

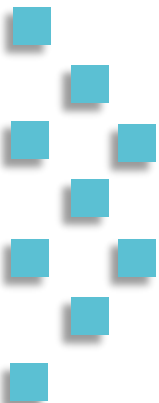


D5.3 Report on the application of ConConsus

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Project Consortium



Executive Summary

D5.3 describes the transformation of what had been called the ConCensus approach to citizen engagement into a concept named the Local Water Forum. It investigates the different components of the Quintuple Helix and their role in the creation and promotion of the digital administration of water as well as broader water-based issues. Local Water Forums demonstrated their worth. This paper examines the underlying philosophy which inspired them, the methodology which created them and the role which they subsequently played in the involvement of all sectors of a local society. The deliverable reflects the close relationship between the project consortium and the United Nations World Water Quality Alliance and how such a relationship was mutually beneficial in that it created a permanent channel of dialogue between local communities and supranational strategists as well as permitting the creation of knowledge exchange between one local community and another to form part of a global network. The deliverable also reflects two further important products of the work of Fiware4Water. The first is the full online engagement of a community which was a consequence of the inability to engage prospective citizen participants face-to-face as a result of the COVID-19 pandemic. The second, is the redefinition of the citizen scientist who, Fiware4Water argues, would be far more relevant if, before being asked to contribute to the collection of data, were actively engaged in the issue at hand.

Related Deliverables

D5.1 A Study of the current public perception of digital water and other related innovations, and recommendations

D5.2 The Fiware4Water City and Follower City Conference and Joint Declaration of Intent

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List of Acronyms/Glossary

CMC Computer-Mediated Communication

DSP Digital Social Platform

F4W Fiware4Water project

LWF Local Water Forum

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.

SDG Sustainable Development Goal

SEP Social Engagement Platform of the World Water Quality Alliance

UNEP United Nations Environment Programme

WEFE NEXUS Water-Energy-Food-Ecosystem Nexus.

The link and interplay between the four most important elements of sustainability

WPL Work Packages Leaders

WWQA World Water Quality Alliance

I. Introduction

When designing the proposal for Fiware4Water, the consortium was very much aware of the importance of the social and political integration of its technical developments. The relationship between research, the water utility, the public administration and most importantly the citizen, the individual who is at the same time, the subject of investigation, the end-user and the voter are vital aspects of modern-day environmental endeavours. By the raising of societal awareness not only with regards to water as a global challenge but also as a local issue, by incorporating all the above-mentioned components of the Quadruple Helix and by converting that Helix into the Quintuple Helix with the addition of the emotion-stimulation capacity of art and culture, the issue of water and the digital administration of the planet's most important yet undervalued natural resource can become the subject of public debate, engagement and the co-creation and implementation of solutions.

Fiware4Water sought to implement an approach to citizen engagement which would satisfy all sectoral needs. By examining previous work undertaken in the creation of the ConCensus approach, it looked to revise, improve and demonstrate the means to establish citizen engagement that supranational organisations have been demanding, national governments have been resisting and a number of local administrations have been attempting to provide. The result was the Local Water Forum. Fiware4Water provided proof of concept in the pilot site, the town of Great Torrington situated in South-West England, which was subsequently disseminated to cities in Eastern Europe and the locations of the Fiware4Water case studies in the Netherlands, Greece and France. Furthermore, as a result of the creation of a close working relationship with the World Water Quality Alliance under the umbrella of the United Nations Environment Programme, the project had a unique opportunity to not only extend its work to a far wider global audience but was capable of establishing permanent links between the world of supranational strategy and the reality of municipal implementation.

This deliverable describes the socio-political approach to citizen engagement to which Fiware4Water subscribes. It defines the Quintuple Helix, observes the debate concerning open as opposed to representative democracy at a local level and explains why local communities are so important if supranational objectives such as the Green Deal or the Sustainable Development Goals of the United Nations are to be achieved.

The social and political aspects of Fiware4Water were undertaken during the time of an unprecedented pandemic which obliged the consortium to employ a purely online approach to citizen engagement. This was regarded as a fascinating opportunity to examine the effectiveness of such an approach in combination with the use of broad public Digital Social Platforms (DSPs) as opposed to more traditional face-to-face methodologies. The findings described in this deliverable would suggest that online engagement is possible, but it also identifies certain disadvantages and demonstrates that the extent to which online engagement is feasible, depends, as do other aspects of citizen engagement, on local norms, political habits and societal idiosyncrasies.

Members of the consortium of Fiware4Water project became the founders of the WWQA Social Engagement Platform. This not only offered the advantages already mentioned above but resulted in the fact that the continuity of the Local Water Forums is guaranteed beyond the timeline of the project itself. Furthermore, as this deliverable will demonstrate, the creation of the Local Water Forums is now contributing to a new definition of citizen science, where the local participant instead of being the mere subject of investigation or the casual collector of a sample becomes an important member of a scientific or academic initiative due to the fact that they are previously a fully engaged stakeholder in the issue of water.

II. CONSENSUS

II.1. THE QUINTUPLE HELIX

The principal challenge we are facing as a society in the modern world is the creation of a sustainable global community which manages to live and evolve within the ecological boundaries set by our planet. A vital step in such a move towards a far more balanced approach is the recognition of the importance of two factors which are of great relevance to the European Union's *'Twin Transition towards a digital and green economy'*. First, is the intrinsic relationship between the world of water, energy, food and eco-systems. The WEFE Nexus is defined by both the JRC of the EC and the UFM as *'...addressing sectoral interdependencies in the management of natural resources and as an approach for operationalising the United Nations' 2030 Agenda for Sustainable Development'*. [1] The second factor is social and political by nature. It is the true and open engagement of the Quintuple Helix, the coming together of all social sectors in a process of co-creation, implementation and analysis of public policies. In 1995, Henry Etzkowitz and Loet Leydesdorff published "The Triple Helix - University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development" in which they described how a closer bilateral relationship between either the academic sector, private sector or the public sector would evolve into hybrid institutions which would mutually strengthen the aims of each sector; research, the production of commercial goods and the regulation of the market. Much would depend on which sector was the driving force behind the initiative. If the public administration is the dominant catalyst, the result is a top-down approach which would result in the strengthening of intersectoral ties. If market forces are the predominant factor, the ties would be weaker and far less defined whereas if knowledge is the lead sector which, in the opinion of Etzkowitz, is precisely what had tended to occur in recent years, not only does knowledge itself gain more prominence but also the three elements tend to enjoy a more equally balanced relationship. [2]

Building on the concept of the Triple Helix, in 2009, Carayannis and Campbell introduced the notion of the Quadruple Helix [3] and, three years later the Quintuple Helix. The Quadruple Helix approach argues that the world of research must relate to the real demands of society in general and that as a result there must exist a relationship between the original sectors of the Triple Helix with the end-users of innovation and civil society in general. In other words, the citizen. The Quintuple Helix, the concept of which has developed further during the lifetime of Fiware4Water (F4W), is the additional input of cultural activity and environmental preoccupation and its effect on the four other helix sectors, although the definition of the fifth sector does vary depending on who is advocating the Helix at the time and is still the source of much debate. Fiware4Water (F4W) interprets the fifth sector as being cultural stakeholders who are capable of creating emotional stimuli with regards to the environmental issue at hand.

II.2. REPRESENTATIVE VERSUS OPEN GOVERNMENT

The growing recognition of the importance of the Quadruple and subsequently the Quintuple Helix has over the last decade been defended and advocated by supranational administrations especially when discussing the environment. The United Nations clearly stated that *'...one of the major challenges facing the world community as it seeks to replace unsustainable development patterns with*

*environmentally sound and sustainable development is **the need to activate a sense of common purpose on behalf of all sectors of society**. The chances of forging such a sense of purpose will depend on **the willingness of all sectors to participate in genuine social partnership and dialogue**, while recognising the independent roles, responsibilities and special capacities of each.'* [4] When discussing the importance of the digitalisation of the water sector in 2021, EASME of the European Commission recommended that '*Legislators/Authorities must ensure that end-user engagement is considered a priority in the co-creation and implementation of initiatives involving the use of digital water technology.*' [5] This, indirectly, would appear to suggest an important political shift from what is described as 'representative or indirect government' to 'open or direct government'. This perceived move constitutes one of the most important elements of debate concerning 21st Century political theory.

The principal pillar of many Western democracies over the past 150 years (the four most quoted examples being the United Kingdom, France, the United States and India), has been the electoral system whereby representatives are chosen by citizens to represent their interests and concerns. Those elected meet to debate and make laws on behalf of the whole community or society, instead of people voting directly on laws or participating individually in debates. The growth of the influence of political-party interest and the decline of the trust that the general population are prepared to give to the political sector, perceived at best as insincere and at worst, as increasingly self-serving or indeed corrupt has led to a steady decline in public participation in elections and the enhancement of a divide between elected representatives and the voter. In other words, there is a lack of trust. This is by no means, a modern phenomenon. As early as 1911, in his book, *Political Parties*, Robert Michels stated that representative systems will almost always decline into oligarchies.[6] It is almost apathetically accepted by the lay person that promises made during elections will not be fulfilled and that professional politicians will look to their own interests once they have obtained a position of power working behind closed doors. [7]

As the perception of the monopoly of political parties financed by private interest has intensified so has the search for remedies. In 2005, the OECD argued that '*There is growing consensus that openness lies at the heart of good and effective government as an essential ingredient of 21st-century democracy.*' [8] It defined open government as '*the transparency of government actions...and the responsiveness of government to new ideas, demands and needs.*' In 2009, the Involve Group demonstrated that more open approaches would enhance the creation of objective data on which decisions could be based, reinforce a sense of '*integrity*', combat corruption and restore public faith in government. [9]

The existence of trust or the lack of it, is an essential element in all types of policymaking but perhaps even more so when addressing environmental issues which often require long-term visions and sufficient time in order to bear fruit. [10] Trust is required not only in the creation of a policy but also in its implementation. It can only occur if a) all sectors, representing the Quadruple/Quintuple Helix including the entity proposing a specific action are fully informed from the very outset of an initiative of all the advantages and disadvantages and subsequent results of said action and b) if all social sectors within the affected community are truly engaged. It does not necessarily represent the abandonment of representative democracy, which at a supranational, national or indeed regional level would be logistically challenging to say the least. In 1997, Bohman discussed the concept of 'Deliberative Democracy', a combination of the rule of the majority but with a base founded on social consensus, permitting representative democracies (which are the socio-political reality in European Union member states) to coexist with more direct forms of governance. [11] Where this is most likely to occur and indeed where such an approach has been seen to be practicable is at the local, municipal level.

I.3 LOCAL GOVERNMENT – GLOBAL WATER STRATEGY

The European Union, the United Nations, the OECD and the World Bank have all been very clear. There has, during the last three decades, existed a broad call for the involvement of the **Quadruple/ Quintuple Helix**, for more **open forms of environmental policy creation and implementation** and for the need for local communities to become key stakeholders in the interpretation and implementation of supranational environmental policies aimed at establishing the basis for sustainable urban and rural municipalities. [12] [13][14] This desire for a top-down/bottom-up approach has been further stressed since the introduction of the European Green Deal where emphasis has been placed, in the words of EU Commissioner Virginijus Sinkevičius, on the necessity to involve ‘...all social sectors in order to ensure the ‘Just Transition’ to a green and digital economy.’ [15] Despite the tremendous effects of both the COVID-19 pandemic and the present military, social, economic and humanitarian crisis in The Ukraine, these remain solid EU priorities.

There are a number of reasons why local governments and local agencies such as utilities lend themselves to effective engagement of the Quadruple/Quintuple Helix and to act as the implementors of international environmental strategies. Direct access to the Private, Research, Citizen and Environmental/Cultural sectors of a local community is far more readily available to a local administration, as is the capacity to interact with all genders, age groups, income groups and ethnic minorities. This was, to a limited extent, demonstrated when the United Nation’s Agenda 21 (1992) was executed in numerous municipalities around the World, whereby citizens including representatives of local industry, research institutes, members of NGOs and inquisitive citizens came together to envision their own communities in the 21st Century. The Covenant of Mayors for Energy, which was instigated by the European Commission in 2008 has provided further opportunities to demonstrate the effectiveness of municipal policies contributing to the overcoming of global environmental challenges. To date, nearly 11,000 cities, towns and villages have signed the Covenant which originally established objectives for the year 2020 and which has subsequently, under the name ‘The Covenant of Mayors for Climate and Energy’, identified significant objectives in renewable energy production, energy efficiency and the reduction of CO₂ by 2030. (See also D5.2 : *The Fiware4Water City and Follower City Conference and Joint Declaration of Intent Signed*). Many of the signatory municipalities, being obliged to create and implement a Strategic Energy and Climate Action Plan (SECAP), have involved the local Triple/Quadruple/Quintuple Helix in the process to varying degrees.

