

NAIADES Co-creation workshop: Will you join us to improve water management? Every drop counts!

DUBLIN













Welcome!

JUNE 23,2022

13.45-16.30 CET

#### **Co-chairs**

#### Moderation by:





Anna Brékine Mandat International

Juan Fernández Montenegro **AIMEN** 

#### Agenda



- Water in the global agenda: What is the role of smart water in achieving the SDGs? Anna Brékine, MI Water solutions for SDGs; co-creation exercise
- From source to tap to reuse: smart water cycle applications Ignacio Casals, AMAEM Developing solutions for smart water management: co-creation exercise
- From old to gold: the challenges of revitialising aged water technology Iulian Mocanu, CUP Braila Modernising the water flow: co-creation exercise
- Towards a greener, more sustainable city: how smart water solutions can help Eunah Kim, UDGA How 'smart' is water in your city?: Co-creation exercise
- Welcome to the Jungle: the standardisation story so far Aitor Corchero, EURECAT Standardisation in the water sector: Co-creation exercise
- From consumer awareness to behavioural change: how can we involve citizens in water management? Juan Fernández Montenegro, AIMEN

Citizen science and water management: co-creation exercise

- Recommendations for smart water management: co-creation exercise Anna Brékine, MI
- Wrap-up Juan Fernández Montenegro, AIMEN

#### Feedback session



#### https://ahaslides.com/LJDCG



#### **Speakers**





Anna Brékine
Mandat International





# Water in the global agenda: What is the role of smart water in achieving the SDGs?

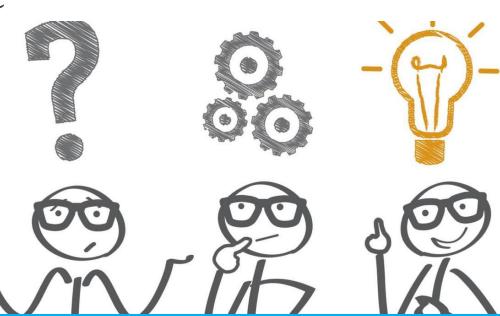
Anna Brékine, Mandat International



#### **Urban water issues**

IOT Week
Dublin — June 20-23, 2022

- Rapid urbanisation
- Leadership and governance
- Investment
- Water utilities and infrastructure
- Water availability and quality
- Climate change



- Rapid urban growth
- Slums and poverty growth
- Urban decay

**Urban Water Management Challenges**  **Other Environmental Stressors** 

Weak political leadership

Institutional complexity

on water

Weak regulation

and redundancy

- Aging infrastructure
- Leaks and unaccounted water
- Problems in urban sanitation

**Climate Change Impacts** 

- Under Investment in infrastructure
- Under-priced water

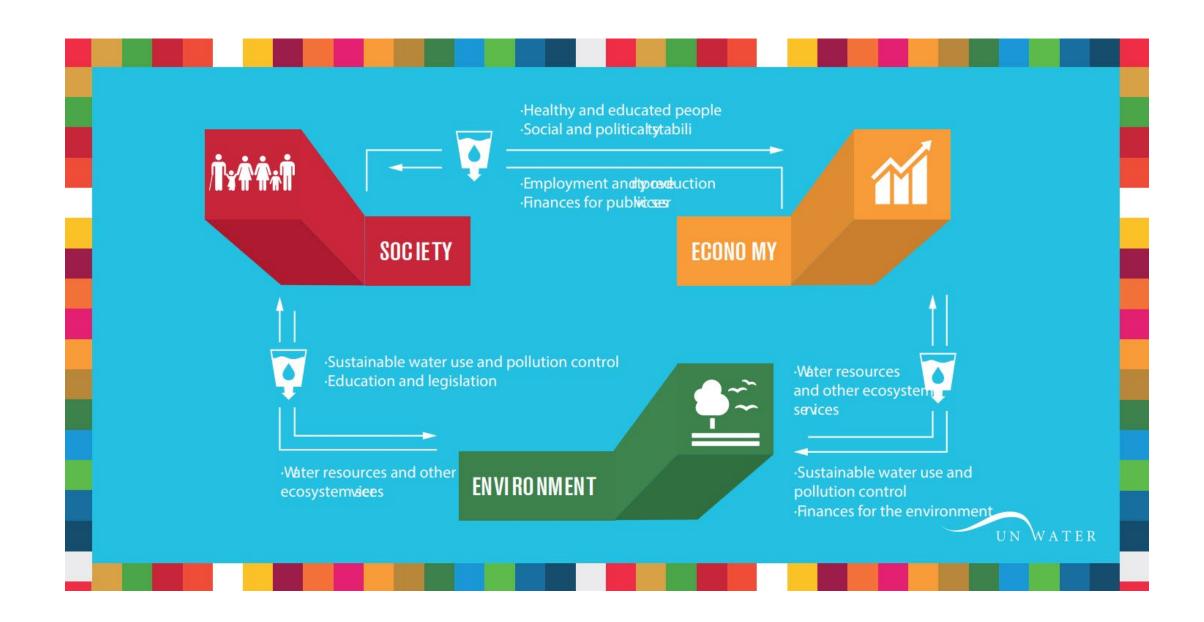
Water Availability and Quality

#### Smart water management & SDGs



- Use of ICT to provide real-time, automated data for use in resolving water challenges in integrated water resource management
- 11 of the 17 SDGs directly relate to water.
- Smart Water Management benefits include:
  - reduction of wastage through water leaks,
  - increased irrigation efficiency,
  - health improvements.





