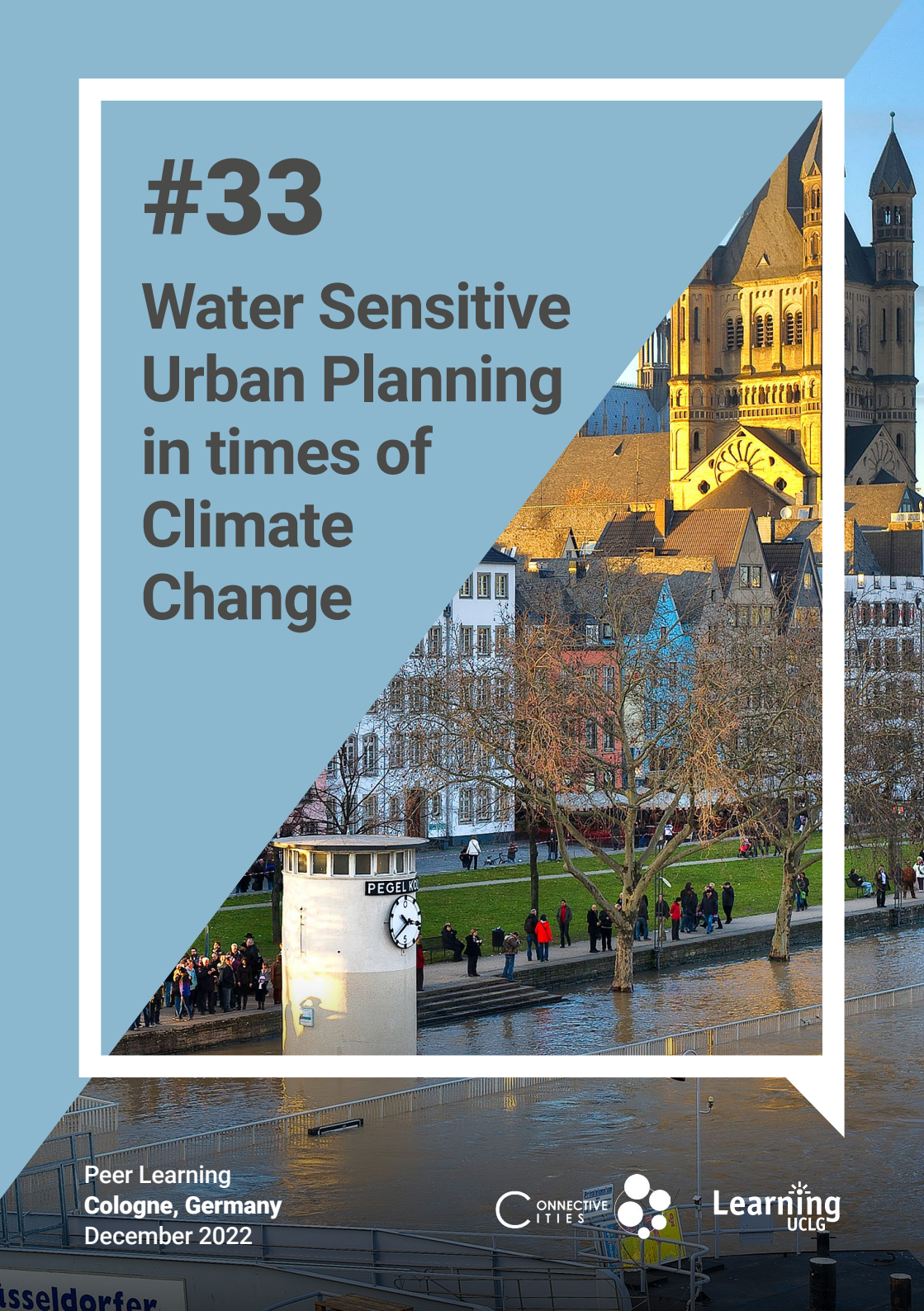
#33

Water Sensitive Urban Planning in times of Climate Change



Peer Learning
Cologne, Germany
December 2022

CONNECTIVE CITIES

Learning UCLG

Credits

Coordination

Connective Cities
Municipal Drainage Services of Cologne (StEB Köln)
United Cities and Local Governments (UCLG)

Edit
Connective Cities
UCLG Learning

Cover Photo: StEB Köln - Photographer: Peter Jost

For more information, please contact:
UCLG Learning – learning@uclg.org

Contents

Foreword

For our city Cologne, the river is the reason for its existence. Like many other cities, Cologne is founded in riverbanks, where commerce and industrial development have developed for centuries. When looking back in time, the risk of flooding and its associated uncertainties are not new. But the scale of these extreme weather events is unprecedented. Last year, 700 citizens lost their lives in floods in the Ahrtal region, leaving the whole country in shock. On the other hand, we have immense losses in the natural systems, such as dying forests, due to prolonged droughts.

