



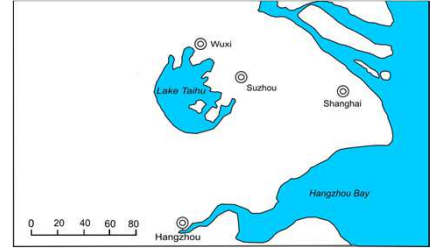
SIGN
SINO GERMAN NETWORK
Assuring water quality
from the source to the tap

SIGN: Sino-German water supply Network

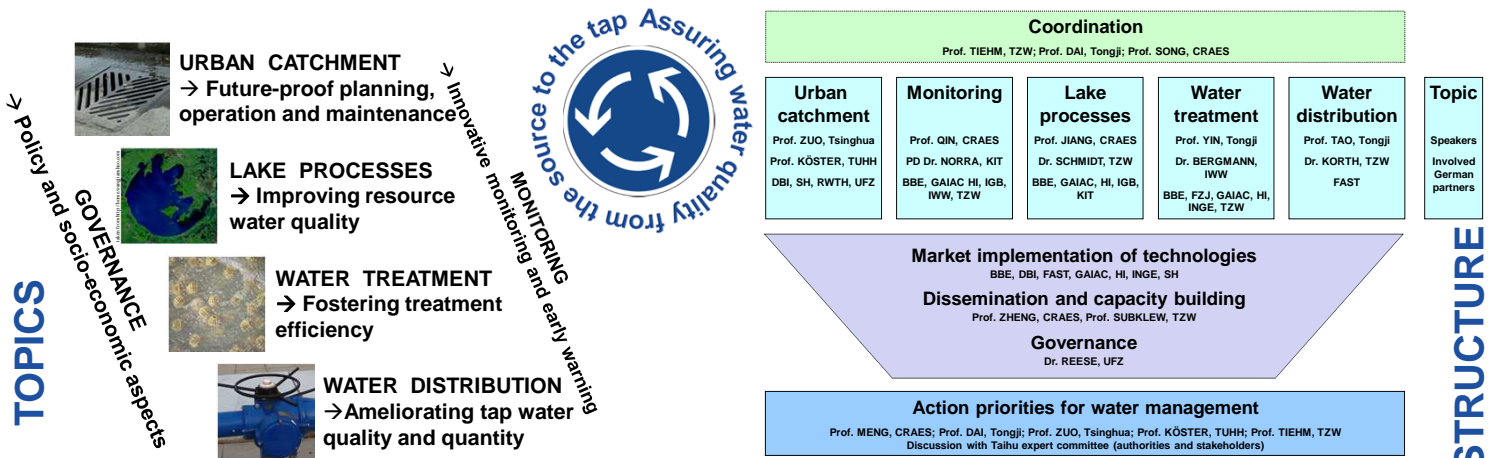


WHAT IS THE PROJECT ABOUT?

- Taihu region: One of the most economically prospering regions of China
- Taihu region: One of the focus regions of the Chinese National Major Science and Technology Program for Water Pollution Control and Treatment
- Tai lake: A drastic example of water pollution with nutrients (nitrogen, phosphate), organic contaminants and heavy metals
- Problem: Insufficient raw water quality → problems with the drinking water supply in recent years
- Aim: To assure the supply with good quality water by taking into account the whole water cycle



**PROJECT
AREA**



IMPACT

- Development and adoption of German water technologies and management concepts to Chinese boundary conditions
- Contribution to an improved water quality at the Taihu and in the megacities Wuxi and Suzhou
- Pilot project for other regions of China facing similar problems
- Strong linkage between science and practice in both countries ensures scientific progress as well as practical applicability
- Involvement of the leading research institutes, the relevant administrative entities as well as the water stakeholders warrants implementation in China

CHINESE SUMMARY

SIGN: 中德合作供水网络
——从源头到龙头的清洁水

太湖是中国中东部地区最大的淡水湖，也是我国重要的水源地。太湖流域人口密集，经济发达，是长三角地区的重要水源地。太湖水质污染问题日益严重，已成为制约太湖流域经济社会可持续发展的主要因素。德国在供水技术和管理方面具有先进经验，通过中德合作供水网络项目，旨在将德国的先进技术和经验引入太湖流域，提高太湖水质，保障太湖流域的供水安全。

2015年，中德两国政府签署了《中德合作供水网络项目谅解备忘录》，明确了项目的目标和任务。项目旨在通过合作研发、人才培养、技术推广等方式，提高太湖流域的供水质量和供水效率。项目的主要内容包括：太湖水质监测与预警、太湖水质改善技术、太湖供水管网改造、太湖供水管网运营管理等。

SIGN项目自启动以来，得到了太湖流域各级政府和社会各界的大力支持。项目团队积极开展各项工作，取得了显著成果。项目的主要成果包括：太湖水质监测与预警系统、太湖水质改善技术、太湖供水管网改造、太湖供水管网运营管理等。

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清華大學 Tsinghua University

ACKNOWLEDGEMENT We gratefully acknowledge financial support from the Federal Ministry of Education and Research (BMBF) in the frame of the German-Chinese research and innovation programme "CLIENT - Clean Water".