Undoubtedly, the Covenant of Mayors and certain subsequent actions have demonstrated that some of the environmental elements of a sustainable society are easier to ‘sell’ when seeking the participation of lay people. Much of this has to do with visualisation. The Covenant has been incredibly successful in creating public awareness about energy and contamination. Energy is a subject that is capable of giving political stakeholders the opportunity to offer tangible, attractive, visual results. The appearance of photovoltaic panels, solar panels, and wind mills generating energy is proof of action that all can see. Similarly, with regards to public transport and the elimination of CO₂, the appearance of bike lanes, electric vehicles, enhanced public transport and pedestrian zones will be noticed by the entire community, as will the disappearance of heavily contaminated air.

Water and the digitalisation of the management of the World’s most vital natural resource is, however, another question. It is possible as a result of Extreme Weather Events such as droughts or flooding to temporarily attract the attention of a large percentage of the population. However, depending on the location in question, such crises do not normally have a permanent effect. If one can turn on a tap and water is available, neither lay people nor their political representatives are particularly interested in something which, to many, is an invisible element. (An example of an Extreme Weather Event which did cause a long-term change in water policy was the famous Copenhagen Cloudburst of July 2011

which resulted in 90,644 insurance claims and the city of Copenhagen joining the United Nations *Making Cities Resilient Campaign* ten months later [16]). Indeed, many local political decision makers will try to avoid water-based issues such as leakage, given that in the eyes of the general populace, the only visual result would be the inconvenience of streets being closed for extended periods of time, large amounts of funding spent and, once completed, nothing to be seen but a repaved road.

However, if what may appear to be a superficial problem, is overcome at a local level and public awareness can be created with regards to both local and global water-based issues, there are other obstacles to be addressed if purposeful public engagement is to be achieved:

- 1) The definition of engagement itself has been and continues to be debated. It cannot, as was the case all too often in the creation of the Agenda 21, be limited to attendance by members of the general public to conferences or workshops, where occasionally, a citizen can pose a question to a local expert. Despite the claims of many elected representatives, this is not policy co-creation and indeed has, in many cases, proved to be the cause of further disaffection and mistrust on the part of people who would otherwise be interested in contributing to the debate. **(See also D5.1 : A Study of the current public perception of digital water and other related innovations, Pag 11).**
- 2) Participants have been observed to collaborate in public engagement processes as a means of advocating their own interests or the interests of a particular political party. As a result they are often unwilling to contribute towards jointly-created solutions and the result is that no new outcomes are produced. Indeed by serving political-party interests, such members of local initiatives can deliberately constitute the principal means of undermining the value of an engagement process.
- 3) Time is a valuable commodity and many members of society cannot permit themselves the luxury of dedicating the hours needed in order to build trust and a sense of common purpose. Furthermore, the representation of social sectors may provide a biased reflection of the population of the local community in question. Genders, certain age groups, low-income earners and ethnic minorities are often unaware of a public engagement approach or do not have the means or time to be able to contribute to the subsequent activities.[17]
- 4) Public engagement does not necessarily lead to public consensus. Conflicts of interest, and individual differences of opinion must be overcome. The art of compromise can only be established over time, especially if the subject in question is highly controversial and capable of producing a strong emotional response. Only if a broad general consensus is established can such an exercise have the opportunity to produce lasting effects. [18]
- 5) Perhaps the most important aspect of any policy, once approved, is that of ensuring its continuity until it has truly provided the desired results. The principal obstacle to such continuity is political-party rivalry which at a local level can be just as vicious and single-minded as it is in any other sphere of political action. If, once approved, a policy is still being implemented when a change of local government happens, due to elections (Once every four years in Spain and Germany, once every five years in Italy and once every six years in France) or a vote of no-confidence, it is often the case that a policy, clearly identified with the programme of one specific party, is abandoned or relegated to the archives by that party's successful rivals before having been completed. The result is wasted time, wasted public funds and perhaps most importantly a failure to address pressing water-based issues.

I.4 THE COUNCIL OF CITIZEN ENGAGEMENT IN SUSTAINABLE URBAN STRATEGIES

To answer certain aspects of the aforementioned challenges, the concept of ‘The COuncil of Citizen Engagement in Sustainable Urban Strategies (ConCensus) was created in 2017 and was then tested and developed. A paper was published in 2018. [10] During the course of F4W, the concept has been adopted, modified and improved upon, in the guise of Local Water Forums. Within F4W, the consortium has striven to demonstrate, in the words of the OECD, ‘...that services work better when designed and delivered in partnership with citizens, and that listening to stakeholders’ insights can foster innovation in service delivery practices and better risk management’. This would help to ‘...legitimize government actions and set a foundation for successful policymaking and implementation, thus allowing a focus on medium- and long-term planning, an essential feature of effective water policymaking.’ [13]

The original ConCensus concept was a simple one. By co-creating, from the outset, a policy by means of a process which involved a broad sectoral representation of the local community it was assumed that a sense of public ownership would evolve. This approach is not original. Indeed, it is the basic principle upon which most citizen engagement processes have been constructed, whereby awareness leads to interest and concern, interest and concern lead to engagement and collaboration leads to social consensus. What ConCensus, in the early stages of its development addressed specifically, as opposed to other engagement methodologies, was the issue of policy continuity. If those stakeholders who have participated in the identification of the issue to be tackled and in the design of a solution are also **instrumental in the implementation of said solution**, be it a campaign, an initiative or a formally approved municipal policy, said action would no longer be associated with one political party or the management of the relevant utility. It would not be the property of one specific group but the vision of a far broader proportion of the local community as a whole. Furthermore, by offering lay volunteers the opportunity to participate in the execution of the project at hand, one would avoid the sense of disappointment, disaffection and mistrust which had resulted from many examples of the Agenda 21 initiative described above.

The question to be answered was what role a non-qualified lay person could play in the implementation of a possibly complex technical process. The answer was that of spokesperson and overseer. The volunteers would be encouraged to assume the role of disseminator not only to their local community but beyond. Ordinary citizens would become interlocutors on behalf of their community to higher governmental levels and third-party stakeholders beyond the frontiers of their municipality. Furthermore, as overseers of the initiatives’ progress they would be able to hold the relevant administrative and technical entities to account and would a) impede future politically motivated intervention by newly elected members of a local government and subsequently b) enhance the possibility of guaranteeing the continuity of *their* initiative until it had been completed as originally planned, thus providing more attractive conditions for investment in terms of both staff hours and public funding. In short, it would represent a tangible, specific move from representative to open policy creation and execution and would thus promote public trust and third-party funders’ confidence.

The theory was initially put into practice in Los Angeles (USA) with the collaboration of the University of California (Irvine) and then, as part of the Horizon 2020 project ‘POWER’, in Jerusalem (IS), Ramallah (PAL), Milton Keynes (UK), Sabadell (ES) and Leicester (UK) where the ConCensus approach was first linked to the issue of water and the role of Digital Social Platforms (DSPs). From the outset, it became apparent that the methods employed to a) enhance awareness and b) generate initiatives were far too contrived and subsequently less effective than expected. Furthermore, it was clear that once the project (POWER) had been completed, there was little guarantee that the resulting actions would

continue to be supported by the relevant public authorities or water utilities. In both Milton Keynes and Leicester that proved to be the case, although in Jerusalem, Ramallah and Sabadell, the actions devised were not abandoned and have in fact, developed further, as a result of their being informed of the progress of F4W. Such lessons have been addressed during the course of F4W with the creation of the Local Water Forums.

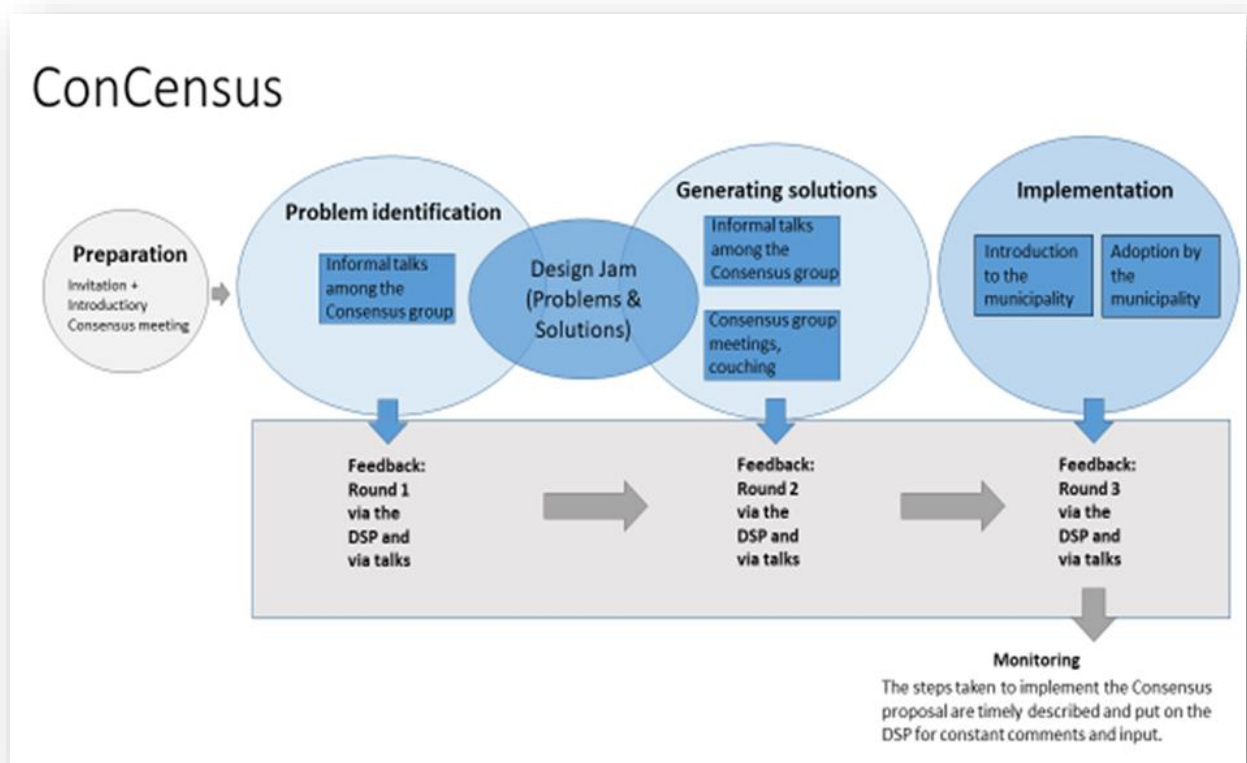


Figure 1 The original ConCensus methodology (Source: Author)

III. THE FIWARE4WATER LOCAL WATER FORUMS

III.1. THE OBJECTIVES

The specific purpose of the ConCensus in Fiware4Water was to achieve a broader social awareness and, subsequently, a solid foundation for the long-term application of water-based open technologies in relation to the supply and administration of water. The aim was to develop public knowledge and support through the engagement of the full Quintuple Helix at a local community level in order to incorporate local industry, businesses, SMEs and citizens of all social standing. Furthermore, it was intended to establish permanent channels of communication between the volunteers of the ConCensus, the local authorities, the water utility and the research sector which has often ignored the need to interact directly with other sectors unless seeking funding or volunteers to monitor or observe local conditions in what has mistakenly been described as citizen science. Thirdly, it was decided that the chosen pilot site (Great Torrington, UK) would serve as a model for possible replication in a number of follower cities in Eastern Europe situated in Romania, Hungary, Serbia and Bulgaria as well as offering an example of the merits of citizen engagement for the other case studies of F4W (Athens,

Cannes and Amsterdam). Finally, it was considered essential that the volunteers composing the ConCensus would initiate a bottom-top link between their local community and supranational administrations responsible for both the design of long-term international environmental strategies such as the United Nations, the OECD, the European Commission and the World Bank together with organisations that represent the water sector such as Water Europe, the ICT4WATER Cluster and the EU Water Alliance. It was hoped that such an interaction would contribute to the establishment of an ambitious but practicable exploitation plan and contribute to the enhancement of civic engagement in the issue of water. Above all, F4W has sought to satisfy the demands made as early as 1985 when Cernea et al. spoke of a ‘...rising public concern for environmental protection, sustainable development, and participation and institution building’ [20] or Gigler who wrote in 2016 that ‘Empowering citizens to make their voices heard is not enough. We have to go beyond just listening to citizens; rather, we need to support governments to build institutional systems that incorporate citizen voices in decision-making processes, and thereby increase the responsiveness of government programmes to people’s real needs’ [21]

It had been noted during the early stages of ConCensus design and the experience in the POWER project that it is vitally important that all components of the local ConCensus be fully and objectively informed of all the possible aspects of the issue in question. This demands a more open approach to knowledge sharing on the part of both utilities and researchers who must come to terms with communicating often complex information in an accessible manner so that the elderly widow, the local owner of an SME, a college student, an artist, a local city councillor or the specialised technical and scientific expert can all enter into a dialogue based on mutual respect and shared concern about the benefits of digital technology in water-based issues. All too often, not matter what the subject, people form opinions based on hearsay, which in recent years is a habit that has become both socially and politically dominant thanks to the growth of social media which does little or nothing to differentiate between the outlandish claims of many and the informed opinions of a few. The trustworthy exchange of objective data is the only means to combat that which Kant famously described when he stated that ‘Enlightenment is man’s emergence from his self-imposed nonage. Nonage is the inability to use one’s own understanding without another’s guidance. This nonage is self-imposed if its cause lies not in lack of understanding but in indecision and lack of courage to use one’s own mind without another’s guidance.’ [22]

III.2. THE PROCESS

The implementation of WP5 of F4W commenced with an analysis of to what extent the general public were aware of digital water and if they were, how Industry 4.0 was perceived. (**See also D5.1 : A Study of the current public perception of digital water and other related innovations**). The investigation, although admittedly limited in its outreach, did suggest that whilst most people were aware of the importance of water as a natural resource, the concept of digital water, automation and artificial intelligence, was still a relatively mysterious area for the lay person. They were equally ignorant of the capacity of such technologies to extend water resources or support a dialogue between themselves, local government, the utility and environmentalists. Two demands stood out. The first, warmly welcomed by the F4W consortium, was the need for inter-sectoral collaboration. The second was a call for much more detailed information presented to the end-user. This was especially noticeable in Eastern Europe, which was to subsequently represent an important region of citizen engagement development within the project.