In Cologne, as in many cities in the world, water excess is considered a threat, as is water scarcity. For years now, we have been investing in flood control, with good results and reducing risks. In terms of mitigation, we need to rethink the way of using land and look for more integrated urban development patterns. However, no technical solution will be enough to reduce risks if citizens are not aware and engaged. It is here where we need to learn the most, and this is what we hope to do with exchanges like the one documented in this note: get inspired by other cities' strategies to respond to flooding events together with their communities.

We are very thankful to our Municipal Drainage Services company of Cologne, StEB Köln, for hosting a Peer Learning event on "The Role of Rain and Storm Water Management in Water Sensitive Urban Planning" at their headquarters, and for allowing such a rich exchange between practitioners, managers and engineers to look for different ways to solve problems.

Besides many German, African and Asian cities, we are also happy to count on the partner cities of Rio de Janeiro (Brazil), and on our most recent partner city, Dnipro (Ukraine). These partnerships can both benefit from and contribute to a broader learning agenda and network around the knowledge created.

I thank Connective Cities for preparing the exchange so carefully, and also United Cities and Local Governments (UCLG) for connecting these issues to the overall global agendas in which cities have a critical role to play. Our recently adopted UCLG Pact for the Future is one more practical and inclusive step to showcase the municipal will and capacity in addressing global challenges such as climate change, and their impact in our territories.

Mr. Andreas Wolter
Deputy Mayor of Cologne

Introduction

This Peer Learning Note (PLN) documents the practices and discussions shared between cities and partners during the Connective Cities Dialogue Event "The Role of Rain and Storm Water Management in Water Sensitive Urban Planning", which took place from December 6-8, 2022 in Cologne, Germany.

Heavy rain and storm water events such as those in the Ahr Valley in Germany in 2021, or in Pakistan, Australia and South Africa in 2022, cause streams to swell to raging torrents, flood roads, destroy houses and bridges and lead to loss of life as well as damage worth billions. They occur suddenly and can only be predicted in the short term. According to a study supported by the World Bank, flood risk already affects 1.81 billion people, more than 20% of the global population, most of them in poor and middle income countries.[1]

Climate change has enormous meteorological effects, with very unequal rainfall and continuous sea level rise. In consequence, the frequency and severity of flash floods and other climate-related shocks is becoming more persistent, as highlighted by the latest Intergovernmental Panel on Climate Change Sixth Assessment Report (2022). In urban areas, heavy rain can trigger additional risks such as water's potential contamination with sewage and its impact on health, disruption of power supply and other services, damages on transport networks and infrastructure, and the need for evacuation of people.

[1] *Rentschler, J., Salhab, M. & Jafino, B.A. Flood exposure and poverty in 188 countries. Nat Commun 13, 3527 (2022)*

15
cities

43
participants

In consequence, local governments and municipal leaders, planners and service providers look for more integrated and inclusive solutions to avoid human, environmental and financial losses related to flood.

Acknowledging the importance of this topic for cities, Connective Cities and United Cities and Local Governments (UCLG) organized a Peer Learning event on "The Role of Rain and Storm Water Management in Water Sensitive Urban Planning". During two and a half days, experts from German cities (Cologne, Heidelberg, Mannheim, Hamburg, Düsseldorf, Hagen, Duisburg, the Ahr Valley) and other municipalities (Banjul, The Gambia; Mwanza, Tanzania, Kigali, Rwanda; Dnipro, Ukraine; Zarqa, Jordan; and Rio de Janeiro, Brazil) gathered at StEB Köln to exchange knowledge on flood management.

Peer Learning
Methodological approach

As in previous dialogue events organized by Connective Cities and UCLG, the exchange was highly participatory and practice-oriented. This is meant to ensure that the participating experts communicate their respective challenges and receive feedback from each other on practical solutions, leading to common learning (see video on the Power of Peer Learning).

Peer exchange

This is the most important part of the dialogue event, and it was divided into three distinct phases:

1

Exchanging good practices

The good practices were brought in by the practitioners to give an insight into practical actions taking place in their local or regional contexts. All presentations were structured along the same six guiding questions regarding the institutional setting, the starting point and project goal, the approach used, the outputs, the lessons learned, and the follow up. Following each presentation, participants engaged in a discussion that served as a basis for the next phase of the exchange: peer consulting.

