Data-Driven Solutions for Water Management in Smart Cities

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Global challenges in cities

- Rapid urbanisation
- Urban Heat Island effect
- Effects of climate change

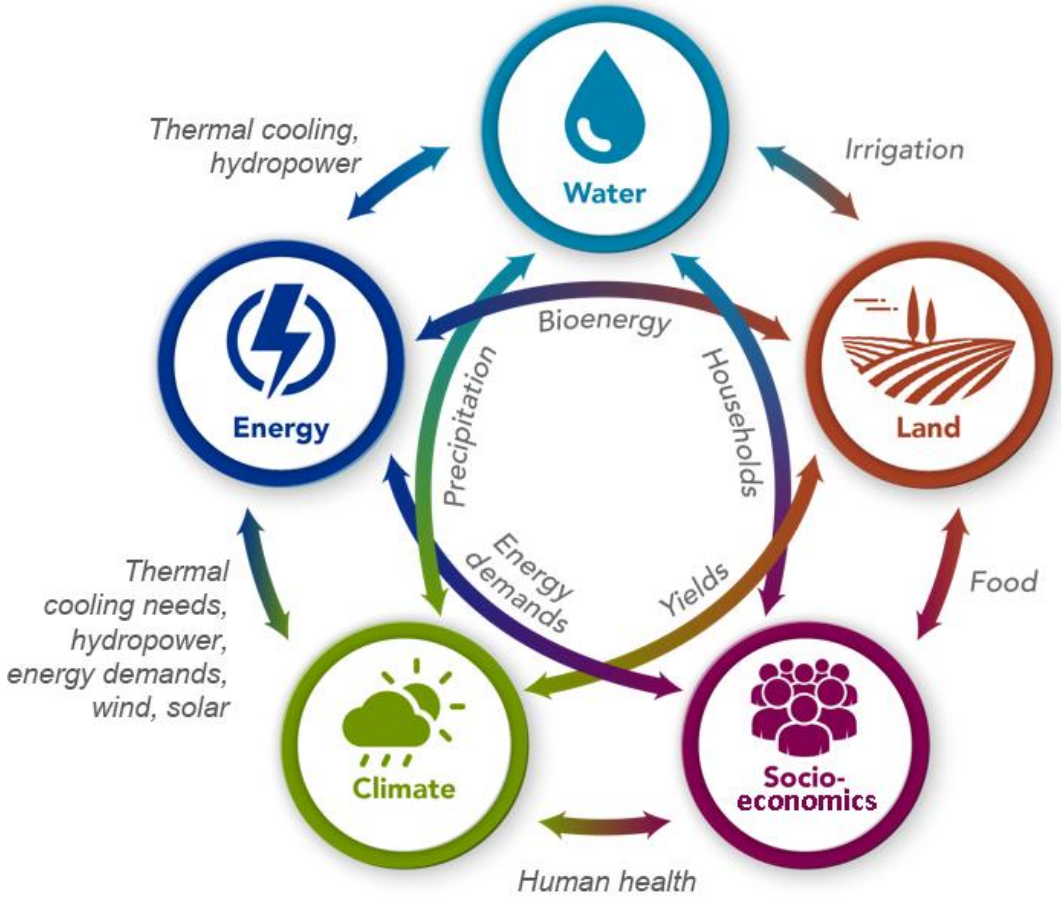
⇒ What does this mean for the water supply in cities?

⇒ How can modern tools make water management efficient?

⇒ How can digital solutions shape the future of water management?

Global challenges

Interconnections between the climate, energy, water, land and socioeconomic dimensions



https://gmd.copernicus.org/articles/12/677/2019/

National Water Strategy

https://www.bmuv.de/download/nationale-wasserstrategie-2023

The fields of action of the Water Management Roadmap 2030

Six fields of action:

- Sustainable use of natural water resources
- Near-natural quality of water bodies
- Water-conscious urban development
- Resilient supply and disposal infrastructure
- Resource-efficient and climate-neutral water management
- Water-conscious society

https://www.roadmap-zukunft-wasser.de/

Sustainable water resources management

Challenges

- Worldwide increasing demand for food and the simultaneous deterioration of environmental conditions
- Increasing extreme weather events
  - ⇒ Gaining knowledge of the impact on water resources and quality is getting more relevant
  - ⇒ Heavy rain or drought can have massive effects on the quality of surface and groundwater and lead to an increased concentration of pollutants at local hot spots.