## Social dimension: Interlinkages within the 2030 Agenda with SDG6





- Wastewater treatment [6.3] and WASH [6.1, 6.2] are basic services that are mutually interlinked with poverty reduction [1.1, 1.2, 1.4] in two main ways: by reducing the risk of water-borne diseases [3.2, 3.3, 3.9] and malnutrition [2.2], and
- by supporting girls and women, to participate at all levels in education, economic activities and politics [4.1, 4.2, 4.3, 4.5, 5.1, 5.2, 5.4, 5.5, 8.5, 8.8, 10.2, 10.3];
- WASH is also a prerequisite to improved healthcare [3.1, 3.8]
- Interlinked with agricultural productivity [2.3], sustainable and resilient agricultural practices [2.4] and ending hunger [2.1]

## Economic dimension: Interlinkages within the 2030 Agenda with SDG6





- Nearly 80% of all jobs globally are dependent on sustainably managed water resources and water-related services
- Investments in water and sanitation provide significant economic and social returns, as well as generate employment [1, 8].
- Positive linkage between using more efficient water technologies [6.3, 6.4] and support to poor farmers [2.3, 8.5, 10.1]
- Access to WASH in the workplace is a component of decent work [8.5], with a strong positive impact on workers' health and thus their productivity [8.8], as well as women's participation [5.5].

## Environmental dimension: Interlinkages within the 2030 Agenda with SDG6





- Implementation of the Goal on climate [13] and Goal 6 will be mutually supportive.
- Healthy water-related ecosystems [6.6, 15.1], can provide pollution control (from wastewater and runoff) [3.9, 6.3, 11.6], support resilience through flood and drought protection [11.5, 13.1] and support agricultural productivity [2.1, 2.3].
- Implementing targets 6.3, 6.5 and 6.6 mutually reinforce targets on marine pollution (from land-based activities), protecting and conserving marine and coastal ecosystems [14.1, 14.2, 14.5] and targets on terrestrial ecosystems [15.1, 15.3, 15.5].

## Gap Analysis of the Existing SDGs and EU Framework for Smart Water Management



	- 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Drinking Water Directive	Х	Х	Х			Х			Х	Х	Х	Х					
Water Framework Directive			Х			х	Х	Х	Х		х	Х	Х	Х	Х	Х	
Groundwater Directive		Х	Х			Х			Х			Х		х	X		
Bathing Water Directive			Х			х					X	Х					
European Flood Directive			Х			х			Х		х		х		Х	х	
Marine Strategy Framework						х		Х	Х		х	х	х	X			Х
Urban Waste Water Treatment Directive			Х			Х					Х	Х					
Environmental Quality Standards Directive		X	Х			x					х	Х					





## Water solutions for SDGs: co-creation exercise



#### Feedback session



#### https://ahaslides.com/LJDCG



#### **Speakers**





Ignacio Casals **AMAEM** 





## From source to tap to reuse: smart water cycle applications

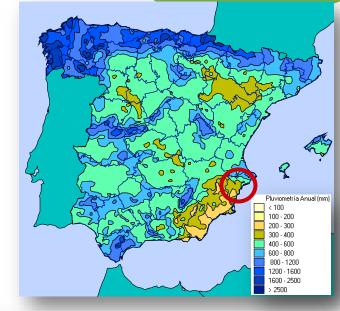
Ignacio Casals, AMAEM



#### Context: the city of Alicante

- Southeast of Spain, classified as semi-arid
- Scarce and irregular rainfall
- No local surface water resources
- Profile of water demand:
  - Concentrated and increasing water demand on the coast.
  - Peak seasonal demand
  - Key role of water reuse for the sustainability of resources

Seasonal population variation 300,000 → +500,000 inh.

