

## Economic Appraisal Guidelines – Guidance on climate change for asset and infrastructure assessments

**The NSW Government Guidelines for Economic Appraisal (TPP 07-05) have been updated to provide guidance on climate change for asset and infrastructure assessments. The attachment to this circular *Guidance on Climate Change for Assets and Infrastructure Assessments* should be read in conjunction with the original economic appraisal guidelines (TPP 07-05).**

### Summary:

Supplementary material has been added to the *NSW Government Guidelines for Economic Appraisal* (TPP 07-05) providing guidance on climate change for assets and infrastructure assessments. The publication is available on NSW Treasury website [www.treasury.nsw.gov.au](http://www.treasury.nsw.gov.au)

An economic appraisal assists efficient public sector resource allocation decisions, by systematically analysing all the quantifiable and non quantifiable costs and benefits - economic, social and environmental - of various ways of meeting a service objective.

Economic appraisal (cost benefit analysis; cost effectiveness analysis) is the standard evaluation framework for resourcing decisions. It is applicable to policy evaluation and analysis of recurrent programs as well as capital projects, to assist decision making.

Agencies should contact NSW Treasury for advice on issues that should be addressed in the appraisal and to ensure smooth progress when appraisals are subsequently submitted for consideration.

Agencies are responsible for ensuring that economic appraisals are conducted in the appropriate manner and that the organisations or individuals undertaking the appraisals have relevant expertise.

Advice and guidance on economic appraisal is available from the NSW Treasury contact below. This Circular is supplementary to NSW TC 07/10.

Michael Schur  
Secretary

**Further Information:** Roger Sayers ph 02 9228 4641 or email [roger.sayers@treasury.nsw.gov.au](mailto:roger.sayers@treasury.nsw.gov.au)

NSW Treasury website : [www.treasury.nsw.gov.au](http://www.treasury.nsw.gov.au)

## Annex 5 to TPP07-05

# Economic Appraisal Guidelines - Guidance on Climate Change for Assets and Infrastructure Assessments

This Annex contains supplementary material to the *NSW Government Guidelines for Economic Appraisal*.

## Climate change

NSW has a highly varied climate which ranges from hot and semi-arid about parts of the west and north west of the State, through sub-tropical in areas of the north east, to cool temperate in the south east.

NSW has historically experienced a range of extreme weather related natural hazards such as fires, coastal storms, flooding, hail, wind, heatwaves and droughts.

However, climate change has the potential to alter the frequency, intensity and distribution of extreme weather related natural hazards, including more intense and frequent heatwaves, droughts, floods and storm surges.<sup>1</sup> (IPCC Hennessey et al 2007). The incidence of extreme natural hazards may also become more complex if different hazards (such as fire and severe thunderstorm) occur close together or concurrently.

Potential risks to public assets from climate change should be considered in the context of the guidance framework outlined here.

## Climate and weather-related risks

Government asset and infrastructure managers have a long experience in managing climate and weather risks. Climate change risk is, in many ways, an extension of current climate and weather related risks. However, climate change projections suggest that over time, adverse events may occur more often, more intensely and in different places<sup>2</sup>.

## Climate change risk for infrastructure

Climate change is one of many risks that should be taken into account by those responsible for public infrastructure. Those responsible for infrastructure are best placed to manage risks - based on best available information.

Climate change adaptation<sup>3</sup> planning and risk management is an evolving field. While it presents some unique methodological challenges, standard risk management processes are applicable. Climate change risk management should be incorporated into existing risk management frameworks, rather than considered in isolation to other risks and relevant factors.

---

<sup>1</sup> NSW DECCW has completed a biophysical assessment of projected climate change impacts to 2050 in each NSW State Plan region.

<sup>2</sup> For example climate modelling undertaken for the biophysical assessments referred to in the footnote above broadly suggests that in future, slightly more rain relative to historical experience is likely in northern NSW and relatively less rain is likely in the south of the State.

<sup>3</sup> Responses to reduce the risks of climate change broadly fall into two categories: *mitigation* and *adaptation*. Using the definitions of the Inter-governmental Panel on Climate Change (IPCC, 2007), *mitigation* aims to reduce human effects on the climate system by strategies to reduce greenhouse gas sources and emissions, and to enhance greenhouse gas sinks. *Adaptation* refers to adjustments in response to actual or anticipated climate changes or their effects, to moderate harm or to exploit beneficial opportunities. Most infrastructure decisions will relate to an adaptation response.