⇒ Adaption and mitigation are the main short-term factors for climate resiliency

⇒ Establish a relationship with water as water is an essential resource for the daily life

⇒ Develop a future strategy with sustainable engaged imagination integrating innovative scenarios

Importance of raw water monitoring and testing

- Assess suitability of water for key uses
- Assess impacts agriculture on ecosystem services
- Observe the sources and pathways of pollutants
- Obtain real-time data necessary for mitigating impacts of agriculture water bodies
- Establish baseline values necessary for knowledge and understanding specific waterbodies
- Assess impacts agriculture on aquatic ecosystem health
- Assess impacts agriculture on the health water bodies
- Environmental disasters uncovered by monitoring

Introduction FLOW project

- Citizen science stream monitoring - volunteer groups analyse the ecological status of their streams and the macrozoobenthos as indicators of pesticide pollution in the water
- Standardised data collection - to supplement scientific and official stream monitoring
- Results - Need for action in water and insect protection
- Alles im FLOW (srh-hochschule-heidelberg.de)

FLOW monitoring results 2021-2023

Citizen science stream monitoring

Results

⚠ **58%** of agricultural monitoring sites (n = 101) **not in good ecological status** (macroinvertebrate community - **bioindicator SPEAR$_{pesticides}$**)

⚠ **65%** of agricultural monitoring sites (n = 113) **not in good hydromorphological status**

✓ **High citizen science data accuracy** for SPEAR$_{pesticides}$ + hydromorphology

Impact for

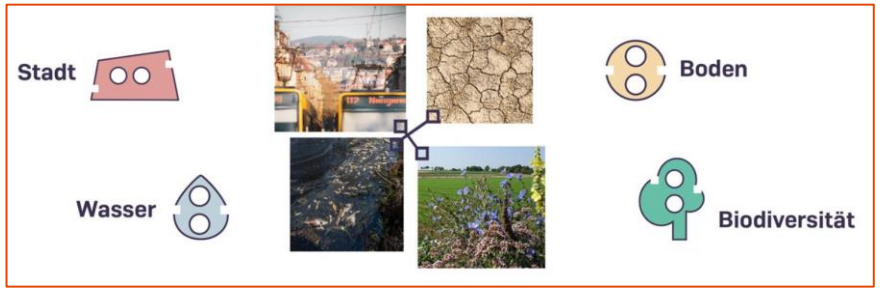
National + international freshwater monitoring (EU Water Framework Directive)

Freshwater science

Stream conservation

ParKli – Partizipative Klimaforschung (Participatory climate research)

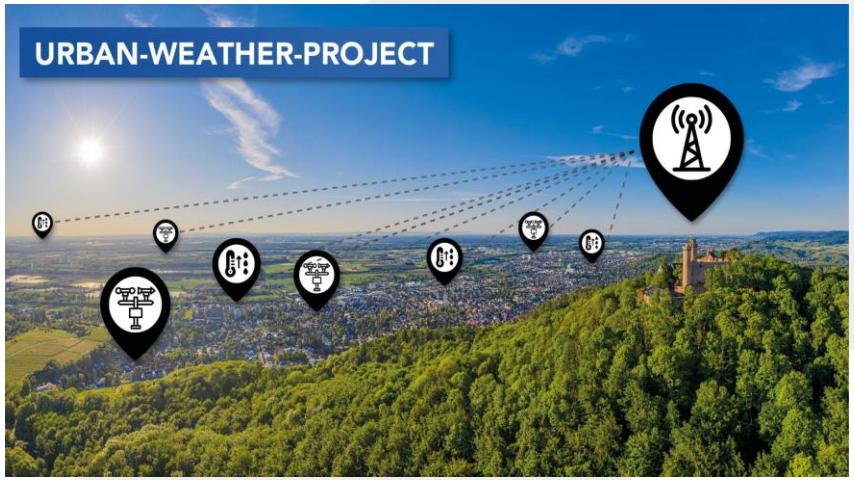
- ParKli views monitoring as a solution approach to jointly collect information/data that can be further processed and analysed.
- **Open-Science-Plattform**
- Recording environmental data using sensors, e.g. measuring the water quality of lakes and rivers
- Citizen Science: Record observations through the use of mobile applications (apps) and enable to build up a database for early warning systems



https://www.parkli.de/

Urban-Weather-Project

- Aim: to create a better understanding of the weather in urban areas.
- Cities have their own microclimate, which is influenced by many factors such as buildings, roads, green spaces and human activities.
- By collecting and analysing data about the weather in cities, we can learn more about the impact of urban activities on the climate.
- Comprehensive platform for monitoring and analysing weather in urban areas.



www.urban-weather-project.de/

Schlaues Wasser Darmstadt

- Smart Water in Darmstadt => Sponge City
- The aim is to build climate-resilient structures in Darmstadt with the help of digital and smart applications.
- Data-supported irrigation of urban trees
- Schlaues Wasser - Smart Water Darmstadt

Digital solutions for sustainable water management

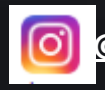
- Clean water thanks to real-time monitoring and early warning systems
- Monitor the water quality, e.g. to prevent lakes from "tipping over"
- Elimination of leaking infrastructures
- Efficient irrigation
- Effective water management
- Early warning system for real-time bathing water quality assessment

Invitation: Symposium Water in transition

- 9. – 11. October 2024, Tagungszentrum Xplanatorium Schloss Herrenhausen, Hannover
- Topic Water in transition: opportunities and challenges for the use of artificial intelligence
- The symposium will focus on effects of extreme weather events on water quality in streams, rivers and lakes and discuss innovative solutions using artificial intelligence.
- More information: https://www.srh-hochschule-heidelberg.de/en/events/2024/water-in-transition-opportunities-and-challenges-for-the-use-of-artificial-intelligence

THANK YOU FOR YOUR ATTENTION!

Are there any questions left?

Follow us  @hshd_water_technology/  Democratia Aqua - YouTube