The Water4Cities tool for informed decision making in the management of urban water supply

CEMEPE 2021

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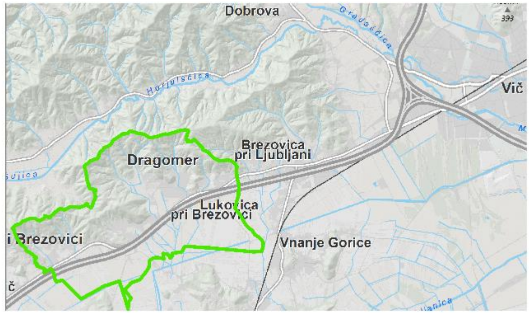
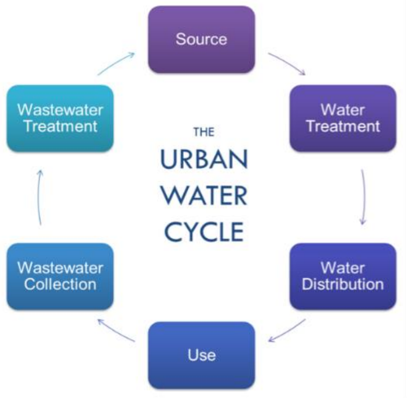
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 734409 WATER4CITIES

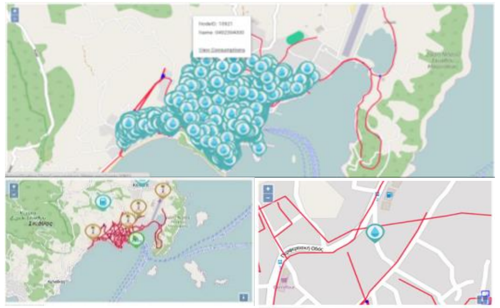
Use Cases

Ljubljana, Slovenia





Skiathos Island , Greece



Objectives

Water4Cities Platform

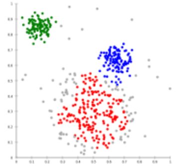
Real-time monitoring of urban water resources

