D.T2.5.3 JOINT PEER REVIEW

FUA SPLIT

2021

Smart water metering

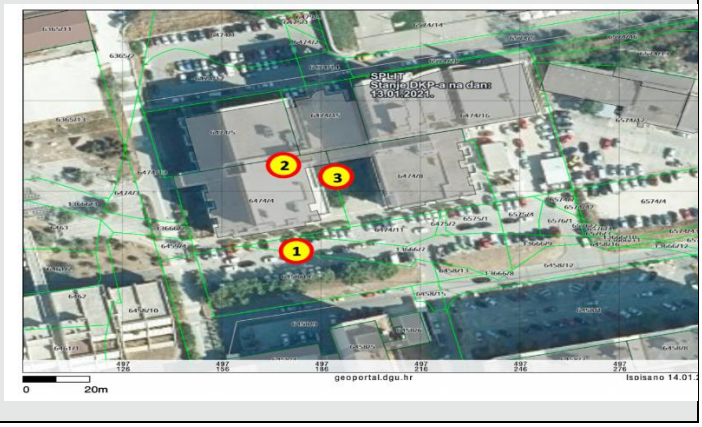
Version 1
12 2021

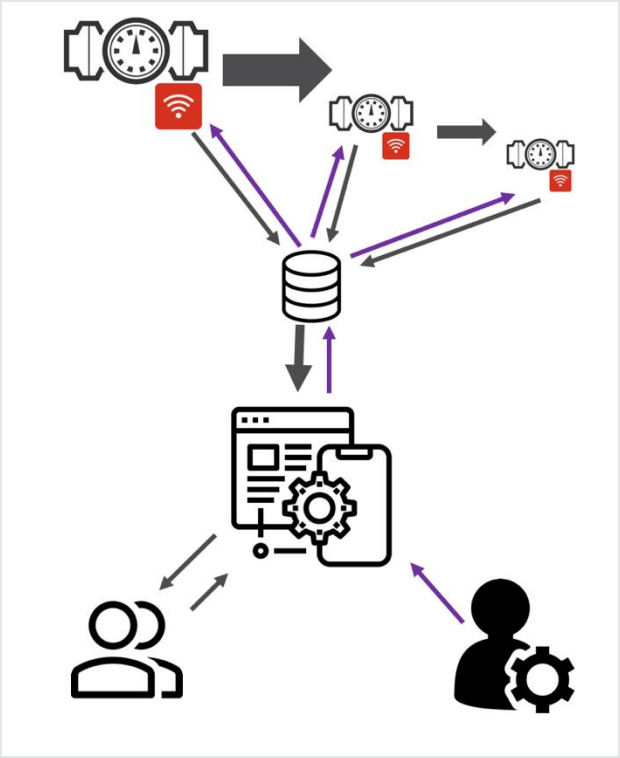
CONTENT

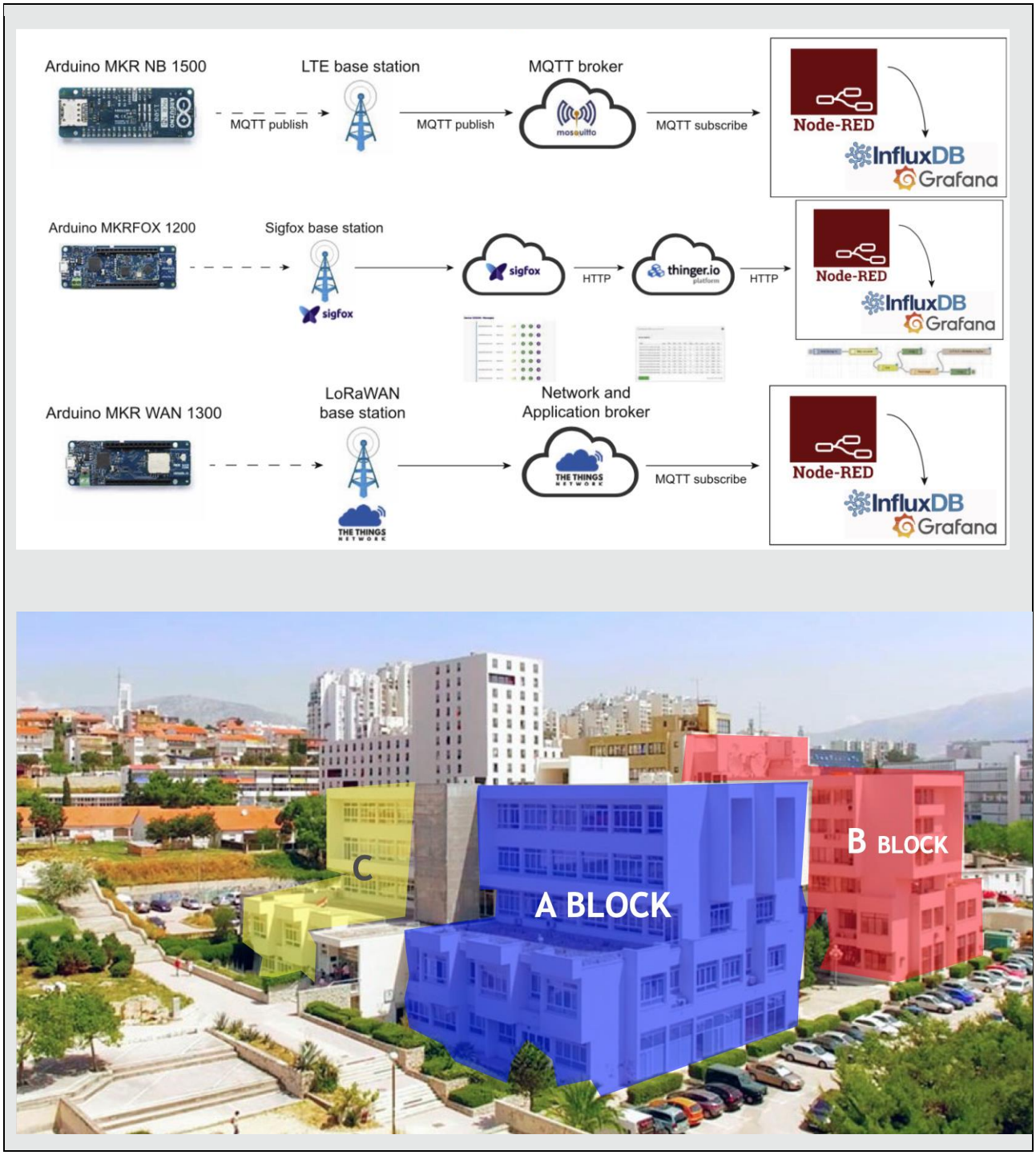
1. Pilot Action

This section should include case study - description of pilot action (information prepared for study visit using the table below). All chapter is prepared by host partner.

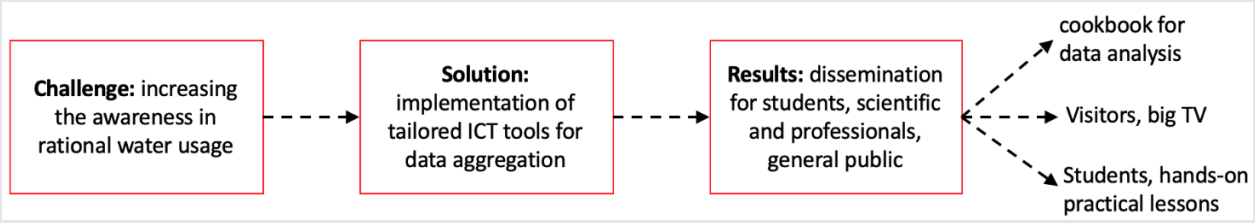
ORIGIN AND EXPECTED RESULTS OF PILOT ACTION	*Location is the proposal-planned public place (University building - Faculty of Civil engineering, Architecture and Geodesy), with a high-rate daily-based change in the number of people that contributes to the process of raising the awareness in water usage. The reasoning hiding behind choosing the location is the added value that arise from the analysis coming from scientific personnel/students further exploiting acquired measurements. Exact location is Ulica Matice hrvatske 15, 21000, Split, Croatia. Faculty building is consisted of three main blocks is given in Figure 1. Mess hall and classrooms are located in A block, offices are in B block, while C block is classrooms-only. Before the investment, three different state-of-the-art IoT radio technologies are to be used for purposes of testing: Sigfox, LoRaWAN, and NB-IoT. Each of the proposed technologies have its own pros and cons. As the implementation of IoT communication infrastructure in Croatia is still early, it is required to check the availability at the particular positions, moreover at underground positions where the smart water-meters should be installed. It is important to note that given locations are harsh in terms of radio signal propagation, i.e. wireless communications, and need to be tested on given sight before the investment. Upon smart water-meters installation, remote data preview and analysis is required by monitoring and separately analyzing different location consumption. To achieve this goal, the dashboard-like mobile/web-based application with architecture depicted in Figure 4 is to be used. It*

