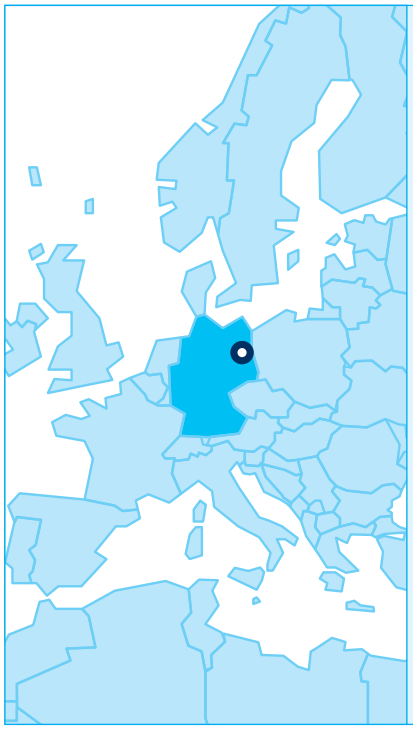
City Water Stories:
Berlin

the international water association



Population
- 3.700.000 (2019) — Largest city of Germany
- Fast population growth: prognosis is 4.000.000 inhabitants in 2025

Geography
- 12 Boroughs
- Area: 900 km²
- 25% of the city's area is in a water protection zone and has an ecological and recreational value; water supply consists of 100% groundwater and requires water basin management with artificially recharge from the river Havel

Main challenge
- Demographic and climate change
- Resilience of critical infrastructure
- Increasing trace organic concentration in partially-closed water cycle
- More intense rain events

Main solution
- Natural and technical approach for advanced wastewater treatment to remove trace organics
- Decentralized rain management involves public and private urban activities
- InfraLab Berlin – a network of all infrastructure utilities to design innovative solutions for Berlin
- Strong network with academic institutes and infrastructure utilities (e. g. InfraLab Berlin, KompetenzZentrum Wasser Berlin)
- Water utility has an own R&D department with long tradition, which enables innovative technologies in full-scale

Managing a sustainable water cycle

How Berlin is striving to rely on its own water sources

Four million people live in Berlin, the German capital. It is one of the most populous urban areas in Europe, which covers nearly 900 km². There is low topographic variation (30-70 m above sea level), and lakes and rivers comprise 6% of the city's surface area. The flow in these surface waters is very low with a summer average of less than 20 m³/sec.

The objective pursued by the Berlin Senate is to adapt a management strategy which allows the city to rely on its own water resources. The utility "Berliner Wasserbetriebe" is responsible for supplying and treating drinking water and recycling wastewater in the city. For more than 100 years the water supply has been designed to be replenished by surface water through bank filtration and aquifer recharge via infiltration ponds. Due to low natural discharge in its rivers, treated wastewater contributes significantly to the overall flow, thus generating a partially-closed water cycle.

For wastewater treatment special focus is on the removal of nutrients to avoid eutrophication which may impact drinking water production and recreational activities along the city's lakes and rivers. For this reason, the national government and Berliner Wasserbetriebe have invested considerable effort in upgrading and managing the water cycle to secure safe and sustainable use of available water resources. Millions of euros are being invested in upgrading wastewater treatment plants with teartiary filtration and also ozonation.

Climate change, pollution and a growing urban population are increasingly impacting urban water supplies. Higher levels of treated wastewater in surface water can be an increased risk for conventional drinking water treatment plants.

Sustainable water and wastewater treatment and recycling are of growing importance worldwide. In order to reduce the pollution of surface waters and release the pressure on the urban water cycle Research & Development (R&D) projects, funded by the German Ministry of Education and Research (BMBF) are running. As a reliable and drought-proof alternative to potentially impaired freshwater resources, recycled water can assist in meeting the increasing demand for potable and non-potable water supplies. The R&D projects aim to develop new multi-barrier treatment processes for planned potable water reuse schemes. This new process will augment existing drinking water resources using better recycled (waste)water while protecting public health and groundwater qualities. The benefit of environmental buffers is also used for periodical storage of water. Multiple benefits from the recycled water include advanced wastewater treatment, conservation of wetland ecosystems and wildlife habitats, the use of energy crops and recreational uses.