The actual process undertaken by F4W to implement an improved form of ConCensus principally in the pilot site, the town of Great Torrington (UK) identified by both South-West Water (SWW) and the University of Exeter (UNEXE) was divided into six basic steps:

- A) The recruitment of volunteers. This was undertaken in the pilot site in collaboration with the Town Council of Great Torrington and the water utility (SWW). It is these entities which would have sufficient local knowledge and contacts in order to disseminate the fact that a ConCensus would be created in the municipality. A pamphlet was created which explained extremely carefully what would be expected of the volunteers. It was, when creating the pamphlet that it was decided to rename the ConCensus as a **Local Water Forum (LWF)**. The original name was far too complicated to transmit effectively.



Figure 2: LWF Recruitment Pamphlet Cover (Source : Author)

- B) A series of meetings discussing global and local water issues and the introduction to the volunteers of the suggestion to initially organise a campaign at a local level to increase public awareness about the importance of water. Such an action is proposed as it is politically innocuous and permits the creation of a group identity based on what cannot possibly be described as a controversial initiative.

What is Fiware4Water?

Water is one of the greatest challenges of the 21st Century and everyone has a role to play in the future of our planet's most valuable natural resource. Fiware4Water is a project funded by the European Commission investigating the use of smart, water-related applications which also wants to give local communities the opportunity to have their say.

What is a Local Water Forum?

A Local Water Forum is a group of people from your village, town or city who want to participate in actions which will contribute to solving water-related problems. Everyone is welcome to join; young and old, local councillors, scientists, businesspeople, artists, nature-lovers and citizens who are concerned about the future of the planet and want to do something about it at a local level.

What qualifications do I need?

None whatsoever. Just a desire to help and to ensure that one day, everyone no matter where they live, will have access to clean water.

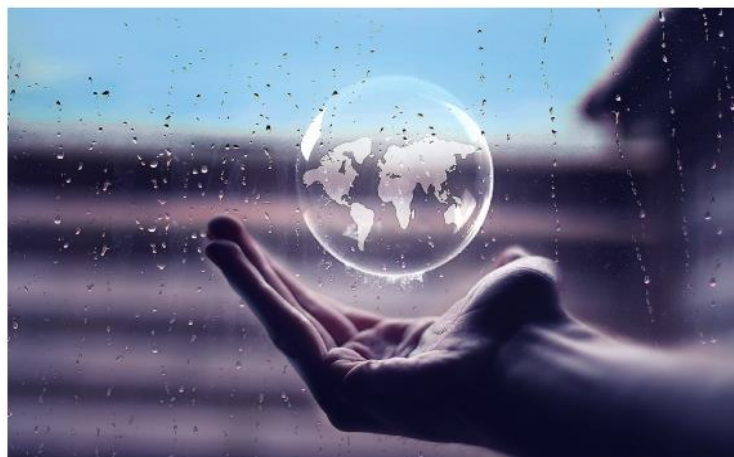


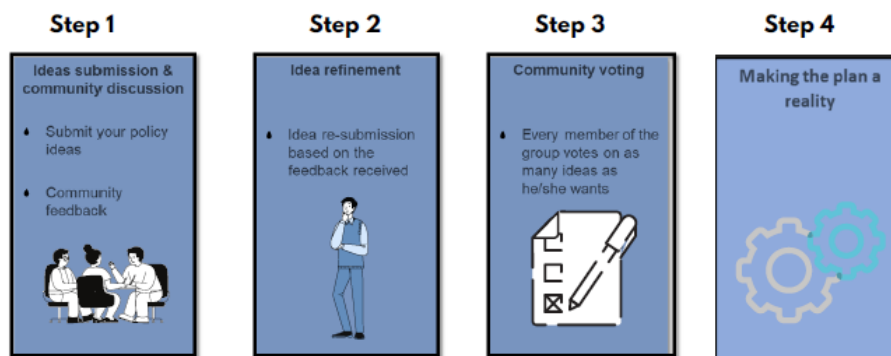
Figure 3: LWF Recruitment Pamphlet (Source: Author)

- C) The volunteers examine the arguments in favour and against different forms of citizen awareness campaigns. This process lasts approximately one month with a frequency of one meeting a week, but it is important that the participants feel that they have sufficient time to develop their ideas own both in the meetings, in between meetings, alone or in tandem with fellow volunteers.

What does a Local Water Forum do?

Volunteers will meet together with members of the local council or local water company and representatives of Fiware4Water. They will be given an introduction to the water situation in the World and then asked about local water issues. Then they will create an idea for a local water plan.

What the plan is about depends a lot on where you live. Perhaps flooding is a major problem. Perhaps it's a lack of water at certain times of the year or perhaps the biggest problem your community faces is the pollution of water. You and the other volunteers will decide. The most important thing is that people are aware that, no matter where they live, they consume water from all around the World. So, a good first plan, for example, is a local campaign to raise awareness. How does this happen?



Step 1 Idea Submission and Community Discussion

As a volunteer you will be invited to an initial meeting organised by Fiware4Water and the local contact (The Local Government, the Local Water Utility or an active Interest Group). Under normal circumstances this would take place at a venue in your village, town or city but due to COVID-19 the meeting will probably take place using one of the many digital platforms available such as ZOOM, WEBEX or TEAMS.

Once the Local Water Forum members have been registered and after an introduction to the water problems which exist in the World you will be asked to share your opinions regarding water at an international and a local level.

We are interested in listening and learning about your community's relationship with water, or maybe you are not aware of any water issues. You will be asked to think about ideas for a water policy in your village, town or city. The most common policy to begin with is the organisation of a citizen awareness campaign.

Figure 4: LWF Recruitment Pamphlet (Source: Author)

- D) A series of actions are agreed. Unanimity is often difficult to achieve but the volunteers are expected to assume the responsibility with the support of the Town Council, the utility and the members of the F4W consortium, to implement the course of actions which LWF members have devised and which have most convinced the majority. If however, the action requires expert technical implementation, the LWF volunteers concentrate on explaining the action to the rest of their local community.

You will be given two weeks to think more about your ideas and share them via email with the other members of the Local Water Forum. Then you will present the idea to the Local Water Forum in a second meeting, where everyone will offer comments and suggestions to everyone else.

At all times, people from the Local Government, the water utility and Fiware4Water will be available to give you support and technical advice, so you do not have to know anything about water or have previous experience. We want people who are willing to participate and share their views.

Step 2 Idea Refinement

In the second meeting, you will have the opportunity to listen to the other volunteers' comments and suggestions. Then you will be given more time to develop your idea.

Many volunteers from different sectors of local society like to team up with each other to work on one specific idea. So, businesspeople, scientists, shopkeepers, artists and local residents from all walks of life come together to produce ideas which will then be put into action. Other people prefer to work on their own idea. It's up to you. Remember that technical support and advice will be available for whenever you need it.

Step 3 Community Voting

In the third meeting, all the members of the Local Water Forum vote for what they think is the best idea for a citizen awareness campaign (or other action if that is what your Forum decides). The most voted idea is then adopted by the Local Council. You will have participated in the creation of a local plan.



Figure 5: LWF Recruitment Pamphlet (Source: Author)

E) The volunteers are encouraged to be spokespeople for water-based issues not only to the local population but beyond. They are encouraged to participate in conferences and workshops, supported by F4W. Furthermore, they are expected to interact and create a permanent dialogue with other Local Water Forums established in other municipalities around the World.

Step 4 Making the plan a reality

So now your Local Water Forum has created a plan. Now the plan has to become a reality. With professional help from Fiware4Water together with local government workers, scientists, local business, schools, colleges and cultural groups you will be invited to participate in the carrying out of the plan. There is no obligation. We understand that people have busy lives so you can participate as much as you want. It's up to you.

What would you do? The Local Water Forum can contribute to all stages of carrying out the plan. But there are some specific tasks we would especially like your Forum to do. In order to be able to do these tasks you will receive training from our experts.

- Firstly, you are now the supervisors of the plan. It is up to the council, researchers, etc. to carry out the plan but they have to report to you and tell you about the progress.

- As a member of the Local Water Forum, you will be invited to become a spokesperson and tell other citizens in your community about the importance of your plan. You will be taught how to do this and how to work with the local press.



- You will be invited to give your opinion on the results of the plan. You may then begin to think of new ideas and to suggest future actions.



Jerusalem



Sabadell, Spain



Leicester, UK.

You will become a representative of your village, town or city. You will be invited to meet and explain your experiences with other Local Water Forums from around the World.

Figure 6: LWF Recruitment Pamphlet (Source: Author)

- F) If a municipal government favours a more complex, technical action suggested by the LWF and it deems such an action as being sufficiently important that it be converted into an approved municipal policy, the LWF volunteers are to assume the role of the non-technical overseers of the project. This is a step which tests to what extent local elected representatives and/or local water utilities are prepared to involve ordinary, non-professional stakeholders in their activities. The role of overseeing or monitoring the progress of an action does not signify much more than being informed periodically by those professionals responsible, on details of

the work completed. However, its significance is important. It recognises that the citizen should be informed and that explanations in the case of a failure to achieve a milestone by a specific date must be provided directly to the citizen. Just as importantly, it represents a significant obstacle to a newly formed government which attempts to silently brush aside initiatives that commenced under the mandate of their predecessors.

III.3. FACE TO FACE VERSUS ON-LINE ENGAGEMENT

Before the outbreak of the COVID-19 pandemic, it was generally agreed that community engagement **should involve both online and in-person methods**. In 2007, Seong-Jae Min affirmed that *'...both online and face-to-face deliberation can increase participants' issue knowledge, political efficacy, and willingness to participate in politics.'* [23] The combination of the two approaches permitted the local community in question to enjoy more continuity in the discussions and debates that would arise from engaging citizens in whatever issue was being examined. Whereas face-to-face events offered people the opportunity to connect and perhaps build closer relationships, it was argued that online strategies allowed more people to participate and provide greater flexibility with regards to when and for how long people created and described their own ideas. However, the use of online technology may also prejudice low-income groups, the elderly and other minorities who may not be IT literate or have immediate access to IT, a circumstance described as the *'digital divide'*. When discussing public engagement in health research, Scruby *et al* were seen to be even more belligerent towards online methods, arguing that while both *'...digital or virtual meetings have their place, fostering community engagement through a face-to-face meeting proves invaluable to the participants.'* [24] As the effects of COVID-19 were quickly felt by society as a whole, the face-face versus on-line debate intensified especially with regards, for example, to education [25] Earlier in the century, there had been little empirical research investigating the effects of online interaction on public opinion. A number of studies had examined *e-democracy*, i.e., the use of internet with regards to political participation by analysing survey data, but it concentrated on mass interaction between anonymous individuals as opposed to specifically created working groups. Little work compared the effect of online methods with that of face-to-face engagement in more specific initiative-creating enterprises. There still does not exist a broad consensus as to which is best, bringing one to the conclusion that a combination of the two is still, and should be, the preferable option.

