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FP7-ICT-2013-11

Water analytics and Intelligent Sensing for Demand Optimised Management

WISDOM

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WP6

D6.4 | **CU**

Final Dissemination Event and Training (Final)

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EXECUTIVE SUMMARY

This deliverable presents the results of T6.4, which is focused on the organisation of the WISDOM final event. This document will firstly present the organisational steps that were put in place for organising the event, followed by a report of the event itself and then, finally, with a description of the training that has been conducted for the WISDOM user interfaces.

In the description of work, there are two key objectives described for this task:

"A final dissemination event, including a public demonstration and a "hands-on" training of targeted users will be organized in Month 36 in Cardiff City, host of one of our two pilots."

This objective has been met through the organization of final event that was held in Cardiff on the 19th of February. This event was attended by 57 people and featured;

- A series of talks from the WISDOM partners on key areas of the work done within the WISDOM project;
- Invited talks from the ICT4Water Cluster;
- A panel discussion session, designed to provide feedback and identify differing viewpoints on important aspects of the research that has been conducted within the project.

The second objective of this task is:

"This task will include training material preparation using the WISDOM simulation and decision support tools."

This objective was met by the training sessions conducted at the final event for the WISDOM user interfaces along with the dissemination and training material for the consumer user interface that was developed for distribution to the participants in our demand management trial.

1. Organisation of Final Event and Event Program

This section will describe the organizational activities that were conducted in the preparation of the WISDOM final dissemination event/conference – that was held on the 19th January 2017.

1.1. Event Scope

The scope of the WISDOM final event was targeted at the following groups of stakeholders; (a) water networks, (b) local/national government, (c) academia, (d) consultancy groups. The decision was taken to not invite water consumers (i.e. members of the general public) to the event.

This decision was taken because the WISDOM platform and services are primarily focused on water stakeholders. Even in the case of the WISDOM end-user interface, the technology behind this interface would still need to be purchased and installed by water network operators in order for end-users to utilise the interface. Thus it makes sense to target our final event and "sell" ourselves to those who are able to engage in exploitation of the project results with us.

Despite this, hands on training for end-users still took place through other avenues. This is described in Section 3.

1.2. Venue

As described in the description of work, the WISDOM final event was held in the last month of the project in Cardiff. Thus, the prestigious main building of Cardiff University was used to hold the event.

Figure 1 - Cardiff University Main Building

Within this building the large "Viriamu Jones Gallery" was booked to hold the final event, along with the university council chambers. See Figure 2, and Figure 3 on the next page.

Figure 2 - Main Council Chamber

Figure 3 - Viriamu Jones Gallery

1.3. Event Program

To develop the event program – a discussion was held amongst WISDOM partners and it was decided that three key elements needed to feature in the program:

1. The presentation of the key results of WISDOM;
2. An opportunity for presentations from the ICT4Water Cluster;
3. The opportunity to gather the views of attendees on key concepts that have been proposed/developed within the project.

Thus, the following program was devised:

09.00	Registration Opens and Refreshments
09.30	Welcome *Dr Tom Beach (Cardiff University)*
09.45	Keynote Speech *The Direction of Water Research – Jacob Tompkins - WATERWISE*
10.30	Introduction to the WISDOM Project *Daniela Belziti (CSTB)*
10.45	WISDOM – A System of Systems: What is WISDOM? *Keith Ellis (Intel Labs)* Enabling Smart Water Using Semantics *Shaun Howel l(Cardiff University)*
11.30	Refreshments
12.00	WISDOM Research Highlights: Machine Learning and Optimisation in Water Network Operation *Wanqing Zhao (Cardiff University)* Disaggregating Water Usage in the home *Davide Carboni (Intel Labs)* Edge Processing in a water network *Julie McCann (Imperial College London)*
13.00	Lunch
14.00	Panel Discussion: What is the opportunity for IoT / ICT in the Water Industry? Adaptive Pricing – an achievable goal? Water Networks of the Future - what will they look like and what role will they play in the development of future cities?
15.00	Refreshments
15.30	The Wider Smart Water Field – The ICT4Water Cluster: WaterInnEU: Spreading of innovation in ICT for river basin management - *Lluís Pesquer Mayos* Improving People's water consumption behaviour by employing Internet of Things Technologies - *Lili Yang* Smart Water Digital Services - *Antonio Candelieri*
16.30	Concluding Remarks
17.00	Event closes

Some of the rationale for key decisions made in developing the programme is described below:

- **Inviting a guest speaker to start the day:** When developing the final event program, it was decided that the invitation of a speaker external to WISDOM to start the day would be beneficial. The idea behind inviting this speaker was to help set the scene and provide the context of the current research into the use of ICT in the water sector that WISDOM is operating in. To this end the Waterwise, who are an authoritative UK body on water research, were invited.
- **Topic and selection of experts for the panel discussion:** The key concept of the panel discussion was to allow attendees of the event a chance to express their views and participate in lively discussions. To this end three topics were chosen that were highly related to the scientific objectives of the project: (a) Adaptive Pricing: can it be implemented and if so will it be worth it? (b) What are the challenges and benefits that ICT brings to Water systems? (c) Water Networks of the Future, what will they look like in 20 and then 50 years time?
  Further to these, the panel members were chosen based on their technical experience in the fields related to the topics above.
  - Marco Fantozzi – an expert on water network management.
  - David McIver – an expert in ICT applied to the field of water network optimization.
  - Andy Blackhall (from DCWW) – the WISDOM representative on the panel.
  - Jacob Tompkins – our keynote speaker from WATERWISE.

1.4. Interactive Exhibits and Training

In addition to the talks and panel discussion that was arranged, the project also wanted the opportunity to showcase its achievements in a more informal but interactive fashion. To this end a series of interactive stalls were envisioned that would be staffed by members of the WISDOM consortium during all breaks, and during lunch. Each of these stalls would have a large screen with a series of slides/videos describing the work being shown on the stall. The following stalls featured at the final event:

- **WISDOM@Home** – led by CU and featuring:
  - Live demos and training on the WISDOM User interfaces for household water consumers.
  - Demonstration of sensor devices used in the home including, the WISDOM gateway, the heat exchanger and smart meters.
- **WISDOM@Network** – led by Intel and featuring:
  - Live demos and training on the WISDOM User interfaces for water network operators
  - Live demonstration of the Internet of Things technologies deployed by Imperial College London as part of their leakage localisation research work.
- **Water Efficiency:** Led by DCWW Featuring a selection of water saving devices that have formed part of the demand management study.

1.5. Invitations

Sending out invitations for the final event was the responsibility of all partners, and all partners distributed the event to their contacts. In particular:

- **CU** distributed invitations to its network of academic contacts, through the Cardiff University Water Research Institute.
- **CCC** distributed invitations to their network of industry contacts, including attendees of their recent Energy Innovation Conference.

- **DCWW** distributed invitations to their contacts in the water industry and via the UK Institute of Water.
- **CSTB** distributed invitations via the European Construction, built environment and energy efficient building Technology Platform (ECTP) and also asked the European Water Platform (WssTP) and to the French Competitiveness Cluster HYDREOS to promote this final event on their website. Additionally, CSTB distributed invitations to the WISDOM special interest group. Finally, CSTB, as coordinator, took responsibility for inviting the ICT4Water Cluster.
- **DAPP** – tweeted invitations to the event as well as creating a section on the WISDOM website about the final event .

Following these invitations, a total of 62 attendees registered for the event.

1.6. Dissemination Materials

A set of dissemination materials was prepared (a) to advertise the final event and (b) to be utilised at the event itself.

Firstly, a leaflet advertising the final event was produced (as shown in Figure 4), an Eventbrite page was created (shown in Figure 5) and the event advertised on the WISDOM, WIDEST and other ICT4Water Cluster websites. The event has been also advertised in the ECTP newsletter and through the ECTP Energy Efficient Buildings Committee linkedIn page.

Additionally, a series of dissemination materials were produced for use at the event. These include:

- A large banner to be placed outside of the event venue.
- A series of roll up banners to be placed near the reception desk and the interactive exhibits.
- WISDOM branded balloons.
- Enough copies of the WISDOM brochure (as described in D6.1) for each participant to take home.
- A final WISDOM dissemination video.

Images of these dissemination materials are presented in the event report for the final event (Section 2 in this deliverable).