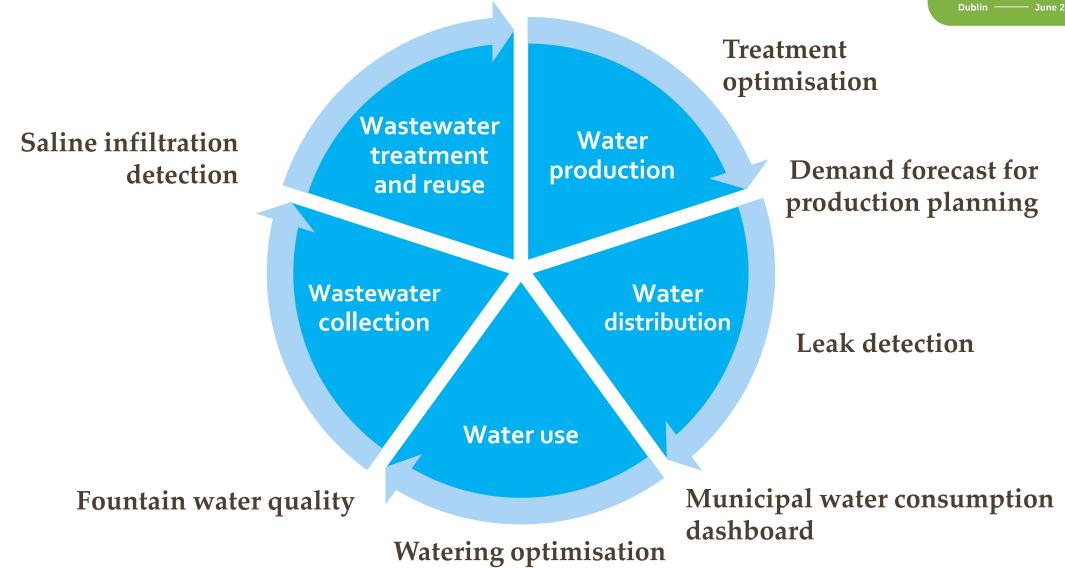


Annual rainfall 200-300 mm



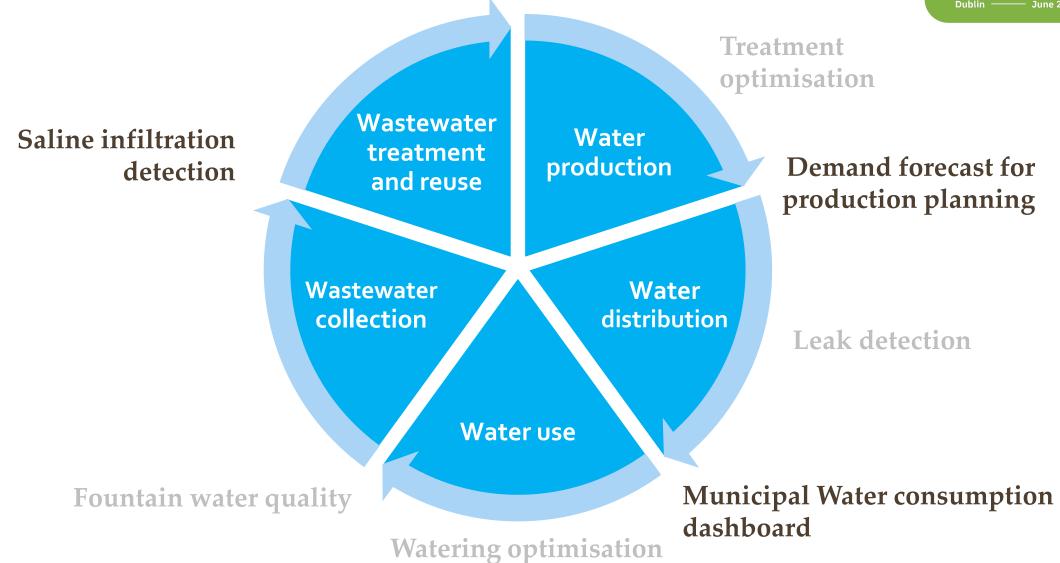
#### **NAIADES** Use Cases





#### **NAIADES Use Cases: Alicante**





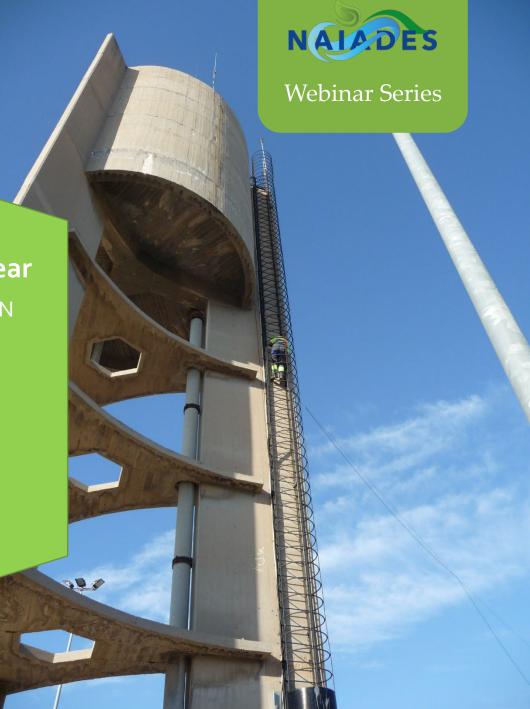
#### Water demand forecast

#### Short term forecast: 1 day - 1 week

- Application: DAILY OPERATION
  - Optimization of water production → energy costs
  - Water Demand fulfilment
  - Water quality assurance
- Data sources
  - Historic records:
    - SCADA Control meter
  - Weather forecast

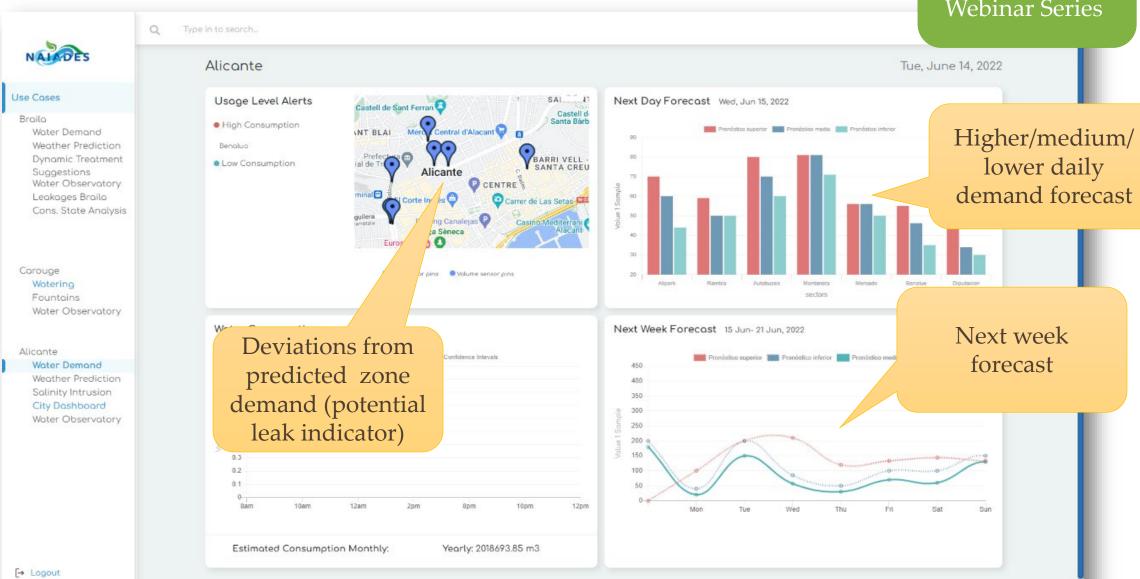
Medium - long term forecast: 1 month-1 year

- Application: PLANIFICATION
  - Management of hydraulic resources
  - Water purchase
  - Financial
- Data sources
  - Historic records:
    - SCADA Control meters



