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Finnish Environment Institute

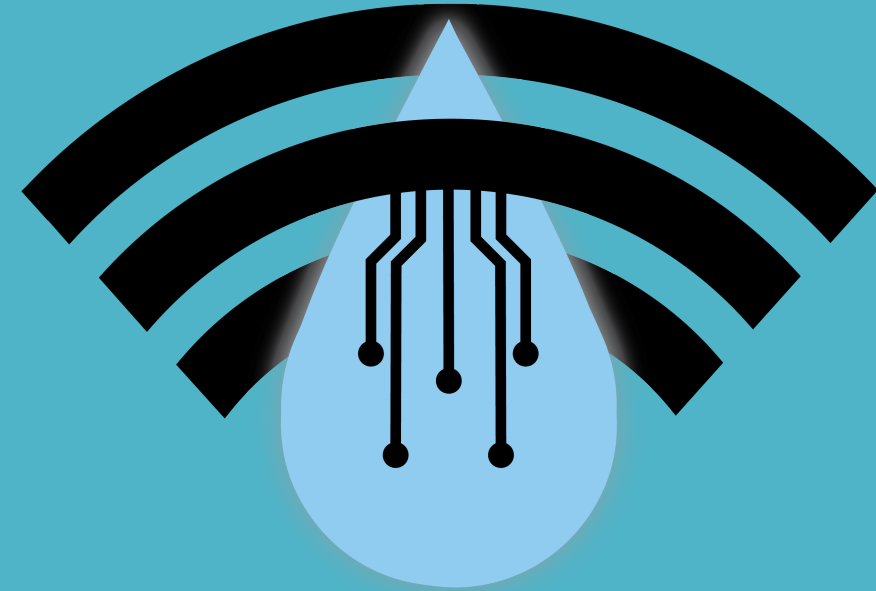
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SWAIN: Sustainable Watershed Management Through IoT- Driven Artificial Intelligence

CHIST-ERA Projects Seminar – 13.04.2021

Dr. Atakan Aral, University of Vienna



FWF

Der Wissenschaftsfonds.



SWISS NATIONAL SCIENCE FOUNDATION



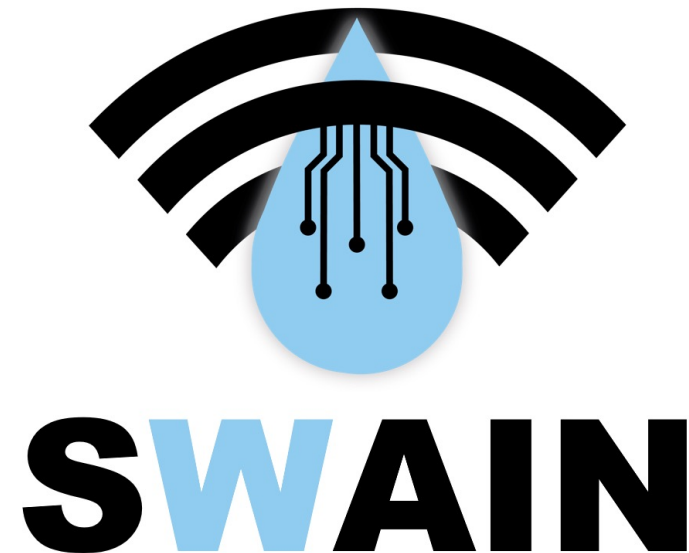
SUOMEN AKATEMIA
FINLANDS AKADEMI
ACADEMY OF FINLAND



TÜBİTAK

About SWAIN

Call	CHIST-ERA Call 2019 – Novel Computational Approaches for Environmental Sustainability
Funding	FWF, SNSF, AKA, and TÜBİTAK
Budget	1,157,341 €
Duration	3 years
Start	01.03.2021



Micropollutants

Hundreds of different chemicals found in surface water around the world

Very low concentration (e.g., few micro or nanograms per liter)

highly toxic

endocrine-disrupting

carcinogenic

mutagenic

contribute to antibiotic resistance

tolerant to decay



Motivation

Kokemäki river, Finland (July 2014)

