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Supporting Innovation in Smart Cities through Cascade Funding: the Case of Water Management

1st Margherita Volpe
Zabala Innovation
Brussels, Belgium
mvolpe@zabala.eu

2nd Iñigo González Rojas
Zabala Innovation
Brussels, Belgium
igonzalez@zabala.eu

3rd Gabriele Gaffuri
Zabala Innovation
Brussels, Belgium
ggaffuri@zabala.eu

4th Ramona Marfievici
Digital Catapult
London, UK
ORCID 0000-0002-1960-7529

5th Edoardo Genova
Zabala Innovation
Brussels, Belgium
egenova@zabala.eu

6th Ana Gheorghe
Digital Catapult
London, UK
ana.gheorghe@digicatapult.org.uk

7th Jasmin Kniewallner
AVL List GmbH
Graz, Austria
ORCID 0000-0003-4420-9386

8th Omar Veledar
AVL List GmbH
Graz, Austria
ORCID 0000-0002-8302-7721

***Abstract*—Despite witnessing an infinitely long list of large infrastructure projects dragging on for longer than expected, bursting the original budget, and negatively impacting stakeholders, there is no common fast-acting cure for the issue. The causes of failure are often associated with either human factors or risk management. One of the potential remedies for ensuring success for infrastructure projects of significant social impact relies on building tight collaborations. These call for experimentation with different mechanisms that have the potential to improve project outcomes and maximise end-user benefits. We consider the potential to contribute to the successes of socially impactful infrastructure projects by piecing together a range of smaller less-related projects that are funded, monitored and supported through the mechanism of cascade funding. With the assumption that the product of combined projects is more impactful than the sum of their contributions, we demonstrate a representative example of several successful use cases that, when combined, enhance the digitalization of water utilities and help maximise the impact of complex multi-faceted issues that are often entangled in large projects.**

***Index Terms*—Cascade Funding, Water infrastructure, Cooperative Experiments, Innovation, Sustainable Impact, Digitization**

I. Introduction

Multifaceted infrastructure projects often rely on substantial public investment, carry significant social importance, and are associated with long durations. Several causes could undermine projects and the fulfilment of their overall objectives. When (catastrophic) failures happen, the delivery of capital-intensive, long-lived infrastructure is generally associated with an escalation in capital costs, the reason for which is linked to renegotiations of the value to be created and the value distribution i.e., relaxing the project performance targets [1]. A comprehensive literature review of major infrastructural project failures has produced a list of key reasons for frequent megaproject let-downs [2]. These are clustered into themes: (1) decision-making behaviour; (2) strategy, governance, and procurement; (3) risk and uncertainty; (4) leadership and capable teams; (5) stakeholder engagement and management; and (6) supply chain integration and coordination. Crucially, some of the suggested remedies to improve the chances of project success include: bridging the gap to manufacturing, and building and leading collaborations. Finding an easy fix and a fast-acting pill to cure the frequent failures to deliver is not to be realistically expected. Hence, there is a need to experiment with different mechanisms that have the potential to improve the outcomes of megaprojects. The complexity could be even taken down a notch so that we are not considering only megaprojects, but infrastructure projects of significant social impact. The question that this work considers is how could cascade funding [3] help address multi-faceted issues and reduce the costs and risks of large projects by combining the idiosyncrasies of small-size, agile implemented, independent projects. In other words, would it be meaningful to dissect large infrastructure projects into smaller segments and tackle these complex structures one issue at a time? DigiFed's use case of water utility digitalisation answers that question from a practical perspective. This paper offers an insight into managing a portfolio of smaller projects and related funding to effectively improve the water management value chain by combining the core competencies of smaller organisations. Diverting from the traditional schemes for financing innovation and enticing collaboration, cascade funding is a promising alternative for small and medium-sized entreprises (SMEs) and start-ups, especially in highly innovative sectors. It has also proven to be a more agile and less bureaucratic financing method compared to the traditional ones. The DigiFed project [3] is a real example of how the cascade funding practice (also known as Financial Support to Third Parties) can lead to the development of highly innovative solutions with market uptake. Indeed, the complexity of large projects is often likely to cause issues in terms of implementation quality, achievement of project objectives and coordination of different types of resources and expertise. The combination of these conditions might jeopardise progress, adherence to the schedule and quality defined ex-ante, and the possibility for smaller (non-established) stakeholders to contribute or partic-

