

Impacts of Climate Change on Urban Infrastructure & the Built Environment



A Toolbox

Tool 2.4.5: Drainage Tools – Linkages to Risk Assessment, Adaptation Options and Decision Tools

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1. Introduction

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. A critical question is what to do with this information?

Assessments of the potential impacts on infrastructure performance and capacity, such as the examples described in [Tool 2.4.2] and [Tool 2.4.4] can be used as input into a risk assessment. Such an assessment requires detailed information on what could be affected by flooding – e.g. buildings, infrastructure, and people. Following on from a risk assessment of potential hazards, work can be done on assessing adaptation options to reduce the risk. This assessment should, if possible, include some form of cost-benefit analysis. The Tools highlighted in the next section demonstrate some of these risk assessment, adaptation options and cost-benefit methodologies.

2. Linkages to Other Assessment Tools

Table 2.1 outlines the Tools in this Toolbox that can be used to build on an assessment of impacts on urban drainage under climate change. In particular, the Tools shown here demonstrate various approaches to risk assessment, identifying adaptation options, and analysing costs and benefits. It is recognised that other approaches are available which can be used to perform functions similar to those described here.

Table 2.1: Linkage Tools associated with risk assessment, adaptation options and cost-benefit

Tool Name	Tool Reference	Purpose of the Tool
Climate change risk assessment good practice	[Tool 3.1]	Provides guidance on quantifying climate change risks, the treatment of uncertainty and how to make judgements about the tolerability of risk, to support decisions about the levels of protection that would be considered sufficient and appropriate.
Subjective quantified risk assessment tool	[Tool 3.5]	Provides order-of-magnitude estimates of the consequences and risks of defined events which may be used in preliminary evaluations of high-level strategic options for adapting to climate change, amongst other things.

Overview of an option screening tool	[Tool 4.2]	The Options Screening Tool is specifically designed to assist in the identification of plausible risk reduction measures, and the short-listing of these prior to a more formal assessment of options. Options can also be screened against sustainability and other guiding principles when faced with an uncertain future.
Rapid cost/benefit evaluation of impacts and adaptation options	[Tool 4.3]	The rCBE tool is specifically designed to allow prioritisation of actions to prevent or reduce the impact of a hazard (in this case, flooding) based on the level of risk these types of event present, taking account of climate change.
Individual house flood mitigation measures - benefit/cost tool	[Tool 4.4]	Example application of the classical Benefit Cost Analysis process to explore the balance of economics versus performance of alternative building design adaptations for particular valued buildings.
Setting priorities using a multi-criteria analysis approach	[Tool 4.5]	The MCA-based tool is specifically designed to allow prioritisation of actions to prevent or mitigate the impact of hazards (in this case, landslides) based on the level of risk they present, taking account of climate change.
Policy-based (top down) decision making	[Tool 4.6]	Often resource consents are sought in areas prone to flooding. The Top-down Decision Tool will need to be applied in such circumstances. If there are many applications, leading to concern about cumulative effects, or adequacy of plan policy or other provisions, this may also lead to application of the Policy and Plan Audit Tool [Tool 1.5]
Sustainable urban drainage systems as a climate change adaptation option	[Tool 4.7]	The ability of stormwater management devices to both treat stormwater and modify flows has led to their being an increasingly common sight in Auckland's urban landscape. This tool uses used locally available guidance on climate change adaptation (MfE, 2008) and stormwater design (ARC, 2003) to investigate how device design may change over the coming decades. Possible adaptation strategies are also discussed. The devices investigated are ponds and raingardens, these devices differ in their location in the drainage network, function, level of capital expenditure and their scale of operation.

3. References

Auckland Regional Council, ARC (2003) Stormwater management devices: design guidelines manual. Second Edition, TP 10.

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.