

Impacts of Climate Change on Urban Infrastructure & the Built Environment



A Toolbox

Tool 2.4: Overview of Drainage Tools

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1. Introduction

Management of the three urban waters (water supply, waste- and stormwater) are key services provided by local authorities. These services were identified by the Ministry for the Environment (MfE, 2008) as being sensitive to weather-related hazards and therefore at increased risk due to climate change. Urban drainage (waste- and stormwater) is particularly sensitive to heavy rainfall events, which are projected to become more intense as the climate warms. In addition to changes in extreme rainfalls, the seasonality of rainfall delivery can also have an effect on urban drainage. Wetter winters could mean that soil is unable to dry between events so that catchments respond more rapidly and with greater peak flows to rainfall. In contrast, drier summers could lead to increased soil moisture deficits decreasing recharge and base-flow.

The Tools in Bin 2.4 of this Toolbox provide general information including data needs and available models, current practices, current climate change guidance, and a worked example that can be used to better understand the potential impact of climate change on urban drainage. These tools should be used together with an appreciation and understanding that urban drainage infrastructure and performance is also significantly impacted by population growth and urbanization.

2. Description of the Drainage Tools

Table 2.1 outlines the Urban Drainage Tools in this Toolbox. The Tools build on the guidance material in MfE (2008) as well as an extensive survey of council-based reports and policies (using Auckland as an example) [see Toolbox Overview and Case Study Examples for more details]. The methods and models described in the Tools are used for demonstration purposes only. It is recognised that other methods and models are available which can be used to perform functions similar to those described here.

Table 2.1: Tools associated with the evaluation of urban drainage

Tool Name	Tool Reference	Purpose of the Tool
Climate change and urban drainage modelling – data, issues and assumptions	[Tool 2.4.1]	<p>This Tool overviews the issues and assumptions involved in urban drainage modelling. Topics covered are:</p> <ul style="list-style-type: none"> • Model choice; • Urbanisation story-lines and their representation in urban drainage models; • Spatial representation of urban drainage networks; and • Climate change (rainfall) scenarios <ul style="list-style-type: none"> ○ Adjustment of extreme rainfalls for event based

		<p>simulations.</p> <ul style="list-style-type: none"> ○ Adjustment of historical rainfall records for continuous simulation. ○ Direct input of synthetic rainfall records for continuous simulation.
Incorporating climate change into urban stormwater management: current practices	[Tool 2.4.2]	<p>This tool investigates how climate change guidance available in the region is currently being used by stormwater practitioners in Auckland Council and how they apply this guidance with respect to stormwater quantity control. The results are presented in two parts:</p> <ol style="list-style-type: none"> 1. Stormwater Practitioner Interviews 2. Regional Literature Review <p>The interviews and literature review are complementary with the opinions of practitioners shaped by their organisational experience of modelling as part of impact assessment. Note that while the focus is on stormwater, wastewater was included in the literature review. This is because wastewater overflows following heavy rainfalls are a major issue in the city and much of the work to date has been to assess the possible impacts of climate change on sanitary sewers.</p>
Climate change guidance material for urban stormwater management	[Tool 2.4.3]	<p>The purpose of this tool is to provide a stock-take of guidance material available to urban stormwater managers. The tool is split into two sections. The first is a summary of the regulatory framework relevant to stormwater management noting where climate change is addressed in relation to stormwater. The second and main section is a review of national and Auckland regional technical guidance material that can be used by practitioners to plan for possible adaption to the impacts of climate change on stormwater management.</p>
Modelling the North Shore City Council wastewater network: a case-study of potential climate change impacts	[Tool 2.4.4]	<p>This tool provides an example of a risk assessment using an existing urban drainage model of the NSCC wastewater trunk network. It presents work commissioned by NIWA that was carried out by NSCC (Lockie and Brown, 2010) using the MOUSE model of the network developed for Project CARE. As synthetic climate data were available for only one climate change projection, the study does not comply with MfE (2008) guidelines for risk assessment. None-the-less, it can provide an insight into real-world modelling applications.</p>

Linkages to risk assessment, adaptation options and decision tools	[Tool 2.4.5]	To identify the next stages in an assessment of urban drainage impacts due to climate change; particularly the assessment of risk [Tools 3.2, 3.3 and 3.5] and adaptation options [Tools 4.2, 4.3 and 4.4].
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3. References

Lockie, T. and Brown, N (2010) Potential impact of climate change on NSCC’s wastewater capital works programme. North Shore City Council Report

MfE, Ministry for the Environment (2008) Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand. 2nd Edition. Mullan B; Wratt D; Dean S; Hollis M; Allan S; Williams T, Kenny G and MfE. Ministry for the Environment, ME 870, Wellington