#### Water demand forecast

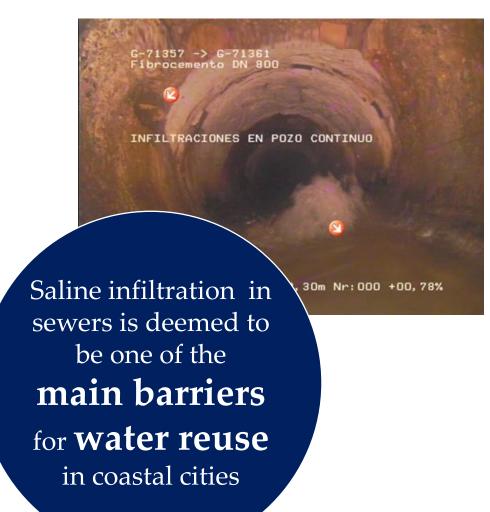




#### Saline infiltration detection in sewers

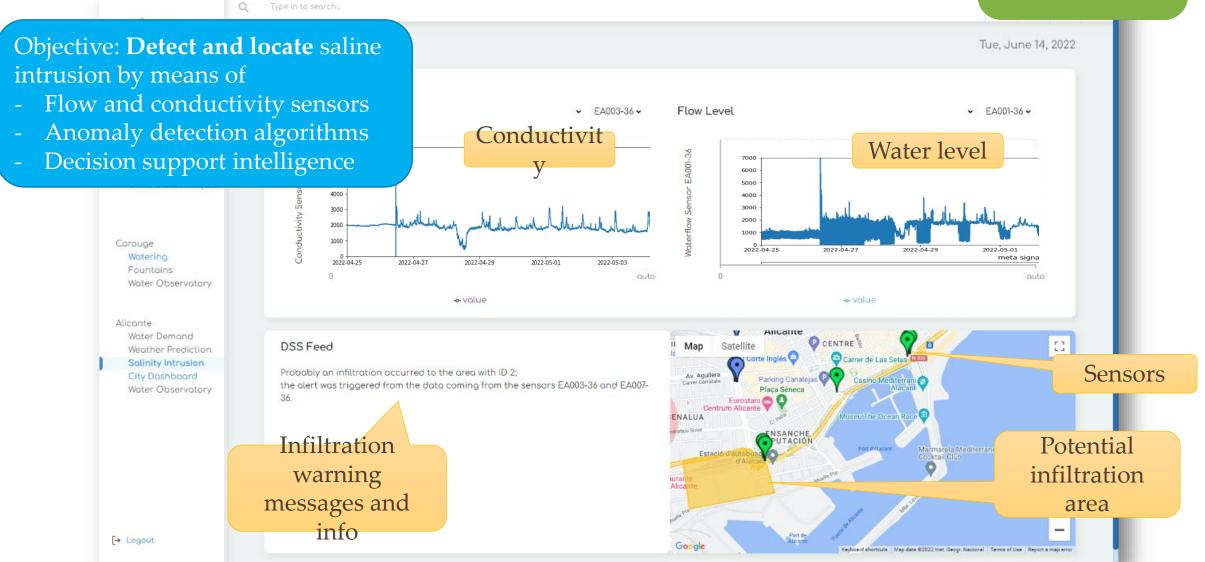


- Saline intrusion of phreatic water to the sewers amounts to 12% of the water that gets to the Waste Water Treatment Plant
- Salinity can not be removed by conventional waste water treatment process
- High conductivity prevents water reuse → additional desalination treatment is required
- Energy costs of Waste water treatment: 0,5 kWh/m3
- Energy costs of Water Recycling: 0,9-1,25 kWh/m3
- The estimated total economic cost of saline intrusion in Alicante's sewers amounts to **1M€/year**



#### Saline infiltration detection in sewers





Municipal Water consumption dashboard

- Municipal (public) consumption accounts for 10% of urban consumption in Spain
- Large potential for consumption reduction
- Most consumption points equipped with Smart Water Meters for remote reading





• Many factors involved in the interpretation of data (type, size, users...)

Webinar Series

Need for awareness campaigns based on real data



07/29/2022

#### **Use Case 2: Municipal Consumption**



- Consumption evolution
- Normalized consumption ranking (per type)
- Map view
- Comprehensive insight & understanding of the consumption

#### Context Information

• Type (garden, school...)

IoT Hourly metered

consumption per point

• Present (last days)

Historic record

- Normalization
  - Number of users
  - Size (gardens)







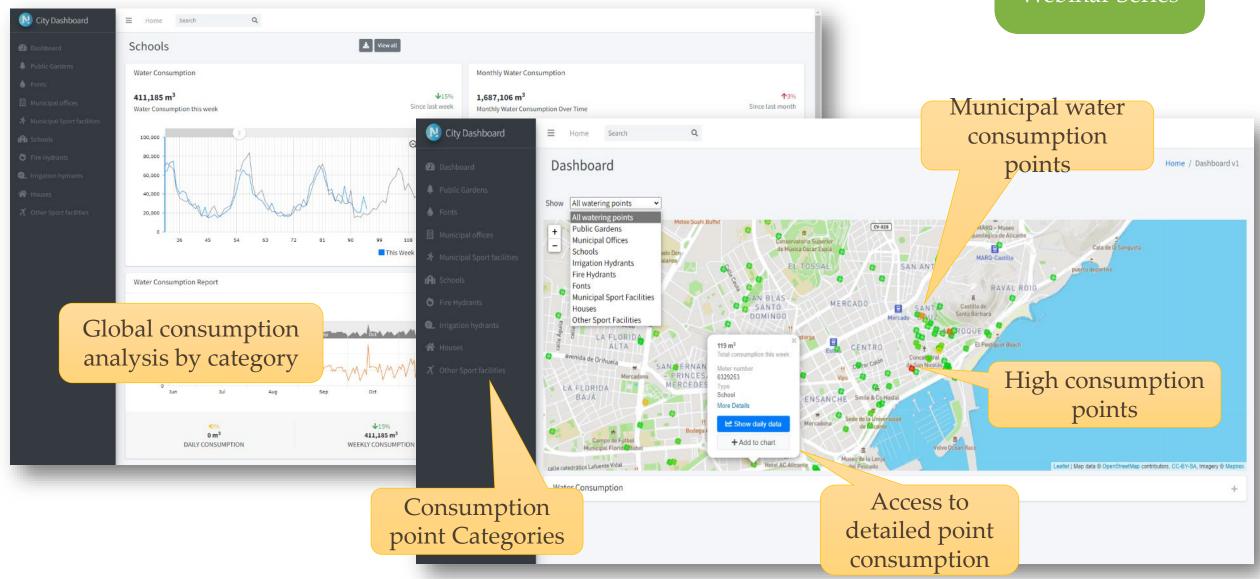
- Tool to boost the students' awareness on their water consumption through real data
- Tested on a Water Efficient Consumption Contest for Schools ("The Water Watchers")