ipate in the decision-making process. By dissecting the issues and tackling each section separately, the third set of failure themes (risk and uncertainty from [2]) is mitigated (or ideally avoided) and some of the proposed remedies are applied, i.e., bridging the gap to manufacturing, and building and leading collaborations. By forming agile collaborations with smaller tasks at hand, different perspectives are amalgamated hence leveraging the power of benchmarking different domains that would not necessarily be considered in a classic infrastructure mega-project. By giving a voice to the smaller organisations, different perspectives might also uncover different potential uses. It is only the usage that delivers the final benefits, which is what the public expects. The effect of realising risks is also minimised as the dynamic environment with a more limited scope lets easier discovery of negative outcomes, as well as withdrawal of the less promising initiatives with limited losses or impacts on the general objectives endorsed. By focusing on smaller impact-driven projects that should deliver outcomes in short intervals, there are opportunities to react fast (i.e., either reject or improve) to emerging needs as well as potential competitive solutions. In this scenario, there must be an overall system integrator that oversees the portfolio of projects financed, manages adequate resources to perform overall system integration, and incorporates outcomes of successful small projects. The assumption is that, if successful, the product of the cooperation is a lot higher than the sum of its inputs just as the corporate strategy makes the corporations add up to more than the sum of their business units [4].

II. WATER MANAGEMENT INNOVATION ECOSYSTEM AND RELATED CHALLENGES

While the term water innovation is quite recent in publications, it has gained higher strategic importance in the last decade, paving the path for conversion of water-related challenges into clearly defined research and innovation gaps [5]. The key water sector functional categories are services, resources management and water infrastructure. Despite being a sector of high societal significance, the innovation within water management is generally less dynamic (e.g., water for production and hydropower [5], urban and rural water supply and sanitation, water-related disasters) although highly needed. Indeed, several contextual factors influence the trends and dynamics of the sector, bringing the need for specific innovations to be developed, such as in the case of the increasing demand for water coming from the agriculture industry, pressured by climate change, extreme weather events and water scarcity. As a consequence, innovative solutions are needed to increase environmental friendliness of water management, prevent overexploitation and contamination, and foster smart management of the hydric resource (e.g., optimization of evapotranspiration and multi-criteria and risk-based irrigation practices) [6]. Aside from the technological issues related to this field, one must also consider the non-technological aspects e.g., governance, security, etc. In this regard, the case of water management in urban environments is particularly representative, as urban domains typically provide appropriate conditions for potential collaborations among technological stakeholders (e.g., research institutions, innovative ecosystems, start-ups/SMEs). Institutional innovation is also an essential factor that supports and coordinates such innovative environments and promotes societal behaviour changes, as intertwined factors to secure impact innovation [7]. In addressing either technological or non-technological challenges, the appropriate opportunities are being exposed and further pushed into prominence with the rise of digitalization. While digitalization is proving to be the key enabler for stakeholder engagement, it is the complexity and the social significance of the sector that dictates the need for holistic solutions. Some of those solutions may be tackled in a phased multi-staged fashion using a range of smaller distinct projects which are related to each other in terms of challenges that they are tackling, but are not necessarily connected into a single entity. Such smaller-scale agile projects draw their potential for success from lowered barriers to entry caused by digital transformation propped by technology innovations and agility associated with short, goal-orientated activities. On the other hand, as human skills that drive digitalization are transferable between different domains, the expertise could be attracted from other domains that would traditionally not be associated with the water sector (e.g., ICT, or information and communications technology). In that case, exploiting the benchmarking concept, as a method of learning from other domains through structured comparisons to identify new ways of operation may be supplemented by interlinking with services from other domains [8]. Technical overlaps also offer the possibility of sharing services with other domains.

