

Water Urban

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Sensitive Design

as a Role Model for Water Management in Germany?

Lessons learned from Australia

“Water Sensitive Urban Design” (WSUD), originally developed in Australia, is a planning and design approach, combining the functionality of water management with principles of urban design. WSUD is mainly used when it comes to the development of integrated solutions for stormwater management in urban areas. Besides water management, WSUD regards urban design and socio-economic aspects, such as usability, functionality, aesthetics and public perception [1].

This article gives an overview about the (historic) background of WSUD in Australia and describes current developments and achievements, while emphasizing the main framework requirements and strategies to establish WSUD. Legal and statutory aspects, incentives and further education and communication strategies will be highlighted. Finally, by comparing the Australian and German situation, the authors draw conclusions on the possibilities for applying Water Sensitive Urban Design in Germany.

„Water Sensitive Urban Design“ (WSUD) ist ein in Australien geprägten Begriff, der einen integrativen Planungsansatz zwischen nachhaltigem (Regen-)Wassermanagement und Stadtplanung unter Berücksichtigung sozio-ökonomischer Belange beschreibt (vgl. Hoyer et al. 2011). Dieser Artikel gibt zunächst einen Überblick über die Hintergründe und Geschichte des WSUD in Australien und beschreibt aktuelle Entwicklungen in Melbourne mit einem Schwerpunkt auf der Darstellung der vorhandenen Rahmenbedingungen und der bisher etablierten Strategien zur Umsetzung von WSUD. Politische und gesetzliche Aspekte sowie Förderinstrumente und Kommunikationssysteme werden dabei besonders beleuchtet. Abschließend wird der Frage nachgegangen, inwieweit der australische Ansatz des WSUD auf Deutschland übertragbar ist und erste Schlussfolgerungen hinsichtlich der Umsetzung von WSUD in Deutschland / Hamburg gezogen.



Source: J. Ziegler

Fig 1: Urban (stormwater) stream in Melbourne

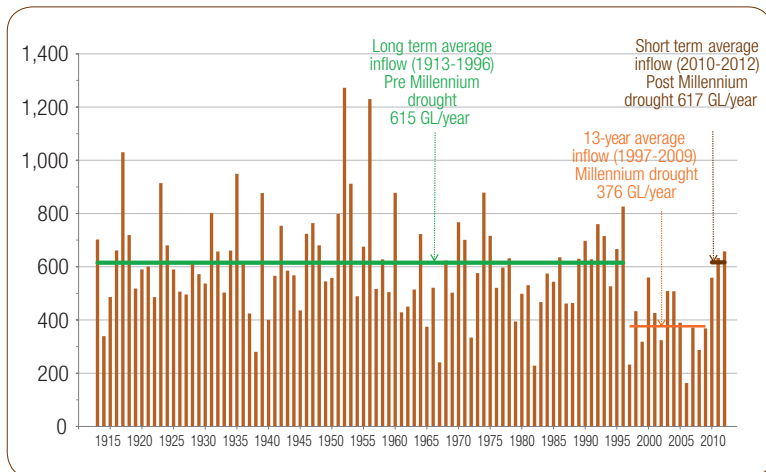
The effects of climate change are one of the most challenging facts, cities are faced with in the future. Longer dry periods in summer and the increase of heavy rain events put pressure on existing urban water infrastructure, and in consequence can lead to flooding or droughts with high damage potential, both on private and public property.

Decentralized stormwater management technologies can help to counteract these issues. However, these systems are still not seen as daily business. In fact, it might be a feature in sustainable housing, but it is not mainstreamed yet.

Having a look at approaches in Australia, the authors' aim was to find out more about, how Australia – a country, where the effects of climate change are already in state – deals with droughts and floods. These led to Water Sensitive Urban Design (WSUD), a design and planning approach, which uses decentralized methods for stormwater management in order to cope with droughts and floods, while enhancing the liveability, and therefore competitiveness, of a city.

Fig 2: Water flowing into Melbourne's main water supply reservoirs – annual totals

To get insight in Australia's approaches, challenges, developments and achievements, the authors lived in and visited Australia in 2011 and



Source: [11]

2012, based in Melbourne. Australia has a well-established and facilitated network of professionals, working in the topic of WSUD, where they got part of. In 2012, a group of young Australian professionals visited Europe to learn more about existing ideas and technologies back here.

This article summarizes the results of interviews, literature research and personal experiences around Water Sensitive Urban Design in Australia and develops first ideas on how the approach could be adopted to Germany. While having some side views, this article focusses on Melbourne as the most active community in Australia in terms of WSUD. The final results of the research will be shown in the dissertation of Jacqueline Hoyer.