## Timing and impact significance

Much of the major long-lived infrastructure provided by government (either wholly or in partnership with the private sector), such as water and energy supply infrastructure, transport infrastructure, and public buildings, are potentially vulnerable to the impacts of a changing climate, including rising sea levels and possible increased frequency of severe weather events over time.

However, not all projected climatic changes are expected to occur within the same timeframe, with the same potential degrees of severity and the same degree of impact significance for assets. Many impacts will occur over lengthy periods of time, if authoritative projections are correct.<sup>45</sup>

While strategic risk management analysis and planning should be undertaken regularly, possible adaptive actions for individual assets should be considered in detail at an appropriate time depending on the urgency and significance of the potential damages from climate change.

## Climate change uncertainties

Expected timing of significant impacts is an important consideration in such decision making. While there may be scientific confidence in broad long term projections, the expected extent and timing of significant climate change impacts, to the degree of certainty to assist ready decision making, may not be possible in many cases.<sup>6</sup>

“The climate is an immensely complex system and long-term projections are inherently fallible. The current range of projections is too wide to be usefully applied by households, businesses and governments in preparing for climate change. For example, our current understanding of potential rainfall outcomes for Australia indicates a range that includes both an extreme dry outcome (10th percentile) and a wet outcome (90th percentile). There are similarly significant uncertainties in projections of sea level rise. Added to the uncertainty is the lack of certainty about when and how quickly the impacts will arrive.” (Garnaut, 2008)

While uncertainty is not an excuse for inaction, areas of uncertainty are common when making investment decisions. A decision to ‘do nothing’ may be the most appropriate course of action at a given time.<sup>7</sup> This may be related to a decision to collect further information. In other circumstances, options to build the capacity for adaptive management as information changes over time will be optimal.

Climate change uncertainty should be explicitly acknowledged and built into decision-making processes. Flexibility is a virtue in uncertain situations.

---

<sup>4</sup> Although there could well be combinations of weather related events which occur at the same time, such as rainfall, flooding, storm surge etc.

<sup>5</sup> Current international best practice for *adaptation* assessments is to adopt investment horizons up to 2050 only - “to project what is known today with greater certainty, rather than making even less reliable longer term estimates”. (World Bank 2010: “The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates”). Refer also Chapter 8 on period for analysis, and Chapter 10 on discount rates.

<sup>6</sup> If climate scientists are sufficiently comfortable with assessments of the expected timing and severity of particular climate change impacts then those data inputs should be clearly attributed to the relevant sources.

<sup>7</sup> A perceived lack of action to address potential climate change risk, may be the result of considered thought by relevant decision makers taking many factors into account, to do nothing at this stage.

## **Asset and infrastructure guidance**

Agencies are responsible for their asset and infrastructure planning.

Agencies are increasingly incorporating consideration of climate change impacts into current decision making processes, where relevant, and to the extent possible.

Potential climate change impacts on public infrastructure should be assessed as an integral part of the many factors taken into account in the economic life cycle analysis of assets.

Climate change should be addressed as part of ongoing risk management strategies for existing assets, and in decision making on new assets, rather than a discrete consideration.

Adaptation options for replacing or upgrading assets, which might also include potential emission reduction aspects, should be assessed within a standard cost benefit framework (economic appraisal of the costs and benefits of various options to achieve a service objective) in accordance with *NSW Government Guidelines for Economic Appraisal*.

- **Existing assets** – strategic risk assessments taking account of expected climate risks within relevant timeframes should be undertaken to inform decision making.

Consideration of actions to replace, upgrade, or relocate assets or infrastructure would be undertaken at the appropriate future time, supported by cost benefit analysis. This would take into account likely impact significance on asset, asset life, potential technological change in future, and assessment of continuing likely future need for the asset to meet community demand, government priorities, etc.

A strategic planning review of a specific long lived asset now might indicate a potentially significant threat in say 50 years' time, so consideration of the need for possible replacement may not need to occur until say 40 years' time. If the asset life is expected to be shorter than that, then such consideration would normally occur toward the end of the expected life of the asset. Options for staged upgrade may also be appropriate.

Assets which may presently be considered at risk from weather or climate related events should be subject to normal capital assessment processes, and Budget Committee of Cabinet approval and funding processes.

**New assets** - assessments should as far as possible take into account expected climate change impacts over the expected life of the project. Proposed responses should aim to maintain acceptable levels of risk over the life of an asset, using an evidence based approach.

Options to reduce uncertainty might include options to stage a project, deferring some capital works till potential climate change impacts become more clear in the future, or shortening the design life of a new asset.