2

Peer-to-Peer consultation

Peer consulting forms the core of these learning events. Inspired by the discussions that followed the presentations of good practices, six concrete problems were gathered and discussed in small expert groups to jointly develop innovative solutions. No external consultants, experts or moderators were involved: it was the municipal practitioners themselves who gave each other advice on key sustainable urban development issues based on their own experiences. You can see a video of the Peer-to-Peer consultation methodology used here.

3

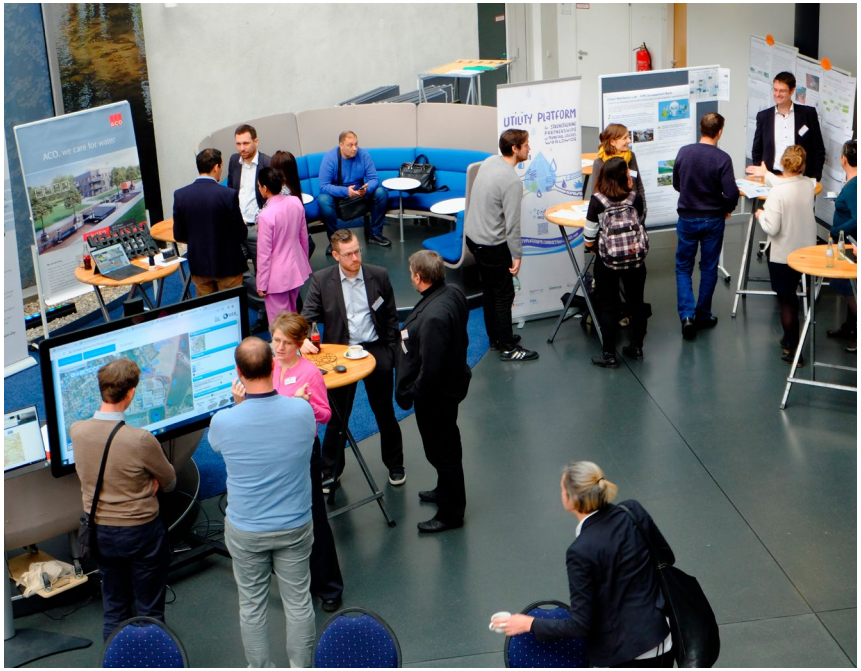
Thinking ahead: common project development

The last phase of the peer exchange focused on the development of new project ideas, which were put into concrete terms and elaborated. After the conclusion of the event, Connective Cities will continue to support the implementation of these project ideas (e.g. through expert secondments, delegation trips, local project workshops, virtual collaboration spaces, webinars and advice on financial funding opportunities) until they are ready for implementation.

Marketplace

On the second day of the event, the institutions and other invited entities got the opportunity to present their work in detail to participants. Like at a market, each organization had its booth to display its products, allowing participants to walk around and interact with the ones that were more of their interest.

The presenting entities were the following: *Municipal Drainage Operator of Cologne* (StEB Köln), *United Cities and Local Governments* (UCLG), *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ), *Service Agency Communities in One World* (SKEW), *Kreditanstalt für Wiederaufbau* (KfW) (Germany's state-owned investment and development bank), *ACO Ahlmann SE & Co. KG* (water-tech company providing systems to collect, channel, clean, retain and ultimately reuse water), *Global Water Operators Partnerships Alliance* (GWOPA) and the *Utility Platform for Strengthening of Municipal Utilities Worldwide*.



Site visit

One of the key elements in Peer Learning events are site visits, as they provide participants with the opportunity to discover firsthand a good practice being implemented by the host city in relation to the topic of the event.

On the last day, StEB Köln organized an excursion to visit first the High Water Pumping Station "Schönhauser Straße", which has been operating since 2008, and whose illuminated structure changes its color depending on the water level of the Rhine. In the second part of the visit, participants visited the "Deutzer Brücke", which is one of the eight storehouses for mobile elements of the Cologne flood protection system. This system is composed of 39,405 elements which represent 10,27 km of mobile flood protection walls.

The host: StEB Köln

With over one million inhabitants, a city like Cologne needs a modern and efficient water supply and disposal system. Stadtenwässerungsbetriebe Köln (StEB Köln) is a municipal water management company and a key pillar of public service delivery in Cologne.