66 tons of nickel

Vistula river, Poland (September 2019)

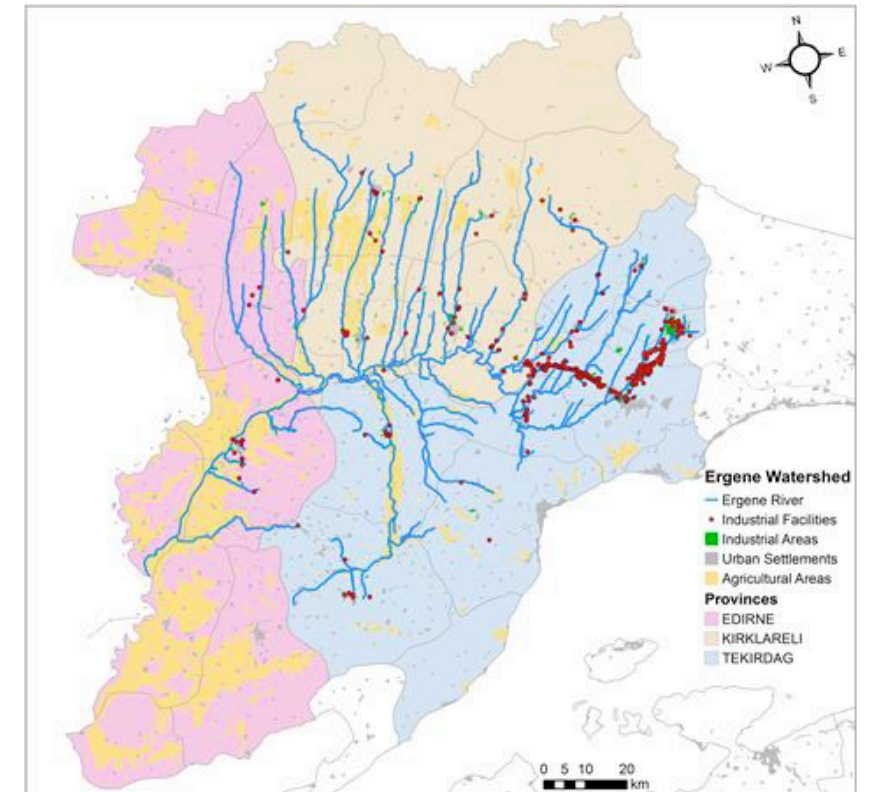
300 tons of nitrogen

30 tons of phosphorus

Use Cases

Ergene river, Turkey

Kokemäki river, Finland



Partners



University of Vienna, Faculty of Computer Science

PI and coordinator: Dr. Atakan Aral

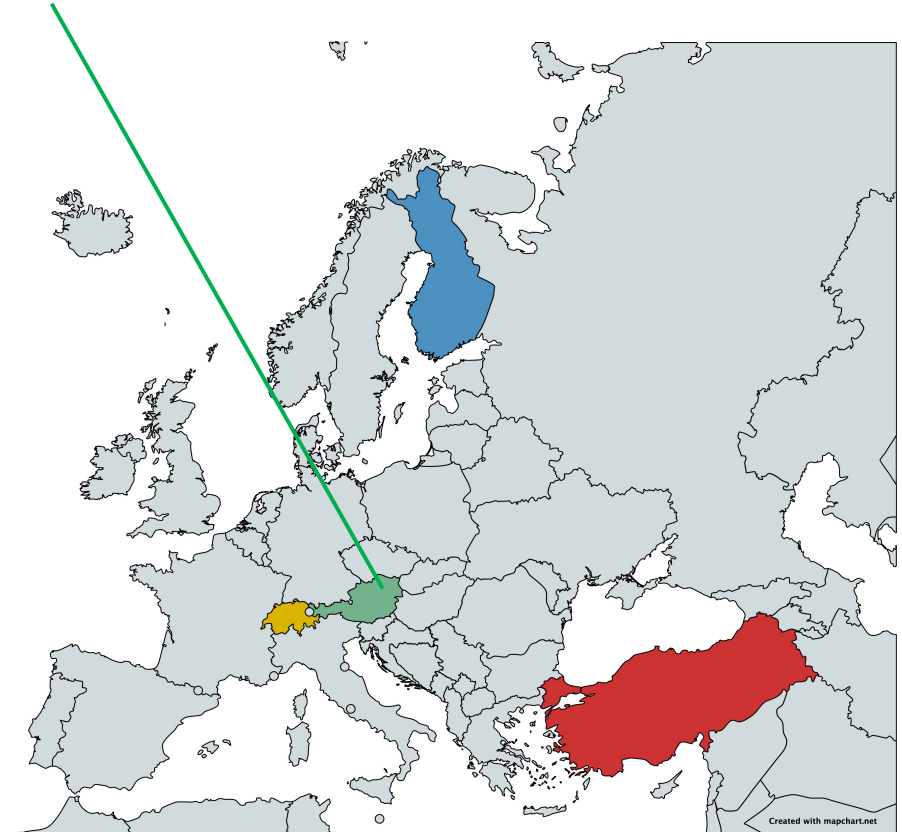