Urban water management decision support

Technologies & Fields of Expertise

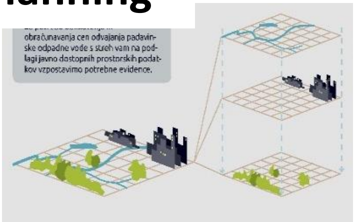
Sensor networks

Data Analytics

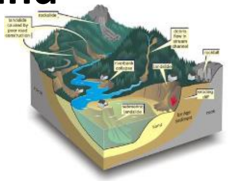


Data visualization

Urban Planning



Water systems Modelling and Simulation



Partners

IJS
IBM
SingularLogic
iquadrat
Prifysgol Bangor University
LUZ

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2 Water4Cities CSs

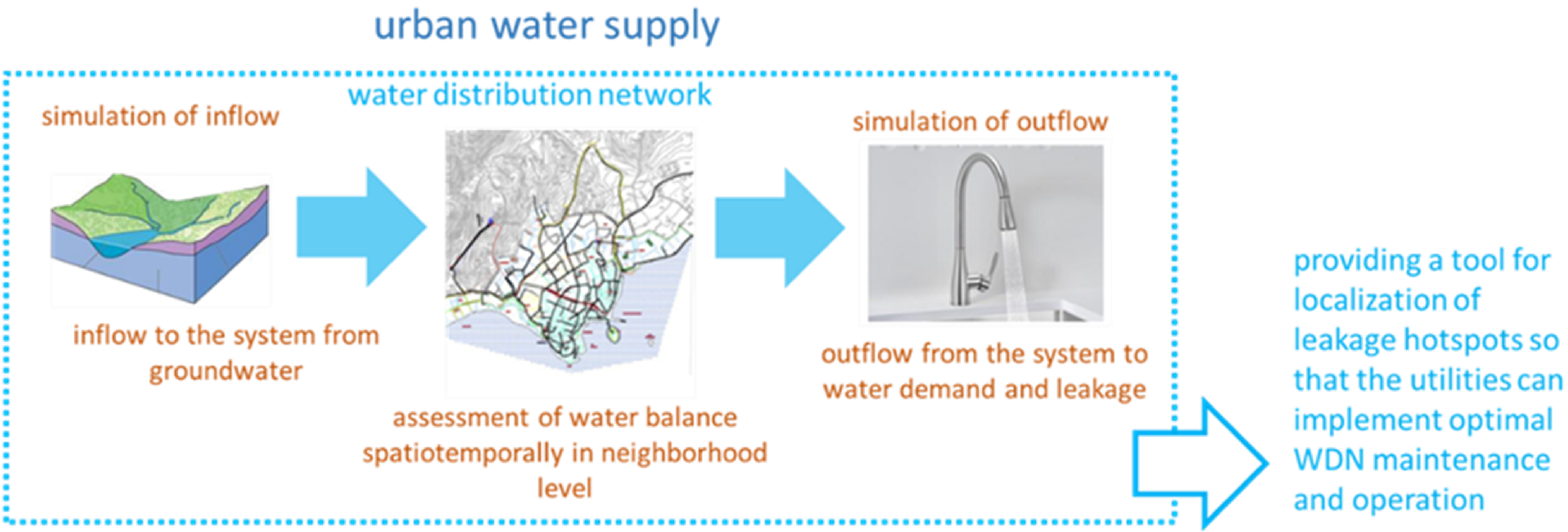
Ljubljana

- a very green capital
- water abundancy
- technologically savvy
- tradition in water-engineering achievements
- risk of flooding

Skiathos

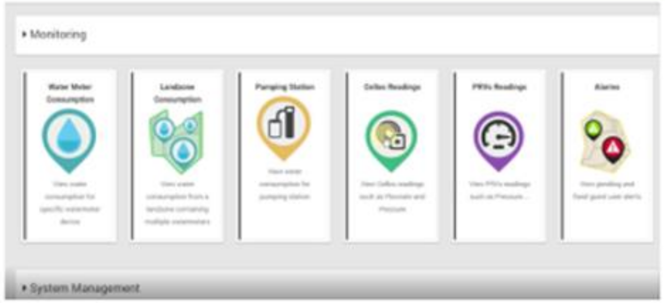
- a small town in an island in central Aegean
- population of 5,000
- touristic character
- aging infrastructure with high leakage
- water scarcity incidents

the Skiathos case study



Polis_Wizz: a water smart tool for facilitating urban water supply management

Case Study: WDN of Skiathos Island, Greece	
3,500 water meters	**infrastructure**: • pressure sensors at 3 critical points • spatiotemporal WDN model • PRV linked to DSS • PCM scheme • 9 household faucets monitored
bold relief	
single DMA	
day/night variation	
seasonal tourism	
insularism	



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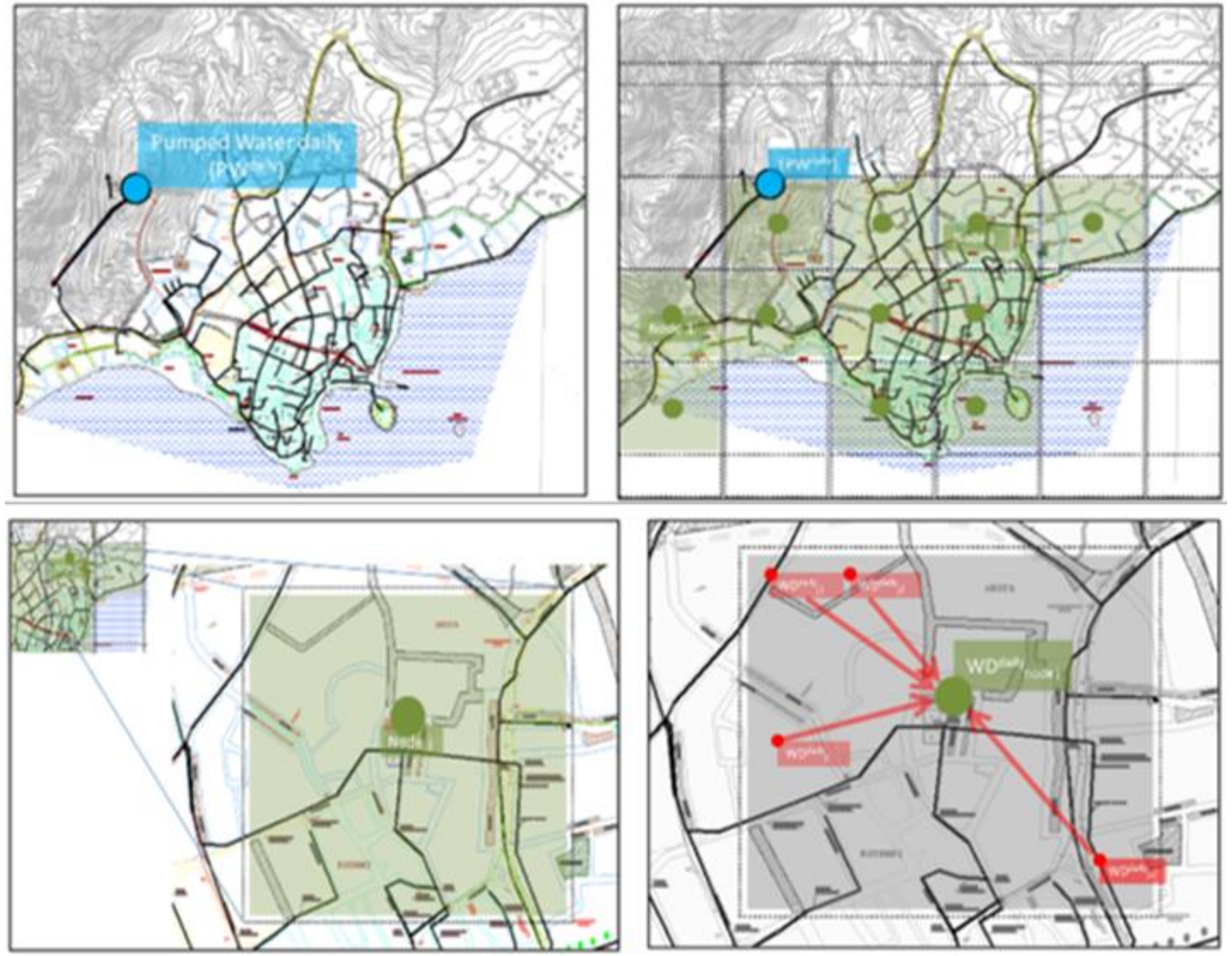
the land zones concept



