

# ***Improvement of wastewater-treatment and stormwater-management for better water quality in urban area waterways***

*Developments and experiences in Leipzig*

World Canals Conference 2022 in Leipzig

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3/6/2022

WORLD CANALS  
CONFERENCE

2022

LEIPZIG

**Landschaften neu gestalten –  
WasserWege im Wandel**

Reshaping landscapes – Waterways in transition

[www.wccleipzig2022.com](http://www.wccleipzig2022.com)

30. Mai  
bis 3. Juni  
2022

**Leipziger**  
Wasserwerke

# Agenda

1. Water in Leipzig and surrounding area - Introduction
2. Strategies for improving water quality - Examples
  - 2.1 Development and Extension of WWTPs (Wastewater-Treatment-Plants)
  - 2.2 Control strategy sewer-system
  - 2.3 Water sensitive urban design – a common task
3. Conclusions

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# Water bodies in Leipzig and surrounding area



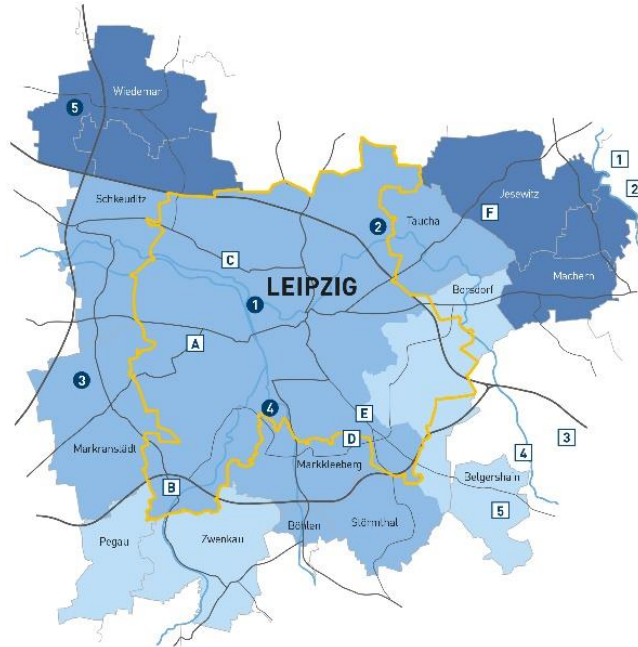
- Leipzig located at „Wasserknotenpunkt“  
Weiße Elster, Pleiße, Parthe
- Waterways and lakes characterize cityscape and region  
(important and manifold functions)
- „Transformation history“ (flood protection, brown coal, urban  
development etc.)
- Unique riverside wood system
- In Leipzig area: 69 km (I. Ordnung) and 184 km (II. Ordnung)

1990: Poor water quality due to insufficient  
wastewater-treatment and industrial effluents