Normal economic appraisal assessments for new projects apply.

Funding of any proposal relating to existing or new assets is, as always, a separate consideration taking account of the economic appraisal.

## Example – sea level rise

The State Government has released its sea level rise policy, based on best available scientific assessment. The Policy Statement includes sea level planning benchmarks to support consistent consideration of sea level rise in land use planning and coastal investment decision making. The adopted benchmarks are for a rise relative to 1990 mean sea levels of 40 cm by 2050 and 90 cm by 2100. The benchmarks will be subject to ongoing review.

Further information is available here:

- DECCW Guidelines

<http://www.environment.nsw.gov.au/climateChange/sealevel.htm>

- Department of Planning Guidelines

<http://www.planning.nsw.gov.au/PlansforAction/Coastalprotection/SeaLevelRisePolicy/tabid/177/Default.aspx>

Sea level rise is a gradual long term process and its potential future impacts on government assets will require considered case by case assessments by responsible agencies addressing the issue as part of their strategic planning/risk assessment framework.

Planning and management of public assets likely to be affected by long term sea level rise, taking account of expected asset life and need, might cover for example:

- upgrade of existing assets where and when justified, or undertaking relocation (including progressive relocation over time) where feasible and appropriate - for example when an asset is approaching the end of its economic life, or when potential future sea level impacts determine;
- assessing at the appropriate time through economic appraisal methods whether engineering or other works may be appropriate, including assessment of whether the particular infrastructure is expected to be relevant in 50 or 100 years (in light of technological change, changes in community needs, etc); and
- avoiding, redesigning, or upgrading future investments likely to be exposed to high risks.

## General

For adaptation of an existing asset or for assessment of a new asset, as far as possible the estimated benefits (damages avoided) should be compared with the costs of asset adaptation. Where the likely damages avoided are uncertain, as they nearly always are, they should be expressed in terms of expected damage costs avoided.

For example if there is a 1 in 20 chance of a \$10 million damage event in the year, the expected damages are  $\$10\text{m} \times 0.05 = \$0.5$  million per annum. Allowing an asset life of 50 years, in a simple case, this could be \$0.5 million for each year 1 to 50.

Using the central discount rate of 7%<sup>8</sup>, the present value (PV) of these damages avoided equals:

$$PV = \$0.5\text{m} / 1.07 + \$0.5\text{m} / 1.07^2 \dots + \$0.5\text{m} / 1.07^{50} = \$6.9 \text{ million (1)}$$

---

<sup>8</sup> Refer to Chapter 10.5

Accordingly a capital expenditure on adaptation could be justified if it is less than \$6.9 million. It would not be justified if the expenditure exceeded \$6.9 million.

Alternatively, suppose that the adaptation expenditure is \$10 million. The cost (in terms of other opportunities foregone) of implementing this in any one year is \$10 million  $\times$  0.07 = \$0.7 million.

In this case expenditure on the asset could be warranted if the expected benefits exceed \$10 million. Importantly, also, the benefits in year one should exceed \$0.7 million. This determines the appropriate timing of the project.

It is recognised that the data on possible damage costs is often not available or the damage costs are estimated subject to wide variances. However, attempted quantification supported by appropriately sourced material, is essential to rational decision making and efficient use of resources.

Attention is also drawn to the need to undertake sensitivity analysis, including for example different cost estimates and other relevant aspects - refer Chapter 12.3.1.

## Summary

Climate change is one of many considerations of those responsible for public infrastructure and assets. Climate risks should be weighed by decision makers along with other factors as normal practice.

Case by case assessments of the need for action (or inaction) at particular times on particular assets will be made by the responsible decision makers, in the context of relevant timeframes for anticipated significant impacts and the uncertainties inherent in climate projections.

## Further information

Department of Environment, Climate Change and Water for climate change information.

NSW Treasury for advice on economic appraisal.

.....

## References

IPCC: Hennessy, K., B. Fitzharris, B.C. Bates, N. Harvey, S.M. Howden, L. Hughes, J. Salinger and R. Warrick, 2007: Australia and New Zealand. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 507-540.

Garnaut, R. (2008). *The Garnaut Climate Change Review*. Cambridge University Press, Melbourne.

Department of Environment, Climate Change and Water, *NSW Sea Level Rise Policy Statement* NSW October 2009

Department of Planning, *NSW Coastal Planning Guideline: Adapting to Sea Level Rise* August 2010

World Bank *The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates* 2010