Renaturation for river basins and protection of surface waters

Berlin has a vision of a livable city which ensures renaturation for river basins and protection of surface waters. Berlin's goal is to create a city-wide network of landscaped streets, and linear parks which link the city's neighbourhoods to one another and to the major parks (about 18%) to ventilate and absorb extreme storm weather (e.g. Gleisdreieck). Neigbourhoods and buildings are constructed on the principle of a "sponge city", which means urban areas are structured and designed to absorb and capture rain water and utilize it to reduce floods. Key strategies for water-sensitive urban development will prevent extreme weather events – e.g. flash floods, cloud bursts and urban heat waves - by using and combining different processes such as percolation, evaporation, storage, retention, ventilation, shading and cooling. These measures will decrease the negative effects of combined sewer overflow and urban heat islands.

How to achieve this vision?

The Berlin senate focuses on sustainable integrated water resource management and has the overall objective to achieve and maintain a high quality of surface and ground water. The measures that the city implements to reach these goals are based on and justified in the European Water Framework Directive (EU-WFD), which is an exemplar of modern environmental regulation. Berlin is for instance actively involved in the sustainable management of river basins and in implementing eco-services such as the restoration of moorland and creation of water protection zones to ensure groundwater replenishment.

Communicating with citizens and urban planning

Communication with stakeholders on the measures being implemented to develop a "sponge city approach" is organized by the "Regenwasseragentur" (English: rain water agency) through "City Talks" where the impacts of e.g. "green roofs" and natural based solutions - which serve as an additional resource for summer droughts - are discussed and explained.

Sharing of knowledge and creating networks

The six infrastructure utilities responsible for water, waste, public transport, electricity and gas created a Co-Working Space called "InfraLab Berlin", where they work together with the Senate of Berlin, start-ups, SME's and institutes. The InfraLab Berlin offers young entrepreneurs the opportunity to experiment, test and realize their ideas with the help of competent people with an industrial, scientific and political background. This network of expertise promotes better communication, cooperation and knowledge exchange by offering regularly conferences and workshops which lead to innovative ideas and projects for a smarter, more sustainable and livable Berlin.

Commitment to a climate resilient future

Since Germany is committed to achieve the goals from the Paris Agreement (2015) all utilities of Berlin signed a "Climate Agreement" with specific measures to work actively together with the senate to achieve the goal of 40% green house gas (GHG) reduction by the end of 2020. Berliner Wasserbetriebe (BWB) is responsible for treating drinking water and wastewater but also for recycling phosphorous in the sludge cycle and already achieved a reduction of 30% GHG between 1991 and 2005. The next goal will be to implement energy self-sufficient wastewater treatment plants.

be Berlin
Senatsverwaltung für Umwelt, Verkehr und Klimaschutz

Berliner Wasserbetriebe

Case study - Berlin's early warning system for river bathing sites

No other metropolis offers so many opportunities for swimming in natural waters like Berlin. There are 39 official bathing sites suitable for swimming, which are monitored regularly during the warmer months when people access these areas. However, water pollution in rivers can be especially high after heavy rainfall, impacting river bathing sites due to discharges from the city sewerage system (combined sewer overflows and non-disinfected secondary effluent from wastewater treatment plant).

For protection purposes a model which includes the development of a website (http://www.badegewaesser-berlin.de/) was created to inform Berlin's population and visitors on the water quality at the official bathing sites. This early-warning tool is based on multivariate regression modelling, using data from combined sewer overflow and weather forecast. This model gives people who plan to swim in these official bathing sites the information whether it is safe to swim. This early warning system is also a smart and efficient tool to help Berlin open and communicate information on new bathing sites to the public.