The main tasks of StEB Köln include:

- **Collecting and treating wastewater.**
- **Maintaining and improving the quality of surface waters** (e.g. city streams, park's ponds, renaturing).
- **Guaranteeing flood prevention and control**, as Cologne stretches along 70km of the banks of the River Rhine, which makes it at particularly high risk for floods. In this sense, StEB Köln is highly experienced, particularly in technical solutions, which are based on extensive local and national data and forecasts. In terms of information and communication with the citizens, StEB Köln provides a series of recommendations on how to behave in case of flooding, flood hazard maps to find out whether you are in an area at risk and water level forecasts on its website. It also recommends the use of apps such as "Meinepegel" or "NINA", and makes available an emergency telephone.

StEB Köln is financed through service charges and fees that cover all operations, and also a high tech oversight facility that assesses, measures and analyzes water cycles and does long-term planning. Specific projects may also be funded from regional or national funds.

Similar to the political leadership of the city, StEB Köln does not hesitate to invest in knowledge sharing and reflection on an international level by hosting events such as this one. "*Over the years, our focus has been to share technical solutions. However, we need to learn from partner cities on engaging communities better and help them to have an active role, and not only being a consumer of services*", were the words of the StEB Köln Senior Director Mr Henning Werker.

Management of Cologne's water cycle by StEB Köln (retrieved from www.steb-koeln.de)

Global Water Operators' Partnerships Alliance

Although there's been a general increase in water and sanitation services worldwide, there is still an important inequity in the access to those services, as well as a huge gap in the quality of those services. Most of them are pretty fragile: they don't have the robustness and resilience that is needed to face a crisis such as floods, pandemic, etc. Against this background, the UN-Habitat Global Water Operators' Partnerships Alliance (GWOPA) works towards operators helping one another to improve their provision of services by establishing Water Operators' Partnerships (WOPs). WOPs are not-for-profit partnerships between two or more water and/or sanitation operators carried out in the objective of strengthening their capacity to sustainably provide quality services to all.

Key Concepts

Water sensitive urban planning, and rain and storm water management increasingly recognize the need for cities and their systems to integrate into and work hand-in-hand with the natural morphology and ecosystems they are rooted in.

Grey infrastructure

Response to exposure of communities to natural hazards has traditionally relied on grey infrastructure.[1] Grey infrastructures are engineered physical structures, often made of concrete or other long-lasting materials, that mediate between the human-built system and the variability of the meteorological and climatic system. This includes:

- dikes, floodgates, levees, embankments, seawalls and breakwaters for riverine and coastal flood protection;
- drainage systems for stormwater management, such as storm sewers, pipes, detention basins;
- air conditioning or cooling centers to cope with extreme heat.

Grey infrastructures provide an important means of adapting to biophysical challenges including hazards and climate driven extreme events, but are often costly to install and maintain, tend to have low flexibility, and when they fail can generate catastrophic social and ecological impacts.[2]

Soil sealing

Soil sealing is the permanent covering of the soil surface with impermeable artificial materials (e.g. asphalt, cement) leading to non-reversible loss of soil and most of its ecosystem services (FAO, 2016). These materials do not allow water to filter into the ground and instead favor the rapid flow of water into gutters, drains, and rivers, increasing the risk of flooding and of polluted runoff reaching natural water bodies without treatment. Also, as rainfall cannot infiltrate sufficiently, groundwater resources can recover only poorly.

[1] *Jones HP, Hole DG, Zavaleta ES (2012) Harnessing nature to help people adapt to climate change. Nat Clim Chang 2:504–509. doi:10.1038/nclimate1463*

[2] *Depietri, Yaella & McPhearson, Timon. (2017). Integrating the Grey, Green, and Blue in Cities: Nature-Based Solutions for Climate Change Adaptation and Risk Reduction. 10.1007/978-3-319-56091-5_6.*

Green and Blue infrastructure

Urban green and blue infrastructure can be defined as a strategically planned network of natural and semi-natural areas and other environmental features designed and managed to deliver a wide range of ecosystem services (i.e. contributions or benefits that ecosystems provide to people) within the boundary of a city (EC, 2013). They rely primarily on healthy, functioning ecosystems and allow for little or no technological intervention. Some examples of urban green and blue infrastructure are:

- Green infrastructure: parks, street trees, green roofs and other green spaces
- Blue infrastructure: ponds, rivers, lakes and other urban watercourses

Sponge cities

Sponge cities are cities using green and blue infrastructures or other nature-based solutions that enable water to be infiltrated, absorbed and stored into the subsoil, preventing the accumulation of water in hard surfaces.