Added value:

Edge computing

Distributed data analytics

Edge intelligence

Fault tolerance and resource placement



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Vienna University of Technology, Faculty of Informatics

PI: Prof. Dr. Ivona Brandic

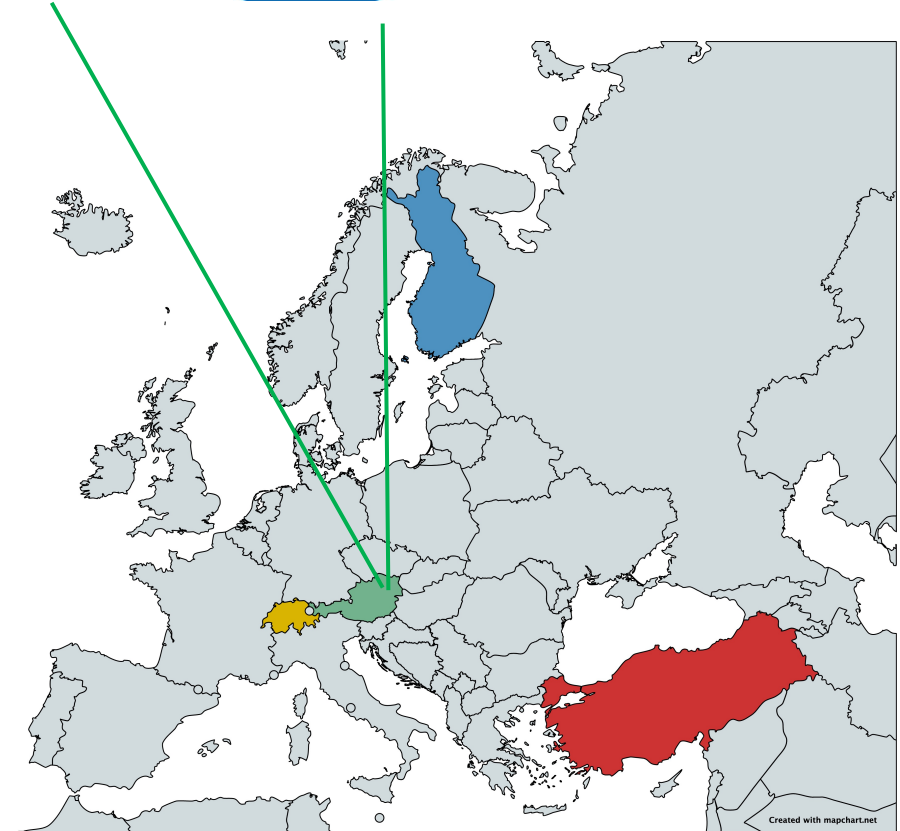
Added value:

Edge computing

High performance computing

Energy efficiency

Multi-objective optimization



Partners

Università della Svizzera italiana, Advanced Learning and Research Institute

PI: Prof. Dr. Cesare Alippi

Added value:

Internet of Things

Graph-based learning

Life-long learning



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Partners

Istanbul Technical University, Faculty of Computer and Informatics Engineering

PI: Asst. Prof. Dr. Mehmet Tahir
Sandıkkaya

Added value:

Data and model adaptation

Model verification

Data visualization



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Partners

Boğaziçi University, Institute of Environmental Sciences

PI: Assoc. Prof. Dr. Ulaş Tezel

Added value:

Geodatabases

Watershed modeling

Micropollutant transport modeling

Validation



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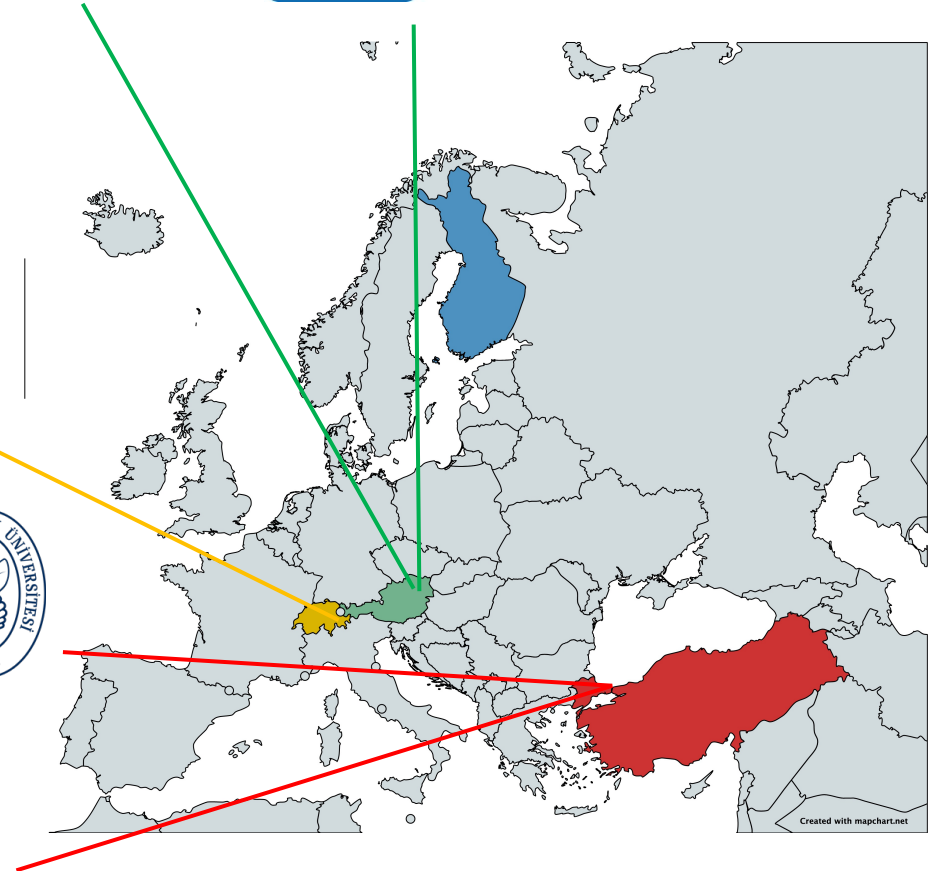


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Partners

Finnish Environment Institute (SYKE) / Freshwater Centre

PI: Dr. Janne Juntunen

Added value:

Data provision

Hydrodynamical modeling

Hydrological modeling

Validation



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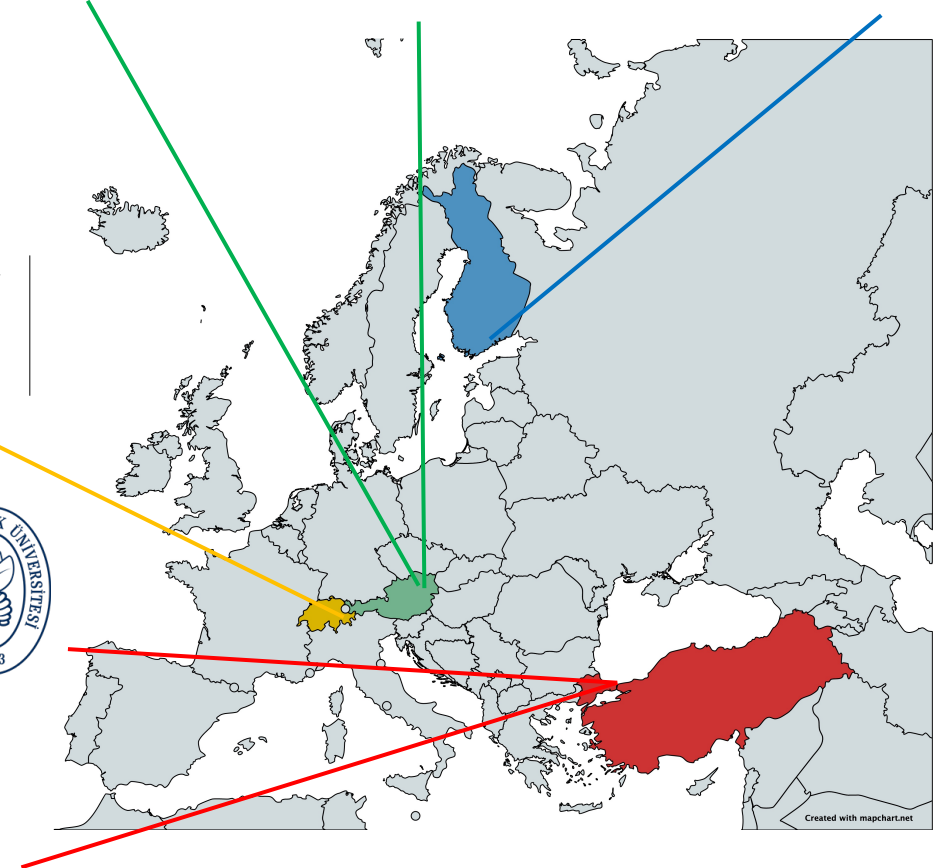