Figure 4 WISDOM Final Event Leaflet

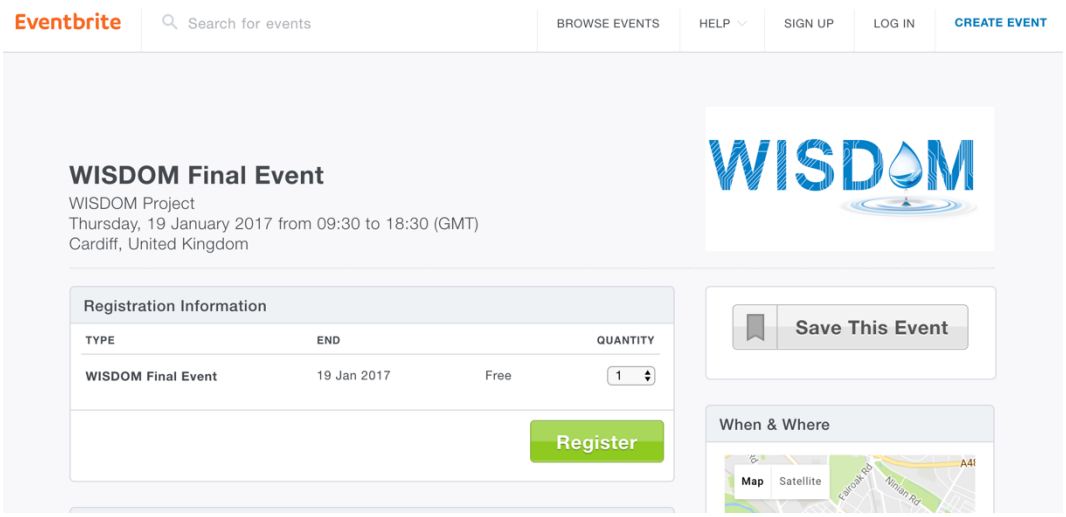


Figure 5 WISDOM Final Event - Eventbrite Page

1.7. Feedback

To gather feedback on the event, and the WISDOM project; a feedback form was developed and distributed. This is shown in Annex A.

2. Final Event Report

The WISDOM final event was held, as planned, on the 19th January 2017. This section will briefly report on the key outcomes of the event. Following the event a dedicated section of the WISDOM website was created. This is referred to below and can be found at: http://www.wisdom-project.eu/final-event

2.1. Final Summary of Attendees

From the 62 people that signed up to attend the event 57 attended on the day. The breakdown of these attendees is shown in Table 1.

Table 1 Breakdown of Event Attendees

Water Companies:	15	Academia:	17	Local Authorities:	5
Industry Groups	4	Local Government	1	Industry	5
Consultancies	7	Other	3		

2.2. Dissemination Materials & Activities

All the dissemination materials were used on the day to set up the venue. Images of these are provided in Figures 6 and 7. Additionally, all participants were given a name badge and were given a copy of the WISDOM brochure, an agenda for the day and a feedback form.

Figure 6 Final Event Banner

Figure 7 - Example of WISDOM Roll-Up Banner

In addition to the dissemination materials a series of dissemination activities were conducted as part of the event.

- The event was live tweeted from the WISDOM twitter account (@WISDOM_EC) – see Figure 8. Additionally, consortium parnters and guests (Waterwise and DCWW) also tweeted.
- CCC recorded some interviews that were placed on Youtube (and twitter). See https://t.co/J3dlLXwb0r for more information.
- A radio interview was given on Cardiff Radio by CCC. (1300 hours on the 20/1/2017).
- All event material publicised on the WISDOM website.

Figure 8 Live Tweeting the WISDOM Final Event

2.3. Interactive Stalls

The interactive stalls were set up as described in Section 1.3. Throughout the day a high level of interest was shown in these stalls – and during all three of the break periods demos were given by CU (WISDOM@Home Stall), Intel (WISDOM@Network Stall), ICL (WISDOM@Network Stall) and DCWW (Water Efficiency Stall). Images of these demos are shown in Figures 9-13. In addition, the slides used for the displays running on the stalls were made available on the WISDOM website.