Integrated Water Resources Management

Although there is no single definition of the concept of "Integrated Water Resources Management" (IWRM), it is commonly defined as the process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. This requires the active participation and cooperation of the various social and private actors and stakeholders in the planning and decision-making processes. IWRM often uses a combination of grey, green and blue infrastructure development and maintenance, adapted to the specific local contexts within a city and in its surrounding watershed.

Today, IWRM is considered one of the best ways to achieve SDG 6 "Clean Water and Sanitation".

Case Studies

In this section of the PLN, five out of ten practical cases presented during the event are introduced. Each of these cases went through rounds of peer consultation around concrete challenges. The conclusions obtained from these rounds are included in a box at the end of each of the cases.

Banjul, The Gambia

Rehabilitation of a poor and dysfunctional drainage network to build resilience against flooding

Banjul, the capital of The Gambia, is located at the mouth of the Gambia River only 80 cm above sea level and is considered one of the ten most vulnerable cities worldwide due to sea level rise. In July 2022, the country suffered its worst flooding in nearly half a century, killing 11 people and internally displacing more than 5,000. Only in Banjul, 276 millimeters of rain fell in two days, with disastrous consequences for the urban infrastructures, houses, water points and sanitation facilities, affecting especially women and children.

This extreme event revealed the deficiencies of Banjul's current drainage system -including the ring canal and the pumping station-, which was built by the British during the colonial era and hasn't been rehabilitated since. Moreover, mangroves, which are natural reservoirs for water, have been cut out in the past years, thus aggravating the problem as water flows back into the city.

Against this background, the Banjul City Council formed a multistakeholder taskforce which included members from relevant public institutions (e.g. the Ministry of Transport, Works and Infrastructure, the National Environment Agency, etc.), and members of ward development committees and community-based organizations with the aim of designing together an effective and functional drainage network that would ensure the easy flow of rain and storm water from all collection points in the inner city into the sea.

Also, the multistakeholder taskforce initiated community outreach activities and sensitization campaigns among the general public to raise awareness about the importance of not dumping waste into the drains: by keeping them clean, it is not only floods that are being reduced, but also water logs that serve as breeding ground for mosquitoes. To ensure this, and to be prepared for future flooding events, different teams have been set up: a drain excavation team, an evacuation and disposal team, and a logistics and coordination team.

Peer-to-peer consultation

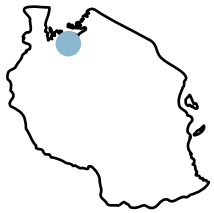
How to avoid too much water from flowing into the mangroves?

The proposed solution to meet this challenge includes, on the one hand, the rehabilitation of the mangrove area by replanting mangroves and coconut trees where they have been cut out, and on the other hand, to build tree trenches.

As part of an EU project, work has already begun to plant 5,000 coconut trees along the coastline. And, inspired by the good practice in Hagen, a pilot project is now planned to increase infiltration areas by planting more trees in the city through tree trenches. The action plan envisages involving the City Council as well as departments of the city administration, for example the department of forestry for park maintenance and the city planning office for the project design. In the medium term, citizens should be involved, for example, through tree sponsorships. In the long term, a legal framework is to be created to protect the trees from being cut.

Mwanza, Tanzania

Improvement of municipal management at a technical, social and ecological level to prevent flooding during rainy seasons



Mwanza is the second largest city in Tanzania. It is located in the Northwest part of the country, on the southern shores of Lake Victoria. Two distinct rainy seasons hit Mwanza: the short rainy season between the months of October and December, with heavy rainfall in a short period of time; and the long rainy season, with prolonged rainfall throughout the day. In both cases, the city experiences flooding, a phenomenon that has been aggravated in the last years due to climate change.

These extreme floods have severely affected neighborhoods and caused road blockages, raising the need to enhance the present drainage system to better channel rain and storm water. The main tasks include:

- Rehabilitating the drainage system and unblocking it where necessary
- Constructing water trapping systems to direct water to a river named Mirongo that then leads the water to Lake Victoria
- Planting trees
- Adopting rain water harvest methods in schools, hospitals and public institutions also as a means of having a reservoir of water for future use
- Improving informal settlements through a Master Plan on Urban Development
- Strengthening emergency preparedness and disaster management committees at district level
- Developing information systems to alert the population on heavy rains and floods

For the latter, the city of Mwanza collaborates with telecommunication companies, who send SMS to all the registered phones when the Meteorological Authority of Tanzania issues weather and disaster warnings. Moreover, social network platforms such as Whatsapp communicate with local leaders at grassroot level on climate updates enabling them to disseminate information to the community. Preparedness trainings and sensitization campaigns are also carried out.