The beginning of the socio-political engagement tasks of Fiware4Water coincided with the outbreak of the COVID-19 pandemic in Western Europe. The original ConCensus methodology had been founded on a combination of *'online and face-to-face deliberation'* as described by Min. However, after having delayed the initiation of T5.2 and 5.3 by a number of months, it was decided to undertake the engagement of the Quintuple Helix in F4W employing what was initially called Computer-Mediated Communication (CMC) but more recently has been labelled Digital Social Platforms (DSPs). The question was, to what extent would the exclusive use, until the end of 2021, of Platforms such as Zoom, Teams and the broader more public channels of communication such as LinkedIn, Facebook and Instagram, affect the creation and efficiency of the Local Water Forum in the pilot site and subsequent locations of LWFs. Instead of bemoaning the impossibility of organising face-face encounters, it was decided to take advantage of the situation and fully explore the possibilities of DSPs in relation to Quintuple Helix engagement. Full emphasis was placed on a digital approach, which was only altered in the pilot site and certain follower cases in Eastern Europe towards the end of the project's funded period as a result of the relaxing of COVID-19 regulations.

III.4. THE FIWARE4WATER PILOT SITE: GREAT TORRINGTON

Great Torrington, a small town in the English county of Devon has proved to be the perfect pilot site for the execution of the first F4W Local Water Forum. All of the key elements of the Quintuple Helix are present. The F4W consortium partners, the Centre for Water Systems at the University of Exeter (UNEXE) and South West Water (SWW) initiated, with the support of the Town Council of Great Torrington, led by the Mayor, Doug Smith, a Local Water Forum which presently consists of 12 members with hopes to increase this number as lockdowns ease. This is considered to be the ideal size of a Local Water Forum [10] representing the interests, in the case of Great Torrington, of a total population of 6,053 (2020). At first, recruitment was slow. Although, one could point to the COVID-19 crisis and the fact that no face-face launch event was possible as mitigating factors, this tendency was also observed during the early stages of the ConCensus approach during the execution of the POWER project in 2019. Very often, people must see that an initiative is established before deciding to join. However, once the action begins to produce tangible results, the increase in participation can be dramatic. In the case of Jerusalem, for example, a diminutive core group of 3 has grown, in a period of four years, to over 450 volunteer participants. Indeed, one of the challenges that has had to be addressed in this city is how to a) effectively satisfy the demand of so large a group of people to be involved in local water issues and b) how to efficiently coordinate such an extensive group. (The answer is that in large cities, such activities should be divided into districts).

The Great Torrington Local Water Forum has enabled the members of the local community to understand the broad concepts of the global water crisis, how even in areas such as Devon, which has abundant water, the reduction of the water footprint is essential and to share their concerns regarding water whilst identifying ways in which they can work together with the public administration and the water utility to reduce their water use. Despite the online nature of the forum, it has successfully created a space based on trust between the University of Exeter, South West Water and the community which enabled effective knowledge exchange and ultimately the strengthening of the more technical aspects of Fiware4Water. This is due, in great part, to the important role of the coordinator from the University of Exeter and the interlocutors from SWW whose informal approach and use of accessible language enabled the rapid establishment of a group rapport between the different sectors represented within the LWF. Equally of note, was the capacity of the coordinators, who were perceived by the volunteers as being local people, to cede the leadership of the LWF from March 2021 onwards to volunteers who naturally emerged as the driving force of the group. This is a vital sociological and even political aspect of LWFs. The organisation that commences the action, be they a local council, a water utility or a university or research centre, must be prepared to step back and encourage the more active volunteers to assume the initiative. In the case of Great Torrington, a local vet and a retired engineer naturally emerged as the leaders of the group, as a result of the amount of effort that they had made in the initial awareness-raising campaign and subsequent actions.

By placing citizens at the centre of a water saving campaign, the campaign itself has developed according to the local community needs and idiosyncrasies, rather than those perceived by others. The combination of citizens, researchers, and water company in the water forum naturally leads to stronger outputs. However, engaged research is not a risk-free activity and consideration must be given to i) aligning expectations between community, researchers, and the water company ii) the longevity of the LWF especially once the Fiware4Water project has finished and iii) the fact that, in the case of Great Torrington, the co-design of the smart water app finally only addressed personal wishes rather than real technical needs. That said, the volunteers learnt about the advantages of smart metering and have developed into a group capable of disseminating water-based arguments to their fellow citizens. The relationship that has evolved with SWW has arrived at the point, where now the

discussions have moved on to incorporate totally new aspects of water management. Perhaps the most noticeable has been the issue of water poverty with regards to which, the consumer department of the utility and the LWF are collaborating to the extent that the LWF will act as communicators to those people who would perhaps feel intimidated by a utility offering direct support.

It is confidently believed that the Great Torrington LWF will continue to function well beyond the conclusion of F4W. Its relationship with SWW and the local council has proved to be extremely beneficial, constituting an important link between the utility and the end-user. The LWF is actively engaged with the community it represents and employs both social media and the local press to disseminate information and the progress of its activities both to the local community and stakeholders beyond the borders of their municipality. **(This aspect is discussed in more detail in Conclusion and Perspectives)** The group has a regular monthly column in the local newspaper, *The Crier* and an active social media presence:

Facebook: www.facebook.com/GreatTorringtonWaterForum

Instagram: www.instagram.com/gt_waterforum

LinkedIn: www.linkedin.com/company/great-torrington-water-forum

Just as importantly, its members have been proactively involved in inspiring follower cities to adopt the F4W approach, explaining their own experiences. They have become ambassadors of the Local Water Approach and were a central part of the Followers City Conference organised by F4W in November 2021 (**See D5.2 The Fiware4Water City and Follower City Conference and Joint Declaration of Intent Signed**).

As described in Section II.1, one of the aims of the creation of Local Water Forums was to constitute a means whereby members of the Quintuple Helix at a local level could interact and enter into a permanent dialogue with supranational entities such as the European Commission and the United Nations. The Great Torrington LWF has emerged as a model for the building of Local Water Forums around the World. The development, in parallel to the execution of F4W, of the United Nations World Water Quality Alliance Social Engagement Platform employing the F4W approach, (**See Section II.6**) has signified that the Top-Down/Bottom-Up exchange that has so often been defended by those who determine international environmental strategies such as the Green Deal and the achievement of the Sustainable Development Goals is now possible. The Great Torrington LWF volunteers have an important role to play. The F4W video demonstrating the experience in Devon was used by the United Nations Environment Programme (UNEP) as an example at the United Nations Environment Assembly in February 2022 and the Great Torrington LWF will play a prominent role in a) the World Water Quality Alliance event to take place in Konstantz (Germany) in July 2022 and b) the GEMS of Water Programme for Citizen Science currently being prepared by the European Commission.

GREAT TORRINGTON LWF TIMELINE

Meeting one: 21st January 2021: During Great Torrington's first online forum there was a discussion about the water situation in the World and about local water issues.

Meeting Two: 3rd February 2021: The following session focused on brainstorming and discussing ideas for a water awareness campaign whereby activities and events could encourage the town to talk about water and people's usage. Representatives from SWW were also on hand to take questions about the

new smart water meters that are being installed in the town and there was keen interest from the community to be involved in helping to design the app to utilise the smart meter information to further reduce water consumption within the community. A survey was sent out after the second meeting to find out what people would like to do in the LWF.

Meeting Three: 18th February 2021: The results of the survey were discussed. (See ANNEX A). The forum decided to create material to put into Great Torrington's local newspaper which would include a fun activity pack for children and a list of 'quick fixes' to demonstrate how people can reduce water usage. They volunteered to support SWW to design the new smart water meter app and organise regular meetings with speakers to raise awareness of water issues.

March-April 2021: Informal and smaller meetings occurred during this period to support the group with their activities.

12th May 2021: Meeting to decide next steps and to consolidate what will be in the newspaper, *The Crier*.

June 2021: Front page and four pages in *The Crier* with information about the importance of reducing water usage and activities for kids (See Figure7).



Figure 7: The Front Cover of Great Torrington's Local Newspaper (Source: GTLWF)

3rd June 2021: University of Exeter researchers met with the Great Torrington Water Forum to have a walk around the town to discuss how the town could be more water efficient.

24th June 2021: Great Torrington Water Forum presented at the Danube Local Water Forum Conference.

1st September 2021: Great Torrington Water Forum presented at Aqua 360 conference organised by the University of Exeter

28th September and 12th October 2021: Online workshop with South West Water and the University of Exeter to design a water app that will support households to be more aware of their water usage, and ultimately support people to use less water.

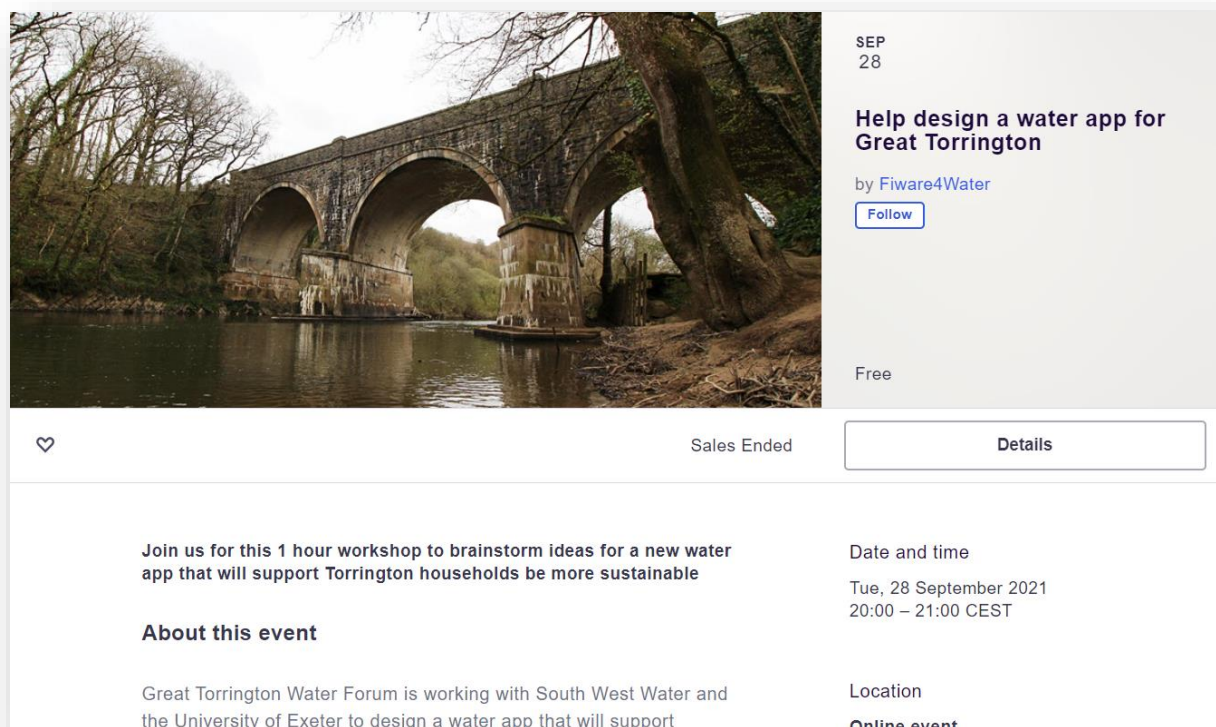


Figure 8: Eventbrite announcement for Water App Workshop (Source: GTLWF)

19th March 2022: World Water Day in Great Torrington with stands and free tea in the village. Exhibition about the water cycle - water saving tips - how to reduce water bills- make a water saving pledge and the chance to enter a prize draw to win a water butt. (See Figure 9).

19th April 2022: Representatives of GTLWF will be present at the inaugural meeting of the Sofia Local Water Forum in Bulgaria.

July 2022: Representatives of GTLWF will be present at the UN-WWQA Social Engagement Platform Conference in Konstantz, Germany.



Figure 9: World Water Day in Great Torrington's (Source: GTLWF)

III.5. THE FIWARE4WATER FOLLOWER SITES

EASTERN EUROPE

The Local Water Forum pilot site (Great Torrington, UK) would, it was planned, serve as a model for possible replication in a number of follower cities in Eastern Europe situated in Romania, Hungary, Serbia and Bulgaria. It was further suggested at the interim Review Board, that Great Torrington would also offer an example of the merits of citizen engagement for the other more technical case study sites of F4W (Athens, Cannes and Amsterdam).

Despite there being a certain amount of evidence to the contrary, such as Petrova's analysis of Bulgaria [26], there are still indications that there remain key gaps in the political structure of many of the EU's Eastern nation-states due to the mutual distrust that exists between the citizen and the state. The relatively low economic status of average households has also been cited as an obstacle to more fluent citizen engagement whilst at the same time, it is true that the same economic difficulties have stimulated civil society and trade union mobilisation. [27] Nevertheless, initiatives to address corruption coupled with an increase in social learning and the appearance of new social norms appear

to be heralding a more open acceptance of citizen engagement as sought by such methods as those proposed by F4W. Nevertheless, the process is slow, formal and very much dependent on the willingness of individual municipal administrations and/or water utilities to accept what many would still view as a public intromission in their work.

