

## **Pathways to water resilient South African cities**

### **Introduction**

Scientists from Cape Town University and the University of Copenhagen have been working together for the past four years on making South African cities more 'water resilient' in the Danida funded research project "Pathways to water resilient South African cities (PaWS)". The research includes physical experimentation through a pilot-scale implementation of re-purposing existing (often derelict) stormwater detention ponds for groundwater re-charging and amenity purposes as well as evaluation of already implemented water sensitive design (WSD) and nature-based solutions (NbS) for stormwater management and exploration of governance processes for enabling the transition to water resilient cities in South Africa. PaWS has been running since May 2018 and finished on 31 October 2022. We have secured a three-year extension of the project – PaWS 2, which started on 1 November 2022.

### **Results**

In Johannesburg, the PaWS team has been examining and evaluating already implemented nature-based solutions (NbS) and explored what has worked, not worked and whether there are missed opportunities both in relation to actual water management (water quality and quantity) as well as in respect of governance and the integration into the urban water cycle. The examination showed that water quality can be improved by implementing NbS but also that some solutions due to bad designs and limited maintenance perform poorly. The evaluations found that limited capacity and poor coordination and collaboration between city practitioners, private developers and consultants often result in faulty designs. Also ambiguity as to the management and maintenance roles of different actors after implementation leaves some solutions in disrepair. This ambiguity limits the learning from WSD projects, which remains scattered and tacit.

South African cities make use of stormwater detention ponds to manage excess storm flows. In Cape Town over 800 such ponds exist. The PaWS team designed and established together with local residents a nature-based solution to retrofit a mono-functional pond into a stormwater management hub with multiple functions. During a two-month construction process local youths took part in building litter traps, sandbag walls, and dig trenches which provided them with paid work, new skills; as well as allowing for the mutual transfer of socio-ecological knowledge. The redesign created infiltration areas to promote Managed Aquifer Recharge (MAR) – a process wherein groundwater is replenished by purposefully infiltrating water into an aquifer below – and then incorporated landscaping to extend the pond's amenity functions. The research team monitored the experiment throughout and the repurposing improved the stormwater quality markedly and maximised the groundwater recharging volume while still guaranteeing that the pond achieved its core function of handling rainwater during storms. The complexity of the technical interventions and cost for materials have been kept low so that local residents and stakeholders are able to manage the maintenance themselves afterwards. Various engagement activities have been taking place continuously to build stewardship; for example, involving school children in planting sponsored by a local garden centre, study trips for local women to nature reserves and painting of a large mural on boundary walls facing the pond. Interviews, observations and the local WhatsApp groups show that the close interaction with the site have made local residents use it more, given them a sense of ownership but also an

ecological literacy. They now notice birds and flowers (post them on WhatsApp), which they never saw before when the site was considered no more than a nuisance that attracted crime and informal settlers.

Throughout the project, the research team has involved a broad section of practitioners (not only the WSD 'converted') in meetings and our experiments and evaluations. We have assessed and explored whether and what enabling factors exist for water resilience through interviews, surveys, trainings, focus groups with key city practitioners, officials, consultants and experts. Water resilience is now a recognised issue embedded in policy and legislation – certainly in selected metropolitan cities around South Africa. There is now policy and legislative support for a different way of thinking. The most recent references to water resilience can be found in climate change policy, a new water strategy, and in a resilience strategy. There is eg mention of stormwater management and diversification of water sources. Stormwater issues and resilience are not only about flood control but also reuse and supply as well as amenity, green space etc. Therefore, a transition towards water resilience is emerging but there is a lack of coordination, a limited understanding of WSD and NbS and capacity constraints have a negative impact on further consolidation of the WSD approach. Urban practitioners struggle to reconcile visions of sustainability to be realised through nature-based urban development with the pressing infrastructure deficits that persist in most South African cities. WSD remains mainly in visions and policies whilst implementation lags behind.

### **Conclusions and recommendations**

Without a collective social networking platform for developing common cognitive frames for understanding what urban water resilience and NbS is and without case studies detailing past WSD initiatives, most stakeholders in the sphere of water resilience still lack the confidence to pursue the systematic integration of NbS in the urban water system and governance. This project has built up knowledge by evaluating existing solutions and engaging with city stakeholders in the process. The repurposing an existing stormwater pond in Cape Town has furthermore provided a platform for initiating engagement with residents in the vicinity, pointing to exciting possibilities for collaboration between city departments, civil society and communities as a way of raising awareness and imbuing sustainability transformations with more just outcomes.

The PaWS project contends that retrofitted derelict stormwater infrastructure presents a key nature-based pathway in the transition towards water resilient South African cities. Repurposed multifunctional ponds can help the City and its residents build resilience towards climate change impacts and recurring droughts, while supporting human wellbeing and improving the overall liveability of neighbourhoods. While nature-based approaches may satisfy the environmental aspects of sustainability if designed and maintained properly, it is important that they also address the socio-political and economic aspects of their sustainability in order to gain traction in resource poor cities. South African cities have limited resources to fully engage with WSD; and developers, civil society and local communities need to play a larger, more engaged role for a transition to take place towards wider urban water resilience.

The PaWS team has secured a 3 year extension of the project in order to explore and experiment with how the possible multiple functions of stormwater ponds can be planned, designed, monitored, upscaled and aggregated in collaboration with key stakeholders (including city officials, technical specialists and local residents) to provide a wider range of water-related, amenity and liveability services.