The community has been engaged since the beginning to propose local solutions to rain and storm water management, both due to the solidarity mindset of these groups and the promotion of initiatives by local political leaders as a way to stimulate local development. It has also served as a way to spearhead the initiative and raise awareness among the population, as well as to ensure the maintenance of the rain water facilities by offering themselves as free labor or through small contributions.

Peer-to-peer consultation

How to manage heavy waters flowing from rocky hills like Igogo and Mabatini which are the main areas causing floods during heavy rains?

Several solutions were proposed to address this issue, such as:

- deepening drainage ditches on the side of roads to prevent water from overflowing and blocking the roads;
- establishing tree trenches around the hills both to increase water absorption into the soil and to reduce water flow speed;
- installing water storage facilities, especially in informal settlements, for citizens' personal use.

The Ahr Valley, Germany

A pilot study for the development of integrated and decentralized flood protection

In July 2021, storm depression "Bernd" caused persistent rain in the South and West of Germany. In the Ahr valley, more precipitation fell within two days than on average in the whole month of July. As a result, one of the most severe natural disasters ever occurred on the 14th and 15th of July 2021. Torrential water, debris and boulders led a 40-kilometer-long trail of destruction. Several communities were devastated, thousands of houses damaged or destroyed, and entire bridges torn away. With an estimated damage of 42 billion euros, 134 dead and more than 700 injured, the Ahr valley floods shows that no place is safe from the impact of climate change, and that risks of both heavy rainfall and drought are increasing exponentially.

Against this background and the particular vulnerability of the settlement areas in the Ahr valley due to the topographical conditions, the proposed model project not only breaks new ground in flood water protection by developing innovative solutions, but its uniqueness lies in the fact that it is being driven forward by a unique alliance of affected communities, universities and research institutes.

The integration of technical and decentralized flood protection measures is unique and new in order to provide the people living in the flooded areas with the best possible protection after the traumatic experiences of 2021. A variety of established decentralized measures in agriculture and forestry and in the landscape structure are available for the retention of water on the areas of origin. These include, for example, a change in farming methods and measures in arable farming and grassland management aimed at improving the absorption capacity of the soils, distributing the water in the parcels and slowing down the massive surface runoff. Special attention is given to so-called "hidden water networks" throughout the landscape structure, such as ditches, drainages and paths, which were created decades ago under different conditions and which now channel concentrated and critical runoff to underlying streams and water bodies, thus promoting the development of flash floods. In other federal states, measures described above for flood and heavy rain prevention have already been systematically applied in smaller catchment areas for years. Established methods and procedures that improve water retention in forests are also available for the large area of forestry.

The project has started with a status survey of all relevant area data and land use conditions by the universities and research institutes involved, as well as the preparation of the area water balance models and slope runoff models involved. This will be followed by the planning of water retention measures on the catchment areas in combination with landscape-integrated flood retention basins in the floodplains. The efficiency of the planned decentralized and technical measures will be analyzed using advanced simulation models and presented to the authorities and the public.

The transfer of decentralized water retention measures to the tributaries of the Ahr river would also serve as preventive flood protection, especially for the towns and cities in the middle and lower segment of the Ahr. The procedure and results of this model should also be of interest for other low mountain ranges in the state and the federal government, and the commitment of the affected citizens should serve as inspiration for other communities.

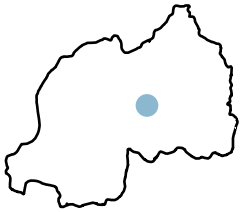
Peer-to-peer consultation

How can I convince different stakeholders to implement a pilot study on decentralized flood protection?

Previous flood protection projects only focused on areas in the Ahr valley itself. Today, a decentralized pilot study focuses on the river tributaries to the Ahr and can thus make an important contribution to reducing and slowing down a rise in water levels in the Ahr valley through protective measures upstream. However, the approach is new and decision makers as well as land owners have to be convinced. Suggested solutions include stakeholder mapping to gain more clarity about all involved groups, targeted outreach to farmers and landowners, and increased outreach to the local population and officials (e.g. through further events and well-prepared information material).