Berlin's Journey to Become a Water Wise City

A closer look at how Berlin is satisfying the IWA Principles for Water Wise Cities

1 Regenerative Water Services

Replenish Waterbodies and their Ecosystems
- ✓ Creating a partially closed water cycle
- ✓ Obtaining drinking water completely from the urban area

Reduce the Amount of Water and Energy Used
- ✓ Berlin Energy and Climate Protection programme 2030

Reuse, Recover, Recycle
- ✓ Phosphorous recovery
- ✓ Sludge to energy

Use a Systemic Approach Integrated with Other Services
- ✓ InfraLab Berlin: Joint Innovation network of all (public) infrastructure enterprises in Berlin
- ✓ Rain water agency: facilitates dialog about decentralised storm water measures (e. g. green roofs)

Increase the Modularity of Systems and Ensure Multiple Options
- ✓ Smart remote-controlled pumping stations

2 Water Sensitive Urban Design

Enable Regenerative Water Services
- ✓ New neigbourhoods and buildings are constructed on the principle of a "sponge city"

Design Urban Space to Reduce Flood Risk
- ✓ Political goal for decentralised rainwater management: 1% uncoupling rate from sewer system per year
- ✓ 1000 green roof programme

Enhance Livability with Visible Water
- ✓ Drinking fountain programme
- ✓ Lakes and rivers as public accessible recreation zones
- ✓ Early warning system for bathing water sites

Modify and Adapt Urban Materials to Minimise Environmental Impact
- ✓ Decentralised rainwater management
- ✓ Partial permeability of pavements
- ✓ Reduction of Trace Organic Contaminants (TrOC) in stormwater

3 Basin Connected Cities

Plan to Secure Water Resources and Mitigate Drought
- ✓ Berlin Federal Strategy for water supply 2030 (in revision)

Protect the Quality of Water Resources
- ✓ Nutrient reduction strategy Berlin-Brandenburg
- ✓ TrOC strategy Berlin: Millions of euros are being invested in wastewater treatment plants with teartiary filtration and also ozonation.

Prepare for Extreme Events
- ✓ Increase of storage volume for CSO
- ✓ Multiple strategy to connect the operation of seven wastewater treatment plants

4 Water Wise Communities

Empowered Citizens
- ✓ Several Public water initiatives and NGO´s

Professionals Aware of Water Co-benefits
- ✓ Cooperation and communication network with local authorities, SME´s, public service providers and scientific institutions; About 500 water scientists

Transdisciplinary Planning Teams
- ✓ Excellence cluster on "urban water interfaces" (funded by German research foundation)
- ✓ Use of KURAS method (see http://www.kuras-projekt.de/) for stakeholder dialogue towards a blue-green city

Policy Makers Enabling Water Wise Action
- ✓ Berlin climate protection programme 2030
- ✓ City development programme – adaption to climate change in a growing city

Leaders that Engage and Engender Trust
- ✓ Demonstration sites for innovative water concepts (e.g. Potsdamer Platz, grey water use in buildings, aquaponic)

5 Building Blocks for Berlin on the journey to water wise cities

Vision

Create a city-wide network of landscaped streets and linear parks linking neighbourhoods and parks using the "sponge city" principle.

Governance

Using the European Water Framework Directive (EU-WFD) to apply sustainable integrated water resource management for high quality of surface and ground water.

Knowledge & Capacity

Six infrastructure utilities created a Co-Working Space called "InfraLab Berlin" offering young entrepreneurs the opportunity to experiment, test and realize their ideas for a sustainable future.

Planning Tools

All Berlin utilities signed a "Climate Agreement" to reduce green house gas (GHG) by 40% the end of 2020.

Implementation Tools

Communication with stakeholders through "City Talks" on the application of approaches such as green roofs, and mobile technology, e.g. the web based early warning system for bathing water quality information.