

6.12 Climate change

6.12.1 Policy setting

Climate change refers to the warming temperatures and altered climatic conditions associated with the concentration of greenhouse gases in the atmosphere. There is a need to understand climate change and the effect it could have on all existing and potential new projects and infrastructure. In NSW, responses to climate change are provided in various policy and guideline documents such as the *NSW Greenhouse Plan* (NSW Government 2005).

The Intergovernmental Panel on Climate Change produces global climate change projections. In Australia both the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology (BOM) have produced regional downscaled projections for Australia. In 2008 the NSW Government published refined climate change projections for each region in NSW. This work was carried out by researchers at the Climate Change Research Centre, University of New South Wales.

6.12.2 Existing environment

Existing climate

The Wagga Wagga area receives an average annual rainfall of 573.5 millimetres. Rainfall is spread evenly throughout the year with a maximum in October (BOM 2012).

The mean maximum temperature for Wagga Wagga is 22.1 degrees Celsius. The mean minimum temperature is nine degrees Celsius (BOM 2012).

Climate change

The former Department of Environment, Climate Change and Water (now OEH), in partnership with the Climate Change Research Centre at the University of New South Wales, developed regional climate projections for NSW based on preliminary analyses of global modelling data (DECCW 2010b). The projections have been developed for 'State Plan regions' throughout NSW. The proposal occurs in the Riverina Murray Region, which lies in the drainage basin of the Murray, Murrumbidgee and Lachlan rivers and their tributaries.

By 2050, annual rainfall in the Riverina Murray Region is projected to decrease, with a shift in pattern from winter-dominant to summer-dominant rainfall.

Winter rainfall is likely to decrease by 20 to 50 per cent. The southern parts of the region, where the proposal is located, are likely to experience the greatest reductions in winter rainfall.

By 2050, rainfall in spring and autumn is also expected to decrease, with declines of up to 50 per cent. Evaporation is projected to increase in spring and autumn, which would further reduce the availability of stored water and moisture in the soil profile.

Summer rainfall is likely to increase by between 10 and 20 per cent over most of the region, with the greatest increases occurring in the eastern Riverina and South-west Slopes, where the proposal is located.

Rainfall events are likely to become more intense, causing altered flooding regimes. However, this would be influenced by factors such as soil moisture, water levels in major water storages and the timing of rainfall events.

By 2050, daily temperatures are projected to increase by 1.5 to three degrees Celsius for all seasons. Night-time temperatures are also projected to increase, but to a lesser extent than daily temperatures.

6.12.3 Potential impacts

Potential impacts of climate change on the proposal

Fluctuations in rainfall and temperature caused by climate change are expected to be variable in nature. There is the potential for climate change to cause short-term and long-term impacts. Impacts could therefore occur during both the construction and operation phases of the proposal.

Construction

Increases in temperatures may reduce work capacity and increase the risk of heat stress for site workers.

There may be impacts to various construction activities from climate change, such as increased temperatures interfering with the laying of asphalt or concreting.

There may be an increase in extreme weather events, such as intense rainfall interfering with construction timeframes or dry, hot weather conducive to generation of dust.

Increased summer rainfall may result in increased flooding and erosion risks at the site and associated sediment loss. Potential overtopping of construction sediment basins could occur during extreme rainfall events.

Operation

Increases in temperature may affect the integrity of pavement, and other aspects of the proposal in the long-term. This may occur either directly or through evaporative changes and changes in soil moisture content and soil instability, which in the long term may impact on the foundations of structures, softening of pavements, and road rutting.

Changes in rainfall intensity may result in the following impacts in the long term:

- Increased potential for localised flooding.
- Drainage and stormwater impacts.
- Aquaplaning (cars sliding in pooled water on the road).
- Changes to flora and fauna species and distribution, including pest and weed species.
- Erosion impacts, resulting in sediment loss from the site.
- Watercourse impacts, including changes to channel structure and other characteristics resulting from changed hydrological conditions.
- Potential overtopping of sediment basins (during extreme rainfall events).

Potential impacts of the proposal on climate change

Construction

Impacts of the proposal on climate change would include the release of the following greenhouse gases as a result of the construction activities:

- Carbon dioxide may be generated from land clearing (decomposition of cleared vegetation).
- Carbon dioxide and nitrous oxide would be generated from liquid fuel use in plant and vehicles (diesel, petrol) during construction and disposal and transport of materials.
- Methane would be released from landfilling any carbon based waste, and from possible fugitive emissions from the use of natural gas.
- Various greenhouse gas emissions would be associated with the extraction and production of materials used in the construction of the road.

Operation

No significant increase in vehicle emissions is anticipated as a result of the proposal. This is because the only increase in vehicle usage resulting from the proposal would involve higher mass limit vehicles. Therefore the greenhouse gas emission changes would be low.

Roads and Maritime would regularly inspect pavement and structures along the road corridor. Maintenance activities would be undertaken as necessary. Maintenance activities would be potentially less frequent than at present. There would therefore be a negligible change in vehicle emissions resulting from maintenance activities for the proposal.

6.12.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Climate change - flooding from extreme rainfall events	<ul style="list-style-type: none"> • Detailed design, including drainage requirements, will take into consideration the effect of climate change on the proposal. 	Project manager	Pre-construction
Climate change - greenhouse emissions	<ul style="list-style-type: none"> • Investigations into opportunities for reducing greenhouse emissions during construction and operation of the proposal will be undertaken during the detailed design phase. 	Project manager	Pre-construction
Climate change - greenhouse emissions	<ul style="list-style-type: none"> • Delivery of materials with full loads will be undertaken from local suppliers where possible. • Appropriately sized construction equipment, plant and vehicles will be used. • Regular servicing of equipment will be undertaken to maintain optimal performance, and to minimise down time (which can improve overall efficiency). • The layout of access, machinery and facilities will be designed to minimise 	Project manager and contractor	Pre-construction and construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>movement and vegetation clearing.</p> <ul style="list-style-type: none"> • Investigation of alternative fuels and power sources to be used will be undertaken and implemented, where appropriate. • Energy efficiency and related carbon emissions of vehicle and plant equipment will be considered, where possible. • Material and waste supply and departure scheduling will be undertaken to optimise full loads and minimise required vehicle trips. • Minimisation of clearing of natural vegetation in the road design process will be considered and undertaken where feasible. 		