	enables separate analysis of data received from different smart water-meters.
CWC GOALS	*Increasing the awareness in rational water usage, with possible impact on water savings, and decreased exploitation of freshwater resources while implementing modern ICT technologies.*
TECHNICAL DESCRIPTION	*1) Check 3 different IoT Radio Technology (LoRa, NB-IoT and Sigfox) performances for a given specific location and choose the best option* *2) Install 3 smart water meters in the specific locations of public building. These will be able to monitor different location consumption and analyze data separately* *3) Develop dashboard-based web application presenting data at the public place, with mobile version given two roles:* • *Standard users that can monitor data* • *Administrators that can monitor/change sampling periods and receive notifications if the consumption is not considered in expected range*
GRAPHIC DETAIL	




Arduino MKR NB 1500
LTE base station
MQTT broker
MQTT publish
MQTT publish
MQTT subscribe
Node-RED
InfluxDB
Grafana
Arduino MKRFOX 1200
Sigfox base station
sigfox
HTTP
thinger.io
HTTP
Node-RED
InfluxDB
Grafana
Arduino MKR WAN 1300
LoRaWAN
base station
Network and
Application broker
THE THINGS NETWORK
MQTT subscribe
Node-RED
InfluxDB
Grafana
C
A BLOCK
B BLOCK

PILOT PERFORMANCE	*Three LoRaWAN smart water-meters where installed in required pilot locations in order to remotely monitor water consumption in three different building blocks. At the entrance (block A) DN50 Axioma LoRaWAN water meter was installed, while blocks B and C are DN40 Axioma LoRaWANT. Once water meters where installed and connected, LoRaWAN data package received from the smart water-meter contains following structure:* *{* *"date": "2020-12-31T14:00:00.000Z",* *"deltaVolumes": [0, 0, 0.013, 0.069, 0.066, 0.042, 0.036, 0.033, 0.034, 0.034, 0.034, 0.031, 0.063, 0.079, 0.046],* *"logDate": "2020-12-30T23:00:12.000Z",* *"state": 0,* *"stateMessages": ["OK"],* *"volume": 0.58* *}* *It contains information on what is the timestamp of the package received from the water-meter, what are the delta volumes (last 15 hours), log date, possible error messages and water-meter volume.*
OPERATION AND MAINTENANCE	*Operation is mainly digital (see technical description) and does not require special training.*
CHALLENGES / REQUIREMENTS FOR IMPLEMENTATION	



BENEFITS	*Social benefits - improving the quality of life of residents.* *Economic benefits - reduction of water and energy consumption.*
CLIMATE CHANGE IMPACTS ON CITY / FUA	*Increasing the awareness in rational water usage, with possible impact on water savings, and decreased exploitation of freshwater resources while implementing modern ICT technologies.*
IMPLEMENTATION SCHEDULE	

Activity	*Planned Start Date*	*Planned End date*	*Status*
1. Revisiting the problem	*30.10.2020.*	*15.11.2020.*	*COMPLETED*
2. On-sight measurements, water-meter purchase	*15.11.2020.*	*15.12.2020.*	*COMPLETED*
3. Pilot implementation (water-meters, LCD, Application installation)	*15.12.2020.*	*28.02.2020.*	*COMPLETED*
4. Continuous monitoring, application updates (web/mobile version),	*28.02.2020.*		*IN-PROGRESS*