As a result of these conditions and of the delay until the beginning of 2021 in actively working in Great Torrington, (although initial conversations took place in July 2020) the implementation of T5.2 and T5.3 in this region of Europe has been difficult. The F4W consortium, represented in the region by BDG, made initial contact with four targeted cities as early as March 2020. On-line meetings were held with the public authorities and water utilities in Timișoara (Romania), Szeged (Hungary), Novi Sad in Serbia and the capital city of Bulgaria, Sofia. Several on-line informal workshops were organised in the late Autumn of 2020 for interested municipalities and local Quintuple Helix stakeholders, situated on the Danube Lower Basin in order to stimulate interest. (See Figure 10)



Figure 10: Invitation to a meeting for Danube Basin municipalities (Source: BDG)

It was agreed to establish Local Water Forums in a number of the aforementioned municipalities, but the severe delays caused by the COVID-19 pandemic at the pilot site in the United Kingdom and a noticeable distrust on the part of some interlocutors especially in Hungary meant that not all local authorities were to participate as fully as would have been hoped. Further contacts were made, at the suggestion of the European Commission, with Klaipėda in Lithuania and Jelgava in Latvia but neither city decided to become involved in the activities of F4W.

The first Local Water Forum to be truly established in the Eastern European Region, following the procedure developed in Great Torrington, was in Timisoara with an inaugural face-to-face meeting held on the 24th of August 2021. This was followed, a month later by the establishment of an LWF in Cluj-Napoca. In both Romanian cities, the global issue of water was discussed, the concept of LWFs was explained and an initial campaign to promote the awareness of local water challenges was begun. Whilst the issue in Cluj-Napoca, the recuperation and promotion of the quality of water in the River Somes, was settled upon quickly by the local volunteers, in Timisoara a broader range of issues were initially discussed. From the beginning in both cities, the fear that the LWFs would last only as long as the project itself was dissipated by the fact that they were invited simultaneously to form part of the WWQA of the United Nations. Complaints that water policy in Romania is imposed by the central

government were accompanied by the belief that digital water would only truly be embraced in Romania if the mindset and structure of Romanian water utilities were dramatically changed. As was discovered in the analysis undertaken for **D5.1 : A Study of the current public perception of digital water and other related innovations and recommendations**, there exists a desire for more knowledge and more participation in water-based issues but equally the opinion of the layperson is that administrations and utilities remain deliberately impervious to demands for change. However, in both Timișoara and Cluj-Napoca, active, imaginative campaigns are being currently undertaken by the LWFs, enhanced by the fact that meetings can now take place face-to-face. Whereas, in Great Torrington, limiting the interaction during the first year to a virtual activity did not constitute an impediment to the development of the LWF, in Romania it certainly appears that physical meetings are not only preferred but considered to be necessary. This is the result of cultural rather than economic considerations but is another example of how any approach to citizen engagement must be capable of responding to local situations and social norms in order to be as effective as possible.



Figure 11: Meeting of the Timișoara LWF (Source: BDG)

As a result of the **The Fiware4Water City and Follower City Conference** held on the 25th of November 2021 and attended by 65 people from 25 countries, the Eastern European cities of Galați (Romania), Chișinău (Moldavia), Novi Sad (Serbia) and Sofia (Bulgaria) confirmed their intention to establish an LWF by signing the F4W Declaration of Intent. (See **D5.2: The Fiware4Water City and Follower City Conference and Joint Declaration of Intent and ANNEX C**) Due to the tragic sequence of events in The Ukraine, Galați will postpone the creation of the LWF (new planning for May 2022). Nevertheless, Chișinău has indicated that it will commence its LWF activities in April as will Sofia, who will hold their first face-face meeting of the LWF on the 19th of April 2022. At least one representative of the Great Torrington LWF will be in Sofia to participate in the event. Novi Sad will establish their LWF in mid-May 2022. Three other Moldavian entities (The Caroma Nord Foundation from the City of Bălți, The

Municipality of Singera and The Basin Water Authority of Moldova) signed the Declaration of Intent but have not yet shown signs of creating an LWF.

The LWFs of Galați, Chișinău, (<https://www.facebook.com/groups/289113493336004>) Sofia, Novi Sad, Timișoara (<https://www.facebook.com/groups/3019894438223735>) and Cluj-Napoca are long term projects that will continue far beyond the conclusion of F4W. They will receive the technical support necessary from the WWQA of the United Nations and the Joint Research Centre of the European Commission. In the coming two months a number of activities have been programmed in Timișoara, Sofia, Chișinău and Cluj-Napoca whose LWF is already organising a film festival based on the subject of water. Working in their respective languages, which is essential, all the LWFs in the region will follow the broad strategy which was further enhanced in the United Kingdom. Nevertheless, changes always need to be made. The leaders of the LWFs need to be flexible and adapt to the local idiosyncrasies and ambitions of the communities they represent. In all the LWFs, created to promote both the issue of water and the benefits of the technological approaches that Fiware4Water has been developing, close collaboration between all sectors is vital. In Eastern Europe, the aforementioned distance between the utility, the municipal governments and the volunteers who wish to become actively engaged in Local Water Forums is still noticeable, but the application of the F4W approach is beginning to construct bridges of dialogue between stakeholders who, otherwise, would not have collaborated with each other.

AMSTERDAM

The establishment of a Local Water Forum in Amsterdam, as was the case with Athens and Cannes, was decided after the mid-term review board. Amsterdam has a long history of citizen engagement and the water utility and F4W partner, Waternet had had previous experience of different forms of citizen engagement. The intention, in Amsterdam was to work on a short-term objective closely related to the technical work that was being undertaken by the F4W consortium as a whole. The first meeting was held on the 19th of April 2021 and after having explained the F4W project and the concept of the Local Water Forums, the volunteers were presented to the issue which the local F4W coordinators wished to concentrate on.



Figure 12: Presentation of the Amsterdam LWF solutions to make the city rainproof (Source: Waternet)

Due to climate change, extreme rain showers are increasingly common in Amsterdam. That makes built-up areas vulnerable. Due to increasing urban construction, rainwater is difficult to drain. This leads to more damage. That is why Amsterdam Rainproof was started in 2014. It is a programme in which more than 100 partners work together to make Amsterdam more rainproof. The starting point is to retain rainwater where it falls as much as possible, for example by using water storage facilities and

more greenery. The 'sponge effect' not only prevents rainwater nuisance, but this valuable water can also be put to good use after rain events. More greenery in the city means less heat in the summer. In this way, three problems of climate change are addressed simultaneously: rainwater, drought, and heat. In Amsterdam Rainproof, the partners map out the rainwater bottlenecks and develop and implement solutions. From green roofs to water squares, from higher curbs to rain barrels - numerous measures already contribute to a rain-resistant Amsterdam. The effect of each of these measures has been investigated. But in practice it is a complex matter. How much effect do these measures have together? Waternet sought to observe the effects of all such countermeasures simultaneously and so presented to the volunteers the challenge of monitoring to what extent built up areas are rainproof.

Over a series of meetings, the LWF composed of a core team of six people produced six ideas (**See ANNEX B**) in answer to the challenge that Waternet had set them which were then submitted to the Winnovatie Platform run by Waternet. All six suggestions had a digital water component and some of them IoT components. The best idea, selected by a joint group of experts from Waternet and the Amsterdam Rainfall Programme would then be further developed by professionals and put into practice. The members of the Amsterdam LWF were not the only people competing, but it was one of their ideas that was finally selected as the winner. What the exercise demonstrated was three things. First, establishing a water forum with a specific purpose helped the group to concentrate its efforts. Secondly, it illustrated very effectively, an efficient method for the initiative/policy design stage of a citizen engagement process. Lastly, the LWF, having already witnessed a tangible result for its work over a series of virtual meetings, is now prepared to monitor the progress of the chosen solution which they helped create and under the umbrella of the WWQA, form the nucleus of a permanent LWF which will look to further co-create and implement solutions to water-based challenges in their city.

ATHENS

In collaboration with EYDAP's Public Relations Department, EYDAP's R&D Department organized the first open public event of the Athens Local Water Forum, under the title Water for City & City for Water. Launched on World Water Day, the 22nd of March 2022, the online event was a high-profile public call for volunteers to join the LWF. EYDAP aspired to launch a creative digital discussion that started with the history of water in Attica and presented the multilevel challenges of water management. Water experts from institutions, educational communities, start-ups, EYDAP's employees and journalists coordinated the conversation using several digital tools (active live participation, chatroom, mini quizzes), in an effort to engage Athenians to state their point of view regarding water challenges in Attica and to create a Local Water Forum capable of promoting common ideas about water.

The event was widely advertised on social media, in newspapers, magazines, web banners in digital media and was supported by professional event management and communication agencies. The call for volunteers for the Local Water Forum constituted the principal contribution of the F4W consortium partner, EYDAP for World Water Day. The event represented a 4-hour online open discussion between experts and citizens with a programme divided into 4 thematic sessions (the history of water in Athens, water management, sustainability, water technologies and resilience). 15 different speakers from different institutions of the city challenged the audience to participate. 210 citizens attended the online event. Of that total number 18% asked specifically for further open discussions, 47% requested more water-based activities in the city and 35% supported the need for awareness-raising campaigns.



Figure 13: Banner of the Athens LWF (Source: EYDAP)

The Local Water Forum having once recruited its initial membership representing the Athenian Quintuple Helix will then proceed to implement the procedure that was so successfully undertaken in Great Torrington. Once again, in order to guarantee the initiative’s continuity, once F4W has terminated, the Athens LWF will be supported by the United Nations WWQA Social Engagement Programme and the Joint Research Centre of the European Commission.



Figure 14: A presentation given to the Athens LWF (Source: EYDAP)

CANNES

There are a number of entities, one can approach in order to initiate a LWF in a municipality. The most obvious choice is the municipal government, the village, town or city council. As was explained in **Section 1.3** local governments provide one with access to the entire community and offer third parties

important links to the idiosyncrasies and social realities of the location. The water utility is another entity which can and has acted as the introduction to a specific local community. A local research entity may perform the role of catalyst as could a local interest group, neighbourhood community association or indeed an active individual. The existence of one LWF can also lead to the idea being adopted in other municipalities within a specific region or an area which is served by the same public administration or utility. The most sought after means of working in collaboration with the Quintuple Helix in a particular location is that one of the stakeholders mentioned above or an already existing water-based social group steps forward and asks for support in the establishment of an LWF.

However, when executing such a process within the framework of a funded project, such as is the case in Fiware4Water, it is possible that for one reason or another, there are obstacles, within the established time frame to achieve a preconceived aim. This proved to be case in the city of Cannes. After the mid-term review, it was decided that F4W would extend the socio-political aspect of its work to the case study sites where the more technical aspects of the initiative were being undertaken. Therefore, in Amsterdam and Athens action has been taken to replicate to a certain degree the work completed in Great Torrington. However, in the case of Cannes, this was not possible. Whilst F4W was able to contact relevant local stakeholders, including the city council, there existed a number of conditions related to the negotiations of a public procurement that precluded any possible action during the time available to the project. Nevertheless, once the project time frame has run its course, an LWF will be created with the participation of the stakeholders with whom talks have been held.

III.6. THE WORLD WATER QUALITY ALLIANCE

At the General Assembly of the World Water Quality Alliance (WWQA) organised by the Joint Research Centre of the European Commission at Ispra in 2019, the concept of the need for citizen engagement as a prelude to the recruitment of citizen scientists and the socio-political obligation to engage all social stakeholders in open and regular dialogue concerning the degree and causes of water pollution, its impacts on human health and food security and the development of data-collection strategies was presented to a high-level audience of supranational institutions and Non-Governmental Organisations in relation to achieving the aims of the United Nations Sustainable Development Goal 6.3 (Water Quality). It was suggested that the original ConCensus model then, already under revision within the scope of F4W, could also be implemented within the workplan of the WWQA, under the umbrella of the United Nations Environment Programme (UNEP). In the February of 2020, in a meeting in Geneva with the Joint Research Centre, the World Economic Forum, the Swiss Agency for Development and Cooperation (SDC) and UNEP, it was agreed to create the Social Engagement Platform (SEP) Workflow of the WWQA, the aim of which would be to extend the work planned within WP5 of Fiware4Water and create what were still named ConCensus in other local communities, not only in Europe but beyond.

The Social Engagement Platform Workflow was led, from the very outset, by Fiware4Water in the guise of EURECAT with the support of the University of Exeter and BDG. The situation offered the project a unique opportunity to extend its activities and disseminate what was planned for the case studies in the United Kingdom and Eastern Europe to a far wider audience. More importantly, it facilitated the establishment of dialogue between local communities and the European Commission and the United Nations Environment Programme together with supranational entities who joined the core team of the workflow. These included the World Bank, the OECD, the World Economic Forum, the SDC, the World Wildlife Fund and the African Ministers Council of Water. It was to prove the key action which guaranteed the achievement of **T5.3.2** which looked to establish ‘*...top-bottom, bottom-up links between the supranational funding agencies, sectoral representatives...national administrations and the municipalities and citizens in order to guarantee coherent regulatory developments*’ whilst further stating that, ‘*The true success of any project is its capacity to feed supranational strategy with realistic answers to the identified challenges and the ability of the implementing institutions, in this case, all*

members of the Quadruple Helix (sic) at a municipal level to establish a realistic and egalitarian relationship with their international counterparts.'