WSUD in history

The term Water Sensitive Urban Design (WSUD) was first referred to in the early 1990s [2], associated with growing public awareness of environmental issues in these times. Defined as a planning and design approach, which combines the functionality of water management with principles of urban design [1], the term “is commonly used to reflect a new paradigm in the planning and design of urban environments that is ,sensitive‘ to the issues of water sustainability and environmental protection” [2]. WSUD is strongly connected to the terms Integrated Water Cycle Management and Sustainable Urban Development.

Similar to Germany, stormwater management in Australia has historically been focused on drainage, discharging all stormwater runoff from urban areas to receiving waters. With growing population and progressive urban development, urban streams got degraded, with bank erosion, increased instances of flooding and poor water quality [2] (Fig. 1).

In many Australian cities, stormwater runoff from urbanized areas is conveyed to huge bays, which are located very close by (e.g. Port Phillip Bay in Melbourne). These bays are a ground for recreation (swimming, diving), fishery and the home of sensitive ecosystems. With more and more inflow of polluted water from the urban streams, the water quality in the bays became poorer and poorer, setting a serious risk for the sensitive ecosystems as well as for the health of the population using these waters for swimming or consuming fish from the bay.



Source: J. Hoyer



Source: J. Ziegler



Source: J. Hoyer

While quality problems were the starting point for re-thinking urban water management and the birth of the term WSUD, the effects of climate change, particularly recognizable in Australia, played and still play an important role in raising the acceptance as well as promoting the application of WSUD around Australia.

If you compare the approaches of Australian cities, it can be recognized that Melbourne is one of the most active communities in Australia. Due to this, the next chapters focus on Melbourne metropolitan area.

Climate and Climate Change

Melbourne is the capital of the state of Victoria and the second largest city in Australia. The city is situated at the south eastern coastline of Australia in a temperate climate. The city center is located at the northernmost point of Port Phillip Bay within the estuary of the Yarra River.

The average annual precipitation is about 656 mm, with a maximum of 67 mm in October and a minimum of 48 mm in January. Climate change affects Melbourne – as well as other major Australian cities – in several ways: sea level

rise, decline of precipitation leading to reduction of water inflows to water supply catchments, increased instances of heavy rain events followed by flooding and the increase of high temperature periods leading to higher risks for bushfires (www.climatechange.gov.au).

From 1997 to 2006, Australia suffered the “Millennium Drought”. In this period inflow to water supply catchments in Melbourne was 40 percent less than average, which in consequence led to severe water restrictions affecting the whole community (fig. 2). Resulting from these experiences, the construction of the first desalination plant for Melbourne started in 2011 – despite huge protest among population.

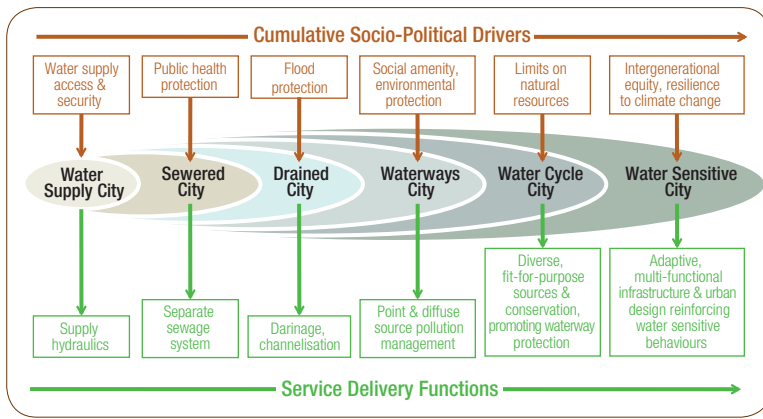
Population Growth and Urban Development

Between June 2001 and June 2011, Greater Melbourne had the largest population growth of all Australian cities with an increase of 18 percent over the decade, leading to an estimated population of 4.17 million. Two of the three main series of projections on population growth in Australia assume that population in Melbourne will exceed 5 million inhabitants before 2030 [3].

Fig. 3: Examples for WSUD in Melbourne (rain garden, wetland)

- a) Wetland Docklands Park
- b) Raingarden in Melbourne
- c) Victorian College of the Arts

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Source: [10]

