



CRC for
Water Sensitive Cities



Program B: Water Sensitive Urbanism | Project B4.1 | Project duration: July 2012 - July 2017

Social-technical flood resilience in water sensitive cities – Quantitative spatio-temporal flood risk modelling

Overview

Recent urban floods have highlighted the need for integrating the planning of urban water systems with other aspects, notably spatial urban planning processes. A number of worldwide studies have found that water in an urban context needs to be given more physical space than what is currently allocated. However, attempts to allocate space for flooding events that occur less frequently than the planning cycle of urban development allows often fail.

The project aims to address the question of how flood risk can be integrated with other spatial planning and management practices to improve the protection of infrastructure assets and help facilitate the overall objectives of a water sensitive city (WSC).

Key outcomes

The project outcomes consist of a variety of tools that will enable better land use planning processes in an urban environment by presenting geographically distributed hazard and risk maps and identifying adaptation options which are based on different factors such as economics and ethics. For the first time, these tools will be able to model both city development and changes in flood hazards within one model whereby historical and potential future linkages between these two processes can be explored. This process will bring together professionals from different fields and allow the development of better and more flexible options of land use in urban areas. Another outcome is the development of a decision-support tool that can evaluate impacts of urban design and planning on flooding which is invaluable for strategic decision-making directed at improving flood resilience. The tools and methods developed will also enhance Australian state-of-the-art flood risk analysis and mitigation methods, thus enabling better decision-making on local and regional scales and perhaps also facilitating statutory changes in the long term.

Early insights into land use changes and flood risk

The initial work focuses on the integration of the models and making offline simulations. The testing occurs then in the context of Scotsmans Creek in Melbourne, a catchment where data is available and which has been used in other CRC for Water Sensitive Cities' projects. Part of this project also examines the changes in distributed flood risk historically and with different projected scenarios as well as tests simplified modelling approaches.

The figure below shows the historical development of the catchment from the initial development to present time and gives an example of a future development scenario. So far, the flood risk for the historical and present time periods have been calculated indicating low to moderate flood risks, even though some areas intended for residential housing have a higher probability of being flooded than desired.

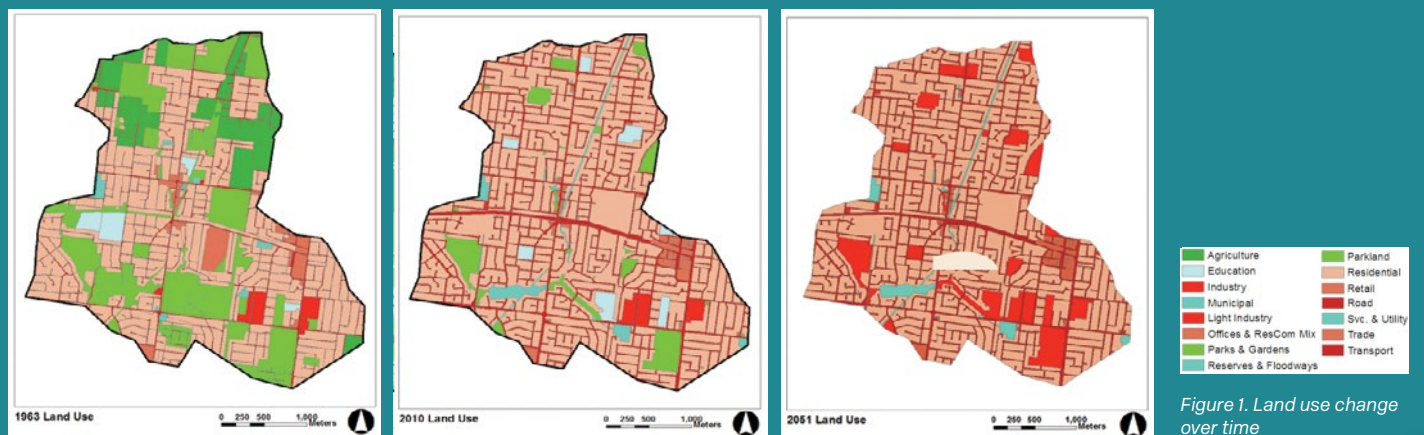


Figure 1. Land use change over time



Project design

This project develops a range of tools and models including a framework for describing concurrent hydrologic hazards, a dynamic model for stormwater harvesting and treatment technologies, and a flood risk modelling tool which integrates an economic valuation of physical assets threatened by these hydrological hazards. Australian cities will be selected as case studies to collect site-specific data to describe recent flooding events. Historical as well as projected future scenarios for urban land use scenarios will then be developed leading to different urban and social developments and changes. Of particular interest in this project is the description of how the public perceives flood risk and the impact it has on risk aversion over time.



Outlook

Currently no framework exists that dynamically describes possible paths for both future city development and multiple hazards occurring at the same time with probabilities that vary over time. Both the type of adaptation solutions to be implemented as well as the timeframes are key variables in the decision-making.


A key output of this project will be the development of a module that dynamically links the integrated flood risk modelling tool with the DAnCE4Water platform (Dynamic Adaptation for enabling City Evolution for Water), which was developed in Project A4.3 (Socio-technical modelling tools to examine urban water management). DAnCE4Water will then enable an assessment of dynamic changes in hazards and vulnerabilities for certain landscapes due to factors like climatic changes and population growth. Linking these two tools will facilitate a leap in the understanding of the complex dynamics of city development, flood resilience and interactions with other water values in order to facilitate the planning of multi-functional and resilient cities.



About the Cooperative Research Centre for Water Sensitive Cities

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) brings together interdisciplinary research expertise and thought-leadership from Australia and the world to address current urban water management challenges facing our cities and regions. In collaboration with over 80 research, government and industry partners, it develops and synthesises knowledge into powerful tools and influences key players aiming to achieve sustainable, resilient and liveable water sensitive cities.

Further information

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