To provide the multi-faceted solutions in a phased manner, the projects must be performed in a coordinated collaborative fashion, so to lend an opportunity for harmonious integration and homogeneous holistic solutions. Additionally, the structural characteristics of the sector appear to make smaller collaborative projects preferable. That is partially caused by the longevity of the infrastructures and price-caps, the characteristics which discourage large investments and consequently place higher preference on repairs or than on renewal [9]. Equally, the normally preferred solutions focus on the implementation of tried and tested options, rather than on innovative experimentation [10]. A general recommendation is to complement specific water sector functions with cross-sectoral approaches and to quantify and monitor the impact of water-related innovations to ensure equitable, short and long-term water security [5]. In response, collaborative innovation is increasingly championed to secure meaningful change leveraging on the combination of competencies, experiences and shared decision making [11]. However, such collaborations pose barriers that block the path to success, often resulting in the failure of projects for a range of reasons. These barriers are mostly occurring when at least one of the following conditions arises: stakeholders without the capacity to act, clear roles and responsibilities not explicitly established, limited acceptance of different values, norms and cultures, absence of a clear and strong vision, that hamper motivation and ultimately the achievement of the expected results [11]. If we assume that full

stakeholder engagement is the key to the success of the water sector collaborations (considering the societal importance of the topic), once again, the complexity of the task at hand and the idea to tackle the challenges in a piecewise fashion using smaller agile projects draws the need for coordinated action to harmonize and coordinate the contribution of each solution to the general goal of improving water management. In such context, cooperation need to be fostered via the launch of shared challenges, the definition of a common goal or a set of common goal composed in an harmonized portfolio of actions, and ideally by providing the contractual framework to stabilize the interaction between the parties. The positively contributing factor is that the sector appears to be more open to collaborative projects and has also learned how to perform those. Such a conclusion is drawn from the finding that trust and an effective coordinator have dropped down the list of causes of collaboration failures while surveyed water practitioners prefer to focus on process design and methodology as a measure to secure project success [11].

On the other hand, as water is primarily seen as a stage upon which politics is played, the drawbacks of collaborative water projects are associated with the need for substantial investment to develop and sustain partnerships, the increased size and complexity of governing bodies, ongoing political contestation between state and non-state actors, the potential for top-down decision making, and parochialism [12]. Hence, how to initiate and financially sustain these collaborative actions remains a core aspect of innovation in water management, as key drivers of motivation, commitment, trust and attitude of participants. Indeed, the introduction of new government requirements or standards, or the presence of a sponsor (early adopter client) or funding incentives (in particular for overcoming the initial costs of the prototyping phase) can foster innovation by lowering the entry costs for SMEs and start-ups which might not enjoy yet the privileges of major companies positioning/reputation in the sector [13], but have great potential to deliver results/innovative products. Grant schemes can be an effective solution to foster the participation of SMEs and startups in the innovation process, provided that the administrative burden is minimized, the involvement costs are transparently shared amongst all stakeholders, no single stakeholder carries all the risk [14], no large an amount of money is expected to be invested by these actors upfront [13], and the time to deliver is relatively brief to allow quick experimentation and follow up (either as scale up or quick dismissal of the project in case of failure).

III. DigiFed Funding Mechanisms

The Horizon2020-funded project DigiFed gathers 12 international partners from 9 Member States of the European Union (AT, BE, ES, FR, GE, HU, IT, SL) and Associated Countries (UK) with expertise in Digital technologies and innovation management with established ecosystems. DigiFed partnerships are designed to strengthen a European high-tech ecosystem through the adoption of advanced digital technologies (such as Cyber-Physical Systems, or CPS) and in combination with Regional, National and European funding instruments. The project supports European SMEs, start-ups and midcaps through knowledge sharing and the development of innovative products and services. To fund and assist companies, DigiFed has developed three main innovation pathways (Fig. 1), i.e.:

1. Application Experiments (AEs) provide financial grants of up to € 55,000 as well as technical and business support for the development of smart applications in Europe. There are two possibilities for demonstrative cross-border projects:

- Single AE: the applying company requests technical expertise from a DigiFed Technology partner to generate a new smart product or service.
- Twin AE: two applying companies generate a new smart application (up to € 110,000 of funding).