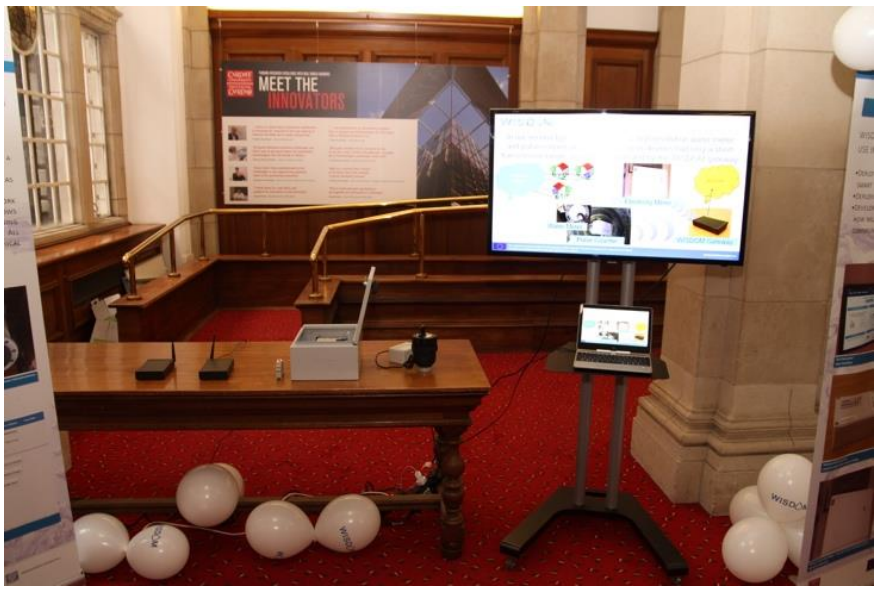


Figure 9 - WISDOM@ Home Stall

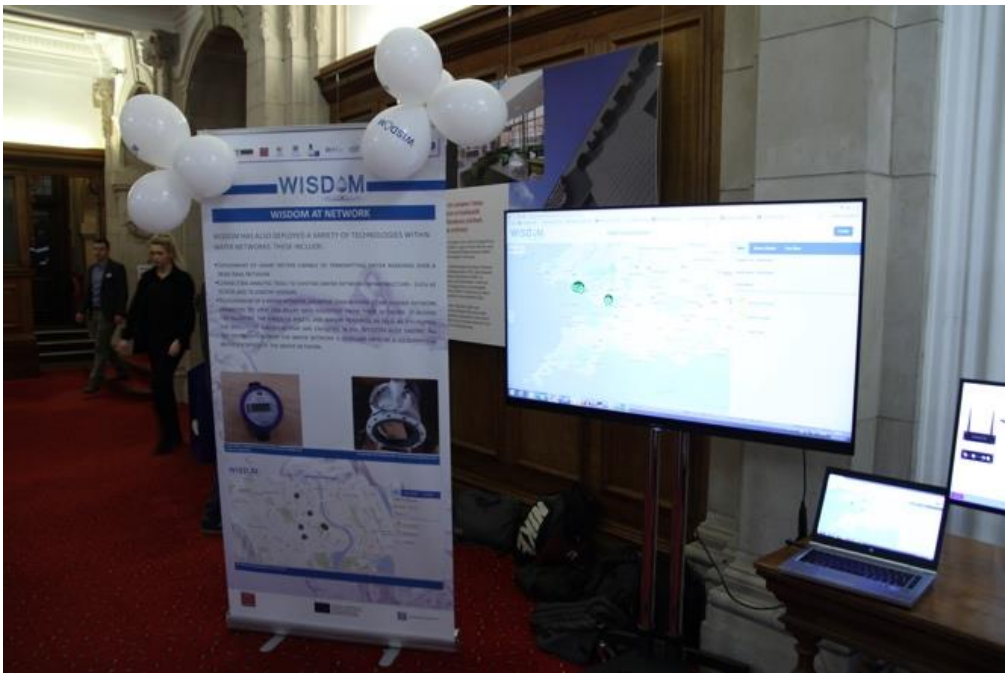


Figure 10 - WISDOM@Network Stall

Figure 11 - Water Efficiency Stall

Figure 12 Water Network IoT Demonstration

Figure 13 - Demo at the WISDOM@Home Stall by Tom Beach (CU)

Figure 14 Demo at the WISDOM@Network Stall by Eugene Ryan (Intel)

2.4. Keynote Speech

Jacob Tompkins, the managing director of WATERWISE, gave the WISDOM final event keynote speech. He presented on what he viewed as the key factors in the ICT for Water field (Figure 15).

Figure 15 Keynote Speech - Jacob Tompkins

WATERWISE is an organisation that focuses on achieving efficiency in water networks at all levels, from consumers, through to businesses and corporations and to government level.

The factors discussed in the keynote speech and some of the key points raised were:

- Smart data
  - Utilities should pick “Smart” data over “Big Data”. i.e. only collect data at resolutions that are useful.
  - People often underestimate the number of sensors already deployed - Water Companies already hold 1% of all data in Europe. Can better use be made of this data?
- Optimised Networks
  - Do water companies have enough data to optimise their networks?
  - It is currently too costly to implement. So, focus must be made on making it cheaper.
- Information to Utilities
  - Need to consider what data utilities need.
  - Lots of data is already being collected, what utilities don’t have are the Decision Support Tools.
- Information to customers
  - What data do customers want?
  - Do customers want live data – or just notifications that something is wrong?
- Outsourced and de-centralised water networks
  - This is a big research field for the future -this is where data is powerful.
  - Imagine the house of the future, not connected to mains or sewage. Consumers maintain their own supply – but role of utility would be as overseer (i.e. to manage water quality) and data manager.
  - This uses the citizen engineer concept – it empowers local people to maintain the network. Leaving local communities to maintain the network. Water Utilities just alert the communities of problems.
- Security issues
  - As we become more and more connected we will see more stories about security breaches and possibly even cyber terrorism.
  - There is security in place already. However, legacy SCADA systems are often weak points – providing possible back door access to the more advanced information systems that use their data.
- Water/Energy/Food Nexus
  - Often difficult situations are caused by lack of water. An example is when water levels fell too low, government had to make a choice between energy and water. They chose water supply to towns, which meant that no water was going to power plants, so no energy to power water treatment works. They are all intrinsically linked.
  - Water networks will be less resilient to “shock” as more and more ICT is put in place to help manage networks.
- Drones/Robots
  - Very interesting prospects for this technology, especially in localised problem detection and repair.

- One of the problems is these systems cannot be trained on a large scale without sophisticated sensing and monitoring equipment to support and guide them.