group water-meters of the same neighborhood under a single **representative node** of shared characteristics

pressure
demand
leakage
elevation
etc

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Spatiotemporal assessment of the International Water Association table components

<table>
<tr><td rowspan="9">System Input Volume (corrected for known errors)</td><td rowspan="4">Authorised Consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption (including water exported)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="7">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer metering</td></tr>
</table>

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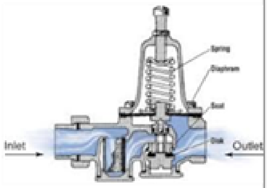
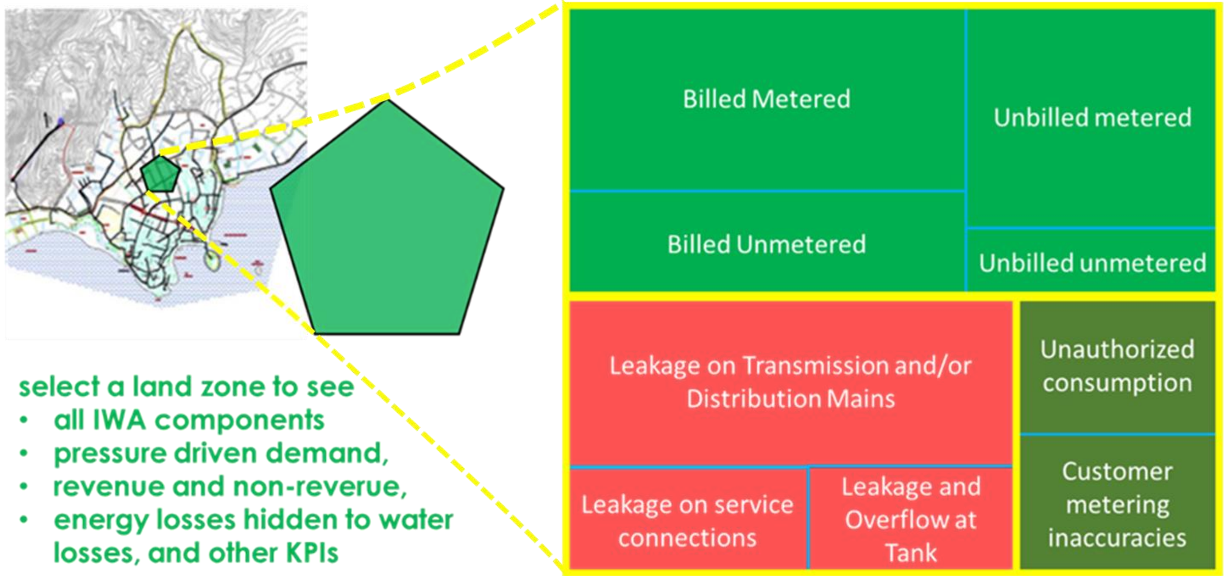
IWA table adjusted for Skiathos