In 2 years of implementation, DigiFed has succeeded in funding 71 companies and 46 AEs in several sectors, for an overall budget of €3.6 M investment over 3 Open Calls aimed at developing innovative solutions that include:

- Access to technical platforms in the domain of cyber-physical and embedded systems (CPS)
- Support aimed at bringing innovations to target markets.
- Innovation management support focusing on sustainable business development, market access and networking.

2. Generic Experiments, focused on the development of new co-funding mechanisms with regions to target a group of SMEs and Midcaps to implement advanced technology demonstrators with co-funding from regional authorities.

3. Digital Challenges, a match funding opportunity where advanced digital technology SMEs are selected to solve industry challenges set by corporate businesses. DC highlights attractive market needs for which new solutions are required: an industry challenge is proposed by a large European organisation, which serves as an early adopter of the accelerated innovation developed by the selected SME and provides additional support to the programme in the form of co-funding, access to innovation support and pilot sites.

Out of the three funding pathways, the water utility industry has been centrally involved in Application Experiment and Digital Challenge, as detailed in the next section.

IV. Success Stories: DigiFed supported experiments in the water management sector

This section describes a set of successful Application Experiments and a Digital Challenge

A. Arno – A Self-Powered and AI-Driven Water Grid Management System

Nowadays, a massive 23% of drinking water is lost in the European Union (EU) due to the inefficient management of distribution networks [16]. Freshwater withdrawals have more than tripled over the last 50 years, and their demand is yearly increasing. As a reaction to the growing concerns about water management, the EU is including water policy objectives in many areas, with individual countries setting their own targets. Old drinking water pipes commonly suffer