Today status and water quality of rivers are quite good

But: Goals of EU Framework Directive still not achieved

# Infrastructure for sewage treatment and stormwater management



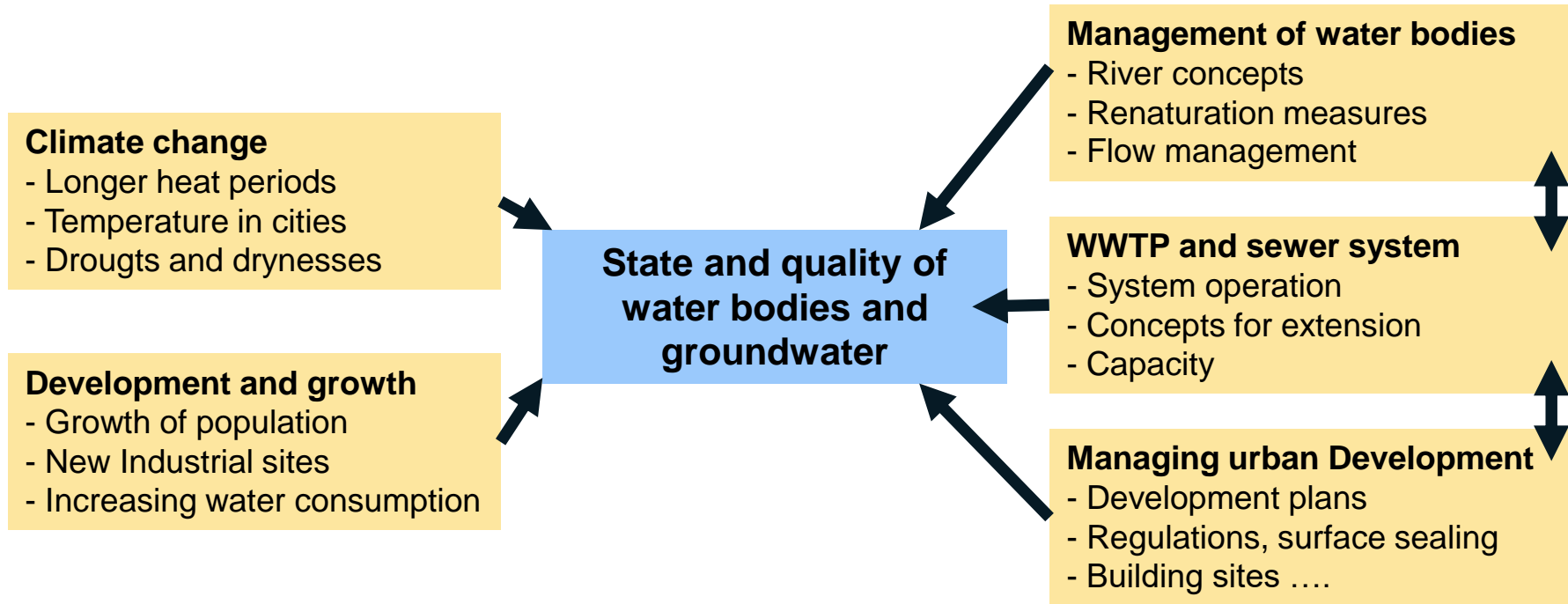
## Leipziger Wasserwerke Infrastructure – Wastewater

- **743 km<sup>2</sup>** managed area
- **662.100** people
- **39 Mio. m<sup>3</sup>** annually treated wastewater
- **2.915 km** sewer system
- **2.257 km** gravity flow sewers  
(1.043 km combined sewers, 617 km wastewater, 597 km rainwater)
- **25** Wastewater-treatment plants
- **155.000** household connection pipes
- **73.700** manholes
- **2.778** special purpose structures
- **129** discharge points
- **255** pumping stations
- **127** rainwater treatment plants

Infrastructure upgrade and renovation since reunification

Significant effects on river water quality in Leipzig and area

# Factors influencing water quality in urban areas

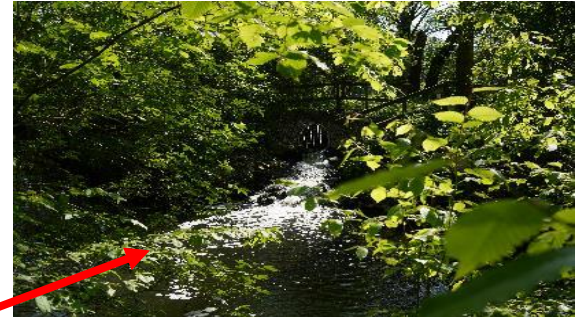
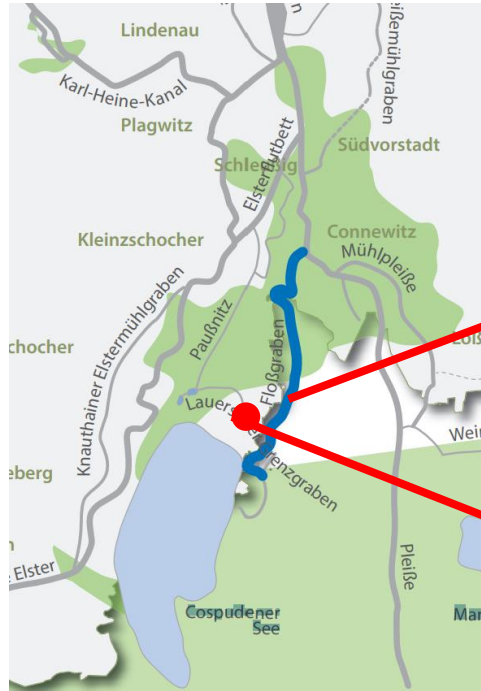


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# WWTP Markkleeberg – Water Quality in the Floßgraben -1