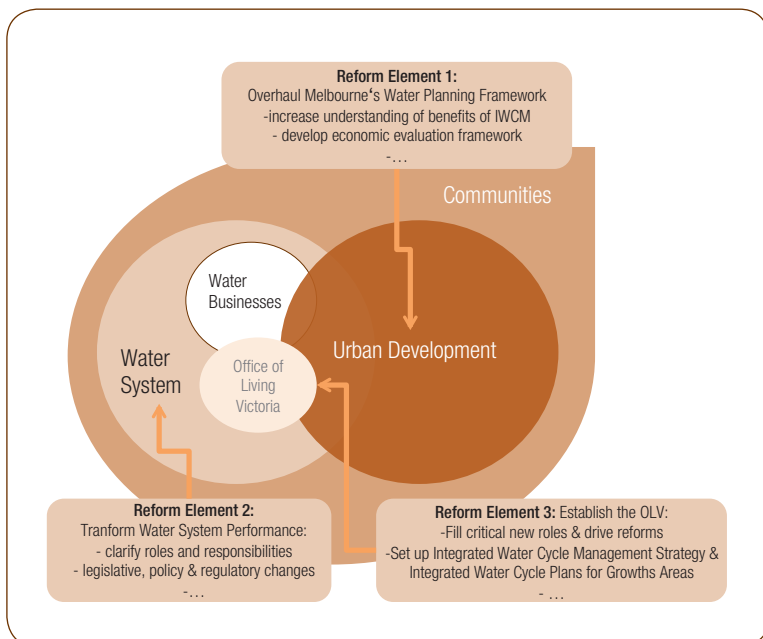
Fig. 4: Historical, current and future states of cities' development towards water sensitive cities

From 2001 to 2011, population growth took predominantly place in the outer suburbs of Melbourne [3] and there population growth will go on in the future. The Growth Areas Authority set up an overarching strategic planning framework to guide future development in the four current growth corridors.

Legislation and Policy Framework

Within the last years, there have been developed several policy and legislative requirements for WSUD, both by the Federal, State, and by regional and local governments in Australia. The policy documents outlining strategic policies to foster WSUD in Melbourne are the *Future Melbourne and the Total Watermark – City as a Catchment Plan*, which set the overall aims for WSUD in Melbourne and were followed by the *WSUD Guidelines for the City of Melbourne* and additional plans, which ensure transfer from the strategic vision towards the ground (e.g. Drainage Plan, Parks Plan, Urban Design Strategy).

Fig. 5: Reform packages indentified by MAC



Source: based on [9]

Concerning the Federal and Victorian Government level, there is the National Water Commission, the body responsible for advancing water reform at a national level, and the Living Victoria Ministerial Advisory Council (MAC), which developed a high-level strategy roadmap for managing water in Victoria, the "Living Melbourne, Living Victoria Roadmap". Fundamental legislation is set by clause 54 and 55 (reduce the impact of stormwater runoff by using permeable surfaces), and – of capital importance – clause 56, which regulates the application of WSUD in all new residential developments [4, 5].

Paradigm shift towards water sensitive developments

Within the last 20 years there have been a lot of things happening with regards to WSUD in Melbourne. Rebekah Brown und Jodie Clarke described the process of transitioning Melbourne towards a water sensitive city in five phases [6]. Phase 1 with the "Seeds for change" (mid 1960s – 1989), where public awareness for environmental issues was rising, which challenged the government to improve the protection and rehabilitation of waterways. In phase 2 that can be described as the phase of "Building Knowledge & Relationships" (1990 – 1995), the innovation of new strategies and technologies began to evolve as well as the development of intensive cooperation between research, policy and industry. This was followed by the phases 3 ("Niche Formation", 1996 – 1999) and 4 ("Niche Stabilisation", 2000 – 2006), where research and development activities were advanced, best practice guidelines produced, pilot projects implemented and funding strategies developed. In result, WSUD was recognized and taken up by all important stakeholders in Melbourne. Since 2007, Melbourne is in phase 5 "Niche Diffusion", where Melbourne focusses on a capacity building program to enable the necessary knowledge and skills, resulting in the establishment of Clearwater (fig. 3).

Figure 4 shows the proposed transitions framework by Brown et al. 2009, presenting a typology of six city states recognizing the temporal, ideological and technological contexts that cities transition through when moving towards sustainable urban water conditions.

By passing through this process, there are four important institutions guiding the transitioning of Melbourne towards a water sensitive city:

Monash University Melbourne, Melbourne Water with Clearwater and the Office for Living Victoria.