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URBAN CATCHMENT

Urban Planning and Urban Water Management

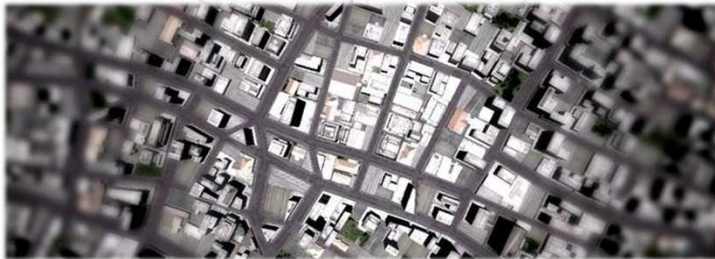
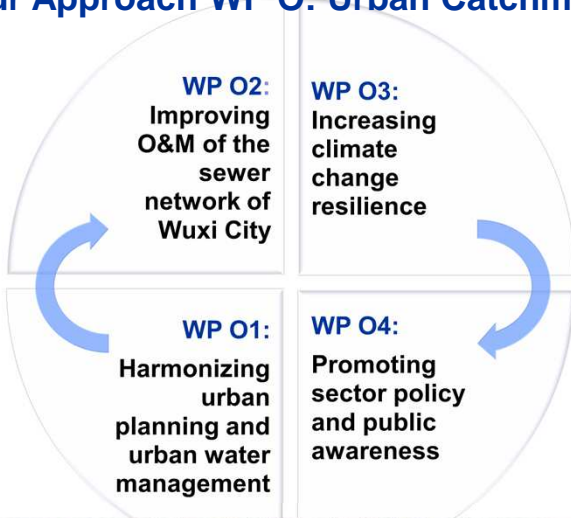
以水定城

Development paths for future-proof wastewater and rainwater management in the catchment area of Wuxi

The Challenges

- China: more than 731.11 million urban dwellers!
- Non-water-oriented urbanization mode
- Deteriorating and depleting water resources
- Increasing climate change vulnerability
- Tens of billions of RMB loss per year due to urban flash floods!

Our Approach WP 0: Urban Catchment



GOVERNANCE

Integrated Urban Catchment Governance (IUCG)

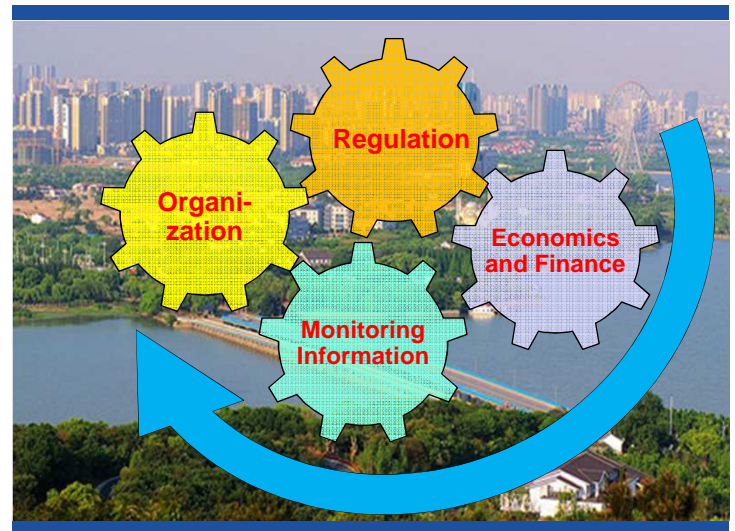
Organizational, legal and fiscal foundations for sound management of waste- and rainwater

The Focus

- Due integration of spatial IUCG requirements into urban planning and development
- Sustainable funding and cost allocation
- Effective surveillance, information and participation

Our main aims

- Exchange of Chinese and German experiences on institutional IUCG drivers and obstacles
- Development of approaches and recommendations towards favorable regulatory, organizational and fiscal practices
- Contribution to global and regional development



Methods & Steps

- Expert assessments of the relevant settings
- Expert/ stakeholder interviews
- Stakeholder workshops
- Reports & recommendations

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LAKE PROCESSES

Measuring

- Organic and inorganic chemical pollutants
- Biological pollutants: Antibiotic resistances
- Biological degradation and nitrogen turnover
- Algae
- Isotopic composition (H, C, N, O, S)
- Ecotoxicity, mutagenicity, endocrine effects