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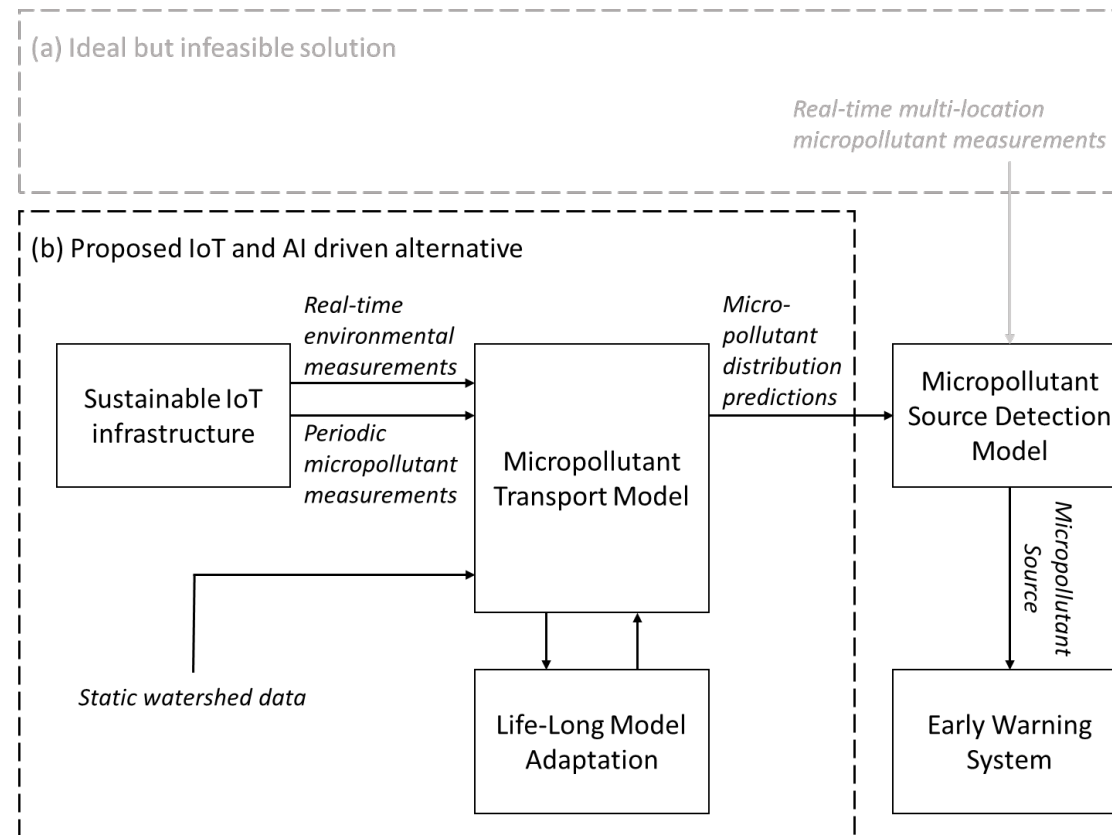
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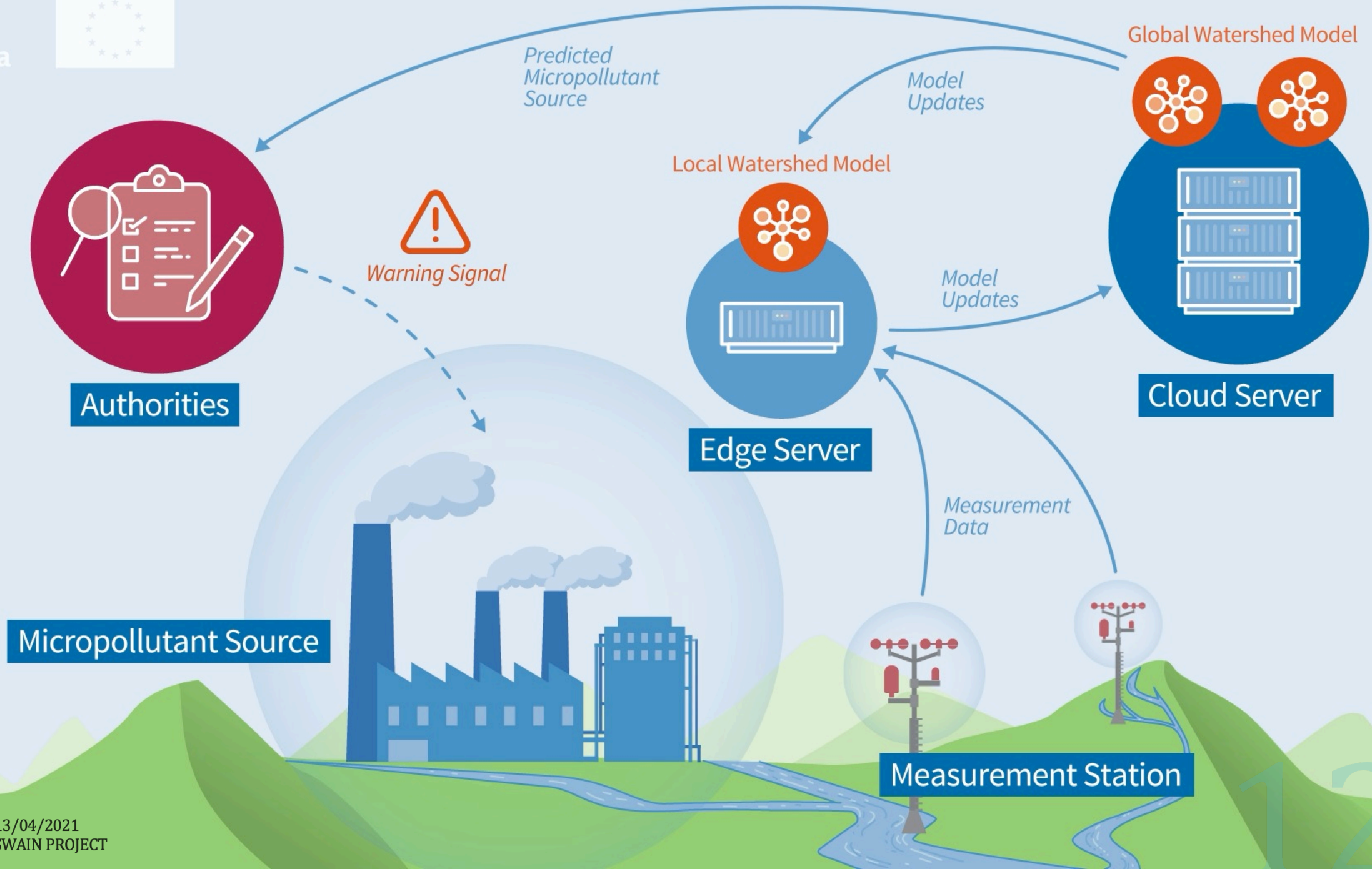