	debugging, and usage instructions			

COSTS	*The budget is within the plan, with activities of 5000 EUR for equipment.*
FINANCING SOURCES	*European Regional Development Fund / Interreg Central Europe; 85%* *Self-financing: 15%*
OBSTACLES	- *positions of the water-meters given the particular location (in block C) was not easy due to the other underground installations next to the pipe location; as a consequence, since the planned manhole size did not match, finding similar tiles was necessary to put it back as it looked before;* - *implementation should be made during the night time, when the building is empty, since placing the water meters is intrusive and time consuming activity as the pipes were not initially ready for the water-meter implementation; pipe quality is an important factor when it comes to its installation.* - *Modern SmartTVs (big LCD screens) have WiFi connectivity; however if cable connection was not planned, given TV location should have WiFi connection. This is required as SmartTV connectivity is required to connect to the IoT Wallet system where water-metering data is stored.* *Deployed software system for continuous data monitoring, Integrating random sensors (including smart water meters) to the system for ViK pilot*

	action assumes the devices are LoRaWAN compatible. For LoRaWAN, The Things Network (TTN) cloud service as third party service was used, and its APIs for data delivery to the Influx database. During the operation phase several important details were announced and to continue software services these were required to be updated. This included major updates: - *TTN V2 to TTN V3 – it involved another LoRaWAN package contents and depreciation of old APIs, while updating IoT Wallet accordingly to continue using its functionalities;* - *Influx 1.8 to Influx 2.0 – another database query style was required and its updates accordingly;* *SmartTV browser functionalities that display data in full screen mode logged out of the system in irregular basis, although the system configuration in other web browser showed that this expiration was set to 5 years (infinite time). As these should be related to the security defaults of SmartTV, IoT Wallet was updated with feature that enables bypassing log-in page and show dashboard data.*
SUCCESS FACTORS / CRITERIA	*Increasing the awareness in rational water usage, with possible impact on water savings, and decreased exploitation of freshwater resources while implementing modern ICT technologies.*
PUBLIC INVOLVEMENT / OUTREACH	*The pilot was presented in various local, national and international conferences (online and live).* *Video showing different implementation phases with basic information about the pilot in english narration with local subtitles has been posted*

	online and shared via number of social media channels.
POSSIBLE APPLICATION AREAS / TRANSFERABILITY	*The pilot concept can be implemented in other locations/regions.*

2. Evaluation of pilot action

The online peer-review visit in Split, Croatia took a place on the Thursday, November 25th 2021.

All project partners were invited, Italian project partners had to participate.

Agenda of the online visit:

Time	Theme	Lecturer	Organization
10:00 - 10:10	Participants registration		
10:10 - 10:20	Greetings	Boris Bulović Bernarda Kuliš	Water and sewerage Ltd. Split PI RERA SD
10:20 - 10:45	Projection of the short documentary *„Peer review of the pilot action in Split"*		
10:45 - 11:15	Interactive workshop: Moderated parallel group discussion on Croatian and English	Božidar Čapalija Ivan Baričević	Water and sewerage Ltd. Split
11:15 - 12:00	Wrap up and Q&A session	Petar Šolić	Waveform j.d.o.o.

Kind regards,

Boris Bulović, dipl. oec.

Workshop will be organized via virtual platform „Zoom".
Link: https://us06web.zoom.us/j/89147876217

Here you can find the links to the relevant documents on Split pilot action for the preparation:
VIDEO ABOUT PILOT:
https://we.tl/t-BGheuep3Y7

ONLINE MENTORING VISIT REPORT:
https://drive.google.com/drive/folders/11IXMXCS3IyEc_7LNlvD6rjZ9SVOmRWH5

ONLINE MENTORING VISIT VIDEO:
https://drive.google.com/drive/folders/11IXMXCS3IyEc_7LNlvD6rjZ9SVOmRWH5
PILOT CONCEPT:
https://drive.google.com/drive/folders/1Q5DtrTG12-H4LV65BKqV-mtPw3Djtl6e
INTERMEDIATE SELF-EVALUATION REPORT:
https://drive.google.com/drive/folders/1Q5DtrTG12-H4LV65BKqV-mtPw3Djtl6e
FINAL SELF-EVALUATION REPORT (DRAFT):
https://drive.google.com/drive/folders/1LxkeZ2-xnKJiaz6imokKhyTkv4Vvc0Cf

In stand of dividing participants into the two break rooms, as it was planned by agenda, discussion with participants was held jointly on the English language.