- Biological Systems
  - In the future, engineered bacteria will be used in the water sector. However, they are very site-specific and job-specific.
  - ICT will be used to manage this i.e. it will be possible to monitor, and dose bacteria at specific points and specific times.

Jacob also outlined what he views as the key successes that have originated from ICT4Water projects:

- The reasons for project successes are not necessarily the project itself but the collaboration between networks, research organisations, etc. which leads on to incremental change in the industry and inspires other other projects where new problems or obstacles have been identified.
- There has not been enough applied research in universities for the water utility (unlike for the energy networks).

2.5. Key Results from Panel Discussion

As described previously, three questions were asked of the panel in the panel session (chaired by ICL). The format of the panel session was that, for each question, each member would then present their view. Once all panel members had presented the audience could give their input or question panel members. The key points raised for each of the questions are described below in more detail. Our panel discussion is shown in Figure 16.

Figure 16 Panel Discussion – (from left to right) Jacob Tompkins, Marco Fantozzi, David McIver

2.5.1. Adaptive Pricing: can it be implemented and if so will it be worth it?

The general view of the panel for this point was that the technology exists to implement adaptive pricing. However, key questions were raised as to the usefulness of it. From the discussion, the following emerged as the key points:

- Not everyone would be able to adapt their usage if adaptive pricing was implemented.
- Needs of low income population, who cannot necessarily change pattern must be considered.
- Main implication is social i.e. when the UK and other countries have suggested this, there has been public outrage. Water is felt to be a universal right.
- Adaptive pricing may not always be to the consumer's interest, but has benefits to the community.
- Some people become adaptive to adaptive pricing – and can play the system to their own benefit.
- The marketing for adaptive pricing must be changed. Incentives should be given, perhaps not financial, for saving water i.e. vouchers etc….
- Adoption would need significant changes in regulation (at least in the UK).
- There are doubts about the real benefit: if difference in pricing is small, resistance to change from consumers will win.
- There is a posibility that the increased technology required to support adaptive pricing might translate into a cost for consumers, who would then be asked to pay more in order to use less.
- There are options to overcome resistance to change in the form of gamification, but this is a niche market.
- Joined up thinking between authorities is needed i.e. some local councils in the UK have advocated waste disposal technologies in domestic sinks as a means of addressing their collected waste reduction targets without fully considering the consequences for water utilities.

2.5.2. What are the challenges and benefits that ICT brings to Water Systems?

Our panel also discussed the challenges and benefits of ICT in Water Network Systems. The key comments raised were:

- **Challenges**:
  - New ICT systems will disrupt consulting models, so big resistance could be felt here.
  - Lack of trust in new technology at an operational level.
  - Water companies are often reluctant to innovate.
  - Change means more customer calls, so bad ratings from regulators.
  - Information security and data security are big concerns in the water industry.
  - Change often has unintended consequences i.e. "stopsmartmeters.com" and public resistance.
- **Benefits**:
  - Increased Efficiency.
  - Efficient automated and robust operations.
  - Facilitating more advanced predictive models.
  - Better base level information about water network operation to aid future decision taking.

2.5.3. Water Networks of the Future: what will they look like in 20 or 50 years?

Our panel's view of what water networks will look like in 20 years includes:

- Pervasive instrumentation and control, using low cost low powered hardware.
- Automated management for small utilities. Personnel involvement will be limited to strategic level. This will create organisations that are smaller and more resistant to change.
- Processes will be built around ICT, not supported by ICT.
- More attention will be paid to how water and energy is used, and on integration of nature based systems and functions.

In 50 years, our panel believes that water networks will be:

- Made up of an interconnected grid of utilities: take water from water plentiful areas to water scarce areas, via a grid of utilities.
- Feature water trading against customer use.
- Perform predictive analytics to guide customers.
- Possibly feature no utilities at all. All water usage will be disconnected, and monitored remotely.

Our panel also identified some key points that must be tackled in the field of water research:

- There is very little peer review of water industry research outputs.
- There are very few PhDs financed by a water utility.
- Only recently, has a water utility set up their own research centre.
- Good innovation teams and practices within the Water industry are not promoted or celebrated well.

2.6. WISDOM Talks

As described in the agenda a series of talks (chaired by CU) were given by WISDOM partners outlining:

1- The objectives of the WISDOM project
2- The WISDOM System of Systems approach
3- The WISDOM Ontology and how the project uses semantics
4- The WISDOM Optimisation Module and Data Driven Modelling Research outputs.
5- Water Usage Disaggregation
6- Edge Processing.

All the presentation slides (and video recordings) are available online at the WISDOM website. Additionally, three members of the ICT4Water cluster presented their projects at the event, giving a wider view of the research that is currently ongoing in the field of ICT for Water. Some photos of the WISDOM Talks are shown in Figures 17 and 18 (on the next page).