System Input Volume (SIV) after Utility's Storage Tank (corrected for known errors) 	Billed Authorized Consumption (BAC) Including leakage after Customer Metering (every 3months)	Metered BAC	Revenue Water
		Unmetered BAC	
	Apparent Losses	Water Theft	Non-Revenue Water
		Customer Metering Inaccuracies (manual recording)	
	Real Losses	Leakage on Transmission and Distribution Mains	
		Leakage on Service Connections up to Customer Metering	



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approaches and assessment of Polis Wizz

water MDPI

Article

Simulation of a Water Distribution Network with Key Performance Indicators for Spatio-Temporal Analysis and Operation of Highly Stressed Water Infrastructure

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2 Institute of Environmental Protection-National Research Institute, ul. Krucza 5/11d, 00-548 Warsaw, Poland; rafal.ulanczyk@gmail.com
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check for updates

Abstract: An annual and lumped water balance assessment of a water distribution network is recommended by the International Water Association as a first step and prerequisite for improving the performance of the network by minimizing real/physical water losses, burst incidents, water theft, nonrevenue water, and energy consumption, among others. The current work suggests a modeling approach for developing the water balance of a network spatio-temporarily, in hour time-scale and neighborhood granularity. It exploits already established key performance indicators and introduces some new ones to highlight the potential in improving the management of a water

- IWA Water balance component analysis
- top down estimation
- bottom up estimation
- minimum night flow
- nexus type Water Energy link
- KPIs recommended by IWA

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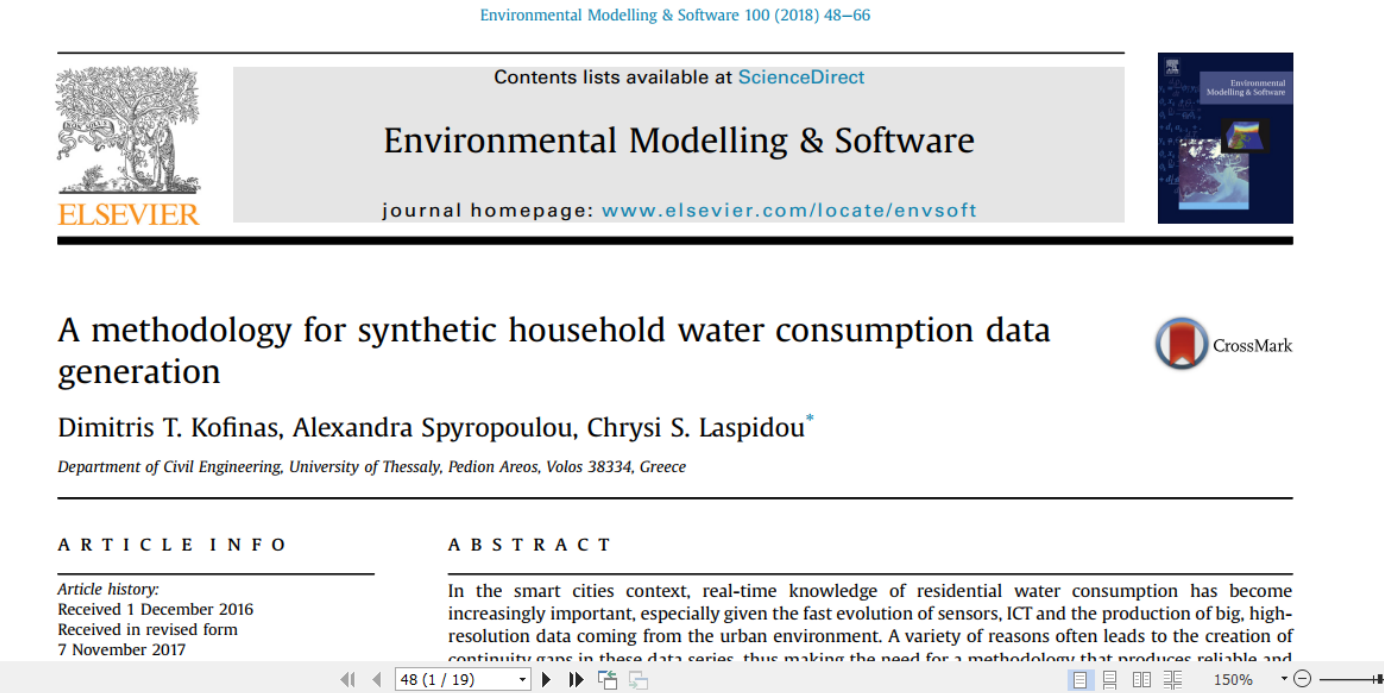
Environmental Modelling & Software 100 (2018) 48–66

