Coastal Adaptation Decision Pathways Project (CAP)

Demonstrating Climate Change Adaptation of Interconnected Water Infrastructure

SYDNEY COASTAL COUNCILS GROUP

Project Factsheet November 2012

The Sydney Coastal Councils Group (SCCG) project *"Demonstrating Climate Change Adaptation of Interconnected Water Infrastructure"* provides simple, practical guidance to ensure that water infrastructure managers are able to implement appropriate asset management approaches to plan for and address the potential challenges of a changing climate. Sydney Coastal Councils Group (SCCG) collaborated with Sydney Water (SWC), and the NSW Office of Environment and Heritage (OEH) in developing this project.

INTRODUCTION

Climate change may pose significant challenges to the practices and strategies of organisations who manage water infrastructure. Projected changes, including altered rainfall patterns, sea level rise, and the potential for increased storm intensity will require managers to re-assess standards, maintenance, construction and expenditure over infrastructure life cycles.

Given this need, the project:

- Demonstrated effective adaptation strategies to address direct and indirect impacts of climate change in situations where there are challenges due to interconnected infrastructure
- Produced guidance and frameworks that assist asset managers mitigate the impacts of climate change on water infrastructure.

METHODS

The project adopted a case study approach to develop appropriate guidance through consideration of real-world scenarios. Five case studies were used to explore particular aspects of adaptation to climate change impacts on interconnected water infrastructure.

The following underlying assumptions frame the case study approach:

- each case has individual characteristics
- some characteristics from each case study would be transferable, therefore
- greatest learning would be achieved by investigating the *different* circumstances of *more* case studies.

KEY OUTPUTS

The main project outputs include:

Part 1 – Overview: the general objectives and the issues and challenges facing interconnected water infrastructure managers in the context of climate change and in introduction to the Framework for developing and implementing adaptation options.

Part 2 – User Guide: an explanation as to how to apply the Framework

Part 3 – Interactive PDF (iPDF) tool: A tool that leads users through the Framework process.

Part 4 – Case Studies: details of how the approach was adopted on each of the five case studies and highlights lessons learnt.

THE FRAMEWORK

The Climate Change Adaptation Decision Making Framework developed in this project is a six step process (see Figure 1) that supports infrastructure managers, asset owners and council officers when considering climate change adaptation pathways. It is applicable across a broad range of situations:

- Where decision makers have no existing strategies and limited or no understanding of the implications of climate change on their assets, environment or community
- Where decision makers have already undertaken significant work, have an in depth understanding of climate change problems and may have already implemented adaptation options. For these decision makers, the guide will build upon the work already done, encourage decision makers to revisit the problem to potentially broaden the scope of their focus and identify gaps in their knowledge.

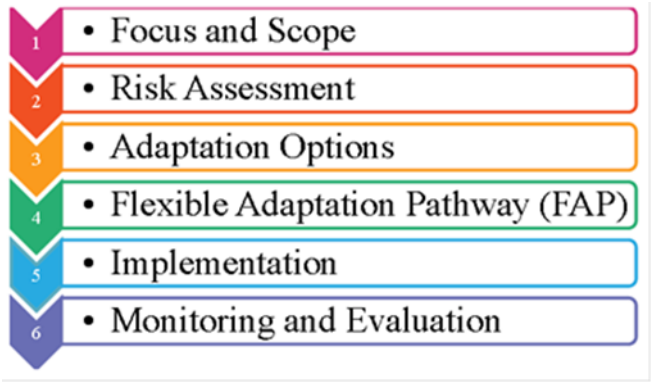

Figure 1 the Framework outline

A key aspect of this six-step framework is its iterative nature allowing the project team to return to previous stages and broaden or refine the project depending on information available.

USER GUIDE

The User Guide provides straightforward practical advice to aid decision making related to climate change adaptation of interconnected water infrastructure. It takes users through the decision-making Framework, helping to break the complex problem into parts and progress through each of the stages, even where there is incomplete data and information.

The approach is instructive, based on a simple layout with clear steps, and ways to assess progress with step-by-step guidance including:

- The inputs required before starting
- The relevant tools and approaches,
- Who should be involved, and when
- The outputs that should be produced at each stage
- A checklist before proceeding to the next stage
- Tips and 'watch-its' (Figure 2)

This icon represents a key finding from the case studies undertaken as part of this study.

This icon represents a 'watch-it' or warning which was identified during the case study.

This icon represents a point to review or return to previous stages based on new information.

This icon represents a link to information in the iPDF.

This icon signifies that monitoring and evaluation is required.

Figure 2 Tips and "watch its"

INTERACTIVE PDF

The interactive PDF (iPDF) complements the user guide and helps water infrastructure providers in decision-making for adaptation of interconnected water infrastructure via the six-stage decision-making framework. The opening page (Figure 3) shows the layout of the document with the navigation bar on the right hand legend allowing movement through the document (using hyperlinks to both internal pages and external resources) from any point.

The contents of the iPDF mirror the contents and format of the User Guide. The tools use a common graphic and colour coding for each step.