#### Municipal Water consumption dashboard





#### School water awareness dashboard









Developing solutions for smart water management: co-creation exercise



#### Feedback session



#### https://ahaslides.com/LJDCG



#### **Speakers**





Iulian Mocanu CUP Braila





# From old to gold: the challenges of revitalising aged water technology

Iulian Mocanu, CUP Braila



#### The challenges of revitalising aged water technology



#### The City of Brăila

- In eastern Romania
- Located on the Danube
- Over 650 years of recorded history under its current name
- Region inhabited since the Upper Paleolithic Age
- Formerly a major European commercial port

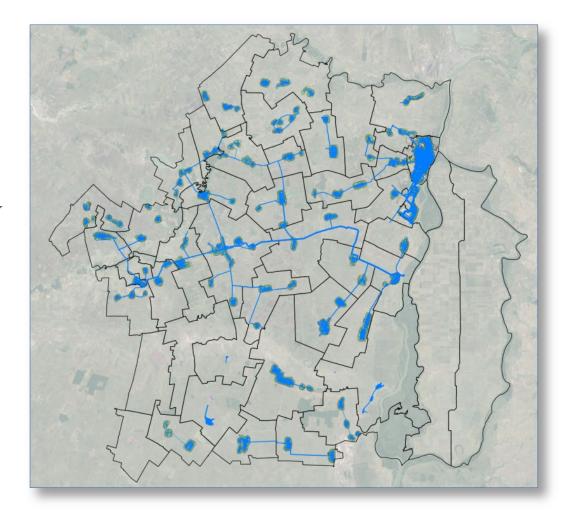


#### The challenges of revitalising aged water technology



#### Compania de Utilități Publice (CUP) Dunărea Brăila

- Operates nearly 2000km of water pipes and nearly 700km of sewer lines
- Pipe replacement in the historic parts of the city must be made with preservation of the area in mind
- New management methods needed to improve
- Efficiency, reduce costs, reduce loss
- Many challenges faced along the way

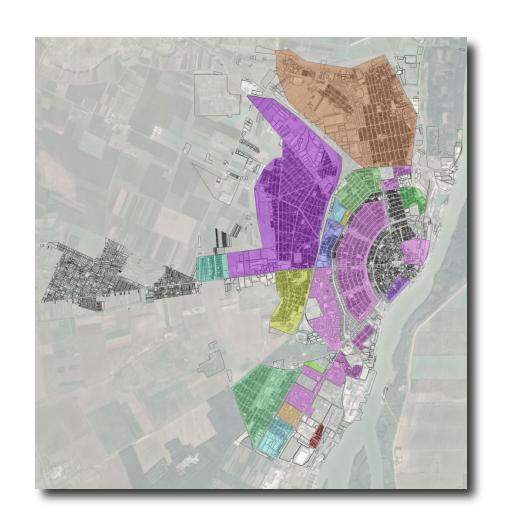


#### The challenges of revitalising aged water technology



#### District Metered Areas

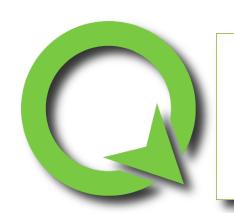
- + Offer the benefit of granular network control
- Offer telemetry with greater detail
- + Allow addressing individual area issues, like pressure limitations
- + Provides potential to more quickly detect leaks and limit loss
- Requires great understanding of network topology and behavior
- Requires modifying the network topology
- Requires numerous sensors for maximum results





#### **GIS**

- Needed in order to properly understand the topology of the network
- Can be accomplished using free software such as QGIS and PostgreSQL+PostGIS and expanded with LizMap and QField for field work
- Must be supported by multiple teams capable of being deployed in different areas to take measurements
- Would greatly benefit from personnel with programming knowledge











#### Hydraulic Modeling

- Needed in order to properly understand network behavior in different scenarios.
- It's the "Digital Twin" you keep hearing about.
- Can be accomplished with free tools like EPANET and Giswater.
- Would greatly benefit from personnel with knowledge of fluid dynamics and some computer science.
- Requires precise data in order to offer any kind of usable result.
- No, really, you need a lot of exact data collected over extended periods of time.



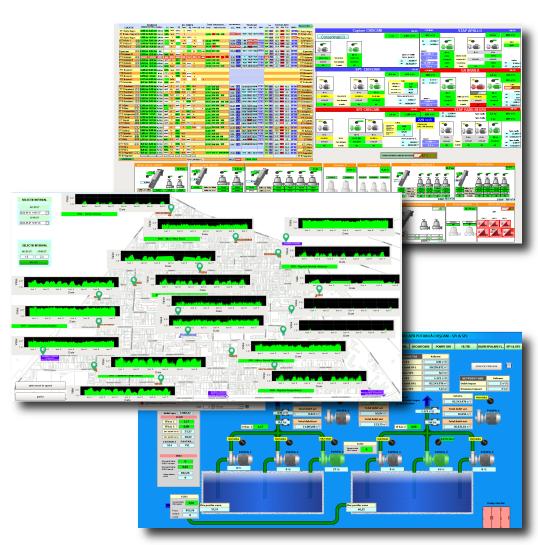


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#### **SCADA**

- Collects and processes all your sensor data
- Would benefit immensely from having your own telecommunication infrastructure.
- You will need programmers, dedicated network engineers and people capable of servicing the sensors.
- Is a massive security risk if improperly built
- Must be built on a framework flexible enough to support any future change
- Development is never "done"