Kigali, Rwanda

Green City Kigali

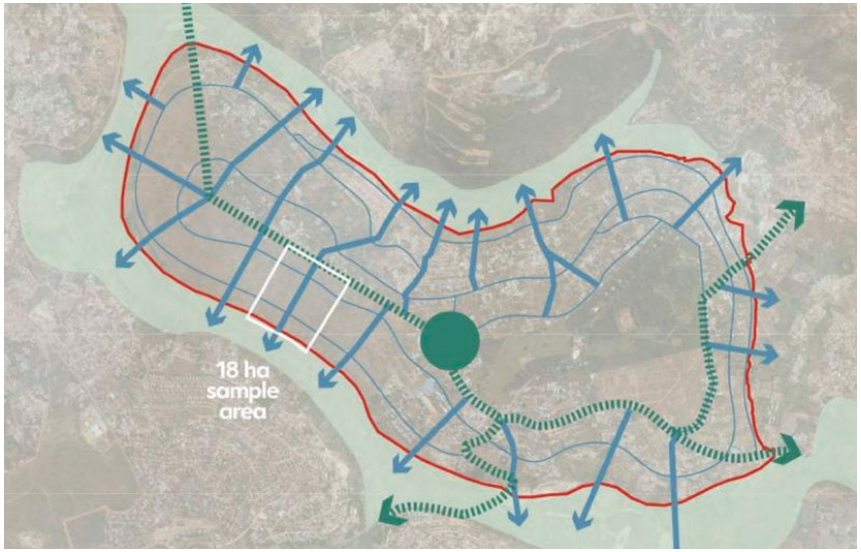


Located within the equatorial belt, Rwanda has a tropical climate with two distinguishable rainy seasons, one around March-May and the other around October-December, which are becoming more intense and short due to climate change. Combined with its hilly landscape and sloped terrain, it is especially vulnerable to extreme flooding events, which occur mainly in the valleys. Traditionally, human settlements were located uphills. However, in the past decades, the country has undergone rapid urbanization, with houses also being built down in the valleys. Kigali, which is the capital city of Rwanda, also follows this pattern.

Against this background, the Government of Rwanda and the City of Kigali, with the support of development partners (BMZ, KFW and GCF) and the private sector (Development Bank of Rwanda) initiated the project "Green City Kigali". The main goal of this project is to reverse this improper urbanization pattern in an area of 600 hectares in Kigali, where more than 170,000 inhabitants live. If successful, it will serve as a model of sustainable urbanization and development for the rest of the city, which covers a total area of 700 km2, and the rest of the country, as well as a long-lasting solution against floods. To achieve this goal, the project has several pillars that must be fulfilled: it must be affordable, equitable, inclusive, resource-efficient, environmentally sustainable and respectful of cultural sensitivities.

The project presents several challenges. First, the populations that are currently living in the most vulnerable areas, or where the new green and blue network will be situated, must be relocated. Second, there is the problem of deforestation, which has been going on for a very long time now, provoking the degradation of the soils and thus its inability to absorb water properly and grow vegetation. Also, although densification has been proposed as one of the solutions against flooding because it

reduces the city's surface, in the context of Kigali it is not possible due to the elevated costs of building high buildings. Finally, accessing finance for stormwater infrastructure has been proven to be difficult.



Peer-to-peer consultation

How to finance stormwater management through public revenue?

So far, drinking water and wastewater have been free for Kigali's citizens. Now Kigali is faced with the challenge of introducing a charging system to cover running costs. As a first step, it was proposed to conduct an economic study to better estimate the total costs. It was also recommended that an operator be established as part of a public-private partnership and that charging begin in the most suitable areas and then be successively extended to other districts.

Hamburg, Germany

The RISA-Project – RainInfraStructureAdaption

RISA was started as a joint project and funded by the State Ministry of Urban Development and Environment of Hamburg in September 2009, in cooperation with HAMBURG WASSER, the municipal Water Supply and Wastewater Disposal Company, and other involved scientific, municipal and economic partners. The goal is to promote a successful adaptation of the urban rainwater infrastructure into a water-sensitive and climate-sensitive urban development, as well as to improve water protection and flood prevention while maintaining the actual high drainage comfort and quality or quantity of precious water resources.

The main operational objectives of the RISA project are:

- Risk prevention against fluvial and pluvial floods
- Water body conservation
- Approach to natural water balance

In order to obtain the project objectives next to technological requirements and concepts also governance aspects and administrational challenges

were worked out. Beyond that, the project became the starting point for an improved integration of water management issues into urban and regional planning and a corresponding adaptation of the institutional Framework.