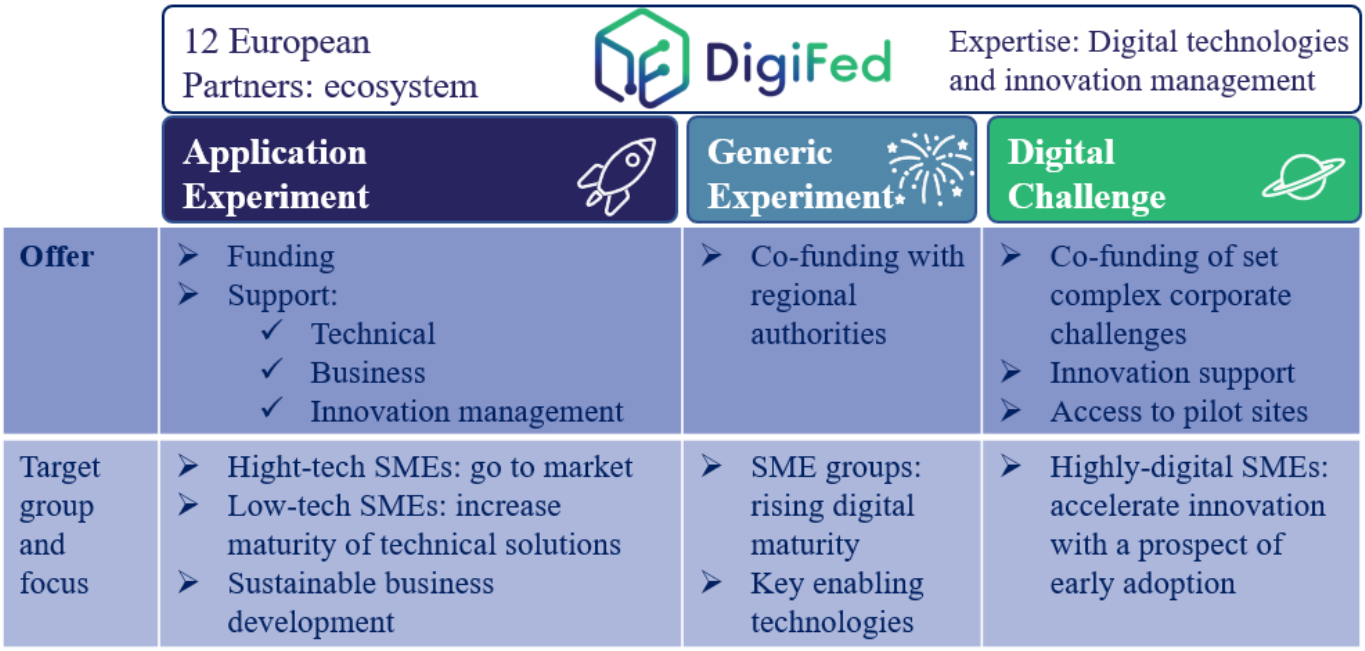

Fig. 1. Key Characteristics of DigiFed's Pathways.

from leakages and failures which are two of the main reasons behind the huge drinking water waste in the EU. As the rate of water pipe replacements is low, there is an urgent need for the implementation of smart functionalities, including smart monitoring and predictive maintenance. In the described context, water shortages, decreasing water quality, and increasing processing costs are the concerning factors that fuel the need for advanced automation and data-driven management in the water industry. Certainly, the implementation of the described functionalities would drastically improve pipeline life and safety, resulting in greater efficiency of the water distribution networks. Nevertheless, pipelines are required to be connected to the electric grid, otherwise, the lack of power limits the implementation of smart capabilities. To tackle this significant issue, the purpose of the Arno project is to reach an unprecedented level in the monitoring of water pipelines. Thus, the Arno solution consists of a self-powered water grid management system, using an Artificial Intelligence (AI)-driven technology for the prediction of system failures and pipeline water leakage. Indeed, Arno reduces pipeline breakages which results in a significant increase in water savings. Furthermore, its implementation will save energy, reduce repair and maintenance costs, and lower the public liability risk and the reputation risk of utility companies. Additionally, the groundbreaking technology developed within the Arno project takes the control and monitoring of water pipelines from a field-based activity to a control centre job, which is suitable for all workers. Moreover, Arno is fully aligned with the sustainable development goals set by the United Nations, the challenges highlighted by the European Green Deal, and the EU "Secure, Clean and Efficient Energy" Societal Challenge. To achieve the ambitious goal of the project, DigiFed's contribution has been key, as it has closely collaborated with Arno's partners AMT (Italy) and Medius (Slovenia). Notably, DigiFed's contribution to the project was instrumental when it came to co-designing the integrated product for the water industry. Additionally, the opportunity to work alongside the DigiFed partners on innovation management has been a determining factor in the project's implementation, particularly in (i) identifying the best marketing strategy to offer the Arno solution in the water market, and (ii) further assessing barriers for entry into the target countries, particularly those outsides of the EU. Overall, DigiFed's support has enabled the achievement of the envisaged objectives for the Arno project. Thus, allowing the creation of the world's best water grid management system on the market.

B. WatU4cast – Water forecast for water utilities

The pioneer WatU4cast solution was conceived by the main partners of the project, Waterjade (Italy) and Global Omnium Idrica (Spain), to provide reliable predictions on water availability. Currently, water supply services require a complex system (Digital Twin) needs to accommodate multiple data to simultaneously reproduce the behaviour of the whole system. Nevertheless, existing systems work under the assumption that water will always be available, never considering water abstraction a real problem. This is unfortunately not the case as water scarcity is already a significant issue in many regions, mainly due to the detrimental effects of climate change. The fact is that current prediction procedures used by most Utilities are based on a "past-to-future" approach, which merely re-projects historical data to the future. Not surprisingly, this approach is subject to substantial drawbacks as it is subjective, and it does not consider the situation on the catchment nor the

effect of climate change on water prediction. Consequently, it results in great uncertainties and high inaccuracy of water predictions. Intending to solve this problem, the partners of the WatU4cast project have developed a leading-edge system integration able to ingest highly-customized water predictions into the management system. By extending the Digital Twin concept, all the activities in the urban water cycle can be managed through dedicated software components, enhancing the correct water distribution to the households. The overall achievement of the solution developed within the WatU4cast project is the optimization of the decision-making process in the water purification plant operations. To attain its ambitious goal, partners were provided with financial support, as well as technical expertise from DigiFed, which allowed them to improve the already existing Waterjade® technology to address urban hydrology. Collaboration with the DigiFed partners and the funding granted are decisive both during the project's development and implementation.