Figure 17 – Shaun Howell (CU) Presenting the WISDOM Ontology

Figure 18 WISDOM Project Coordinator Daniela Belziti (CSTB) presenting overview of project

2.7. Feedback

As described previously all participants were provided with a feedback form, the results from these forms are summarised below:

- All apart from one respondent reported they were satisfied with the day. One respondent, however, identified that they were not satisfied with the brochure.
- All apart from two respondents reported that the presentation of WISDOM was clear and understandable. The exceptions were that one respondent thought the research presentations were slightly unclear and one respondent reported that the research results and the project goals were slightly unclear.

More specifically, several attendees expressed interest in the following areas and were contacted after the event to further discuss:

- Commercial implementation of CSO/Optimisation/Water Usage Disaggregation Algorithms.
- Results of WISDOM once publically released.
- Future collaboration with WISDOM partners.

In addition – various informal feedback was captured from participants during the day. This is summarised below:

- There is big value in the WISDOM ontology - creating a much higher level of interoperability between services.
- There is a lot of value/interest in consumer user interface and CSO prediction. Often very little is done in the waste water network compared to the clean water network.
- There is also a lot of value in the holistic view that WISDOM has adopted. Finding a common language throughout water value chain would prevent misunderstanding between actors which is often is key factor in inefficiency.

3. WISDOM TRAINING

This section will outline the training related activities that were conducted within the WISDOM project. This section will focus on the two WISDOM user interfaces as each of these has a different target audience.

3.1. Water Network Operators

Training on the water network operator user interface, as its only users were members of the WISDOM consortium, was conducted informally. Normally this was conducted in the form of demonstrations and hands on activities as part of consortium meetings. The primary motivation for this was that, especially within the Italian pilot, there were too few users to justify running dedicated training sessions. Additionally, a tutorial video was produced and distributed to partners and is made available on the WISDOM website.

In addition to these training activities, as part of the WISDOM final event, hands on demonstrations and tutorials of the water network operator user interface took place, as shown in Figure 19.

Figure 19 Training and Demo of the WISDOM Network UI by Eugene Ryan (INTEL)

3.2. Water Consumers

The hands on training of water consumers took place in two phases; (a) an initial house visit and (b) provision of training material.

Initial consultations with the participants in the demand management trial concluded (described in detail in D3.4) that their level of competence with mobile and tablet based apps was very high. Thus, our training focused on the app itself and not on training on how to use a mobile device.

As part of the demand management study, each participant was visited and shown how to use the user-interface on a one to one basis (or one to two in some cases). Consumers were than given opertunity to operate the interface themselves to ensure their familiarity before the end of the visit.

Following the visit, consumers were given a step by step guide showing them how to install the interface on their own devices (these are shown in Appendix B). To complement this, a tutorial video was also created and could be accessed by participants in the study (this video is available on the WISOM website). Finally, members of the DCWW WISDOM team were also available to assist end users via the DCWW call centre.

In addition to these training activities, as part of the WISDOM final event, hands on demonstrations and tutorials of the water saving user interface took place, as shown in Figure 20.

Figure 20 Demos of the WISDOM Home User UI by Tom Beach (CU)

APPENDIX A – FINAL EVENT FEEDBACK QUESTIONNAIRE

We hope you have enjoyed the WISDOM final event and found it informative and interesting.

We would be grateful if you would complete the following basic questions before you leave:

1. How would you describe your background / your organisation

◯ Academic	◯ Water Industry	◯ Local Authority	◯ Consultancy	◯ Other

2. What was your impression of today's event?

	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied
Overall Satisfaction	◯	◯	◯	◯
Interactive Exhibits	◯	◯	◯	◯
Content	◯	◯	◯	◯
Speakers	◯	◯	◯	◯
Brochure	◯	◯	◯	◯

3. To what extent did you find the presentation of WISDOM clear and understandable?

	Very Clear	Clear	Slightly unclear	Very unclear
Overall	◯	◯	◯	◯
Project goals	◯	◯	◯	◯
WISDOM System of Systems Approach	◯	◯	◯	◯
Research Highlights	◯	◯	◯	◯
Interactive Exhibits	◯	◯	◯	◯

4. What aspects of WISDOM to do you consider interesting from a research or business perspective

	Very Interesting	Interesting	Not Interesting
Systems of Systems Approach	◯	◯	◯
Ontology	◯	◯	◯
Machine learning/optimisation	◯	◯	◯
Water Usage Disaggregation	◯	◯	◯
Edge Processing in the water network	◯	◯	◯
Gateway/In Home Monitoring	◯	◯	◯
In-Home Water User Interface	◯	◯	◯