- Floßgraben is a small creek in the South of the city (length approx. 2 km)
- Passing ecosystem “Auwald“
- Connection for water tourism between city water bodies and Lake Cosbuden
- Desludging and cleaning of river bed 2000-2004
- Average flow: 1 m<sup>3</sup>/sec
- ● WWTP for Markkleeberg and a small part of Leipzig





# WWTP Markkleeberg – Water Quality in the Floßgraben -2

The first modern sewage treatment plant was erected after 1990 over many years

Capacity: 20.000 population equivalents (PE)  
C degradation (organic materials only)



For better protection of the creek Floßgraben the sewage treatment plant was expanded 2006 and the cleaning performance was improved

Capacity: 30.000 population equivalents (PE)  
C-, Nitrogen and P- degradation  
Additional treatment - **Filtration**

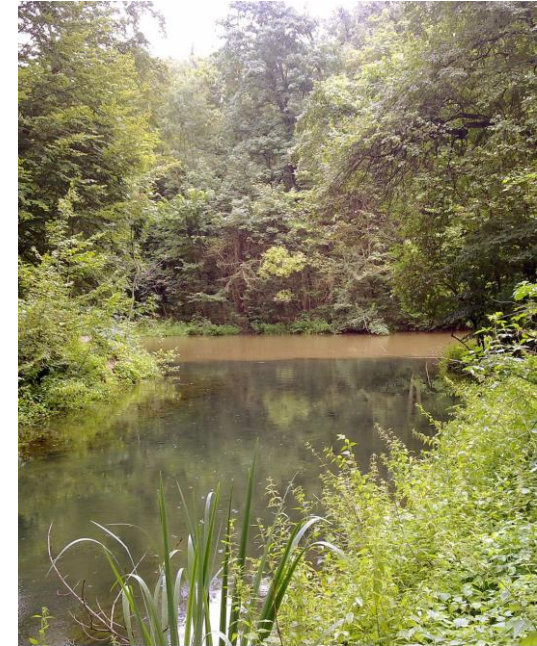


# WWTP Markkleeberg – Water Quality in the Floßgraben -3

The cleaning performance of the sewage treatment plant Markkleeberg is today much better than the permission values

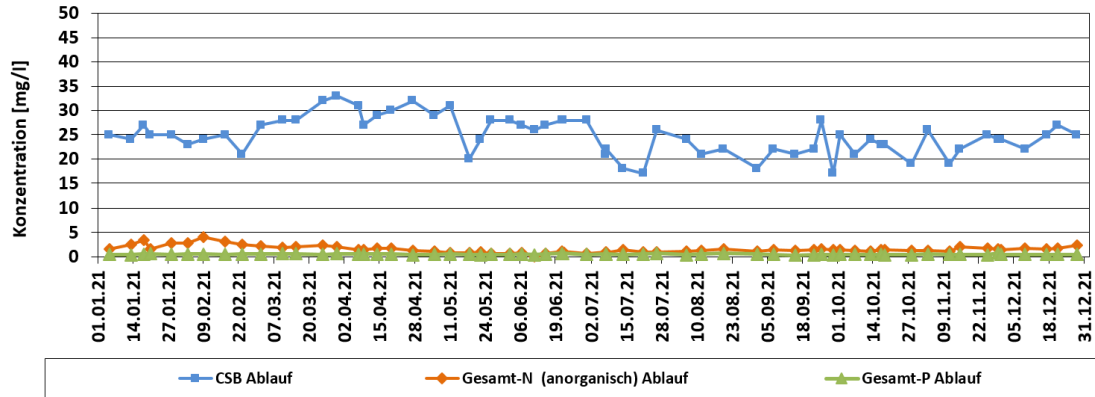
Cleaning performance WWTP Markkleeberg

Year	Chemical Oxygen Demand	Nitrogen (inorganic)
2005	55 mg/l	31 mg/l
<b>2021</b>	<b>25 mg/l</b>	<b>1,6 mg/l</b>
Permission Values (max)	40 mg/l	15 mg/l