C. Waisense Guard - Development and validation of a cyber-physical system for water monitoring

Waisense Guard is another project that addresses the concern about the future water scarcity, which has deepened due to the COVID-19 crisis. The project is developed by Metrica6 (Spain) and it responds to the demand for much-needed measurements to enhance water savings and waste reduction. Even minimal water leaks, which may seem insignificant at the time, account for many litres of water wasted per year. In the current situation, optimal management of water resources could be attained by the substitution of current analogue water meters for digital ones with integrated functionalities for leak detection, warning, and cutting off the supply. Nevertheless, the implementation and use of smart water meters are purely residual in Europe. If its implementation would be extended, and thanks to the use of AI and customers' support, the impact on water waste and savings would be major. However, there are currently limited technologies addressing the described issues and the existing ones are not modular nor compatible. In the described context, the Waisense Guard project arises as an innovative internet-of-things (IoT) solution in the water management field. The project is developing and validating in real scenarios a disruptive cyber-physical system for the remote control of water installations using IoT connectivity. Waste of cold water, water leaks, under and over-watering in farms, and the lack of maintenance in plumbing installations are among the specific issues targeted by Waisense Guard. The impact that the developed system is expected to have on water consumption is significant as it will detect, warn and cut anomalous consumption, mainly related to water leaks. Additionally, data from water flow and other environments will be gathered for a better decision-making tool. Furthermore, all the capabilities of Waisense Guard are centralized and connected in a single digital platform or online app for the ease of consumers. Thanks to the support from DigiFed, the main partner of the project, Metrica6, has succeeded in harnessing pioneer technologies to develop and improve its solution while reducing technical risks. Indeed, the access to DigiFed's industrial platforms, product support, and high-level technical expertise in IoT has made Waisense Guard a technologically robust and efficient Application Experiment. Furthermore, DigiFed will foster the presence of Waisense Guard in European markets.

D. AR4WATER+ – AR detection of underground urban water infrastructure

AR4WATER+, jointly developed by Allbesmart (Portugal) and Aqlara (Spain), addresses the challenge of managing large and complex water distribution networks. Water large infrastructures are mainly underground, difficult to access, and coexist with other utilities (gas, electricity, telecommunications). Therefore they need to be precisely documented and within an easier reach than is often the case. In European cities, water distribution networks can be very old and require constant network maintenance. Due to their sheer size, the amount of investment to completely renew an old network is in most cases not feasible, especially if considering a short term replacement. Likewise, the documentation of these networks has only recently been digitalised, mainly pushed by geographical information systems (GIS) technology. Nonetheless, the coordinates associated with many network elements are still based on old technology, such as metal detectors, or simply based on human visual information. Currently, field workers, when performing maintenance operations, still rely on 2D maps (printed or digital) to locate network assets such as pipers, mains, and manhole covers. AR4WATER+ provides a disruptive method for water utility companies to interact with their network. By taking advantage of recent advances in augmented reality (AR) technology and standardized open-source protocols, AR4WATER+ has developed a minimum viable product, that enables field workers to see and interact with 3D holograms of the water network elements (valves, pipelines, hydrants, etc.) projected on the real-world exactly where they are represented on the GIS system. Any location errors in the GIS system can be easily spotted and reported back to the central GIS database. The solution results in significant efficiency-related improvements, among which the most prominent can be time savings (an average of 20 hours per month for active users), quality assurance (60-80 % less time required for asset location and validation), improved GIS issues updates and reporting (60-80 % quicker updates and record-correction submission), cost reduction in the detection phase, given the low cost of affordable hardware that provides the possibility of working with a € 400 tablet without professional Global Navigation Satellite System (GNSS) device and external antennas, and a more environmentally-sustainable approach, arising from process dematerialisation and fewer travel requirements. Thus, this Application Experiment perfectly addresses the research question in terms of how partial solutions can contribute to a macro-solution, just as single pieces of the puzzle form the whole picture. Given the complexity and rigidity of the underground water infrastructure, utility workers are unable