Created with mapchart.net

Goal and Challenges

Identification and **localization** of micropollutant contamination in European rivers in **near-real-time** and consequently prompt decision-making





Impact

1. The joint optimization and dynamic placement of training and inference tasks across the edge-fog-cloud continuum
2. Expert knowledge from environmental scientists will be incorporated into the evidence-based models via a novel feedback mechanism.
3. Currently water sample analysis for 250 pollutants takes 20 minutes. By identifying indicator pollutants beforehand and reducing the analysis to 20-50 pollutants, it might be possible to detect micropollutants in 5 minutes.
4. Environmental data from watersheds will be made openly available in much higher granularity than state-of-the-art allowing data fusion.
5. Interdisciplinarity, widening countries, young researchers

Early outputs

Attracting significant public attention due to social aspects of the project:

1. Promotional video (CHIST-ERA Short Video Contest – Participant 01)
2. Video interview with the coordinator (in preparation)
3. Article in the university magazine (in preparation)
4. News article in a national outlet (in preparation)
5. Project website (in preparation) and social media accounts ([@SWAIN_Project](#))

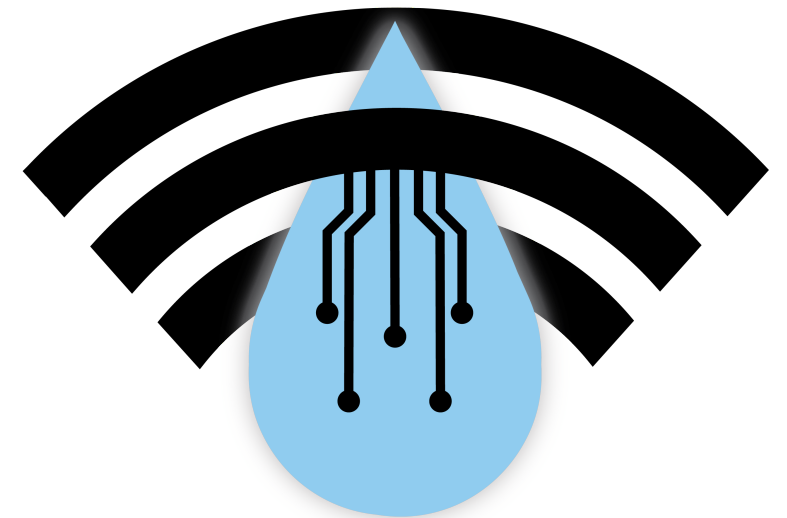
Thank you!

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University of Vienna

Faculty of Computer Science

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[@SWAIN_Project](https://twitter.com/SWAIN_Project)