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ELSEVIER

A methodology for synthetic household water consumption data generation

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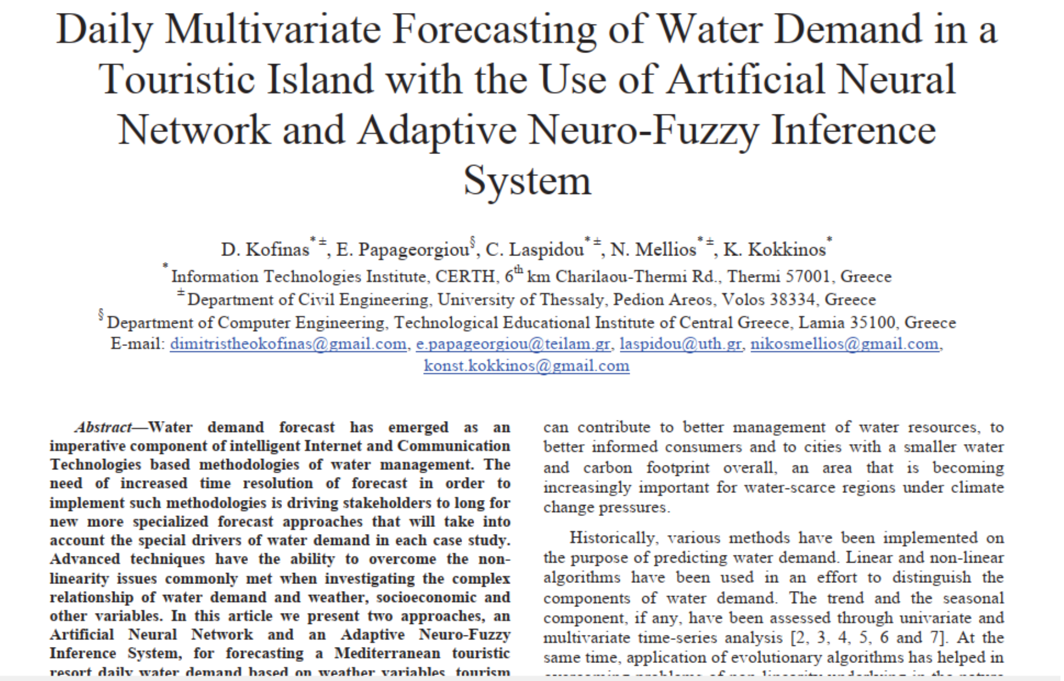
ABSTRACT

In the smart cities context, real-time knowledge of residential water consumption has become increasingly important, especially given the fast evolution of sensors, ICT and the production of big, high-resolution data coming from the urban environment. A variety of reasons often leads to the creation of


Daily Multivariate Forecasting of Water Demand in a Touristic Island with the Use of Artificial Neural Network and Adaptive Neuro-Fuzzy Inference System

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Abstract—**Water demand forecast has emerged as an imperative component of intelligent Internet and Communication Technologies based methodologies of water management. The need of increased time resolution of forecast in order to implement such methodologies is driving stakeholders to long for new more specialized forecast approaches that will take into account the special drivers of water demand in each case study. Advanced techniques have the ability to overcome the non-linearity issues commonly met when investigating the complex relationship of water demand and weather, socioeconomic and other variables. In this article we present two approaches, an Artificial Neural Network and an Adaptive Neuro-Fuzzy Inference System, for forecasting a Mediterranean touristic**

can contribute to better management of water resources, to better informed consumers and to cities with a smaller water and carbon footprint overall, an area that is becoming increasingly important for water-scarce regions under climate change pressures.

Historically, various methods have been implemented on the purpose of predicting water demand. Linear and non-linear algorithms have been used in an effort to distinguish the components of water demand. The trend and the seasonal component, if any, have been assessed through univariate and multivariate time-series analysis [2, 3, 4, 5, 6 and 7]. At the same time, application of evolutionary algorithms has helped in

- forecasting algorithms
- pressure driven demand estimation

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Mapping critical WDN Key Performance Indicators

number of water meters, consumers, pipe characteristics
pressure
IWA components
IWA components per pipe length
pressure demand: waste due to excessive pressure
pressure demand per total consumption
pressure demand per service connection
potential pressure reduction
potential pressure variability reduction
potential leakage reduction
potential leakage reduction per pipe length
potential energy waste reduction linked to leakage reduction per pipe length
potential savings in euro

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PolisWizz

website: poliswizz.uth.gr

Thanks for your attention!

For further information please consult
http://water4cities.eu/

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