



Water Sensitive Urban Design for a Sustainable Stormwater Management in the City of the Future

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Abstract

During the last years decentralized solutions for sustainable stormwater management have been developed all over the world and legislation has been advanced. However these systems are underutilized and public as well as professional reception is still quite low. One reason is that stormwater facilities have often been engineered without considering ecological, social, or aesthetic qualities.

In fact, ecological, social, and aesthetic qualities are important, because they influence public perception and acceptance. The main question that needs to be answered is: How can sustainable stormwater management be integrated into urban design in order to create livable, sustainable, and attractive cities? One approach that supports this intention is the idea of Water Sensitive Urban Design (WSUD). WSUD, originally developed in Australia, strives to harmonize the urban built environment and the urban water cycle, combining the functionality of water management with principles of urban design. The approach embraces an interdisciplinary cooperation of water management, urban design, and landscape planning in order to reach WSUD goals as well as the integration of water management concerns into overall concepts and development plans.

Within the scope of SWITCH, HafenCity University of Hamburg researched in the field of WSUD. The main research questions have been:

- What is Water Sensitive Urban Design?
- What principles need to be considered when applying WSUD?
- What does WSUD look like (case studies)?

The main intention was to elaborate a manual that aims to inspire stakeholders involved in the planning, design, and maintenance of stormwater management in urban areas (such as *The Future of Urban Water: Solutions for Livable and Resilient Cities* civil engineers,

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planners, landscape designers, project managers, architects, administrative officers, and policymakers) to put more sustainable stormwater management into practice and to do in a better quality. Therefore the manual provides an overview of the WSUD approach and creates guidelines by setting principles for WSUD.

For successful Water Sensitive Urban Design, six facts are important:

1. WSUD-solutions should be water sensitive, i.e. they should use methods that are appropriate to bring the urban water cycle closer to nature.
2. WSUD-solution should be aesthetically pleasing, i.e. they should provide an aesthetic benefits where possible and they should be integrated in the design of the surrounding area.
3. WSUD-solutions should function well, i.e. they should have an appropriate design, they should be appropriately maintained and they should provide possibilities for adaptation to changing conditions.
4. WSUD-solutions should be usable for recreation and/or nature conservation purposes.
5. In order to increase public perception and acceptance, WSUD-solutions should ensure acceptable costs and public should be involved in the planning and implementation process for WSUD-measures.
6. All the different demands should be integrated, i.e. planning should be done by a interdisciplinary team of professionals involved in urban water management planning; WSUD-solutions should combine function, aesthetics and use; and they should be designed in an aesthetic, well-functioning and usable way in order to improve the public perception and acceptability of WSUD.

To show what WSUD can look like, the manual also includes case studies demonstrating the WSUD principles listed above. These case studies that show successful implementation of WSUD are from three different scales:

Large scale (city level); e.g. the City of Rotterdam that has developed an integrated water management plan to be better prepared for climate change effects; or the City of Lodz that uses the approach of a Learning Alliance to manage an entire watershed; or the City of Portland in Oregon, USA that developed a set of different sustainable stormwater management programmes to counteract combined sewer system overflows while enhancing greenery.

Medium scale (district level); e.g. the Tanner Springs Park, designed by Atelier Dreiseitl that used decentralised stormwater management to re-establish natural wetland in a dense urban area; or the district of Trabrennbahn Farmsen that uses onsite stormwater management measures as the main design element for open space planning; or the district of Hohlgrabenäcker that saves costs for stormwater management through the application of green roofs, cisterns and pervious pavement instead of enlarging existing sewer system.

Small scale (site level); e.g. Potsdamer Platz that is a sustainable and aesthetically pleasing building complex managing all stormwater on-site, or the 10th@Hoyt Apartments Courtyard that turns rainwater into art contributing to the quality of life in the apartment complex; or the Prisma Nuremberg that uses decentralised stormwater management to establish a balanced indoor climate for a housing block including offices and private homes.

Decentralised stormwater management can provide solutions for the sustainable development of cities when ecological, social and aesthetical concerns are considered, when planning is done in interdisciplinary cooperation of experts in the fields of water management, urban design and landscape planning, and when the planning is linked to overall spatial development concepts. Summarised as the concept of Water Sensitive Urban Design (WSUD), this approach will be essential for further water management development in urban areas.

Through the manual, developed by HafenCity University of Hamburg, planners and other professionals in urban water management planning will be inspired and recommended on how the approach of WSUD can be applied to cities in different scales. The manual therefore will help to go a big step forward in urban water management planning.

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