#### Get the public involved

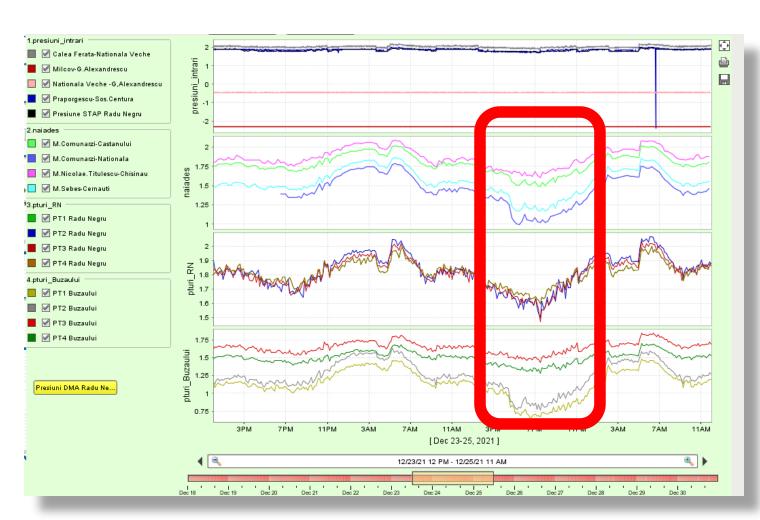
- The more they understand the network, the better off you'll be
- The more they know, the more they can help report problems, or at least not accidentally drill into water mains
- They can help reduce water waste in times of drought if properly informed
- They can help move forward stagnant projects through public pressure.





#### Results

- Pressure sensors within a DMA viewed within the SCADA system
- Pressure drop visible across the board when a leak occurs
- Largest pressure drop is from sensors closest to the leak





#### Results

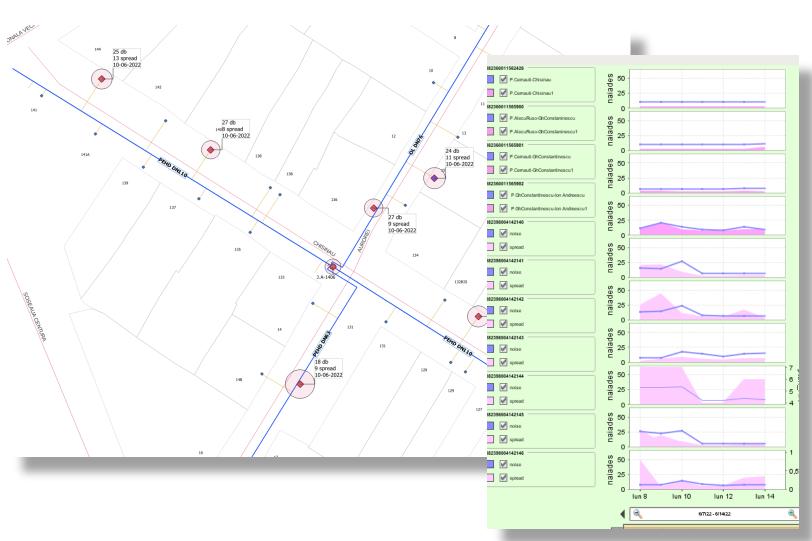
- SCADA interface comparing flow in the current day with the previous day for the main water inlets of the city
- Large flow differences indicate leaks





#### Results

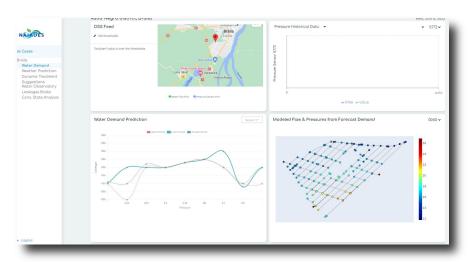
- GIS and SCADA interfaces showing noise sensor activity
- Sensors on the same water line indicating a higher than ambient noise are investigated for leaks in proximity

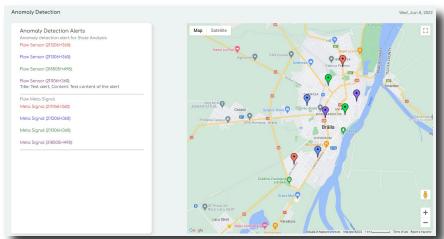




#### The NAIADES Project

- Offers AI driven systems that can help improve leak detection
- Uses noise and pressure sensor to detect anomalies
- Can potentially cut down detection times and pick up previously undetected leaks
- Can also offer water demand forecasts, in order to help save resources









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# Modernising the water flow: co-creation exercise



## Feedback session



# https://ahaslides.com/LJDCG



# **Speakers**





**Eunah Kim UDG** Alliance





# Towards a greener, more sustainable city: how smart water solutions can help

Eunah Kim, UDG Alliance



# Carouge: key facts

- Located in the Geneva Canton:
  - a global financial center
  - international organizations headquarters (UNO, WHO, ITU, WMO, ILO, CICR...)
- Industries, services and about 20'000 jobs
- Fast-growing population (23'000)
- Not-as-fast-growing budget



# Sustainable development



• Efforts to wisely use natural resources and undertake sustainable actions for the environment

• Engagements and Awards: Cité de l'énergie, first Zero waste city in Switzerland



- Strong will by City Council to improve its own water usage and promote responsible water consumption
- Need for technological solutions that can help to achieve this goal



# Water Resource

Water provided by public utility SIG Mostly from the lake (90%) 10% from deep wells. Water scarcity: increasingly a threat due to climate change

- Increased episodes of draughts in the region
- Schrinking glaciers a real issue in the mid-term

Affected by contamination (underground water from 20% down to 10% due to perchlorates pollution)

# 1. Watering Use Case



- Carouge: a blooming city
- Regularly awarded for its flowers
- 180 flowerbeds, green areas
- Focus on local species
- pesticide-free ecological urban gardening
- watering performed with electric trucks.