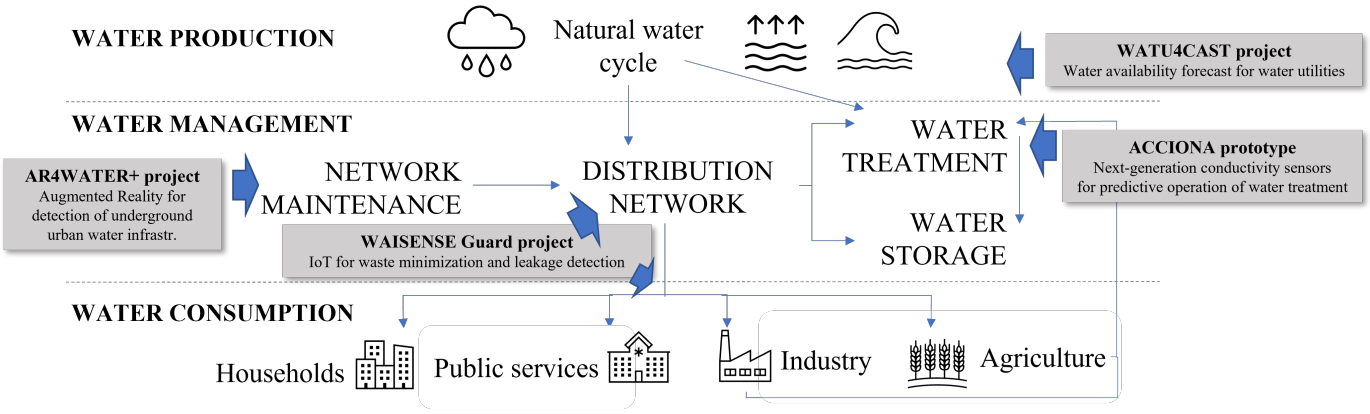

Fig. 2. DigiFed contributions to water supply chain.

to directly look at buried assets in order to access networks, occasionally leading to excavation damages.

E. Digital Challenge: Next-generation conductivity sensors for predictive operation of water treatment

While 72% of the earth's surface is covered with water, 97% of this water is salty or brackish. The distribution of the remaining 3% (freshwater) is very uneven. For countries facing chronic shortages, the only available water resources are treated wastewater or saltwater. To this end, water operators and desalinisation companies are bringing innovation and technical potential into action to create solutions to water scarcity, sanitisation problems, and access to this vital resource. All processes and facilities are run through tracking and automation equipment. Among the various processes, membrane desalination via reverse osmosis (RO) has become the most widely used solution, as it is generally the least costly, being particularly suited in countries under water stress and with limited energy resources. Currently, in the water management industry, the monitoring of the performance of individual RO is still based on manually probing the product water tube of a pressure vessel at different locations with a plastic or stainless steel tube to obtain a conductivity profile that is compared with the expected profile. This is very laborious, time-consuming and not practical, especially for large size desalination plants in which thousands of RO elements are part of a desalination facility. Therefore, Acciona, one of the market leaders in the RO desalination arena, has partnered with DigiFed seeking innovative digital solutions [17] that could continuously monitor the performance of each RO membrane element in a multi-vessel array. As a Digital Challenge Owner, Acciona intended to establish an end-to-end digital wireless solution for measuring, reporting, and visualising the conductivity of each RO membrane. This enables the improvement of the maintenance activities due to the immediate detection of malfunctioning elements and fewer shutdowns of plants. To tackle this challenge, Instrumentation Technologies (SI) is developing SWICSSY, an end-to-end system that exploits new sensors for conductivity measurements and wireless communication to assess the performance of the RO membranes in real-time, have the visibility of the pressure vessel's performance and identify the problematic RO membrane inside the vessel, and enable the integration of the conductivity measurements as part of active operational strategies. The project fills the gap between technology development and market uptake of products by bringing together main stakeholders along the value chain, and developing an innovative product according to end-user expectations and needs. Thanks to the close collaboration between a technology developer and an end-user, with the support of DigiFed partners (innovation management and technology) the product will be developed and tested in a short time.

