

Impacts of Climate Change on Urban Infrastructure & the Built Environment



A Toolbox

Tool 2.1: Overview of Flooding Tools

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1. Introduction

Heavy rainfall totals are expected to increase due to climate change and such increases in rainfall will impact river flooding in New Zealand. Coastal river areas will be particularly affected where sea-level rise will also affect inundation (MfE, 2010a). The Tools in Bin 2.1 of this Toolbox demonstrate a process whereby the effects of climate change on heavy rainfall can be estimated and then used as input to hydrological models to assess changes in flood flows and then to hydraulic models to assess changes to flood inundation.

2. Description of the Flooding Tools

Table 2.1 outlines the Flooding Tools in this Toolbox. The Tools build on the guidance material in MfE (2010a and b) and provide some worked examples based on the Buller River and Heathcote River case studies [see Toolbox Overview and Case Study Examples]. The specific models described in the Tools are used for demonstration purposes only. It is recognised that other models are available which can be used to perform functions similar to those described here.

Table 2.1: Tools associated with the evaluation of river flooding and climate change

Tool Name	Tool Reference	Purpose of the Tool
General guidance on climate change and flood modelling methods used in New Zealand	[Tool 2.1.1]	To summarise the MfE (2010b) climate change and flooding guide, as well as drawing from the source document (MfE, 2010a). The following sections of the MfE guide are covered: (i) choosing a method to estimate the impact of climate change on flooding; (ii) methods for estimating changes in rainfall; (iii) methods for estimating changes in flow; (iv) methods for estimating changes in inundation; and (v) implications for engineering design.
Modelling future heavy rainfall	[Tool 2.1.2]	To demonstrate methods for estimating future rainfall intensity and spatial variation taking into account the effects of climate change.
Hydrological modelling present-day and future floods	[Tool 2.1.3]	To use estimates of future heavy rainfall intensity, temporal and spatial variation [Tool 2.1.2] and estimate the corresponding river flood flows.

<p>Inundation modelling of present-day and future floods</p>	<p>[Tool 2.1.4]</p>	<p>To use estimates of river flood flows corresponding to future scenarios of heavy rainfall [Tool 2.1.3] and estimate the corresponding flood inundations. Two case study examples are presented here to demonstrate the tool: possible future flooding of the Buller River (Westport) and of the Heathcote River (Christchurch).</p>
<p>Linkages to risk assessment, adaptation options and decision tools</p>	<p>[Tool 2.1.5]</p>	<p>To identify the next stages in an assessment of flooding 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]</p>

3. References

Ministry for the Environment (2010a) *Tools for estimating the effects of climate change on flood flow: A guidance manual for local government in New Zealand.*

Woods R, Mullan AB, Smart G, Rouse H, Hollis M, McKerchar A, Ibbitt R, Dean S, and Collins D (NIWA). Prepared for Ministry for the Environment.

Ministry for the Environment (2010b) *Preparing for future flooding: A guide for local government in New Zealand.* Publication number: ME 1012.