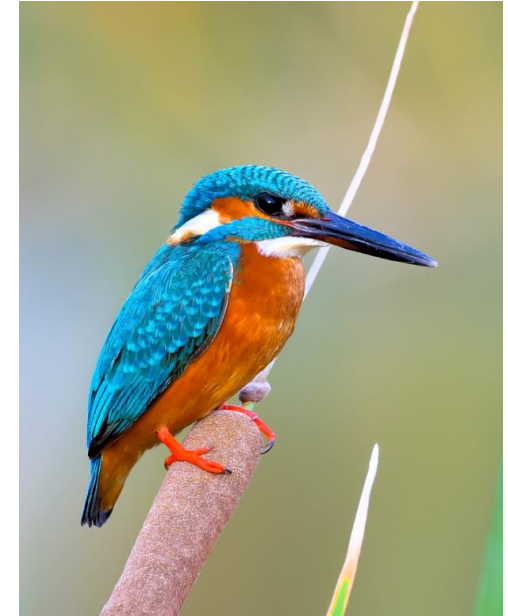


Floßgraben entry to Pleisse river

# WWTP Markleeberg – Water Quality in the Floßgraben -4



Today, Floßgraben is habitat for protected animals and important part of Leipzig recreation areas



Kingfisher (wasserleben-leipzig.de)

# Other WWTPs – Advanced treatment steps and extensions



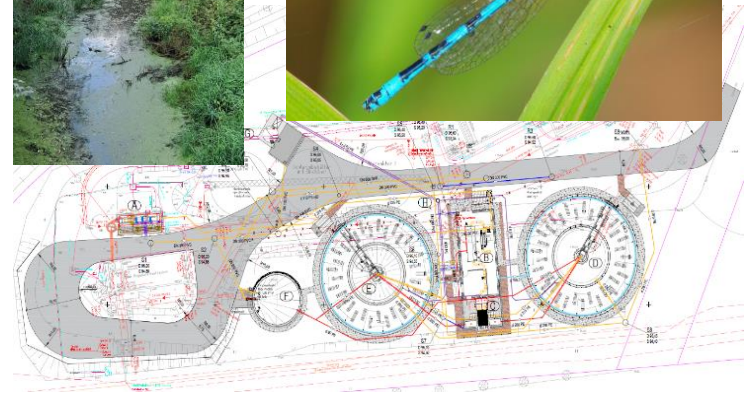
**WWTP Taucha –  
20. 000 PE**  
Additional Treatment: Filtration  
Receiving water: Parthe



**WWTP Dölzig – Extension in 2022 to 6.000 PE**  
Receiving water: Augraben



Lebendige-luppe.de





# Other WWTPs – Advanced treatment steps and extensions

**WWTP Markkranstädt – 18 000 PE - Membrane Filtration Plant MBR!**  
Ceceiving water: Die Renne (very small creek)



# Extention and modernisation of WWTP Rosental

## Main WWTP in Leipzig

- Capacity: 550.000 PE
- 1. Step: Extension to 710.000 PE
- 2. Step: Extension to 870.000 PE
- 30.000 (60.000) m<sup>3</sup> additional treatment volume
- Complete renewal mechanical treatment step
- Construction period: **2023 – 2030**
- Investment: > 100.000.000 €
- Stormwater retention basin: 20.000 m<sup>3</sup>

Research activities and ongoing discussions:

Additional treatment step for micropollutants?



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# Network- Control for the Leipzig combined sewer system

- Sewage flow (rainwater + wastewater) to WWTP Rosental is actually limited to 13.000 m<sup>3</sup>/d
- Main goal is to reduce combined sewer overflows into the rivers in rainwater-situations
- 7 control systems for management of retention volumes in the sewer system (40.000 m<sup>3</sup> in total)
- Combined control strategy for optimized management of retention volume (Reduction of overflows > 30%)





# Example – The first erected control structure - Cottaweg

- Constructed in 2001
- Costs: 1,2 Mio. EUR
- Retention Volume: 5.600m<sup>3</sup>