Handheld fluorometer



Mass spectrometer



Desmodesmus subspicatus



Daphnia magna



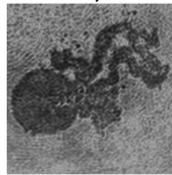
Dario rerio



Potamopyrgus antipodarum

Process understanding

- Pollution situation and origin (urban areas, industry and agriculture)
- Turnover in functional water zones (nitrogen balance, biological degradation of organic pollutants)
- Ecotoxicity – environmental effects
- Algae growth and toxin release under dynamic environmental conditions
- Lake dynamics: Inflow / precipitation, evaporation, mixing processes, flow patterns
- Trophic sediment status (Lake history)
- Interaction of water and sediment phases



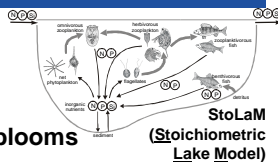
Lysed algal cell



„Yo-yo“ incubation method for algae

Ecological modelling

- Implemented food web interactions including the main nutrient fluxes
→ Prediction tool for cyanobacteria blooms



MONITORING

Advanced technologies will be developed and applied to analyse the spatial and temporal development of water quality within the Taihu.

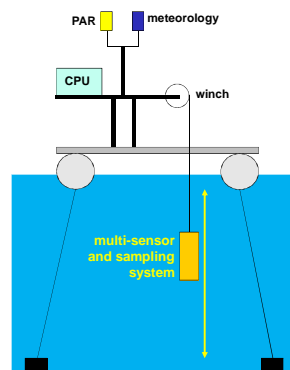
- For spatial monitoring, the Biofish will be adapted to the specific shallow lake situation of Taihu.
- Development of a new profiling buoy for long term vertical in-situ monitoring, equipped with a multi-sensor system combined with the BBE Fluorometer for different algae classes.
- Historical lake development by sediment core analyses.
- Application of enhanced monitoring and analyses methods such as isotope analyses to identify nutrient sources and dynamics and to characterize the water cycle.
- Development of methods for early warning, enhanced monitoring strategies and for lake management concepts.



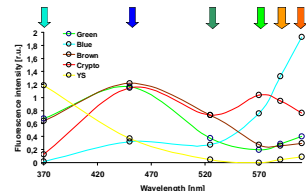
Spatial analysis of water quality relevant parameters by the Biofish



Point sampling for water and sediment quality analyses



Adaptation of BBE-Moldaenke Fluoroprobe for monitoring of different algae classes and installation at the profiling buoy



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WATER TREATMENT

Ultrafiltration

- Development and application of suitable membrane technologies
- Adjusting operation conditions
- Pre-treatment of lake water
- Online algae tests to manage ultrafiltration
- Laboratory tests and pilot study
- Assessment of energetic and material efficiency



Taste and odour (T&O) elimination

- Identification of T&O substances in lake and process water
- Evaluation and simulation of reaction pathways
- Assessment of T&O elimination strategies including evaluation of toxicity
- Optimizing water treatment (e.g. Advanced Oxidation)
- Recommendation of tailored water treatment strategies

Biological treatment

- Simultaneous elimination of nitrogen compounds and organic pollutants
- Assessment of the efficiency of biodegradation
- Isotope measurements of nitrogen compounds and organic pollutants to monitor biological transformation processes

Water quality

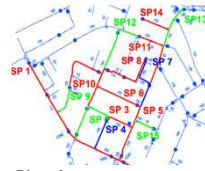


- Water quality analysis around the whole water cycle
- Laboratory identification of algae, organic, inorganic and microbial pollutants
- Toxicological tests of water samples
- Assessment of Taihu catchment to identify pollution and imission hot spots
- Recommendation of Taihu areas suitable for raw water abstraction

WATER DISTRIBUTION

Optimized network flushing strategies

- Avoiding drinking water deterioration in distribution networks
- Adaptation of an innovative optimized flushing strategy to the conditions of drinking water networks in China
- Measurement of the deposit accumulation velocity in pipes as a criteria for the definition of the flushing intervals
- The optimized flushing approach is based on the following steps:



Planning

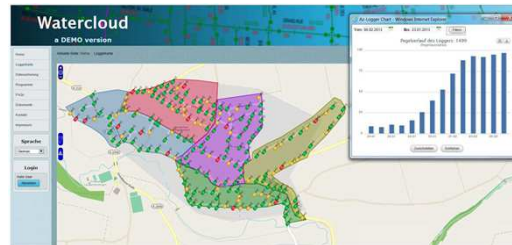


Flushing with FlushInspect

Calculation of flushing intervals

Server based leak control

- Adaptation of an innovative server based active leak control system to Chinese standards and conditions
- Automated leak detection via noise logger
- Wireless transmission of leak control data to a server (cloud) via a radio-network
- Access to the data via internet
- Pinpointing of leaks through network correlation



Example of leak detection software



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