# **Problems**



- Manual watering of all 180 flowerbeds twice per week by staff, even more during heatwaves
- Conditions vary (type of plant and soil, location)
- Risk to use more water than actually needed, "to be on the safe side"
- Tests with commercial solutions, not fully satisfatory:
  - Lock-in solutions
  - Lack of added-value in terms of knowledge: systems tend to work like a black box
  - Lack of data interoperability, issues with data accessibility and ownership

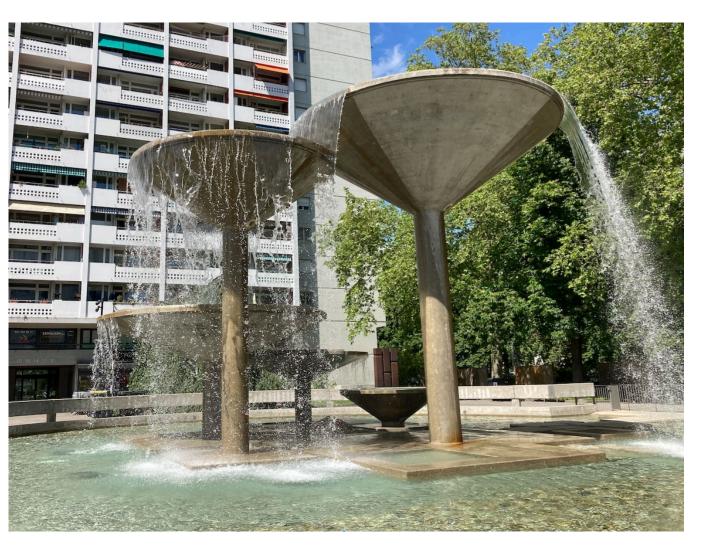


# 2. Water Quality in Fountain



- Iconic fountain located in the very centre of the City
- Beloved from inhabitants, especially families
- A source of refreshment during the hot summer days





# **Problems**



Lack of continous measurements
Limited set of parameters measured
No sensors exist for some key parameters such as chlorates
or bacteria

High fluctuation of the measured parameters Situation can escalate quickly Early detection of issues is a key





## Sustainable City Development

- Sustainable uses of natural resources
- Reducing Urban heat islands during summer times due to climate change
- Improvement of inefficient water usage + reducing labour consumption Data, including from smart cities, more and more important Many existing solutions are limited in scope, tend to store data in silos Interoperability!





# How 'smart' is water in your city?: Co-creation exercise



## Feedback session



# https://ahaslides.com/LJDCG



# **Speakers**





**Aitor Corchero** Eurecat





# Welcome to the Jungle: the standardisation story so far

Aitor Corchero, EURECAT







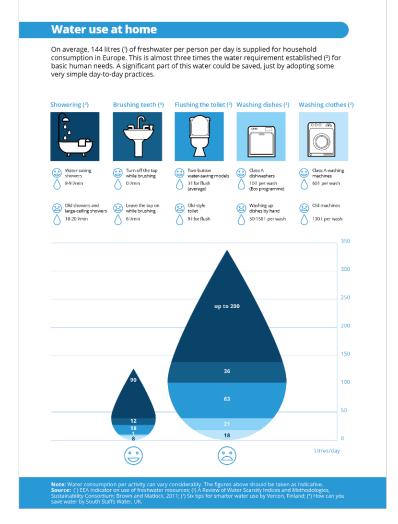
- 1 Importance of Standardisation
- Standardisation Jungle
- 3 Remarks



# Importance of Standardisation



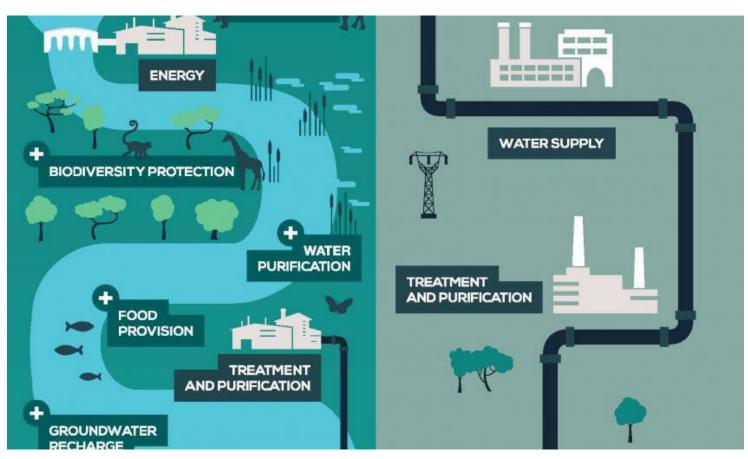
Ensure responsible management of water use towards increasing water scarcity



Source: <u>EEA</u>



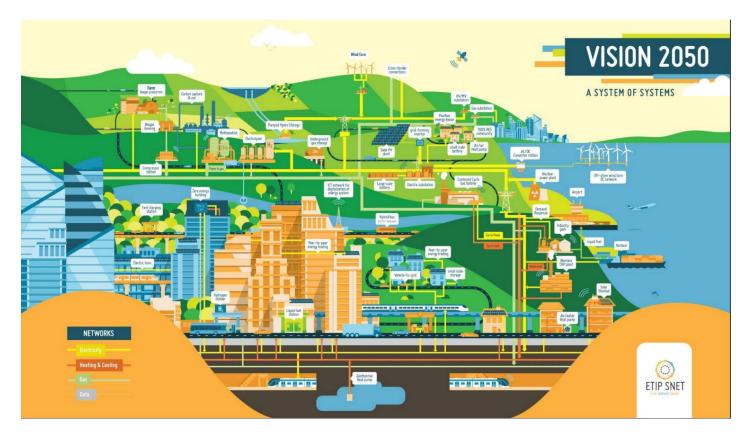
Ensure secure and safe operation of (waste/drinking) water infrastructure