V. Lessons Learned: The Integration Potential

Two issues are evident: water scarcity is a serious concern and large infrastructure projects are often breaking the boundaries set by the original scope, time and budget. While DigiFed considers the possibility of developing appropriate infrastructure through a combined range of smaller agile projects that are possibly easier to manage, it starts to shift the issue away from theoretical consideration and into the practical realm. Fig. 2 depicts the presented set of projects that, when combined, start to resemble a holistic solution. While this example could not offer a full solution, it works towards demonstrating the power of cascade funding for water and utilities sector, if adequately organised and implemented. Although no obvious or one-fits-all approach exists to determine how to break down a macro-objective in a portfolio of smaller actions, the experience of DigiFed points towards some relevant aspects to be considered. These include the internal coherence of a certain set of actions that can be clustered under a single project/challenge, the timing and interdependencies among different action lines (e.g. if the production of a certain object can constitute the base for the launch of a set of other actions) and the feasibility

in a determined time frame (e.g. 1 year prototyping time) sufficiently agile to allow the reshape of actions to alternative solutions, should it be needed. Considering the need for an agile approach to the smaller projects, the success is also likely to be subjected to the ability of the project partners (normally SMEs) to be truly ambidextrous [18] in terms of allowing innovations and traditional core business to coexist and complement each other. DigiFed aimed to not only source innovative solutions but also to bring those closer to the market. Hence, the presented cases do not only strive towards the exploration of innovative solutions, but also work towards exploitation through the implementation of partner go-to-market strategies.

VI. Conclusion

Considering the described success stories, relevant evidence supports the fact that cascade funding is an efficient alternative for funding small-scale water management projects, contributing overall to infrastructure incremental innovation. Crucially, this funding instrument enables small companies to get the funding sought and the needed technical support for the development of their innovative projects in an agile manner, and without having to face cumbersome bureaucracy or high risks. As presented in this paper, although the set-out projects funded by DigiFed are unrelated, together they offer significant contributions to secure relevant impact and improvement on the water management value chain, with a particular focus on the digitalisation of the water system.

The limited amount of money transferred via cascade funding has therefore proven to be efficient in addressing specific challenges in the water utility industry with tangible impact in helping SMEs to overcome the initial prototyping phases with limited risk and opportunity to dedicate time and resources to development activities. More extensive investments will then be needed to scale up these solutions and solve core infrastructure issues: this phase can be better addressed by market traditional instruments, as the critical demonstration phase has been overcome. Hence, DigiFed-like initiatives (i.e., including different funding pathways) can provide SMEs not only with funding support, but also with complementary support in terms of technical expertise provided by involved partners, innovation management guidance, project management monitoring of advancements and support to solve critical issues, and ultimately visibility towards possible future investors or collaborators. This is particularly evident in the case of specific innovation challenge (e.g. Acciona one), for which relevant benefits are also provided to the infrastructure owner in terms of both reduction of the investment size and related risk, as well as access to a wider (European-wide in this case) audience of possible innovators, going beyond their traditional or more close network. By supporting smaller projects, cascade funding instrument appears to be very promising in order to stimulate innovation and discovery of innovative players, as well as to minimize risks of project failures with short term delivery and small investments. This includes also the possibility to withdraw any projects with minimum economic losses and without significantly disrupting the overall objectives of the initiative.

These evidence lead to the conclusion that by coordinating small experiments and related investments towards a shared goal, such as improving digitization of water management system, it is possible to create a portfolio of innovations with limited risk and high potential for scale up.

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