A local volunteer pamphlet first designed for Fiware4Water incorporated the WWQA logo in what became an integrated action between F4W and the WWQA. The name ConCensus was changed to Local Water Forum to facilitate a clearer understanding of the concept in different local communities around the globe. The networking capacity of institutions such as the United Nations and the World Bank proved beneficial to F4W, whilst the funded activities of F4W proved necessary to the supranational members of the World Water Quality Alliance in that it provided a) UNEP with proof of concept to present to the United Nations Environment Assembly and b) did not require funding. Indeed, F4W has observed in its activities under the umbrella of UNEP, that while the multimillion-dollar funding of state-based activities is the norm, the capacity to finance a local community action at the scale of one of F4W's case studies would prove to be impossible. This in fact constitutes a major obstacle in the achievement of UN SDGs despite the efforts of, for example, the Swiss and German governments to discover the means to overcome such as bottleneck.

As a result of the close collaboration between F4W and UNEP, activities such as the Fiware4Water City and Follower City Conference or the Joint Declaration of Intent (**See Section II.7**) created by the project carried the name of the WWQA. Speakers from the United Nations and the European Commission participated in the F4W event, while representatives of the Great Torrington LWF and members of the F4W consortium have spoken in international events such as the SIWI World Water Week (<https://www.worldwaterweek.org/>) and the Cassandra Conference (www.cassandraconference.org) about the F4W methodology. The result was that the F4W socio-political methodology, the proof of concept of which, was developed in Great Torrington was disseminated not only to the demonstration sites and follower cities identified specifically within the work of Fiware4Water itself but was extended to a far broader audience in Europe, Africa, North and South America and Asia. The methodology itself is currently being employed in 27 local communities, with plans to greatly extend this number in July 2022 as a result of an event organised in Konstanz (Germany) by the United Nations where representatives of all the F4W LWFs will be invited to attend and speak.

III.7. THE FIWARE4WATER CITY AND FOLLOWER CITY CONFERENCE

The planned event in Germany in the summer of 2022 will not be the first time that representatives of LWFs will have been invited to come together and discuss their actions and to exchange experiences. To promote the horizontal links between LWFs, to recruit new LWFs, to disseminate further the actions of F4W and to promote the post-project continuity of the social and political results of the initiative, F4W organised a workshop to which a wide range of Local Water Forums from around the globe were invited. Further demonstrating the important relationship between Fiware4Water and the WWQA, the United Nations Environment Programme opened the online event. (**See D5.2: The Fiware4Water City and Follower City Conference and Joint Declaration of Intent for a detailed description of the event**) The reason that the conference was, in practice, described as a workshop was to emphasise the principal objective of the event which was to permit volunteers to openly debate aspects of their work. To prepare for this, members of the LWFs had been invited to answer a questionnaire so that the organisers could concentrate on what the volunteers wished to discuss.

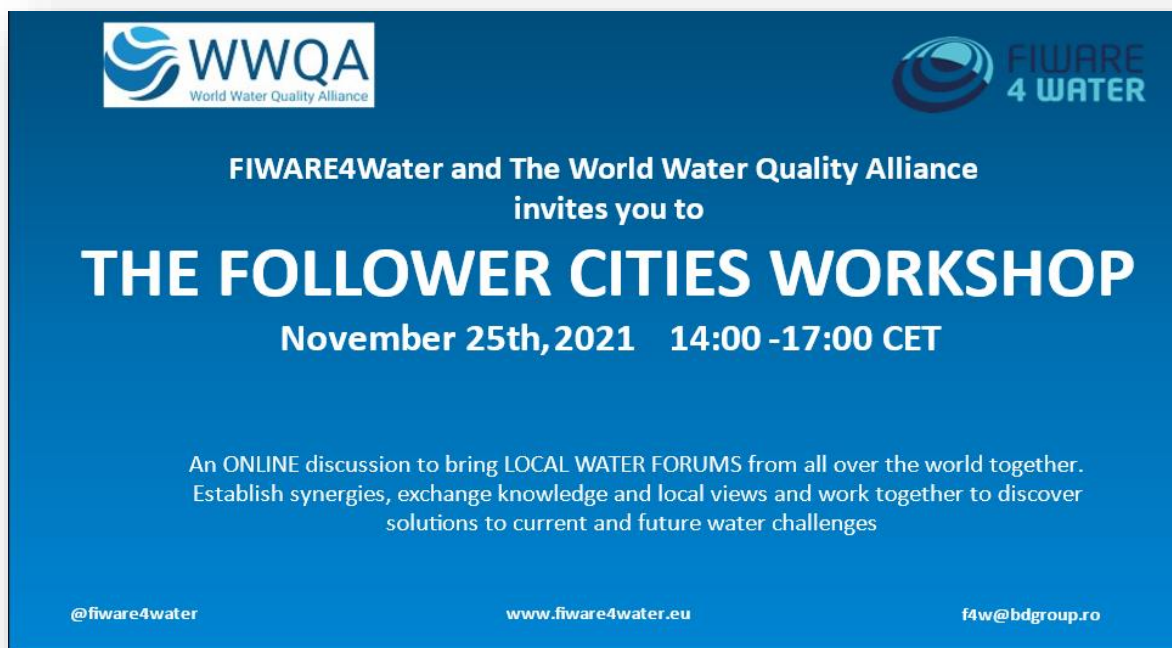


Figure 15: A banner for the Follower Cities Workshop (Source: BDG)

Attended by 65 people representing LWFs and other entities from 25 countries, the event did not attract as many people as had been expected. (**See D5.2: The Fiware4Water City and Follower City Conference and Joint Declaration of Intent**) However, it provided the project with an opportunity to analyse the aspects which had been implemented correctly and mistakes regarding the creation and functioning of LWFs which had been committed and which should be addressed in the future as the work of F4W, under the guise of the WWQA continues. Although no one expressed dissatisfaction with their participation in the LWFs, there was a clear call for a strengthening of the network which would permit regular communication between one Local Water Forum and another and a recognition of the important barriers that language, local social norms and political culture could represent. The language aspect was especially pertinent, given that the event took place exclusively in English. Nevertheless, the Volunteer Recruitment Pamphlet (**See Section II.2**) has been translated into Dutch, French, Greek, and Romanian, and will, in the summer of 2022 be reproduced in 14 different languages. The event also permitted F4W to recruit municipalities interested in replicating the F4W experience. Eleven cities were in a position to formally declare their intention to do so and subsequently signed the Joint Declaration of Intent (**SEE ANNEX C**)

IV. Conclusion and Perspectives

The initial form of ConCensus which had been put into practice in Los Angeles in 2018, then, within the Horizon 2020 project POWER, in Jerusalem, Milton Keynes, Leicester and Sabadell and then subsequently applied independently in Ramallah and Amman, underwent a dramatic revision with the development of the Local Water Forums of Fiware4Water. Although in essence, the underlying political philosophy was the same, the practical application was far less theoretical and far more pragmatic. The strictly structured, academic approach to the engagement of the Quadruple Helix became a more personalised, pragmatic interaction with the Quintuple Helix. The fifth element of that Helix, the cultural aspect, was adopted by the volunteers of the Local Water Forums themselves who, when

designing campaigns to raise their communities' awareness of water as a global issue and the benefits of water-based open technologies in relation to the supply and administration of water immediately turned to art as an effective means of communication. The experience of Fiware4Water transformed academic theory into real-world practice where a certain degree of pragmatism and flexibility are not only advisable but are indeed, necessary.

The Online Effect

In a similar vein, the use of Digital Social Platforms, first to interact with each other in conditions imposed by the appearance of COVID-19 and secondly, as a channel of communication with the local community clearly demonstrated in the pilot site that a Local Water Forum could be effective when undertaken almost entirely online. This suggests important repercussions. Fiware4Water has demonstrated the validity of online citizen engagement and of online communication between different Local Water Forums in different countries. The further value of DSPs in the communication activities of all the LWF activities in F4W is beyond doubt.

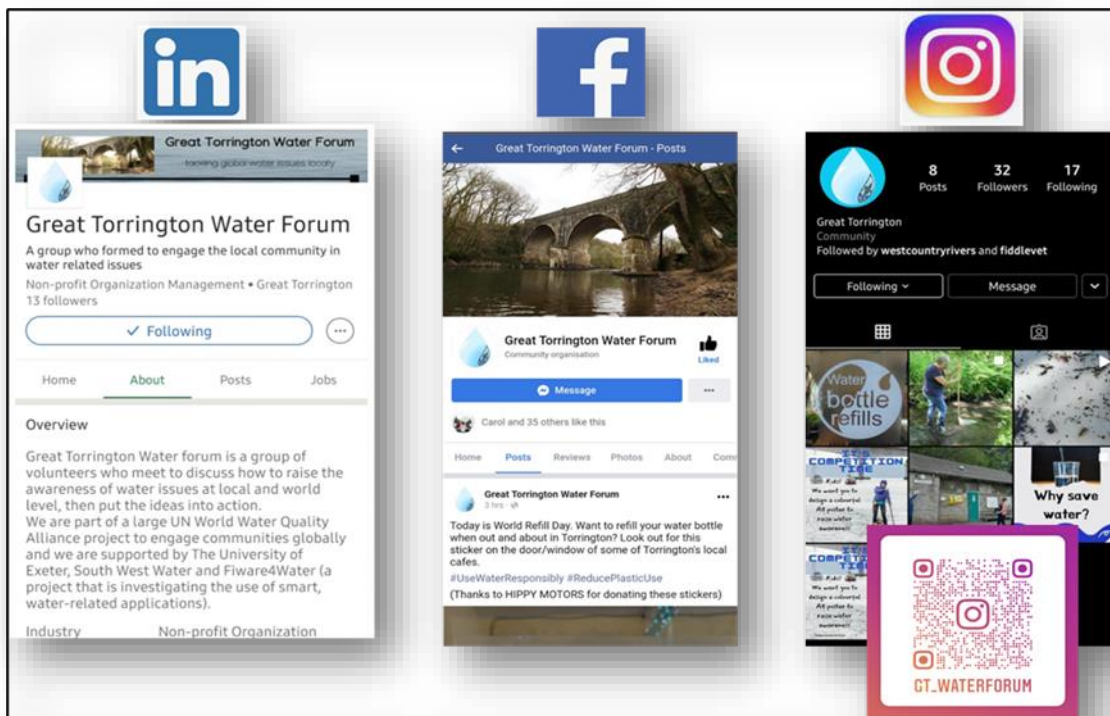


Figure 16: The presence of the Great Torrington LWF in social media (Source: Great Torrington LWF)

DSPs permit one to inform and act as a central point of focus for a broader socio-political movement in which social and political awareness regarding water-based issues is sought. DSPs enable local communities to participate in movements addressing global issues more readily. For the supranational agencies with which F4W has interacted, this is essential as it enhances the possibility of policy stability and as a result, policy continuity. But the true force lies in the involvement of the local community itself. It is the volunteers who generate more public confidence in local and subsequently supranational priorities, and it is the efforts of the volunteers who can assist in bringing local communities together in the task of overcoming grave international environmental challenges. The mere presence of a DSP alone will not produce the desired effects. [28]

The importance of DSPs as sources of information (LinkedIn, Facebook Twitter) and mechanisms of group coordination and communication (ZOOM, TEAMS) does not convert them into the primary motor behind a citizen engagement programme. The fact that the Great Torrington LWF has been so successful is due in no small part to the proximity of both the original academic coordinator who was recognised as being local and the openness of the approach demonstrated by the utility, South West Water. Similarly, in Amsterdam, the fact that Waternet has a proven record in embracing citizen participation facilitated the activities it promoted under the concept of an LWF. As the threat of COVID-19 was perceived to be less threatening, people unconsciously began to resume face-to-face activities. In the work of F4W in the United Kingdom, the Netherlands and Greece, where almost all work has, to date, been undertaken online, such an IT-based activity has been clearly demonstrated to be feasible. But there are problems in such an exclusive approach. There exists the very real danger of excluding sectors of local society. Sometimes, the most vulnerable and perhaps those most in need of being engaged will not have the access that others enjoy. The composition of both the Great Torrington and Amsterdam LWF is predominantly professional and middle class. Local Water Forums, established in parallel to those of the F4W case study sites in Africa and South America on a face-face basis were socially, far more diverse. This is not a reflection on the F4W recruitment process *per se*, but is perhaps, instead the result of what type of individual in what type of culture will lend themselves to such activities.