→ 97 x



Renovation of sewer system



Control unit

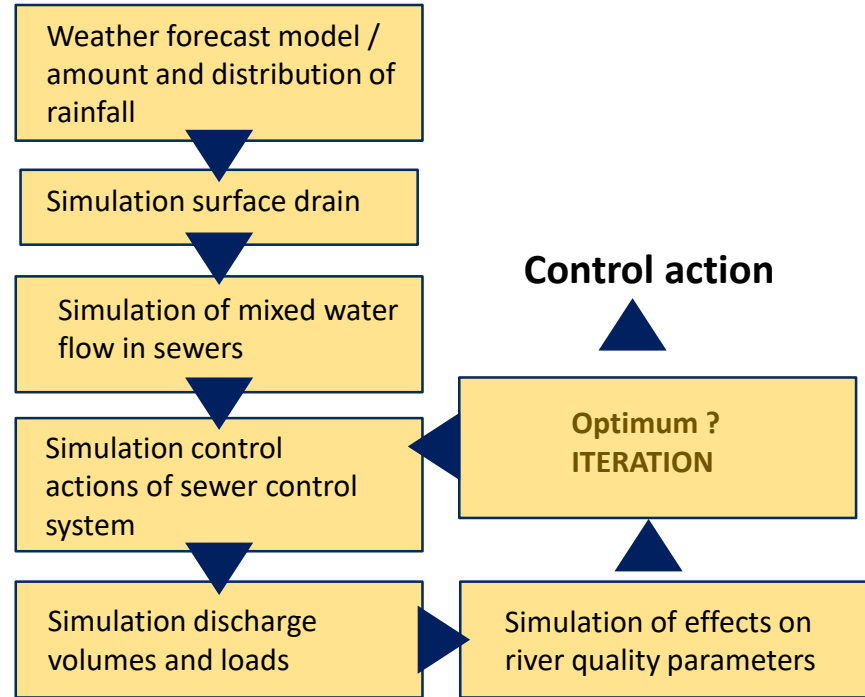


Overflow



# Improvement in future – model based predictive control?

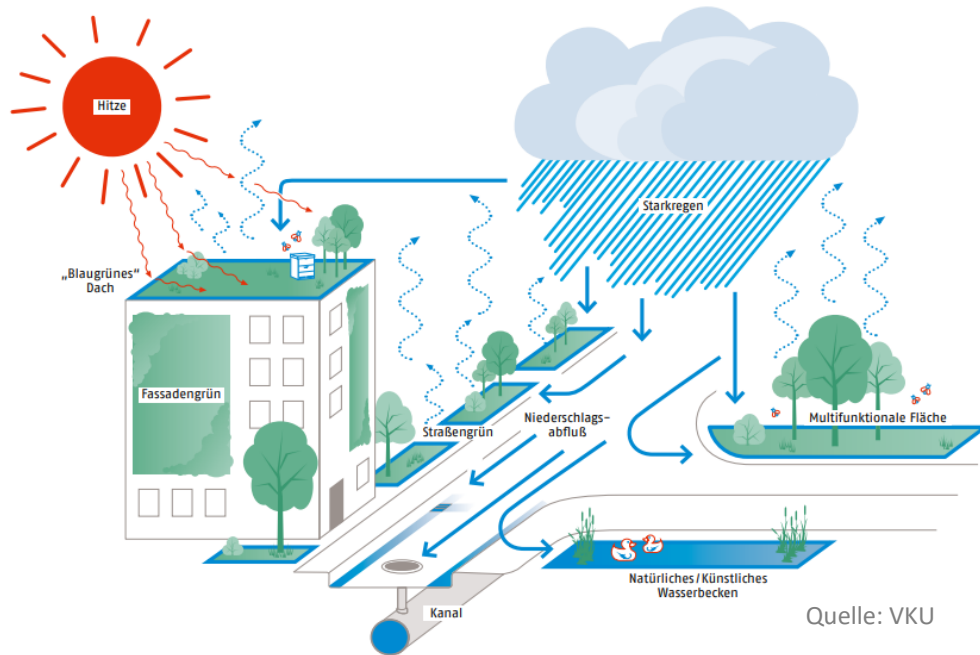
- Sewer control system leads to savings in investment costs and optimized use of retention volume
  - Today, additional storage volume is required due to growth of the city region
  - Challenge: € investment / quality and resilience effect on water bodies has to be optimized
- >> **Further optimization of sewer control**



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# Adapted strategy for stormwater management

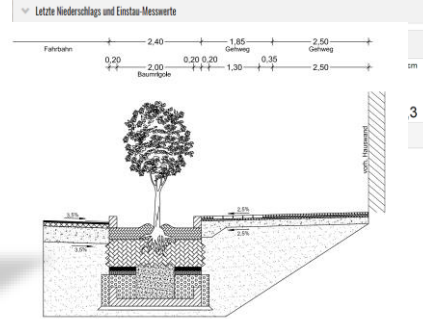
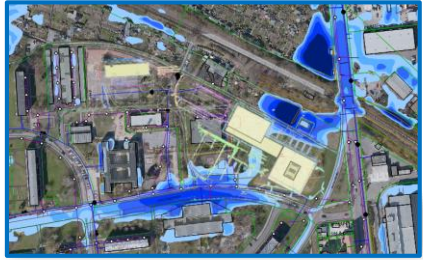