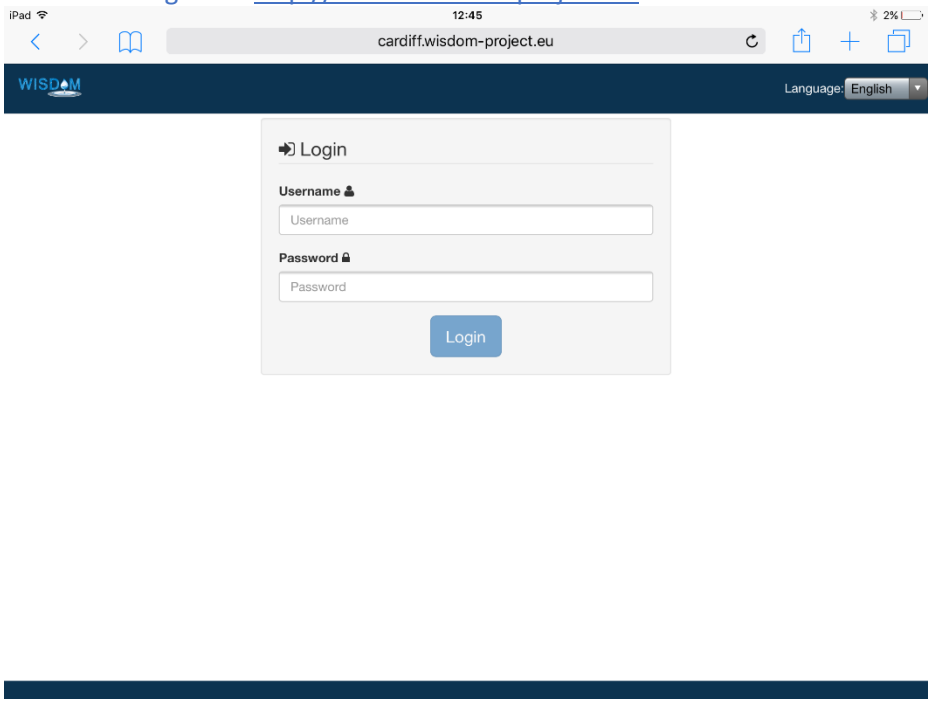
5. Are you interesting in further discussion or collaboration with members of the WISDOM project? If so, please mention what aspects and leave a contact email address.

Thank you for taking the time to complete this evaluation form

APPENDIX B – WISDOM TRAINING MATERIAL

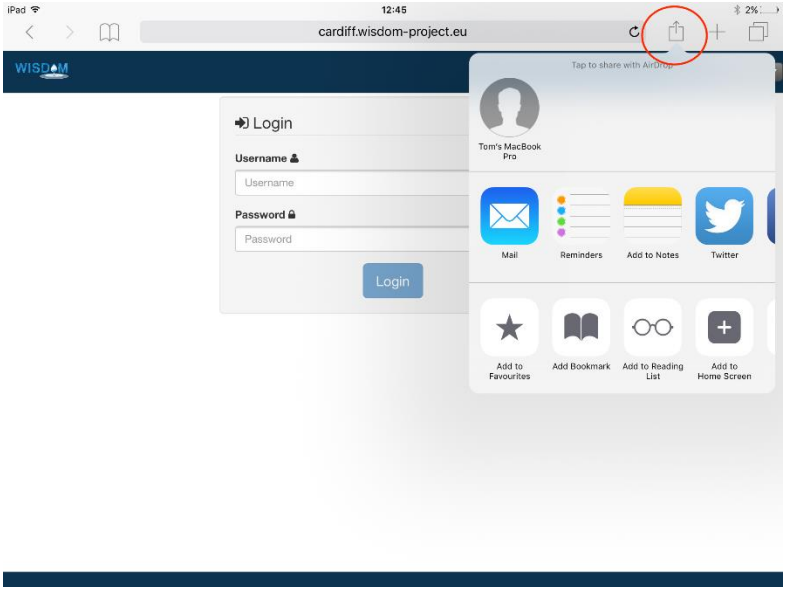
Configuring the WISDOM Water App – Apple Devices.