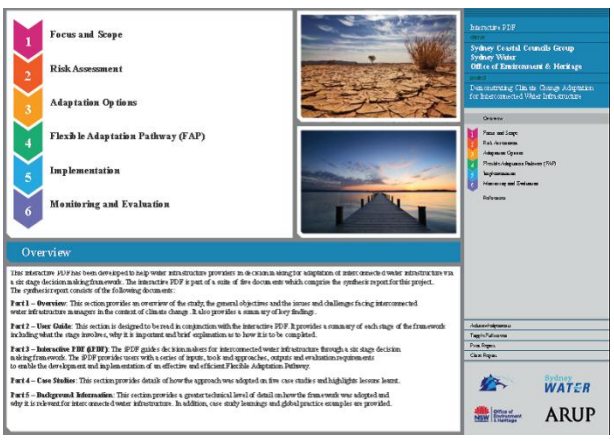

Figure 3 iPDF Opening Page

CASE STUDIES

The Case Studies, due to practical restraints of resources and time, each focused on one climate change event, and one system within the total network, and limited climate change adaptation options. The Final Report includes a discussion and explanation of how the Framework was applied and the issues that were instrumental in developing each study.

The approach of limiting impacts and parameters, if applied outside a learning environment, could result in the selection of options leading to maladaptation.

The results of the Case Studies are intended to illustrate different aspects of the development of Flexible Adaptation Pathway rather than to provide a recommended option for development.

Sydney CBD – Understanding the implications of sea level rise and tidal locking in an area of high value assets

The results of this case study demonstrated that assumptions made in a qualitative workshop need verification by analysis of data to understand the real impacts. An examination of data and the development of a simple model showed the preliminary assumptions were wrong.

The case study demonstrated, in the absence of sufficient information, the adoption of simple approximations to assist in defining the focus and scope of the problem. This approach may require a monitoring program to acquire reliable data before making a decision.

Figure 4 Flooding in Sydney CBD March 2012

Green Square – Redevelopment accommodating the impact of sea level rise on the drainage network

The Green Square case study serves as a useful example to demonstrate two key components of the adaptation framework. Firstly, it highlights the importance of the Focus and Scope stage. In particular, identifying and engaging with all the relevant stakeholders and then forming a project team to set clear objectives. This enables a clear methodology to be prepared to move the project through the stages of achieving these objectives.

Secondly, the case study also provides an example of how a project can be progressed through the adaptation framework by maximising use of only readily available data and resources. In turn, this facilitates future objectives setting by narrowing-down on the range of measures addressed, and uncertainties.

Cooks River – Improving governance arrangements to address existing and future flooding impacts

One of the major barriers within the Cooks River case study is the issue surrounding governance across the catchment, and the lack of an organisation with the particular legislative powers and funding to undertake a lead role. There is enthusiasm and desire amongst the stakeholders to manage issues more effectively on a catchment-wide basis. The Cooks River Alliance, members of which participated in these workshops, provides an example of how catchment-wide issues can be addressed by Local Government taking the initiative to promote progress.

The complexity and scale of existing and future flood risk across the catchment may also be a barrier to identifying the most appropriate course of adaptation, particularly in the context of the governance issues. The case study has shown that, by combining economic damages from a number of receptors, there is a strong financial argument for implementing additional adaptation measures, even allowing for the cost of such measures across a large and densely populated catchment. This should help provide greater confidence to enable decision-makers to approve further assessment of adaptation studies.

Figure 5 Flooding in Canterbury March 2012

Wollongong – A systems approach for interconnected coastal asset owners to adapt to coastal recession

The Wollongong LGA case study identified that the key stakeholders of WCC and SWC had each collated a good amount of data on their at-risk coastal assets. This includes information on the location and condition of assets, risk zones for different coastal zone hazards (erosion, recession and inundation) and preliminary adaptation option assessment. However this cross-stakeholder information had not been considered collectively to obtain an overall understanding of the combined asset risk from climate change effects and the applicability of different adaptation options to provide protection to each stakeholder's assets.

The participants refined the scope of the case study to something more manageable by prioritising the beaches within the Wollongong LGA in terms of vulnerability of the assets within the projected impact zone. This first-pass assessment helped narrow the focus of the assessment to the areas facing greatest risk.

The economic analysis of a vulnerable beach demonstrated that the value attributed to societal amenity (e.g. beach area, back of beach parkland) and "loss of service" costs (e.g. loss of sewerage and stormwater provision) can have a strong influence on the outcome of the results.

Berry Creek – Valuing community and ecological assets in the adaptation of interconnected water networks under multiple ownership

The Berry Creek case study demonstrates the difficulty in accurately defining the scope of the adaptation problem. This case study showed the importance of drawing on the expertise that exists within stakeholder groups to make informed judgements about the potential scope of the problem. Involving the right people early in the process was extremely important.

The inability to define accurately the scope of the problem runs the risk of inappropriate adaptation options emerging. Avoiding maladaptation requires caution in identifying adaptation options prior to the defining scope of the problem.

CONCLUSIONS

There is a range of issues facing water infrastructure managers operating within the Sydney Coastal Councils region. This study has developed guidance, which can apply to all water infrastructure managers no matter how far they have progressed in the consideration of climate change implications on their assets and the services they provide. The guidance will allow more advanced water infrastructure managers to understand the next steps and build upon work already undertaken and, perhaps more importantly, will allow other water infrastructure managers to overcome barriers and 'make a start' by beginning with focussed and manageable initial assessments.

Key learnings from the case study process, and a review of global practice, are:

- Using existing guidance:
- Importance of focus and scope:
- Value of risk assessment:
- Iteration leading to greater understanding:
- Governance as a critical barrier to resolve:
- Accessing project funding through a robust economic analysis:
- Existing climate threats require action as well as future threats:
- Financial analysis is complex and may be iterative.

FOR MORE INFORMATION:

Dr Ian Armstrong, Project Officer – Climate Change Adaptation
(02) 92885802;
ian@sydneycoastalcouncils.com.au

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Project Partners

Sydney WATER
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