The first part of the project (2009-2016) included the analysis of the challenges (e.g. increase of cloudburst, heat waves and drought, higher tides in the river impacting free drainage into the river Elbe, a growing city, pollution of surface runoff, etc.), the evaluation and planning phases, the review of current regulations and the carrying out of pilot projects. The results of these pilot projects were assembled and the RISA Structural Plan Rainwater 2030 was finally presented in 2016. This document contains the guidelines to achieve the operational goals, and it is aimed at administrations, experts and property owners. The project is now in the implementation phase, and has become part of the climate change adaptation strategy of the city of Hamburg.

Peer-to-peer consultation

What are the best measures to start turning Hamburg into a *sponge city*?

Establishing measures to achieve a sponge city in an existing infrastructure is not an easy task and requires a lot of convincing. Some of the proposals were: plan pilot projects in a results-oriented way, define goals up front, measure them continuously during implementation, and eventually publicize the successes, including the positive reactions of citizens in the pilot districts. The ultimate goal would be to raise awareness among decision-makers that the sponge city concept is, or should become, an important criterion in all decisions about urban infrastructure development. Cost-benefit analyses can also help to demonstrate the benefits of certain measures.

Key lessons & recommendations

During the event, experts from each of the participating cities engaged in discussions of their experiences promoting water sensitive urban planning. The discussion topics spanned a variety of themes, ranging from the use of nature-based solutions to reduce the risk of flooding, to the importance of community participation and a good multi-actor coordination in flood management. Below you will find some of the key lessons and recommendations coming out from these discussions:

1. Consider Nature-based Solutions over purely grey infrastructure approaches

Nature-based solutions (NbS) have proven to be locally-adapted and resource-efficient interventions for rain and storm water management. One example mentioned during the Peer Learning event is the use of tree drains (also known as tree trenches) for storage, purification and runoff damping of water in the City of Hagen (Germany), and which at the same time also addresses the urban heat island effect. Another example coming from the City of Banjul (The Gambia) is the replanting of mangroves, which had suffered significant losses over the last decades, as they reduce waves and storm surges, and serve as a first line of defense against flooding and erosion.

Until now, research has mainly focused on environmental benefits, but social and economic benefits of NbS are also quite relevant and must be considered.

2. Establish mechanisms for multi-actor coordination, including the involvement of communities, in flood management

Stakeholder mapping is crucial as a first step to improve rain and storm water management. Then, common efforts are required for planning, organizing and operating among the many actors identified. These efforts include good communication, cooperation, and the clarification of competences and responsibilities. The City of Cologne (Germany), for instance, has adopted a multi-actor approach that includes SteB Köln, the local population through public participation and different municipal offices and authorities such as Roads & Traffic, City Development & Statistics, Environmental & Consumer Protection, Lower Water Authority, Lower Soil Authority, Social & Senior Affairs, Disability Office, City Planning, and Landscape & Green Spaces.

Regarding the participation of citizens, the integration of local or grass root experience and knowledge with the expertise of professionals is key to jointly identify problems and provide long-term solutions.

3. Improve information sharing systems

Informing the population is extremely important, both to raise awareness about flooding prior to an event, and to alert and guide the population on how to act when the event occurs. To do that, different instruments to exchange information must support the process, such as the flood hazards maps developed by StEB Köln, or the village, street and ward governance Whatsapp groups for updates on weather and disasters created in the City of Mwanza (Tanzania).

4. Review insurance and mitigation financing systems for local and regional governments

In recent years, flood management and recovery costs have increased exponentially. In her keynote, the representative from GWOPA mentioned that flood management instruments are still insufficiently resourced: there's an annual financing gap of somewhere between 25 and 300 billion dollars just for flood protection. Although the solidarity in flood disasters activates national and international support, this support does not match the challenges, and funding delays in flood management and recovery are frequent. The acceleration in the frequency and intensity of these disasters is leading the insurance industry to adapt and insurance systems are currently under discussion, as according to the International Recovery Platform, most long-term and national or regional insurance plans are not monitored properly, and funds get lost. Support for LRGs affected by natural disasters must be taken into account in the long term by building financial resilience in order to define new strategies for dealing with these disasters.

5. Include risks in urban planning and strategies for future development areas

As in the case of Green City Kigali (Kigali, Rwanda), the opportunity for new development areas to integrate risk evidence is larger if the development project is done and exposed to partnerships. However, the awareness raising of all stakeholders needs to be a continuous process, that project planning and monitoring should consider from the outset.

Partners

Supported by

Co-funded by
the European Union

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of UCLG and do not necessarily reflect the views of the European Union.

Sweden
Sverige

This document has been financed by the Swedish International Development Cooperation Agency, Sida. Sida does not necessarily share the views expressed in this material. Responsibility for its content rests entirely with the author.