Several questions were discussed in breakout rooms which provided the platform for collective discussion.

- *Which of the achieved pilot objectives are important in your FUA? Do you think a similar action would be an effective way to reach those objectives (or others) in your FUA?*
- *What is the most important information about the idea and the expected results of the pilot action for your FUA?*
- *Would a similar action be feasible in your FUA?*

The discussion took place with the following conclusions:

- *Italian PP were interested whether students already use a measurement data for seminars or scientific articles,*
- *Italian PP has stress out that in the City of Torino water meters are manly mechanic rather than smart water meters,*
- *Croatian PP said that the plan is to implement smart water metering on to Campus level,*
- *Major goal is the awareness of water consumption at the public,*
- *Project partners have discussed options for upscaling Split FUA on to whole building level such as smart heating/cooling metering*
- *Further on, VIK Split has briefly commented water consumption data that has been collected and some interesting results such as water consumption during the night,*
- *Partners were interested for problems during the pilot implementation.*

2.1. Summary

Everyone agreed a similar action could be done in their FUA. Moreover, partners agreed that it is important that mechanisms must be put in place in the future to protect the drinking water sources, increase the reuse of water where it is possible and educate people on efficient water use and reuse of water.

3. Recommendations

Everyone agreed a similar action could be done in their FUA. Moreover, partners agreed that it is important that mechanisms must be put in place in the future to protect the drinking water sources, increase the reuse of water where it is possible and educate people on efficient water use and reuse of water.

Attachments

1. Evaluation of pilot action by Torino representative

ORIGIN AND EXPECTED RESULTS OF PILOT ACTION	*Most important information about the idea and the expected results of the pilot action from your point of view*
CWC GOALS	*Which of the achieved project objectives are important to you?* *The most important objective achieved is the measurement of water consumption; only by knowing this data is it possible to take action to save water use and to monitor the effects of any water measure undertaken*
TECHNICAL DESCRIPTION	*Which of this information can you use? Who could carry out such investments?* *It is interesting to be able to evaluate the cost of the measuring equipment in order to be able to envisage the application in one's own city. The company that should install these types of measurement is Smat in Turin, the company that manages the integrated water service. Technological aspects related to the different existing water meters are also very interesting when planning an application.*
GRAPHIC DETAIL	*Which of this information can you use?*
PILOT PERFORMANCE	*How can you use this information?*
OPERATION AND MAINTENANCE	*Who could manage such an investment?* *The problem of maintenance of such meters can have a big impact on costs, so it is essential to know the real needs in order to evaluate the application in our FUA.*
CHALLENGES / REQUIREMENTS FOR IMPLEMENTATION	*Can you meet similar requirements in your FUA?*
BENEFITS	*Whether and which benefits (environmental, social, economic) may be relevant in your FUA?*

	The most significant benefit would be both environmental and economic, based mainly on savings in drinking water and a more efficient management of water resources
CLIMATE CHANGE IMPACTS ON CITY / FUA	*What impacts of climate change could be mitigated as a result of a pilot operation in your FUA?* *The effect would be indirect but important, since an efficient water metering is in general important for the success and monitoring of any intervention dealing with mitigation of climate change. However, a single pilot action will probably not be enough to have impacts on climate change; broader interventions are needed* *What climate and water challenges in cities / FUA could similar actions solve?* *Support water management and the monitoring of interventions*
IMPLEMENTATION SCHEDULE	*Was the implementation time too long in your opinion? Where do you see the possibilities to shorten the time?* *The implementation time looks appropriate*
COSTS	*Will the cost level be acceptable in your FUA?*
FINANCING SOURCES	*What financing sources could be obtained for a similar investment in your FUA?*
OBSTACLES	*Can you meet similar requirements in your FUA?* *How could you avoid them?*
SUCCESS FACTORS / CRITERIA	*Would such incentives work in your FUA / country? Would you have to consider other conditions?*
PUBLIC INVOLVEMENT / OUTREACH	*Would you have to involve stakeholders to implement a similar investment?*

POSSIBLE APPLICATION AREAS / TRANSFERABILITY	*Other areas where the described solutions can be used (different application area);* *Portability / system adaptation to local conditions / replication options in other FUAs;*
OTHER	