

# **Impacts of Climate Change on Urban Infrastructure & the Built Environment**



**A Toolbox**

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## **Tool 2.2.5: Flooding Tools – Linkages to Risk Assessment, Adaptation Options and Decision Tools**

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## 1. Introduction

The Tools in Bin 2.2 of this Toolbox build on the material in MfE (2008 and 2009) and demonstrate methods that can be used to derive present-day and future levels of the sea using tidal harmonic analysis and extreme value analysis of sea level records. The assessment process can be equally applied to urban and rural environments, although the examples given are specifically for urban centres. A critical question is what to do with this information?

The coastal inundation maps and data produced 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. It should be noted that most of the worked examples presented in these Tools are based on river flood inundation, however they can equally be applied to coastal inundation.

## 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 flooding hazard 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.
Using RiskScope	[Tool 3.2]	RiskScope is a regional risk and impact assessment tool. Its primary purpose is to provide a framework in which the risk of impact to assets due to various hazards can be calculated.

Case study examples of risk assessments using RiskScape	[Tool 3.3]	This Tool demonstrates how RiskScape can be used to evaluate the impact of future flooding.
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]

### 3. References

MfE (2008). Coastal hazards and climate change: A guidance manual for local government in New Zealand. 2<sup>nd</sup> Edition. Revised by D. Ramsay and R. Bell (NIWA). Ministry for the Environment Publication No. ME 892, 127 pp.

MfE (2009). Preparing for coastal change: A guide for local government in New Zealand. Ministry for the Environment Publication No. ME 907, 30 pp. + 6 factsheets. <http://www.mfe.govt.nz/publications/climate/preparing-for-coastal-change-guide-for-local-govt/>