectrum (across the whole water cycle) that they cover. Moreover, they were created with continuous synergies and collaboration, complementing each other and benefiting from each project specific research activities.

They are also expected to have a lasting effect for the ICT4WATER cluster future activities and in particular the revised Digital Water Action Plan (under revision).

Additionally the common policy brief is an asset that could not be produced by a single project and is expected to contribute to the research and innovation needs and gaps for further calls by the EC.

The end of the sister projects entails also the end of the DW2020 synergy group, but the continuation of the activities will be taken over by the Action Groups of the ICT4WATER cluster. Additionally, several of the key partners in DW2020 came to know each other and are already collaborating in further projects in H2020 and Horizon Europe.

Appendix 1: DW2020 poster



Appendix 2: Sensor overview for the projects

Table 1. Overview of new sensors being developed or validated in our projects. For which application we use it, what type of measurement principle uses it, expected costs for the end product and how the sensor is installed in a real environment.

Sensor	**Application**	**Technique**	**Cost (final product)**	**Installation method**	**Validation results**	**References**
Turbinator (by IVL)	Measures turbidity and water level in stormwater wells	Contactless optical measurement	200-1 000€	Is installed under the lid in wells. Hanging down from the ring.	6 prototypes are installed in field. Optics are being adjusted and AI models developed for both turbidity and water level.	
ALERT (by FLUIDION)	Measurement of fecal indicator bacteria in surface and wastewaters	Modified Real-Time Define Substrate Technology (rapid culture-based method)	20000-25000 € depending on options	Sliding rack (fixed to wall, pontoon, dock) or floating		
T-Sensor	CSO detection	installed at CSO crest, measures CSO frequency and duration via shift in temperature	~100 €	Installed (with screws) at the CSO crest		
DTS cables	detection if illicit connections in the sewer	measures anomalies in temperature which indicate illegal connections of waste water pipes to a storm sewer	full monitoring truck: ~100k €; rental for rental: ~30k € for a 4 week monitoring campaign	Not installed, just laying in the sewer		

Soil water content probes	detection of water stress	Frequency Domain Reflection (FDR) probe		Flying with a unmanned aerial vehicle (drone)		
Multispectral camera	detection of water stress	acquires images in the visible and near-infrared bands		Put in soil		
Chlorate sensor	Chlorate real time measurement	Combination of sensor measurements (Redox, Free chlorine, Total Chlorine, pH, temp and Turbidity.)	~8k €/ unit	Installed on the pipe		
Refractive Index sensor	Detection of refractive index changes in water samples	Detection of aMZI phase change in frequency domain		Placed above or below the water surfaces on a platform		
Multiparameter water quality sensors (CNRS/Soteria s)	pH, temperature, chlorine, conductivity (+additional parameters in short term roadmap	Chemistor array based on functionalized carbon nanotubes	3500€/unit	Installed directly on pipe Mostly tested for drink water so far, plan for WWTP by end 2021		

Table 2. Overview of our demonstration sites and what will be measured in them.

Demonstration site	Application	Sensors used	References
F4W-Amsterdam: 1 treatment lane in WWTP has been designated as a research lane.	The research lane has been equipped with additional sensors in order to develop and test data-driven/AI enabled control of WWTP processes.	Various sensors to measure wastewater treatment process parameters.	
DWC-Paris: Measures in Seine and in Marne rivers	ALERT sensors used to measure fecal indicator bacteria in surface waters and reject waters to control bathing water quality	ALERT-System and ALERT Lab	
DWC-Milan: Measure in Peschiera Borromeo WWTP	ALERT sensors used to measure fecal indicator bacteria in wastewater to support health risk management for wastewater reuse; Ground sensors and aerial sensors for water stress detection Process sensors and energy meters already used in the utility existing asset	ALERT-System and ALERT Lab Various sensors for real-time energy and carbon footprinting of integrated urban wastewater treatment and reuse system	
DWC-Berlin: Measurement in the sewer system	Temperature sensors for CSO detection, Distribute Temperature Sensing (DTS) cables for tracking illicit connections, Electrical conductivity (EC) sensors for tracking illicit connections	T-sensors DTS-cables EC-sensors	
DWC-Sofia: measurements in the sewer system	Temperature sensors for CSO detection	T-sensors	
DWC-Copenhagen: measurements in the sewer system	water level and flow sensors in the sewer system	level and flow sensors	
SCOREwater - Gothenburg	In and around a construction site to monitor pollutant entering the site, how much is added, cleaned and then released back to the system	Turbidity, conductivity and pH is measured with Ysi EXO3 multiprobe. Turbidity and water level is measured by Turbinator, Flow is	

		measured with Ultrasonic Flow Meter LRF-2000S and temperature with Pentronic PT100 21-20105	
SCOREwater - Barcelona	Sewage information mining	Flows, (COD, TSS, NH4, K, pH) using spectrolyzer and ammolyzer from scan; ; continuous flow-based composite sampling to measure in the lab the following: pharmaceuticals; antibiotic resistance genes; microbiome diversity; sars-cov-2; oils and greases;	
SCOREwater - Amersfoort	Flood prevention and climate resilience	Precipiation (rain) is measured with Observator OMC-210 RAIN GAUGE. Temperature, humidity and soil moisture with Teneo Soil and climate sensors. Ground water lever is measured with VEGAwell-52 and VEGAPULS WL-S-61,	
NAIADES - Alicante	Water Demand prediction Saline intrusion	Flows will be combined with meteorological information as training data for AI water demand models. Levels and conductivity sensors will be used to detect anomalies and identify possible saline intrusions	
NAIADES - Braila	Water Demand monitoring and prediction Leakages detection	Flows and pressures will be combined with meteorological information as training data for AI water demand models.	

		Pressure and noise sensors will be used to detect anomalies such as leakages.	
NAIADES - Carouge	Plants Watering optimization Swimming Fountains quality check	Temperature and Tensiometer sensors to measure the water demand of plants. Volume sensor to measure amount of water used for watering. pH, Temperature, Redox, Free Chlorine, Total Chlorine and Turbidity sensors to measure fountains water quality.	