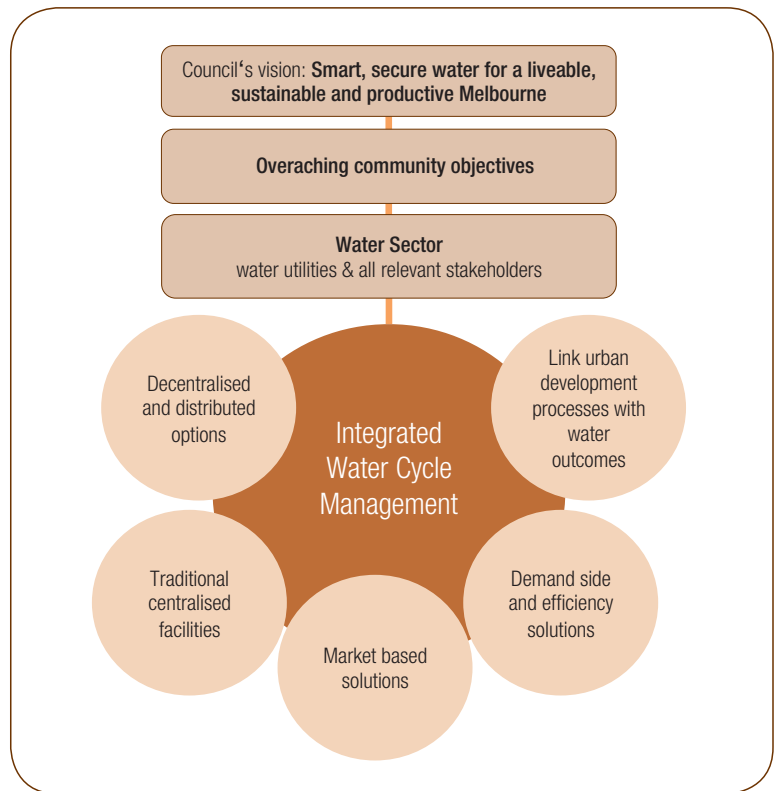
Melbourne Water, Clearwater and Monash University Melbourne

Melbourne Water is the wholesaler responsible for drinking water supply, wastewater treatment and the management of drainage systems and water ways in Melbourne. Due to the fact, the water ways were seriously affected by stormwater inflow and pollution, Melbourne Water started to set overall aims and works with local partners from councils, industry and research to test and advance the application of WSUD technologies, particularly for cleansing and detention purposes.

In cooperation with Monash University, technologies were invented and advanced (wetlands, bio-filters). Until today, Monash University supports and monitors the process of transitioning in Melbourne. In 2011, a Cooperate Research Centre for Water Sensitive Cities was founded. This centre promotes strong cooperation between research, practitioners, policymakers and councils.

Clearwater is the local capacity building program, hosted and funded by Melbourne Water, that plays a critical role in enabling the transition to a water sensitive future by providing technical training, tours, events, advice, tools and online information, in order to train and inform practitioners who intend to plan and design with WSUD or take over its management (www.clearwater.asn.au).

The outcome of ongoing research, cooperation and development in the field of WSUD is the awareness that a shared long-term vision is es-



sential to establish Melbourne as a Water Sensitive City and that the integration of urban and water planning has to be improved [7, 8].

Fig. 6: Integrated Water Cycle Management

Office of Living Victoria

In 2011, the Ministerial Advisory Council was appointed to provide recommendations on strategic priorities for reform in the water sector (compare fig. 6), which are essential to face the numerous challenges driven by population growth, pressure on natural and built environments and increased climate risk and variability. This resulted in the development of the “Living Melbourne, Living Victoria Roadmap” [8] and the corresponding “Implementation Plan” [9].

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As a consequence of these recommendations, the Office of Living Victoria (OLV) was established by the Victorian government in May 2012, in order to achieve the government's ambitious aims, which are to ([8] compare fig. 6):

- establish Victoria as a world leader in liveable cities and integrated water cycle management
- drive generational change in how Melbourne uses rainwater, recycled water and stormwater
- drive integrated projects and developments in Melbourne and regional cities to use rainwater, recycled water and stormwater to provide Victoria's next major water augmentation (to be used for non-drinking purposes), for which the OLV provides a fund of 50 million \$.

Conclusions

Is Water Sensitive Urban Design an approach to be learned from for German practice in managing urban water? Comparing achievements in Australia with the German ones, it becomes obvious that advanced practices in urban water management are dependent from the provision of political guidance and funding. Even, there are very well known best practice examples for integrated stormwater management in Germany, e.g. Potsdamer Platz in Berlin or the RISA project in Hamburg (www.risa-hamburg.de), and a well advanced legislation, there is still a lot to learn from down under, particularly with regards to their will to connect science, practice and politics; to set a high value on socio-economic aspects and develop integrated concepts for future development; as well as to provide sufficient political and financial support.

While Melbourne is transitioning towards Integrated Water Cycle Management, which goes hand in hand with a shift from sustainability to liveability and is accompanied by strong political and scientific support as well as high political and public awareness, we are still discussing about the positive effects of decentralized stormwater methods. Starting to experiment towards integrated, locally adapted solutions, which incorporate a broadening of foci in water management and urban planning, will help to go a step forward. And moreover, to strategically think about how to overcome barriers, such as financial and property borders as well as responsibility disputes.

Sure, at the same time, to directly compare achievements without considering basic local conditions, such as climate, will not tell the whole

truth. Australia is actually in need of doing changes to their water management systems due to the changing climate with limitations in water supply, water quality issues and severe floods. The goal is to set liveability as the core objective for future water development in order to be able to cope with current and future changes – a goal, which is not just appropriate for Australia, but also for Germany.

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