Source: <u>IUCN</u>



Promote and foster knowledge exchange between water and interrelated infrastructures



Source: <a href="https://www.etip-snet.eu/wp-content/uploads/2018/05/ETIP-SNET-Presentation-27-June.pdf">https://www.etip-snet.eu/wp-content/uploads/2018/05/ETIP-SNET-Presentation-27-June.pdf</a>



Engage stakeholders towards building smart water society



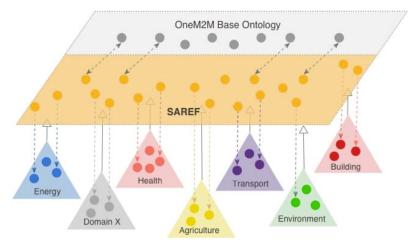
Source: Water Europe

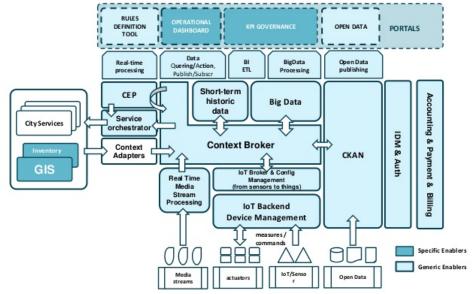
# Standardisation Jungle





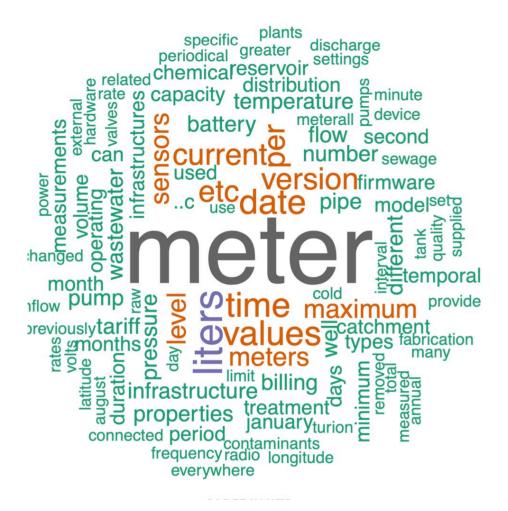
# Standardisation Jungle





FIWARE Lab FIWARE Ops

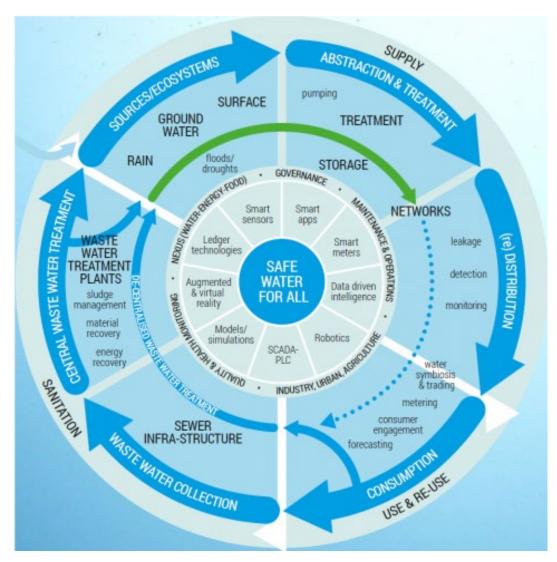




**◯** FIWARE

# Standardisation Jungle







Water quality



Irrigation



Water footprinting



Infrastructure



**Hydrometry** 



Piping and valves



**Drinking water** 



Measurement of fluid flow



**Wastewater** 



Source: ISO

Water reuse

Source: ICT4Water Cluster

# Remarks



Standards provides solutions to to ensure water efficiency, quality, harmonisation, safety, transparency and sustainability.

Bringing accessibility to standards contributes to their wider adoption and the generation of newer business models







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# Standardisation in the water sector: Co-creation exercise



#### Feedback session



# https://ahaslides.com/LJDCG



### **Speakers**





Juan Fernández Montenegro AIMEN





# Behavioural change: how can we involve citizens in water management?

Juan Fernández Montenegro, AIMEN

#### Consumption awareness. Why?





- you understand your water bill/water meter info?
  - Make sense of water consumption data.
- Do you understand how it affects you and your area?
  - Self and environmental awareness
- Do you know how to react to your water consumption data?
  - Water consumption habits

#### Water digitalised. What now?

- Monitor and understand how water is consumed in a specific area or consumption point (schools, sport facilities, gardens, other buildings) in the course of time.
- Compare consumption across various dimensions, including per groups of consumers, areas, types of consumption points and time periods.
- Take **decisions** regarding water consumption mitigation measures based on such information.
- Monitor the **impact** of consumption mitigation measures after their implementation





#### Will you willingly participate?



- Water managers (water utilities...) need to be able to deploy ICTsupported water consumption awareness programs and engage water consumers in water conservation activities.
  - Support different persuasive strategies including:
    - Self-monitoring and feedback
    - Social comparisons and rewards
    - Suggestions and social norm based messages
  - Consumption awareness in education.
    - Students are a group of consumers that can provide a channel for generating great impact.

Ability		Motivation		Opportunity	
Skills	Identity	Beliefs	Resources	Time	
inancial	Goals	Emotion	Complexity	Social	
	Rewards				
5	kills	kills Identity inancial Goals	kills Identity Beliefs inancial Goals Emotion	kills Identity Beliefs Resources inancial Goals Emotion Complexity	





Citizen science and water management: co-creation exercise



#### Feedback session



# https://ahaslides.com/LJDCG







# Recommendations for smart water management: co-creation exercise



#### Feedback session



# https://ahaslides.com/LJDCG







# Wrap-up







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