1. Open Safari and navigate to http://cardiff.wisdom-project.eu as shown below:

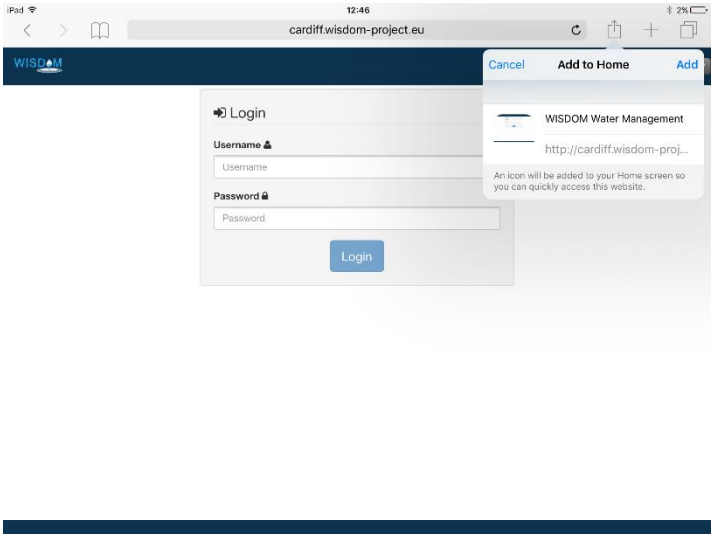


2. Click on the "Send" icon – highlighted in the image below with a red circle.

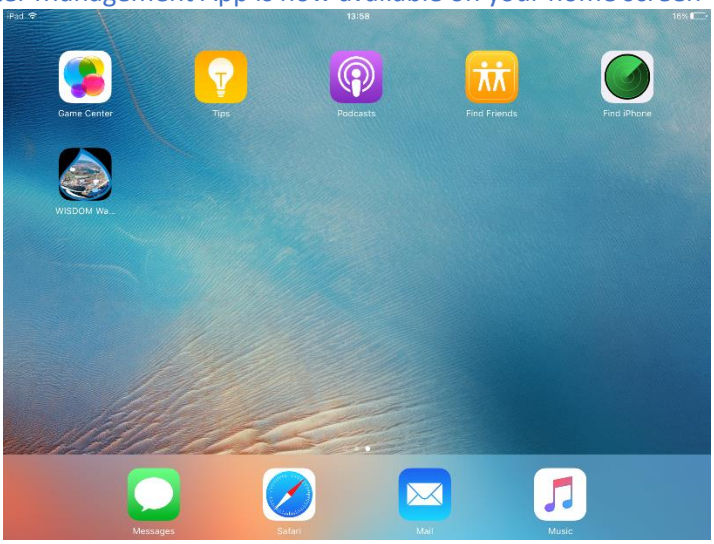
3. Then click on "Add to Home Screen"



4. Then click on the add button – as shown below

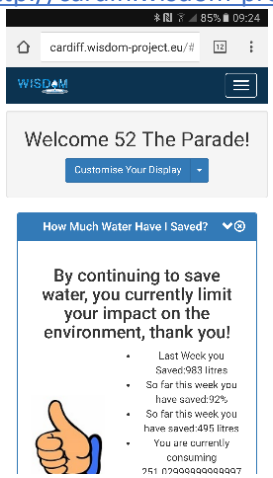


5. The WISDOM Water Management App is now available on your home screen – as shown below.

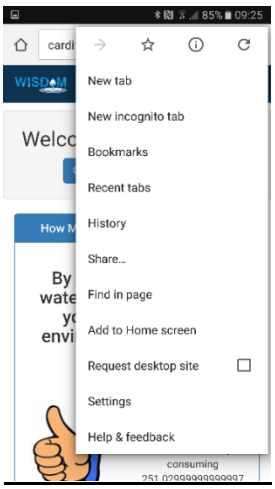


Android Devices

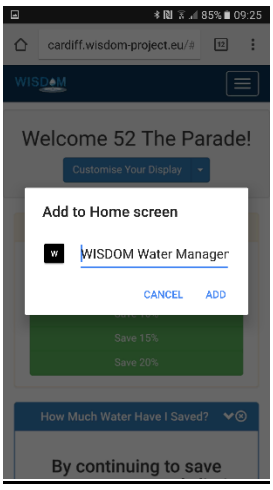
Open your web browser and navigate to http://cardiff.wisdom-project.eu as shown below:



Click on the Menu Icon on the top right of your web browser – and click on "Add to Home Screen"



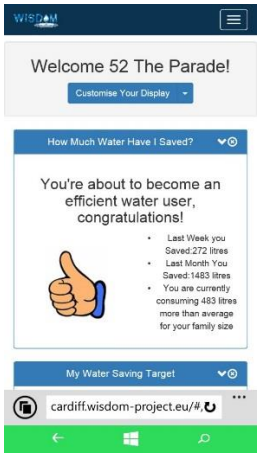
Then click add as shown below.



The WISDOM Water Management App will now available on your home screen.

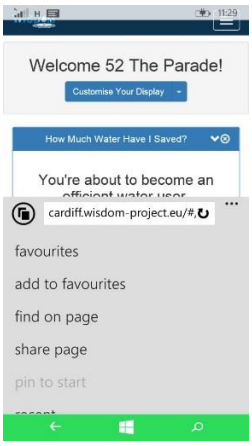
Windows Phone:

Open internet explorer web browser and navigate to http://cardiff.wisdom-project.eu as shown below:



Pull up the app bar by swiping up from the bottom of your screen.

Tap the 3 dots on the bottom right of your screen, and select 'Pin to Start, as shown below:



The WISDOM Water Management App will now available on your home screen.