**Water sensible urban design/sponge city**  
-> **Adapting development to climate change**

Reduce rainwater intake in combined sewer system (decentralised water management)

- reduce risk of flooding in case of heavy rainfall
- watering effect in dry periods
- cooling effect due to evaporation in heatwave periods
- attractive cityscape
- positive effect on river quality

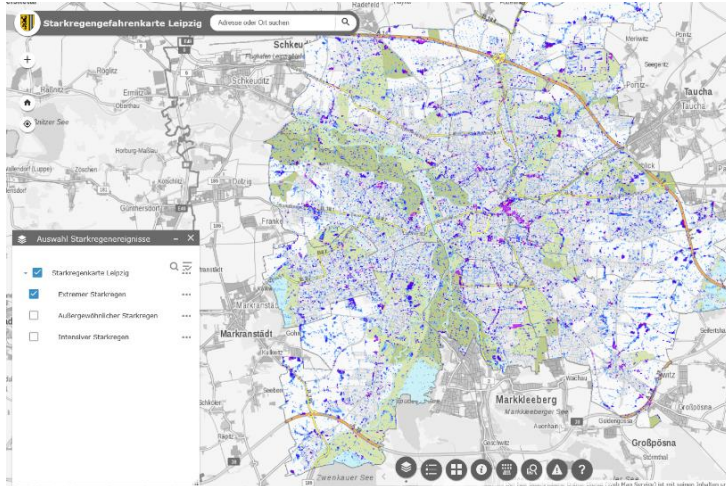
# Leipzig Region – already on the way



multifunctional green areas, infiltration ditches, green roof programm, research projects, zero effluent quarters, etc....

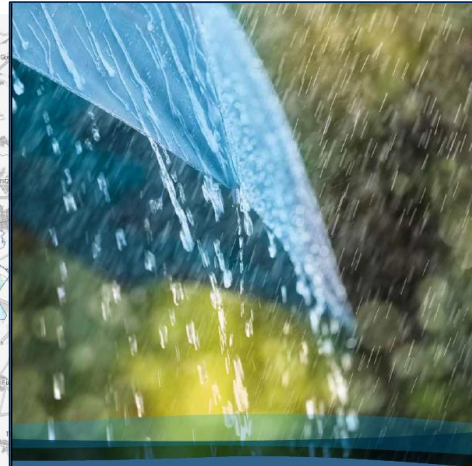


# Information and participation – important success factors



<https://www.leipzig.de/bauen-und-wohnen/bauen/starkregen/>

Flooding information (internet map), Information material for homeowners, city planners etc.



Wassersensibel planen und bauen  
Leitfaden zur Starkregenvorsorge



Niederschlagswasserbewirtschaftung ¶

Leitfaden zum naturnahen, wassersensiblen und klimaangepassten Umgang ¶  
mit-Niederschlagswasser auf Grundstücken¶



# Main challenge – How to ensure sustainable transformation?

**Sustainable transformation process**  
for climate adaption

Coordination of activities between  
different actors is crucial  
- **Transformation is a Common Task**

**Governance Board -  
watersensible urban development  
Leipzig und Umland**

- Information/coordination between all involved parties
- Data management (green-blue-grey infrastructures)
- Coordination of planning-processes / activities
- Identification of hurdles and problem-solving
- Implementation of watersensible structures for existing buildings / quarters
- Research / pilot projects
- Financing / funding
- Work on construction standards / technical standards / approval processes

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# Conclusions

- Dynamic development of Leipzig region and climate change have significant influence on water quality
- Further investments in wastewater and stormwater infrastructure are required
- Sustainable strategies to be developed - end of pipe solutions often not the optimum
- Protection of water bodies is especially in urban areas more and more a common task (development and management of water bodies, wastewater- and stormwater treatment, urban development and design)
- Therefore: Collaboration forms and coordinated strategies to be developed and implemented
- Water sensible urban design to be strengthened and implemented consequently

# Contact

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## WASSER 2030



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