The power of face-face interaction remains important and rightly so at the local level. The experience of F4W would suggest that in Eastern Europe, for example, this will continue to be the preferred *modus operandi* but citizens from Romania, Hungary, Serbia, Moldavia and Bulgaria did participate in the international online events organised by F4W which are logistically far easier and less expensive to plan when online. In a World where energy consumption and the supply of fossil fuels is so questioned, it is surely more coherent to continue with this formula. But, at the municipal level, the possibility to exchange ideas face-to-face is, although more time consuming, probably the more natural means of interaction. A socio-political engagement campaign without the use of social media would be far less successful. Thus, the combination of IT, social activity, both virtual and face-to-face and political compromise to the extent that elected representatives are willing to delegate public responsibility to concerned citizens is a powerful combination in an exercise that only local administrations can truly undertake, due to their proximity to the targeted stakeholders but which satisfies the needs of supranational decision-makers.

The politician

It would be presumptuous and incorrect to state that Fiware4Water has demonstrated the political advantages of its approach. Nevertheless, it has contributed towards an improved relationship between local communities and international entities based on a top-bottom and bottom-up approach. The establishment of the WWQA SEP directly incorporating Fiware4Water's LWF as its approach to interact with local communities is perceived by the United Nations, The World Bank, the European Commission and the Swiss government among others, as being the way ahead. This is demonstrated by the fact that the WWQA has been actively promoting the great Torrington LWF as an example to follow and has agreed to maintain support for all of the LWFs created as a direct result of F4W in Europe and indirectly as a result of F4W in other continents. This lesson has been a hard one for supranational organisations to learn in the past and will prove to be an even more difficult concept for national governments to accept in the future. However, the success of the Covenant of Mayors and other similar movements where local leaders replace national representatives at the tables of international conferences has proved to be a convincing tendency over the last two decades. F4W has established a clear roadmap by the implementation of comprehensive awareness creation and subsequent citizen engagement but it will still depend on the willingness of the individual politician or

utility manager to embrace a more open form of decision-making to be truly successful. Great Torrington certainly benefitted from the extremely active participation and support of both the mayor and a local councillor. Some politicians would perceive this example of open government as a means of guaranteeing that policies developed under their mandate will have more opportunity to be given continuity. This in turns allows them, cynically, to appear to be more '*democratic*' [29] and more importantly from a societal and environmental perspective, permits the creation of long-term visions rather than strategies which are obliged to yield results before the next elections. But others, perhaps more influenced by political party interests, will still refrain from delegating responsibility to the local Quintuple Helix. It is true that Local Water Forums can exist without local political support, but from a legislative perspective they become inoperable and will only function as a pressure group.

Politically, the process which F4W has employed to enhance citizen participation in the promotion and acceptance of water-based open technologies could be applied to almost any issue open to debate at a municipal level. Indeed, different citizen engagement techniques have been applied to subjects as diverse as budgets to drug abuse, education to health care, sports facilities to cultural events. Within the WWQA, the creation of the Local Water Forums is already being examined as a possible means of creating links between different communities in different regions who at a national level would perhaps not find common ground but at a local level when discussing water or energy or other elements of the WEFE Nexus would actually be constructing the basis of an exercise in science diplomacy.

The Volunteer

The result of an increase in awareness and the desire on behalf of a person to 'be involved' should not be ignored but rather employed for the good of a public policy. With the introduction of Local Water Forums, F4W clearly demonstrates that one can satisfy the demand of citizens to be involved in policy creation and to remain engaged during the full life cycle of a subsequently approved project. An individual's initial enthusiasm, interest and concern does not transform into disappointment as a citizen who has participated in the imagining of a solution is reduced to the role of mere spectator as the political and technical stakeholders withdraw to their offices in order to implement or not the plan that had initially been publicly generated. F4W confirms, as have other projects before it, that despite lacking a formal political mandate and technical knowledge, citizen stakeholders can ultimately become the overseers or indeed the implementors of '*their*' initiative. With continuity, this approach would lend public policies with a sense of public ownership, thus enhancing citizen support and comprehension for the programme in question and subsequently extending its life-expectancy.

Further Considerations

As stated in II.1, Fiware4Water has sought to increase social awareness regarding the application of open technologies in the administration of the supply of water. It set out to engage the full Quintuple Helix and establish meaningful permanent dialogue between local authorities, the water utility, the research sector and citizens, the end-users of the supply of water. The model, defined in Great Torrington was to be disseminated and replicated in other countries and it held the ambition to establish a working relationship between the volunteer members of an LWF and supranational administrations.

It can be affirmed at the time of writing that in the pilot site, in Timisoara and Cluj-Napoca and in Athens, an increased social awareness of the use of open technologies related to water has been achieved or, in the case of the latter which only began its activities in March 2022, is well on the way to being achieved. The engagement of the Quintuple Helix did occur in Great Torrington but F4W has, more than anything, highlighted the fact that full engagement with all social sectors is still a challenge

to which there are no easy answers. Great Torrington has the advantage of being a relatively small town. Under normal circumstances, it would not be difficult to ensure the participation of a balanced representation of the social reality of its community, which it achieved despite working during the first year, almost exclusively online. But in larger, perhaps more heterogeneous populations more proactive effort must be made to ensure that different genders, age groups, social classes (in both Great Torrington and Amsterdam participation was predominantly middle-class) income groups and ethnic minorities are fairly represented. It is interesting to note that in two Local Water Forums that were created under the auspices of the WWQA (Mpigi in Uganda and Pueblo Nuevo in Peru) the membership of the LWFs is more representative of the entire population. However, it must be noted that recruitment had been undertaken a) on a face-face basis and more importantly b) to confront a specific, well-identified water-based challenge. (In the case of Mpigi, water pollution as the result of plastic material and in Pueblo Nuevo, drinking water scarcity and quality).

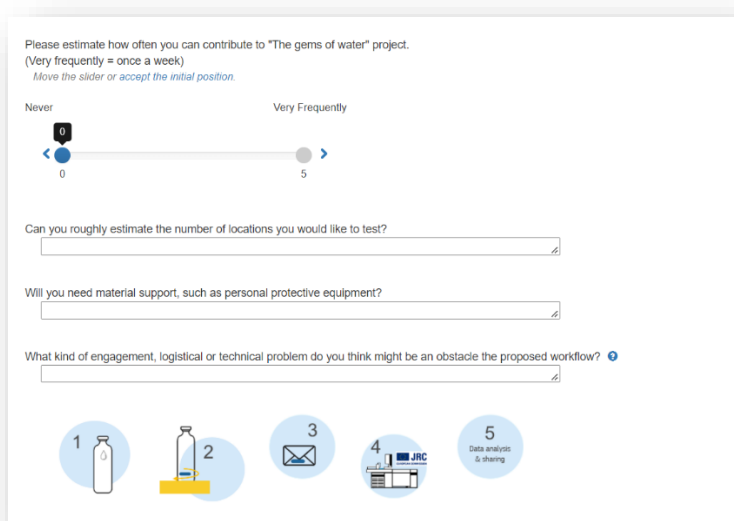
In all the case study sites, the activities which have been undertaken to date have certainly contributed to the establishment of a more permanent dialogue between different stakeholders. The pilot site has proved to be an excellent example of this, but it must be reiterated that the result could have been different if the local council or the water utility had not been so supportive. It is, therefore, important to demonstrate to both political stakeholders, as has been discussed above, and water utilities keen to employ the technical outcomes of Fiware4Water, the advantages of citizen engagement, a factor which the consortium partners South West Water, Waternet and EYDAP can attest to.

The previously explained delay to the initiation of the activities in the pilot site has meant that the full results in the follower cities cannot be fully analysed. Nevertheless, the first results are extremely encouraging both in the communities engaged directly by F4W and in those who were contacted through the creation of the Social Engagement Platform of the WWQA. To varying degrees, the experience of Great Torrington has inspired the replication of the F4W approach within the project to a further 8 European cities. Others, including Cannes will begin in 2022. Beyond Europe, through dissemination via the WWQA, a further 19 Local Water Forums now exist, and the number will increase significantly between June 2022 and December 2023. The experience of Great Torrington is being disseminated by prominent international entities and will be presented to the United Nations Water Conference in March 2023. Fiware4Water can, therefore, rightly claim to have achieved an important link between local volunteers and professional representatives of the supranational organisations who have not only accepted the concept of the work of the Local Water Forums but who now constitute the means by which the work of Fiware4Water with regards to its social and political consequences will be continued.

The Citizen Scientist

The subsequent continuity of the LWFs is, furthermore, leading to a new aspect of citizen participation and collaboration especially with the research sector. The distinction between citizen engagement and citizen science is one that many researchers do not fully comprehend. Many scientific and academic programmes claim to have *engaged* a local community because they have recruited local schools or interest groups to recover samples for them or because they have interviewed a certain number of them with regards to the subject of their investigation. This is not engagement. It is the sudden appearance, in a community, of a third party who having concluded their study, continue their work without, in many cases, informing the sample collectors or interviewees of the results. The interest which may have been awoken in several of the community collaborators is sometimes completely ignored and instead of acting as a positive catalyst for further action can, as was the case with the United Nations' Agenda 21, cause distrust and disaffection. **(See Section I.3 and D5.1: A Study of the current public perception of digital water and other related innovations Pg 11).** Citizen science can

be extremely important. Public administrations, universities and research centres are often in desperate need of up-to-date data which cannot be supplied by more technological approaches such as the use of satellites or sensors. Very often the voluntary collaboration of an individual prepared to monitor or observe can be of enormous value. But, what Fiware4Water has concluded is that such collaboration is of a higher standard and of a greater durability if the member of the public in question is an engaged citizen. Someone, who like the participants in the Local Water Forums, are actively involved in the debate surrounding the subject, be it water, air quality, biodiversity, or any other question of interest. A socially and/or politically engaged citizen is a motivated, enthusiastic future citizen scientist who not only understands why the monitoring is important but who may have participated in the co-creation of the scheme. This conclusion has been understood by the Joint Research Centre (JRC) of the European Commission who are currently preparing a programme within the framework of the Social Engagement Platform of the WWQA, named The GEMS of Water. To begin the pilot scheme, the JRC have contacted the Local Water Forum in Timisoara, as well as four other LWFs in Peru, Uganda, Tunisia and Costa Rica. Questionnaires for the volunteers are being prepared. The members of the LWFs will be provided with training and once the samples have been collected and returned to the JRC, the participants will be able to watch their samples being tested live on internet, receive the results and be involved in subsequent decision-making procedures. This approach to citizen science is based on the existence of the Local Water Forums, all of whom will be eventually invited to participate. The results of the pilot scheme will be seen in the summer of 2022, but it is hoped that the social and political aspects of Fiware4Water will have also contributed to the scientific observation of water quality at an international level.



Please estimate how often you can contribute to "The gems of water" project.
(Very frequently = once a week)
Move the slider or accept the initial position.

Never Very Frequently

0 5

Can you roughly estimate the number of locations you would like to test?

Will you need material support, such as personal protective equipment?

