



DELTA IN TIMES OF CLIMATE CHANGE II INTERNATIONAL CONFERENCE

OPPORTUNITIES FOR PEOPLE, SCIENCE, CITIES AND BUSINESS
ROTTERDAM THE NETHERLANDS, 24-26 SEPTEMBER 2014

Deltas in Practice, policy-practice sessions	
Deltas in Practice Theme 7: Governance and finance	
Session DP 7.2 Mainstreaming flood resilience and green infrastructure with investment and renewal programs: Best practices and challenges from vanguards cities across the globe.	
Chair	Prof. Chris Zevenbergen, UNESCO-IHE and Delft University of Technology, the Netherlands Prof. Gin-Rong Liu, NCU, Taiwan (co-chair) Dr. Peter van der Keur, GEUS, Denmark (co-chair) Dr. Beth McLachlan, City of Melbourne, Australia (co-chair)
Organised by	Prof. Chris Zevenbergen, UNESCO-IHE and Delft University of Technology, the Netherlands
Presentations	<ul style="list-style-type: none"> ● Mayor Ching-Te Lai, Tainan City - represented by dr Yi-Chang Chiang, CCU, Taiwan
	<ul style="list-style-type: none"> ● Beth McLachlan, City of Melbourne, Australia
	<ul style="list-style-type: none"> ● Tan Nguan Sen, PUB, the national water agency, Singapore
	<ul style="list-style-type: none"> ● Jan Rasmussen, City of Copenhagen, Denmark
	<ul style="list-style-type: none"> ● Ellen Kelder, City of Dordrecht, the Netherlands
Panel	<ul style="list-style-type: none"> ● Prof. Lee Ho Ching, NCU, Taiwan
	<ul style="list-style-type: none"> ● Dr. Peter van der Keur, GEUS, Denmark
	<ul style="list-style-type: none"> ● Prof. Nigel Tapper, Monash University, Australia
	<ul style="list-style-type: none"> ● Dr. Sebastiaan van Herk, UNESCO IHE, the Netherlands
	<ul style="list-style-type: none"> ● John Jacobs, City of Rotterdam, the Netherlands
<ul style="list-style-type: none"> ● Ellen Kelder, City of Dordrecht, the Netherlands 	
Session topic	<ul style="list-style-type: none"> ● Discovering strategies for the incorporation of cost-effective measures to make cities more resilient to climate change
Objective of the session	<ul style="list-style-type: none"> ● To explore, successful institutional, planning, policy and business practices for mainstreaming adaptation and greening and opportunities for knowledge exchange
Main conclusions and lessons learnt from the presentations	
<p>Tainan City: Tainan has been expanding rapidly over the last years and faces the challenge of transforming from mitigation measures into an adaptation concept with a focus on flush flooding, heavy rainfall, heat stress and carbon reduction. Climate adaptation focuses on the planning, preparing, building and managing of green infrastructure : Rain gardens, permeable pavements, greening of the canals, multifunctional parks (recreation and discharge), connecting and amplifying ponds, rebuilding and connecting flood discharge channels, regenerating wetlands en green lands. The first experiences with involvement of local communities are promising. Damages to the existing infrastructure caused by extreme weather events give the possibility to implement green infrastructure.</p> <p>Melbourne: Climate adaptation is focusing on water scarcity, drought, heat, storms and flooding. Both extreme bushfires and urban flooding boosted the public support for action. Greening the city is planned by increasing the canopy cover, urban forest diversity and improving vegetation health. A system of storm water harvesting, water catchment and redistribution to dry areas is being developed. A GIS based model is being built, based on monitoring data and climate</p>	





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scenario's in order to carry out simulations to identify which measures are most effective. Both citizens and the private sector are taking initiatives, since it will affect the safety and value of their own property.

Singapore: Singapore faces both flooding and drought. In order to catch every drop of rain, 2/3 of the land is water catchment. The strategy is based on slowing down and retaining the flow. Singapore's ABC (active, beautiful, clean) Water Program comprises a holistic approach of storm water management by making buildings and parks more resilient and using a soft/green redesign of hard infrastructure to avoid run off of water. Learning from lessons drawn from projects within this program is actively stimulated through monitoring and evaluation. The city encourages community ownership by involving residents, school children, NGO's in designing. The private sector is stimulated by receiving a certificate when having an adaption plan which increases the value of property.

Copenhagen: In 2012 the city of Copenhagen launched the cloudburst management plan. The extreme cloudburst of July 2nd in 2011 acted as game changer mobilising high political support for this plan, change in legislation and new financial mechanisms. The plan has adopted a more stringent standard of exceedance probability of 1 in 100 year event. The city is divided into 7 catchment areas which are broken down into 300 projects containing plans for new green and blue infrastructure. A detailed cost-benefit analysis was carried out based on investment costs, estimated damage, value of green infrastructure, avoided costs for not expanding the sewer system.

Main conclusions from the discussion

1. Climate adaptation should be replaced by the word: "climate resilience" since we have to shift from mitigation towards an approach in which adaptation measures are integrated into the long term urban transformation process directed to provide safe and high quality urban environments.
2. We have to send a strong and clear message to the public and businesses to create a sufficient sense of urgency: there is no time to waste.
3. Although a multi level government approach is needed, the city is the most appropriate level when it comes to the development and implementation of integral resilience measures.
4. It is important that cities collect enough data to know which areas or subjects are at risk in order to be able to take most cost-effective (small scale) measures.
5. We need a combination of "hardware" and "software" measures: technology/engineering in combination with managing natural processes for the benefit of cities (building with nature).
6. Disasters are game-changers and provide an opportunity since they demonstrate the necessity and urgency to become resilient.
7. Autonomous urban transformation processes provide an opportunity to adapt cities to climate change through mainstreaming adaptation into urban regeneration (development) projects.
8. Economic and social valuation of the problems and revenues from measures are needed, e.g. a reduction of 1 or 2 centigrade will save hundreds of lives.
9. We have to rely more on community based initiatives, money from the central government should be distributed to the municipalities. Citizens as well as businesses are interested in participating in planning and exploitation of green infrastructure.
10. The presented cities are executing a large number of projects which represent a great source





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of experience from which we can learn over the next few years and enables us to discover which strategies will work.

11. We need a stress test for measuring the resilience of cities.

12. Citizens should know that there is no 100% safety.

13. The education of engineers should not only comprise “hard” technology but also more “soft” green solutions.

Main result of or conclusion from the session

Cities are affected by climate change (flooding, heat, draught) and can become more resilient by integrating green infrastructure solutions into their long term transformation process. This requires 1) a programmatic approach based on risk assessments, 2) knowledge of future urban developments 3) combing relevant mainstream programmes with budgets and 4) participation of the local community and the private sector.

Most exciting insights or outcomes

- Front runner cities have the will, strategy and are implementing appealing adaptation projects. However this is definitely not mainstreamed in their planning and project development policies yet.
- The process of autonomous transformation will take decades to result in climate adaptive cities, this is too slow, according to scientists like Nigel Tapper, Peter vd Keur c.s. No time to waste.
- Extreme events are game changers. However, the City of Dordrecht shows that awareness and change can also be established by leadership and citizen engagement
- Instead of implementing adaptation measures when necessary, the strategy should focus on taking measures when possible along with the regular transformation process so extra costs can be avoided and budgets can be clustered. It requires reframing to a wider, more integrated scope (cq. resilience).
- Resilience is a complicated concept for stakeholders: what is an alternative? This is an issue to be solved. A stress test would be helpful.
- Not climate adaptation but climate resilience.