What kind of engagement, logistical or technical problem do you think might be an obstacle the proposed workflow? ⓘ

1 2 3 4 5

1. Water bottle icon
2. Laboratory flask icon
3. Envelope icon
4. JRC logo icon
5. Data analysis & sharing icon

Figure 17: Preliminary version of the Gems of Water Questionnaire (Source: European Commission)

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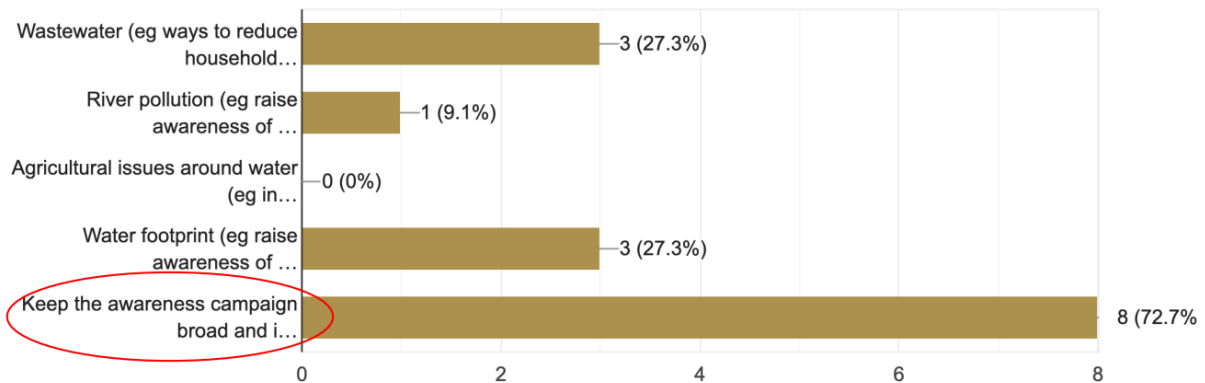
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Annex A: Great Torrington LWF Volunteer Survey February 2021

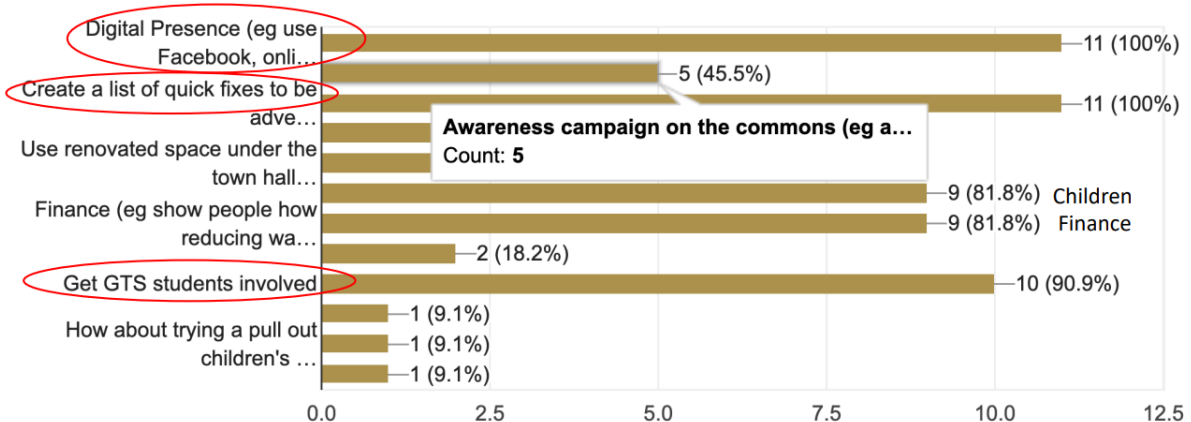
What should be the theme for the awareness campaign? (you can tick multiple boxes)

11 responses



How shall we engage the community of Great Torrington? (you can tick multiple boxes)

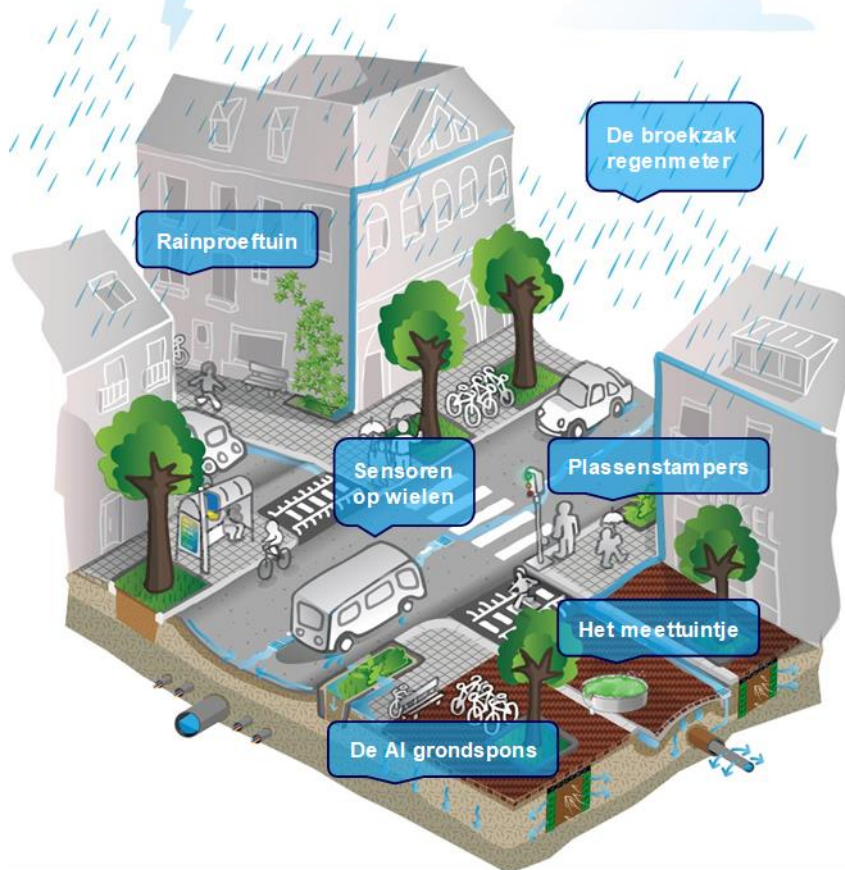
11 responses



- Children's activity booklet to go in the newspaper
- Posters like the speed awareness ones
- All future planning to have a water (and climate) awareness clause

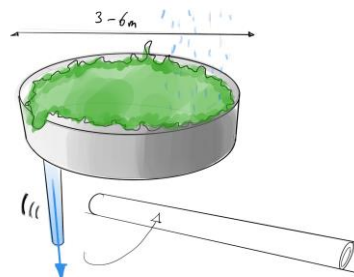
Annex B: The results of the Amsterdam LWF

Lokaal Waterforum ideeën Rainproof-challenge



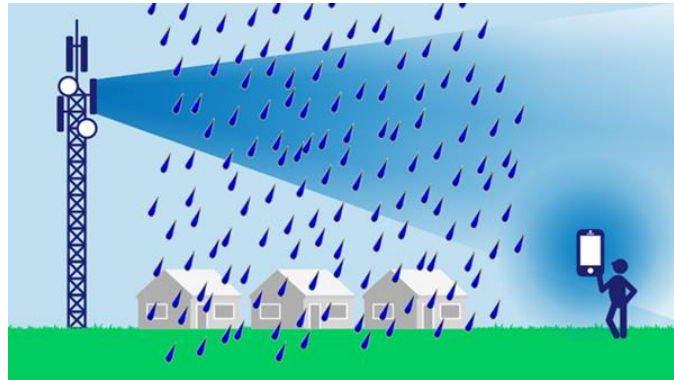
Idea 1: The tiny measuring garden

In the city, movable and permanent landscape design modules are placed with dimensions from a few meters to tens of meters. These “gardens” can be connected to a drainpipe and equipped with Rainproof measures such as a rain barrel, a wadi, infiltration crates or plants for dry and wet circumstances. By installing sensors and valves for a delayed outflow of water in advance, they become manageable and movable Rainproof “Tiny measuring gardens”. The tiny measuring gardens can optionally be filled with local sand and vegetation. By making everything visible, they also have an educational character that can be increased by placing a tiny garden next to it without measures.



Idea 2: The trouser pocket rain gauge

The more it rains, the less powerful a radio signal is transmitted. It has already been shown that there is a relationship between rainfall and attenuation of radio signals. We expect that this relationship also exists between rainfall and the transmission power of a telephone to a GSM antenna. With an app it is then possible, in combination with your GPS, to determine the rainfall very locally, for example per street, by measuring the transmission power of your mobile phone. The app can collect this data that is combined with data from precipitation meters and the rain radar, and you can immediately add a photo of water on the street. Everyone has a digital rain gauge in their pocket, all data is immediately available digitally and you no longer have to go outside with your umbrella and boots to read your rain gauge.



Idea 3: The experimental garden

Choose one example neighborhood to sample in detail, the “Experimental garden”, so that validation remains clear and the uncertainty margin as small as possible. Start a project together with residents with proven methods and if necessary, with a subsidy of the material costs. The advantages of resident participation are awareness and willingness to invest in measures, faster and easier installation and maintenance of sensors and access to the internet and energy. The required sensors are: flipping bucket rain gauges with a solar panel on roofs; EC-like street water meters in gullies; laser TOF level measurements in wells; pressure sensors in wadis, gravel pits and on smart roofs and flow measurements in the sewage system. Data transport can be done via LoRa on TTN and data processing is open source according to the SURF concept with a web portal for observations or Fiware. Look for collaboration with the RIVM for joint measurement and with SURF / SARA for the portal.



Idea 4: The AI ground sponge

Investigate whether the increase in the sponge effect of the subsurface through measures can be determined with Artificial Intelligence (AI) by relating the velocity of the groundwater increases and decreases in monitoring wells (i.e. the derivatives of the groundwater levels) to the rain intensity from data from the precipitation meters and the rain radar at the monitoring wells. This could complement the time series analyses and physical models developed and applied by geohydrologists. It is important that the measurements in the monitoring wells are high-frequency and sufficiently accurate to be able to properly determine the increase and decrease velocities of the groundwater level, even during smaller short rain events, and possibly also an increase in the number of (mobile) precipitation meters.



Idea 5: Sensors on wheels

Day and night vehicles from the municipality, Waternet and the citizens drive through the city. Many vehicles already have sensors and cameras that can be used to determine rain and water on the street. Think of sensors on cars that automatically turn on windshield wipers and make them go faster and slower, temperature sensors, GPS, reverse cameras and the 360 cameras of the parking attendant. If this data is disclosed, of course with permission and privacy proof, flooding can be determined from it. Instead of using existing sensors, municipal vehicles, Waternet and volunteers can also be equipped with a Rainproof sensor dashcam kit to determine the amount of water in the street.



Idea 6: The puddle pounders

There is plenty of unused experience, knowledge and willingness in the streets, neighborhoods, and districts of Amsterdam. Instead of digital monitoring of local downpours and flooded streets, this can also be done closely, analogously, and reliably by recognized volunteers. We already have the bird counters, blood donors, garbage container, adoption parents, neighborhood fathers, etc., let's add the "Puddle pounders" to that. By fully delegating the implementation of monitoring, for example with photos, (digital) fill-in lists and / or gamification, to those concerned, ownership is also reintroduced to the residents. Ownership can also generate spin-offs, especially at a time of growing dichotomy. It provides insight into the environment for bystanders, young and old, to learn through

participation. The public domain is becoming more visible, touchable, and makeable for residents and this leads to more social cohesion.



Annex C: The Fiware4Water Declaration of Intent



THE FIWARE4WATER DECLARATION OF INTENT

Having being informed on results of the 25th of November, 2021 on-line meeting in which municipalities, water utilities, local water-based initiatives and local community projects from Europe, South America and Africa have provided input with regards to the purpose and creation of **Local Water Forums** under the umbrella of the **World Water Quality Alliance** and the project named **Fiware4Water¹** financed under the terms of EU Horizon 2020 programme,

and

having discussed practicable means of addressing the issue of water, at both a local and global level and having been encouraged to assess the current situation, and to support local community integration and inter-municipal cooperation, stakeholder engagement and international networking linked by a common approach to raising people's participation in policies and choices on water whilst emphasising the dialogue between different levels of public administration and the different social sectors engaged,

The signatories recognise that there exist challenges of water and climate change to be addressed;

The signatories therefore affirm that:

- i) Municipalities are centres of economic growth, employment, creativity, culture and innovation; municipalities are producers, consumers, and sources of a host of global environmental problems,
- ii) The initiatives to safeguard water resources often omit to underline the importance of municipalities, local communities and local initiatives as a means of addressing the challenges and co-creating long-term solutions regarding sustainable water use,
- iii) There exists a need to create adequate opportunities in order to ensure that municipalities, local communities and pre-existing local initiatives become the catalyst for the improved management of water resources supported by the employment of Digital Platforms (DPs) and Digital Social Platforms (DSPs),
- iv) Local communities can create and/or be incorporated as Local Water Forums and provide solutions to global issues when they develop a coherent long-term integrated strategy and

¹ www.fiware4water.eu

implementation plan regarding the raising of public awareness of the issues not only of water but of said resource's importance in relation to energy, food, eco-systems and health.

And thus, the signatories state that:

The involvement of local stakeholders by means of **Local Water Forums** has resulted and will result in a positive local influence on international issues whilst enhancing science and evidence-based decision-making supported by digital technology in the field of water. This is the essence of the bottom-up approach publicly supported by institutions such as the United Nations and the European Commission.

Hence the signatories supported by the consortium of the Fiware4Water project and the Social Engagement Workflow of the World Water Quality Alliance seek to work together to implement and exchange experiences in order to provide answers to these challenges:

- i) Ensure improved exchange synergies between their respective communities and involve their respective local stakeholders, researchers and users, decision-makers and consumers, industry, SMEs and national and international authorities in said process,
- ii) Establish the issues of water within the consciousness of citizens as a critical component fostering consensus in the participating communities in relation to water with the aim of increasing international understanding and awareness at local, regional and national levels of best practices in Urban and Rural Water Cycle Services,
- iii) Be informed of the progress of both the Fiware4Water and World Water Quality Alliance initiatives.

And therefore the signatories declare their intent to:

- a) **Form part of a learning alliance and community of best practices for water between the local communities,**
- b) **Seek to implement at least one aspect of the Citizen-Engagement procedures which have been presented in the present meeting,**
- c) **Participate in future events to be informed and to inform others of the progress of the aforementioned Local Water Forums.**

Signed:

Date: