

Environment
Effects Statement

Attachment I

Sustainability approach



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Attachment I

Sustainability approach

1 Introduction

1.1 Purpose

This document is an attachment to the North East Link Environment Effects Statement (EES). This document responds to the North East Link scoping requirements that relate to sustainability and climate change by describing the approach to integrating sustainability and climate change considerations into the planning, design and delivery of North East Link.

This document draws on the work the North East Link Project (NELP) has completed to date in developing a Sustainability Strategy (in development) and a climate risk assessment undertaken by AECOM.

1.2 EES scoping requirements

The scoping requirements for North East Link specify particular matters to be investigated and documented in the EES. The requirement relating to sustainability is in Section 3.1, Section 3.3 and Section 3.8 of the scoping requirements and calls for:

- Section 3.1 – *Implications of likely effects for implementation of statutory provisions, including policy, as well as consistency with principles and objectives of ecologically sustainable development.*
- Section 3.2 – *The proposed approach to incorporate sustainability principles and practices into project procurement and delivery including consideration of economic, environmental and social impacts of goods and services over the entire lifecycle.*
- Section 3.8 – *The draft evaluation objectives identify desired outcomes in the context of key legislative and statutory policies, as well as the principles and objectives of ecologically sustainable development and environment protection, including net community benefit.*

Requirements relating to climate change in the scoping requirements include:

- *Descriptions of the existing environment and future climate change scenarios, where this is relevant to the assessment of potential effects. (Section 3.2 of scoping requirements, dot point 6).*

- Consideration of climate change risks utilising relevant standards for risk assessment (such as AS/NZS ISO 31000:2009), to evaluate the key risks associated with climate change impacts against IPCC projections and identify the proposed approach to ensure that the infrastructure will be resilient to projected changes in climate. (Section 3.3 of scoping requirements, dot point 7).
- Greenhouse gas evaluation objective: To demonstrate that the project will contribute to the need for an effective, integrated and climate change-resilient transport system that provides a wide range of travel choices for all Victorians. (Section 4.11 of the scoping requirements, evaluation objective).

1.3 Sustainability and climate change approach for North East Link

NELP is committed to achieving excellence in sustainability on North East Link. In developing NELP's approach to sustainability, a number of steps are being taken, including:

- Defining what sustainability means for North East Link (refer to Section 2.1 of this attachment).
- Understanding the legislative, policy and industry-led drivers for sustainability (refer to Section 2.1.1).
- Assessing sustainability risks and opportunities to refine the scope of the Sustainability Strategy (see Section 3.1).
- Developing sustainability themes, objectives and targets to encourage innovation (see Sections 3.1.1 and 3.1.2).
- Integrating the sustainability objectives into the design, procurement and delivery phases of North East Link through contractual arrangements, workforce participation and the design process (see Section 4).
- Creating accountability to meet objectives and targets through evaluation and reporting processes (see Section 4.5).
- Delivering climate resilient infrastructure (see Section 5).



2 Sustainability leadership

2.1 Why sustainability?

Sustainability for NELP means moving beyond a ‘business as usual’ approach to one in which we actively seek to maximise long-term benefits for the environment, our communities and our economic prosperity.

North East Link is a city-shaping project that would have a long-term influence on the urban landscape in the north-east of Melbourne. Located within seven local government areas including Banyule, Boroondara, Manningham, Nillumbik, Whitehorse, Whittlesea and Yarra, North East Link is significant in size and scale. The interests of current and future generations need to be carefully considered in the design and delivery of North East Link.

What is infrastructure sustainability?

The design and operation of infrastructure contributes to the sustainability of our cities, communities and the daily lives of individual Victorians, now and into the future.

The Infrastructure Sustainability Council Australia (ISCA) defines infrastructure sustainability as:

Infrastructure that is designed, constructed and operated to optimise environmental, social and economic outcomes of the long term.

Infrastructure sustainability is increasingly considered integral to all major infrastructure projects.

Due to the significant scale of North East Link, savings related to energy efficiency, water use, or resource use would generate substantial benefits.

The implementation of sustainable design and construction practices is becoming common practice across Australia on major infrastructure projects, as it decreases negative environmental impacts and can generate multiple positive outcomes such as community wellbeing, greater active transport choices, healthy ecosystems and enduring infrastructure.

2.1.1 Sustainability policy drivers

Sustainability is a key principle of Victoria’s legislative and policy framework which has helped drive sustainability outcomes across major transport infrastructure projects. These trends and expectations set a healthy precedent for North East Link to forge its own sustainable path, leaving lasting and positive outcomes for Melbourne communities.

The objectives, principles and requirements of Victorian legislation and policy are being integrated into the governance and delivery processes of North East Link. Key legislation relating to sustainability are described below.

The *Planning and Environment Act 1987* (Vic) establishes a framework for planning the use, development and protection of land in Victoria. Part 1 Section 4 objective 1(a) states that “the objectives of planning in Victoria are to provide for the fair, orderly, economic and sustainable use, and development of land”.

The *Transport Integration Act 2010* (Vic) requires that the development of the transport system has regard to sustainability and sustainable design. The Act has objectives and principles relevant to NELP’s sustainability approach including:

- Transport system objective for environmental sustainability and social and economic inclusion.
- Decision-making principles such as triple bottom line assessment and integrated decision-making.

The *Climate Change Act 2017* (Vic) seeks to drive a transition to a climate resilient community and net zero greenhouse gas emissions economy through managing climate change risks and taking decisive, long-term action to reduce greenhouse gas emissions.

The Melbourne metropolitan planning strategy, *Plan Melbourne 2017–2050*, envisions that Melbourne will continue to be a global city of opportunity and choice through the application of nine guiding principles, including environmental resilience and sustainability, living locally, and social and economic participation.

See Appendix A Legislation and policy table and Appendix B Industry guidelines table for further detail on the relevant policies and legislation relating to sustainability and how it has informed NELP’s approach.

All other legislation relevant to North East Link and the EES is presented in other relevant sections of the EES.

2.2 NELP Sustainability Policy

NELP recognises the ability to influence long-term sustainability outcomes is greatest in the planning stage of North East Link. A Sustainability Policy has therefore been developed early to guide the approach to sustainability across the project. The Sustainability Policy is provided on the next page.

The policy articulates NELP’s commitment to delivering enduring positive benefits for communities. To achieve this policy objective, NELP recognises the importance of engaging with our stakeholders, sharing knowledge across the industry and driving and supporting innovation.

SUSTAINABILITY POLICY

Our Vision is to achieve excellent environmental, social and economic outcomes across all phases of the North East Link Project in order to leave enduring positive benefits for communities and contribute to the future liveability of Melbourne.

To achieve this Vision, the North East Link Authority will work with our partners to:

- Use resources efficiently by embedding energy, water, material and waste reduction initiatives into the design, construction and operation of the Project;
- Protect and seek opportunities to enhance the natural environment;
- Make a positive contribution to social, cultural and community health and wellbeing;
- Facilitate opportunities for economic development, provide a skilled local workforce and promote diversity and inclusion; and
- Play a part in Victoria achieving its emission reduction targets while preparing for the challenges presented by climate change.

To give effect to this Policy, our people will:

- Be leaders in sustainability and integrate sustainability principles into planning, design, procurement and project decision making;
- Establish meaningful sustainability objectives and targets that will drive outstanding outcomes;
- Encourage and reward innovation and continuous improvement and promote new ideas and thinking;
- Listen, learn and share knowledge with stakeholders and industry peers; and
- Publicly report our performance and be accountable for meeting sustainability objectives and targets.



Duncan Elliott
Chief Executive Officer
North East Link Authority
April 2018

3 Sustainability planning

3.1 Sustainability Strategy

To achieve the vision and commitments of its Sustainability Policy for North East Link, NELP is preparing a Sustainability Strategy to articulate objectives and targets across the sustainability themes that represent the highest priority opportunities for the project.

The Sustainability Strategy will apply across all contracts for the delivery of North East Link.

3.1.1 Sustainability themes and objectives

NELP has established objectives around six key sustainability themes:

- Leadership
- Resource efficiency
- Urban ecosystems
- Communities
- Economic opportunities
- Climate change.

These themes and objectives were established based on a materiality assessment conducted in accordance with the Global Reporting Initiatives GRI 101 Foundation standard (2016).

The assessment brought together a review of the policy drivers, analysis of sustainability risks and opportunities and community engagement feedback received to date.

The themes and objectives were further mapped against the Sustainable Development Goals of the United Nations (identified in the coloured boxes below) to identify where North East Link could make a positive difference and contribute towards fulfilment of these goals.

The themes provide the framework for NELP's Sustainability Strategy and help to focus targets on key areas of risk and potential for opportunities to be realised.

A sustainability opportunities workshop with council and agency stakeholders (December 2018) further informed NELP's sustainability approach and the themes, objectives and targets that will form part of the Sustainability Strategy (note that a workshop report will be available on NELP's website).

Further detail on the themes as well as references to the related Sustainable Development Goals of the United Nations is provided below.

Theme 1 – Leadership

Achieve excellent environmental, social and economic outcomes across all phases of North East Link.

- a Seek opportunities to share knowledge and collaborate with stakeholders and industry peers
- b Use Sustainability rating tools to set benchmarks and track and report performance.

This theme is associated with NELP's commitments to strong governance and leadership in sustainability.

Key to good governance is to encourage and enable opportunities for knowledge sharing, collaboration, contribution to research and learning and innovation. This includes learning from past projects and setting benchmarks which reflect and drive continual improvement within the industry.

Use of sustainability rating tools to set benchmarks and track performance would help contribute to continuous improvement, transparency and innovation. Further discussion regarding the Infrastructure Sustainability Council of Australia's (ISCA) rating schemes is provided in Section 4.



Theme 2 – Resource efficiency

Embedding energy, water, material and waste reduction initiatives into the design, construction and operation of North East Link.

- a Reduce the use and the lifecycle impacts of all materials including concrete, asphalt and steel
- b Reduce water use and maximise the use of alternatives to potable water
- c Reduce waste and maximise the sustainable reuse of excavated material.

Given the scale of North East Link, significant resource impacts are expected. For example, cement production causes eight per cent of global carbon emissions, more than the global car fleet (BZE, 2017). Using less cement and utilising low carbon cement alternatives where possible would make a significant difference to North East Link's overall carbon footprint.

Turning waste products into a resource is an important part of using resources efficiently, and more recently there has been a significant expansion in the availability and quality of recycled materials for road building. The resource efficiency category of the ISCA rating tool promotes the concept of a circular economy approach, which means encouraging design based on the ability to continuously re-use resources to reduce the dependency on sourcing new materials.



The project will be required to minimise and appropriately manage waste and minimise potable water consumption (EPRs SCC4 and SCC5). NELP's commitment to use resources efficiently is consistent with the Victorian sustainable procurement objectives (as defined in the Victorian Social Procurement Framework) including 'project-specific requirements to use sustainable resources and to manage waste and pollution' and 'use of recycled content in construction works'. For these reasons, resource efficiency is a priority for North East Link.

Theme 3 – Urban ecosystems

Protecting and seeking opportunities to enhance the natural environment.

- a Protect and enhance biodiversity and habitat links
- b Seek opportunities to improve stormwater quality and contribute to improvements in waterway environments
- c Support local urban forest outcomes.

The Victorian Government's Biodiversity Plan, *Biodiversity 2037*, seeks to 'ensure that our natural environment is healthy, valued and actively cared for'. Thriving ecosystems provide multiple benefits to local residents and communities, including clean air, healthy waterways, shading and cooling and recreational amenity.

The project boundary would abut and include natural areas that are highly valued by the immediate community and visitors to Melbourne. These areas include the Yarra River, Bolin Bolin Billabong and the habitats of nationally and state-threatened species and communities. Due to North East Link's location near the Yarra River and Koonung Creek, the Yarra River Action Plan which seeks to protect and promote the health of the river has relevance for the project as well. Therefore, it is critical to prioritise the protection and the enhancement of the urban ecosystems when planning and constructing North East Link

To facilitate construction activities, North East Link would require the removal of indigenous and planted vegetation and trees as well as modifications to Banyule and Koonung Creeks. The assessment of ecological effects and the EPRs proposed to protect sensitive areas and minimise impacts are provided in the Ecology technical report.

Notwithstanding these potential ecological impacts, the sustainability objectives seek to maximise opportunities to enhance the natural environment such as by improving existing habitats and wildlife corridors, creating new habitat, improving habitat connectivity and embedding biodiversity outcomes into water sensitive urban design features.

Replanting programs will be implemented to replace both lost native vegetation and the canopy cover of planted trees. These programs would support the outcomes seeking to be achieved by local urban forest and biodiversity strategies.



Theme 4 – Communities

Making a positive contribution to social, cultural and community health and wellbeing.

- a Enhance open space, active transport opportunities and community facilities
- b Respect and promote cultural and historical heritage values.

Improved access to a healthy natural environment, community facilities and active transport opportunities would contribute to the health and wellbeing of communities in Melbourne's north-east. This would generate opportunities for improved social wellbeing and increased social interactions.

The communities theme seeks to maximise opportunities to improve elements such as public open space, park and ride facilities, water sensitive urban design features, and cycling and pedestrian paths that provide connections and encourage public and active transport use. This aligns with the North East Link Urban Design Strategy and looks to strengthen the shared objectives in the design goals of the project.

There would be impacts and disruption to community and recreational facilities during project construction. For this reason, NELP is actively engaging with groups associated with community facilities and clubs and councils surrounding North East Link to provide project updates and a forum for discussing potential issues. Due to the impacts on public land in Manningham and Boroodara, this engagement has also included a collaborative options assessment process with local councils, with the aim to workshop issues and opportunities and work towards a preferred option within the Bulleen Park area. For further detail on community and stakeholder engagement see Chapter 5 – Communications and engagement.

This communities theme also relates to recognising the Aboriginal cultural heritage significance of the Yarra River and the Banyule Flats. NELP seeks to meaningfully involve and engage with the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation, the Traditional Owners of the land that North East Link would pass through. This will inform place making and urban design outcomes, as detailed in the Urban Design Strategy. This aligns with the cultural principles of the Yarra River Protection Act 2017 (Vic). The active engagement with Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation for the development of the Cultural Heritage Management Plan for North East Link and consideration of heritage in the project's design will promote the protection, enhancement and promotion of cultural heritage values.



Theme 5 – Economic opportunities

Facilitating opportunities for economic development, provide a skilled local workforce and promote diversity and inclusion.

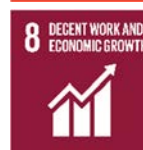
- a Achieve social value and sustainability outcomes through procurement
- b Promote sustainability capabilities within industry.

There is a growing focus on the strategic use of procurement to deliver social, economic and environmental outcomes beyond the value of the goods, services and construction being procured.

The construction of North East Link would generate significant economic opportunities. For example, labour requirements would likely generate training opportunities that could support social outcomes. Procurement activities can help support Aboriginal businesses, social enterprises and small to medium enterprises.

There would also be opportunities to promote sustainability skills and capabilities within industry, which would in turn contribute to sustainability outcomes for future Victorian construction projects.

The economic opportunities theme focuses on supporting the objectives of the *Local Jobs First Act 2003* (Vic) and the Victorian Government's Social Procurement Framework.



Theme 6 – Climate change

Playing a part in Victoria achieving its emission reduction targets while preparing for the challenges presented by climate change.

- a Reduce carbon emissions during construction and operation
- b Design to be resilient to a changing climate.

The construction and operation of North East Link would generate greenhouse gas emissions. Victoria has set an emission reduction target of net zero greenhouse gas emissions by 2050 and interim targets and sector pledges are currently being considered. The targets are given effect via Victoria's *Climate Change Act 2017* (Vic) which also requires that climate change is considered in government decision-making. For these reasons, the climate change theme is a priority for North East Link.

Embodied carbon within construction materials would be the highest contributor to North East Link's carbon footprint, followed by electricity consumption during construction and operation.



Opportunities to reduce carbon emissions will be identified and incorporated where feasible, in accordance with the Environment Performance Requirement (EPR) SCC2, which requires the project to integrate sustainable design practices into the design process to minimise, to the extent practicable, greenhouse gas emissions arising from construction and operation of North East Link. Such measures to investigate would include design optimisation to reduce the use and transport of materials, the use of construction materials with a lower carbon footprint, the use of biofuels or lower emission fuels and on-site generation and/or purchase of renewable energy. Recognising that renewable energy is rapidly improving over time, opportunities to integrate renewable energy into the design of the project, in particular into tunnel operations and the ventilation system, would be investigated.

The role that major projects, including North East Link, can play in transport sector and Victorian wide greenhouse gas mitigation (over and above minimising project related emissions) is also part of considering how the project can 'play a part in Victoria achieving its emission reduction targets while preparing for the challenges presented by climate change'. These opportunities include:

- strategically utilising procurement to create markets for and drive production in lower emission construction materials
- encouraging improvements in industry practice, including research and development, leading to emission reductions for future projects
- encouraging mode shift to active transport through investment in shared use paths
- designing for adaptability to future technological change, and in particular, greater electrification of the vehicle fleet.

In response to objective b) above, the Urban Design Strategy supports resilience by requiring that infrastructure is able to survive, adapt and perform when subjected to acute stresses and shocks such as changes in climate, technology, future fleets, road use and extreme events (Objective 4.2 Resilience and future proofing). As an example, maximising shade from canopy trees along pedestrian and cycle routes, would be part of ensuring that infrastructure can maintain functionality and amenity during heat events. Future proofing for climate change is further described in Section 5.

3.1.2 Sustainability targets

Sustainability targets for North East Link will be developed to set benchmarks for sustainability performance, aligned with the themes and objectives described above. The targets will represent a beyond 'business as usual' approach, promoting innovation and driving positive outcomes.

Sustainability targets will be informed by a review of Australian and international best practice standards. Understanding what 'good sustainability outcomes' on North East Link look like for stakeholders and the community is also an important element to setting targets.

Ownership for the sustainability targets will be clearly defined and integrated throughout North East Link's governance systems and processes. The targets will also form part of the contractual arrangements with delivery partners (see Section 4.3). This is reflected in EPR SCC1 which requires North East Link Project to set sustainability targets and specify ratings to be achieved under the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability Rating Tool. Contractors must develop and implement a Sustainability Management Plan that contains measures to meet, as a minimum, the sustainability targets and the specified ratings.

The sustainability targets will be developed based on testing the feasibility of options with the designers, engineers and external specialists planning North East Link to encourage innovation. Qualitative and quantitative sustainability targets will be set for the project. Targets will be outcome-focused, with flexibility provided to delivery partners on how they will achieve the targets.

4 Sustainability integration

4.1 ISCA IS Rating Tool

NELP is a member of the Infrastructure Sustainability Council of Australia (ISCA), Australia's peak industry body for enabling infrastructure sustainability outcomes. ISCA's Infrastructure Sustainability Rating Tool (IS Rating Tool) is a comprehensive rating system for evaluating sustainability across the planning, design, construction and operation of infrastructure.

The IS Rating Tool provides measurable credits that drive contractors to seek innovative designs and solutions. NELP will require the use of the IS Rating Tool, set a minimum overall ISCA score, and define mandated credits to be met by contractors. These mandated credits will be informed by NELP's sustainability themes and objectives, to define credits that enable project-specific sustainability outcomes. This seeks to ensure that contractors implement opportunities that generate the greatest benefit.

The IS Rating Tool will also allow NELP and contractors to benchmark and monitor North East Link's sustainability performance across its lifecycle. An independent verifier certified by ISCA will assess and report on the sustainability performance of North East Link contractors.

The IS Rating Tool has informed the development of NELP's sustainability approach to North East Link, specifically the project-specific sustainability priorities and objectives.

Applying the IS Rating Tool to the design, construction and operation of North East Link will drive positive sustainability outcomes for the project and help drive step changes across the infrastructure industry.

4.2 Workforce culture and people

A workforce culture that promotes sustainability is a key component of NELP's sustainability approach. Employees working on North East Link will be empowered to contribute to sustainability outcomes, see sustainability as part of their role and responsibilities and share their knowledge and ideas.

To foster a positive sustainability culture, initiatives will include incorporating sustainability into staff inductions, training and development. Sustainability champions will collaborate, share knowledge and demonstrate leadership. A regular culture survey integrating questions around behaviours that drive sustainability will provide insight into influencing sustainability values, behaviours, capability and capacity within NELP and its delivery partners.

NELP is also committed to leading by example and managing the environmental impacts of office-based activities, such as travel, waste, paper and electricity use.

4.3 Contractual requirements

Sustainability will be important to the North East Link procurement process, driving sustainability behaviours and generating innovative initiatives and outcomes. The International Standard for Sustainable Procurement (ISO 20400) provides guidance on implementing sustainability in procurement.

EPR SCC1 requires contractors to develop and implement a Sustainability Management Plan that contains measures to meet, as a minimum, the sustainability targets and the specified ratings. The Sustainability Management Plan for North East Link should document arrangements for implementing the Sustainability Strategy including resourcing, personnel capabilities, monitoring and reporting requirements.

Responding to the sustainability objectives and targets of the Sustainability Strategy for North East Link will be part of the project's contractual requirements. NELP will expect contractors to possess the capabilities and resources to implement the Sustainability Strategy and demonstrate how sustainability objectives will be achieved.

The IS Rating Tool will also be embedded into the contractual requirements to reflect how sustainability performance will be benchmarked. Under the IS rating scheme, NELP will define an overall IS rating target for North East Link, combined with mandating certain levels of achievement on selected IS rating scheme credits that support the objectives. This will allow for North East Link to demonstrate sustainability performance across the program of works in a holistic manner (the overall target) while balancing focus towards those sustainability aspects most important to the project (the mandatory credits).

The overall IS rating target will evolve from an assessment of what levels of achievement are possible for the IS credits most relevant for North East Link. The target will represent the minimum performance expected for the project. This will be reflected through the contractual agreement as this will apply to all delivery partners, amended to be specific to a project area where required.

4.4 Sustainability in design

Applying ISCA's Rating Tool and developing project-specific sustainability targets will integrate sustainability into the design process for North East Link, including across design disciplines such as civil, landscape and urban design.

Sustainability is also integrated into the Urban Design Strategy for North East Link. The Urban Design Strategy uses a performance-based approach to establish the expectations of the Victorian Government for high quality, context sensitive urban design outcomes. The Urban Design Strategy sets out principles, objectives and requirements the design of North East Link must consider and respond to. Principle 4 of the Urban Design Strategy and a number of its objectives relate to sustainability including:

Principle 4 Resilience and Sustainability – Infrastructure must be sustainable, enduring and resilient to support current and future generations.

- **Objective 4.1 Enduring and durable:**

Provide a design that is enduring and functional for generations to come, is readily maintainable and will age gracefully in concept and detail, ensuring a positive built form legacy.

- **Objective 4.2 Resilience and future proofing:**

Ensure the infrastructure is able to survive, adapt and perform no matter what acute stresses and shocks may be experienced such as changes in climate, technology, future fleets, road use and extreme events.

- **Objective 4.3 Environmental sustainability:**

Optimise environmental performance and embed sustainability initiatives into the design response. This includes integrated water management, biodiversity and habitat enhancement and connections, green infrastructure provision and sustainable use of materials.



These urban design principles and objectives will inform and influence the design process for North East Link and provide a basis for evaluating proposed design solutions. Detailed requirements and benchmarks described in the Urban Design Strategy will provide more specific and technical information to inform how proponents may meet these principles and objectives. For further detail see Attachment II – Urban Design Strategy.

4.5 Evaluation and reporting

Sustainability performance across North East Link will be monitored and evaluated as the project progresses. Information and data collected through an evaluation framework and reporting process will help measure and report performance against the sustainability objectives and targets. NELP will report sustainability performance at key phases of the project, key project stakeholders and to the public.

In reporting on sustainability performance, NELP will be guided by the *Principles on open public sector information* as set by the Office of the Australian Information Commissioner (2011). These principles include public accessibility to information, engagement with the community, effective information governance, and transparency. These principles will help drive accountability on North East Link.

To facilitate a robust reporting process, NELP will draw on reporting standards and guidelines to guide content and structure. These include the Global Reporting Initiative's G4 guidelines, the IS rating scheme and International Integrated Reporting Framework (International Integrated Reporting Council, 2013). Reporting will also be structured to provide an overview of performance against the UN Sustainable Development Goals and the ten principles of the United Nations Global Compact (United Nations Global Compact, 2016).

During design and construction activities, each contractor and delivery partner will be required to share regular sustainability performance data to NELP providing a brief, focused update on progress towards objectives and targets. Sustainability performance data – a set of Key Performance Indicators (KPIs) related to the attainment of North East Link's sustainability objectives – will be clearly defined and prioritised as part of the target setting process to enable the collection, reporting and analysis of data at a project-wide level. Controls will also be put in place to help with data accuracy and completeness, and independent data verification undertaken annually.

To drive continual improvement during project delivery, NELP will work with delivery partners to regularly review sustainability performance and strengthen targets or implement corrective action as required. This will also apply to the operation of North East Link to support the evaluation and monitoring of sustainability throughout its lifecycle.

5 Climate change

5.1 Introduction

The scoping requirements for North East Link highlight the importance of considering climate change from the earliest planning phase of the project.

AECOM was engaged by NELP in 2018 to provide advice and guidance on climate risk assessment best practice and to coordinate a climate risk workshop and preliminary climate risk assessment for North East Link. The preliminary climate risk assessment has contributed to NELP's approach to assessing climate change risk and integrating climate resilience into North East Link.

Climate change risks were considered in the development of the North East Link reference project and the EES. The most material risks relate to extreme rainfall events and the impacts of flooding.

The results of the climate risk assessment have informed the integration of adaptation options into the reference project and contractual requirements for North East Link. This has consolidated the approaches to be used to manage the priority risks throughout North East Link's lifecycle.

5.2 Climate change context

NELP has steps in place so that potential impacts of climate change on North East Link are adequately understood, managed and reflected in design and management practices. The Sustainability Policy for North East Link (see Section 2.2) includes a goal to 'play a part in Victoria achieving its reduction targets while preparing for the challenges presented by climate change'.

This approach aligns with industry guidelines and recent legislation in Victoria including the *Climate Change Act 2017* (Vic) and the *Transport Integration Act 2010* (Vic) as described in Section 2.1.1. Under the Climate Change Act, from 2020 onwards five-yearly climate change strategies will outline the Victorian Government's priorities for mitigation and adaptation and complement sector-based Adaptation Action Plans (AAPs). Other key Victorian Government initiatives that respond to climate change include the Victorian Climate Change Framework and Victoria's Climate Change Adaptation Plan 2017-2020. The Climate Change Adaptation Plan outlines the key issues for building the resilience of the transport system. These issues relate mainly to maintaining safe, reliable and efficient transport by:

- Building resilient transport infrastructure to enable the network to cope with future impacts from climate change
- Managing the impacts of climate hazards on the existing network.

Informed by the Sustainability Policy and relevant legislation, North East Link would respond to climate change in two ways:

- Climate change mitigation – reducing the amount of greenhouse gas emissions to the atmosphere during construction and operation
- Climate change resilience – delivering infrastructure that is resilient to the physical impacts of climate change.

5.3 Climate change scenarios

Climate change is defined as a shift in the average climate conditions and the frequency and severity of extreme weather events, experienced over longer time scales than standard weather patterns. The Intergovernmental Panel on Climate Change (IPCC) is a scientific body set up by member governments of the United Nations to provide objective assessment reports every five years.

Historical climate data was obtained from the Bureau of Meteorology weather station at Viewbank in the vicinity of North East Link (station number 86068). The IS Rating Tool technical manual indicates that climate projections used in risk assessments should be consistent with the latest global projections by the IPCC, as published by relevant national and state agencies. The climate projections provided in this technical manual are sourced from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Bureau of Meteorology (BoM) documents *Climate Change in Australia Technical Report* and *Climate Change in Australia Southern Slopes Cluster Report* (Grose et al., 2015). These reports reflect information in the IPCC's latest report, the Fifth Assessment Report (AR5, 2014).

The future with respect to climate change is hard to predict and so the IPCC Fifth Assessment Report (AR5, 2014) developed four new scenarios for climate modelling, referred to as Representative Concentration Pathways (RCPs), replacing the Special Report on Emissions Scenarios (SRES). The RCPs present different scenarios for greenhouse gas emissions and concentrations in the atmosphere and are used to support research on the impacts and potential policy responses.

RCPs are prescribed pathways for greenhouse gas and aerosol concentrations, together with land use change, that are consistent with a set of broad climate outcomes used by the climate modelling community. The pathways are characterised by the radiative forcing produced by the end of the 21st century. Radiative forcing is the extra heat the lower atmosphere will retain as a result of additional greenhouse gases, measured in Watts per square metre (W/m²).

The greenhouse gas emissions projections from 2000 to 2100 for the four RCP scenarios are provided in Figure I-1. The figure shows the current RCP scenarios compared with the scenarios they replaced (noted by the broken lines representing B1, A1B, A2 and A1F1), the Special Report on Emissions Scenarios (SRES).

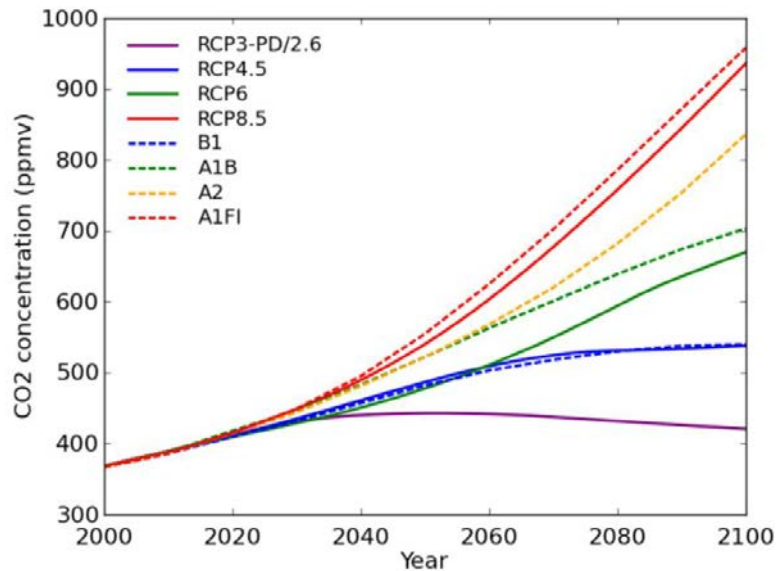


Figure I-1 Greenhouse gas emissions projections for RCP scenarios and scenarios used in the IPCC Fourth Assessment Report

The RCP8.5 projections provide a plausible upper range of how the climate may change. Recent data indicates that global greenhouse emissions are tracking in accordance with RCP8.5 (DELWP, 2015). In accordance with this, for North East Link RCP8.5, projections have been applied for assessment of risks relevant to the near term (2030) and RCP4.5 and RCP8.5 have been used for far-term assessments (2090) to reflect expected emission reductions. This is supported by latest research on climate models.

Research conducted by the CSIRO and BoM indicate the Greater Melbourne region has already become warmer and drier and the trend will likely to continue with:

- Temperatures continuing to increase year round
- Fewer frosts
- More frequent and more intense downpours
- More hot days and warm spells
- Less rainfall in winter and spring
- Harsher fire weather and longer fire seasons (DELWP, 2015).

Additionally, climate projections published in the *Climate Change in Australia Southern Slopes Cluster Report* (Grose et al., 2015) indicate:

- Increases in evapotranspiration and decrease in soil moisture
- Decreases in humidity
- Increases in solar radiation.

Climate projection data, including the range of change and the confidence in projections is provided in Appendix C.

These climate change scenarios have been considered in the development of the existing conditions and impact assessment for Technical report – Surface water, and Technical report N – Groundwater. Climate change scenarios considered in Technical report N – Groundwater informed the assessment for Technical report Q – Ecology.

Greenhouse gas emissions associated with the project are addressed in Chapter 26 – Greenhouse gas and Technical report R – Greenhouse gas.

5.4 Identifying climate variables

Climate change puts infrastructure at risk of degradation, failure and increased maintenance or replacement costs.

Climate hazards identified as having the potential to impact North East Link are:

- Increased average and extreme temperature
- Increased frequency of extreme rainfall events but decreased annual rainfall
- Increased solar radiation
- Increased bushfire risk
- Decreased soil moisture and increased evaporation
- Extreme wind and weather.

5.5 Identifying, assessing and prioritising risks

A risk assessment has been undertaken to identify potential impacts on North East Link associated with the climate variables identified in Section 5.4. The risk assessment was based on the envisaged climate change scenarios outlined in Section 5.3. An additional assessment of climate change adaptation activities during the design and operation of North East Link is also being completed specifically for the tunnel ventilation system as a part of the Works Approval (see Attachment VI – Works Approval Application for further detail).

For North East Link, the climate change risk assessment includes the assessment of the physical assets, hazards and timeframes. The risk assessment involved engaging with key disciplines within NELP to identify components to be considered and to subsequently assess potential impacts and the risk they pose.

A risk rating matrix was developed to rate climate-related risks for North East Link. Eight priority risks have been identified and are described in Table I-1. The most material risks relate to extreme rainfall and flooding.

Table I-1 Overview of climate change risks to North East Link

Risk description	Climate hazard/s
Flooding of tunnel	Extreme rainfall events
Power failure at traffic lights leading into and out of the tunnel	Extreme heat Extreme wind
Power failure in tunnel	Extreme heat Extreme wind
Flooding across the motorway and aquaplaning	Extreme rainfall events
Loss of network power supply	Extreme wind Extreme heat events
Increased degradation and wear on expansion joints, overhead assets, road surface and noise walls, increasing maintenance costs and decreasing asset life	Increased average temperature Extreme heat Extreme rainfall Extreme wind
Fire impacting the North East Link construction site and activities or the project once it is operating, causing a safety risk and damage to assets	Bushfire Extreme heat
Settlement of tunnels and reduced concrete life	Evaporation Decrease in annual rainfall

5.6 Identifying and implementing adaptation responses

Responding to climate change risks requires adaptation to reduce potential impacts. The IPCC defines adaptation as ‘the process of adjustment to actual or expected climate and its effects’ (IPCC 2014, p.118). Developing adaptation responses is an iterative process that involves:

- Deciding whether the assessed climate change risk levels are tolerable
- If they are not tolerable, planning and implementation of new adaptation options
- Identifying potential adaptation options
- Shortlisting adaptation options based on an evaluation of effectiveness and practicability
- Assessing the effectiveness of new adaptation measures when compared with the initially applied risk criteria.

Adaptation measures for North East Link have been adopted for the identified climate change risks listed in Table I-1 above. The adaptation measures are described in Table I-2. To respond to the most material risks of extreme rainfall and impacts of flooding, the impacts of climate change in all flood modelling and drainage design have been considered.

Climate change risk will continue to be assessed throughout the detailed design and construction of North East Link.

Table I-2 Adaptation measures for North East Link

Risk description	Climate hazard/s	Adaptation measure/s	Project stage
Flooding of the tunnel	Extreme rainfall events	<p>Drainage infrastructure for North East Link will be designed to allow for a sea level rise of 0.8 m by the 2100 and rainfall intensity increase of 19 per cent to represent 2100 conditions.</p> <p>For tunnel structures, a risk-based approach was used to determine the appropriate level of flood protection. The potential impact of climate change has been modelled using an increased rainfall intensity for the 1 per cent Annual Exceedance Probability (AEP) design event.</p> <p>The design has provided significant flood protection in the form of flood walls for tunnel infrastructure (that is; vent buildings, substations and other electrical and mechanical infrastructure).</p> <p>See Technical report – Surface water for further detail.</p>	Design Operation
Power failure at traffic lights leading into and out of the tunnel	Extreme heat Extreme wind	<p>It is recommended that designers consider backup power or redundancy to maintain critical systems in the event of an outage as appropriate.</p> <p>During operation, emergency management procedures and tunnel management systems would be enacted in collaboration with emergency services.</p>	Design Operation
Power failure in tunnel	Extreme heat Extreme wind	<p>During operation of the tunnel, emergency management procedures and tunnel management systems would be enacted in collaboration with emergency services.</p> <p>Power failure due to flooding has been described in the risk identified in row one above 'Flooding of the tunnel'.</p>	Design Operation

Risk description	Climate hazard/s	Adaptation measure/s	Project stage
Flooding across the motorway and aquaplaning	Extreme rainfall events	<p>The drainage infrastructure for North East Link will be designed to allow for a sea level rise of 0.8 m by 2100 and rainfall increase of 19 per cent by 2100.</p> <p>The design has been refined on the M80 Ring Road section of North East Link to manage aquaplaning.</p> <p>NELP will not be introducing additional aquaplaning on the Eastern Freeway and this will be addressed within the detailed design. The possibility of aquaplaning on the Eastern Freeway during rain events would be managed through the freeway management system including speed reduction.</p> <p>The stormwater (road surface) drainage basis of design provides a number of network drainage requirements and criteria for new roads including a pipe drainage design event of 10 per cent AEP.</p> <p>See Technical report – Surface water for further detail.</p>	Design Operation
Loss of network power supply	Extreme wind Extreme heat	The North East Link design incorporates the requirement for backup power or redundancy to maintain critical systems in the event of an outage.	Design Operation
Increased degradation and wear on expansion joints, overhead assets, road surface and noise walls, increasing maintenance costs and decreasing asset life	Increased average temperature Extreme heat Extreme rainfall Extreme wind	Material selection will consider the more extreme conditions projected for the end of North East Link's life. Material substitution and selection will also be considered as a part of whole of life costs for North East Link and in reference to the prescribed design life of the assets.	Design Construction Operation
Fire impacting the construction site or during operational phase, causing a safety risk and damage to assets	Bushfire Extreme heat	During the construction and operation of North East Link, emergency management procedures and traffic management systems would be enacted in collaboration with emergency services	Design Construction Operation
Settlement of tunnels and reduced concrete life	Evaporation Decrease in annual rainfall	The design of North East Link considers climate change projections including potential impacts of increased evaporation and reduced rainfall on groundwater conditions. See Technical Report N – Groundwater.	Design Operation

6 References

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United Nations Global Compact, www.unglobalcompact.org/what-is-gc/mission/principles, accessed March 2018.

Appendix A Legislation and policy table

Victorian government legislation, plans and strategies	
Transport Integration Act 2010	The Transport Integration Act recognises the aspirations of Victorians for an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible State. The North East Link sustainability approach is informed by the transport system objectives, such as <i>environmental sustainability</i> and <i>social and economic inclusion</i> , and decision-making principles, such as <i>triple bottom line assessment</i> and <i>integrated decision making</i> , of the Transport Integration Act.
Climate Change Act 2017	<p>The Climate Change Act aims to drive a transition to a climate-resilient community and net zero greenhouse gas emissions economy through managing climate change risks and taking decisive, long-term action to reduce greenhouse gas emissions. North East Link would act on climate change by considering climate change in decision-making and risk assessments.</p> <p>The Climate Change Act is supported by Victoria's Climate Change Framework and Victoria's Climate Adaptation Plan 2017–2020. Victoria's Climate Change Framework aims for Victoria to have an effective, integrated and climate change-resilient transport system that provides a wide range of travel choices for all Victorians.</p> <p>Victoria's Climate Adaptation Plan 2017-2020 aims to build a resilient transport system of the future by incorporating the risks and impacts of climate change into transport planning.</p>
Environment Protection Act 2017	The Environment Protection Act aims to protect Victoria's environment by setting environmental quality objectives and establishing programs to meet them. This includes the sustainable use and management of the environment. The sustainability approach for North East Link is informed by the principles of the Environment Protection Act such as <i>intergenerational equity</i> and <i>integration of economic, social and environmental considerations</i> .
Environment Effects Act 1978	The Environment Effects Act requires that assessments of large development projects are undertaken through preparation of an Environment Effects Statement (EES). The <i>Ministerial Guidelines for assessment of environmental effects</i> require that proposed works be assessed against the principles and objectives of ecologically sustainable development. The EES for North East Link will help identify the key economic, environmental and social impacts.
Aboriginal Heritage Act 2006	The Aboriginal Heritage Act provides for the protection of Aboriginal cultural heritage in Victoria through a series of objectives stated in Section 3. The sustainability approach is informed by the objectives of the Act, including the management and protection of Aboriginal cultural heritage.
Heritage Act 2017	The Heritage Act provides for the protection and conservation of cultural heritage in Victoria. The 'communities' theme is informed by the Heritage Act, considering any places or objects within project boundaries with heritage significance.
Planning and Environment Act 1987	The Planning and Environment Act establishes a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Australians. The Victorian Planning Provisions seeks to foster the objectives of planning in Victoria by integrating environmental, social and economic factors in the interests of net community benefit and sustainable development. This objective has informed the outcomes being sought in the 'communities' theme and the 'urban ecosystems' theme.

Victorian government legislation, plans and strategies	
Plan Melbourne 2017-2050	Plan Melbourne envisions that Melbourne will continue to be a global city of opportunity and choice through the application of nine guiding principles, including environmental resilience and sustainability, living locally, and social and economic participation. North East Link has specifically been identified in Plan Melbourne to improve the efficiency of Melbourne's motorway network.
Victorian Industry Participation Policy Act 2003	The Victorian Industry Participation Policy Act sets out the main objectives of the Victorian Industry Participation Policy by promoting employment and business growth for local industry, access and awareness of local industry capability, best practice in innovation, and international competitiveness. Tendering and procurement processes on North East Link will take these objectives into consideration.
Victorian Government Major Projects Skills Guarantee	The Major Projects Skills Guarantee ensures that Victorians benefit directly from the major infrastructure projects being undertaken in the state by prescribing local apprenticeships, traineeships and engineering cadets. The 'economic opportunities' theme would take into consideration the use of local apprentices, trainees or engineering cadets as per the policy document.
Victorian Social Enterprise Strategy	The Social Enterprise Strategy establishes three action areas to improve and expand on existing support for social enterprises in Victoria, with the aim to drive employment participation and inclusive economic growth. The 'economic opportunities' theme in the strategy supports the Victorian Social Enterprise Strategy by procuring from social enterprises.
Victorian Government Social Procurement Framework	<p>The Social Procurement Framework supports the Victorian Government's commitment to social procurement by generating social value through procurement activities. In addition to social procurement, sustainable procurement objectives include:</p> <ul style="list-style-type: none"> • Maximising recyclable/recovered content • Minimising waste and greenhouse gas emissions • Conserving energy and water • Minimising habitat destruction and environmental degradation • Providing non-toxic solutions. <p>Under this framework, the Victorian Government promotes sustainable practices that go beyond compliance requirements to minimise adverse environmental impact and deliver positive environmental outcomes. This framework has informed the objectives within the 'resource efficiency', 'urban ecosystems' and 'economic opportunities' themes.</p>
Yarra River Protection Act 2017, Yarra River Action Plan and Yarra Strategic Plan	<p>The Yarra River Protection Act provides for the protection of the Yarra River, recognising its connection with Traditional Owners as custodians of land and waterway. The 'Urban Ecosystems' theme would consider the Yarra River protection principles of the Act and the Yarra River Action Plan for any aspect of North East Link that could impact on the Yarra River. An exemption from the provisions of the Act applies for projects declared under the Major Transport Projects Facilitation Act 2009 (Vic) (including North East Link). However, NELP has undertaken strategic planning to consider the long-term community vision and land use framework plan within the Yarra Strategic Plan, as well as having regard to the Yarra Protection Principles set out in the Yarra River Protection Act.</p> <p>The Yarra River Action Plan outlines 30 actions to ensure the long-term protection of the Yarra River and its environs and parklands, and supports the Yarra River Protection Act.</p> <p>The Yarra Strategic Plan is currently under development, led by Melbourne Water.</p>

Victorian government legislation, plans and strategies	
Victoria State of the Environment Report 2013	The State of the Environment Report was developed by Victoria's Commissioner for Environmental Sustainability and provides information on the health of the natural environment in Victoria. Section B of the report puts forward five goals for improving environmental sustainability: resilient ecosystems, sustainable natural resources, sustainable energy, sustainable communities and understanding the environment. North East Link will take these goals into consideration.
Protecting Victoria's Environment – Biodiversity 2037	Biodiversity 2037 is the Victorian Government's plan to stop the decline of the state's biodiversity and achieve overall biodiversity improvement over the next 20 years. Biodiversity 2037 establishes a long-term vision and goals for Victoria's biodiversity. Specific targets have been developed to deliver on these goals. These goals have informed the development of North East Link's Sustainability Strategy.

Appendix B Industry guidelines table

Industry standards and guidelines	
Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability (IS) rating scheme	The ISCA IS rating scheme evaluates the sustainability initiatives and potential environment, social and economic impacts of infrastructure projects and assets. Version 2.0 of the IS rating scheme was released in 2018.
ISO 14001 Environmental Management System	ISO 14001 provides practical tools for organisations to manage their environmental responsibilities. The standard will be applied across North East Link to drive a consistent approach to environmental management.
ISO 31000 Risk Management	ISO 3100 provides principles, framework and a process for managing risk. The standard will be applied to North East Link to identify opportunities and threats and effectively allocate and use resources for risk treatment.
ISO 20400:2017 Sustainable Procurement	ISO 20400 provides guidance to organisations on integrating sustainability within procurement. The standard would be applied to North East Link to make sustainable purchasing decisions and encourage suppliers and other stakeholders to do the same.
Global Reporting Initiative	The Global Reporting Initiative provides global standards for sustainability reporting on a range of economic, environmental and social impacts. This can help inform the reporting of sustainability performance on North East Link.
International Integrated Reporting Framework (IIRF)	The IIRF provides a reporting framework designed to embed integrated thinking into organisational practice to improve financial stability and sustainability. The IIRF talks about value creation through six capitals: financial, manufactured, intellectual, human, social and relationship and natural. This can help inform the reporting of sustainability performance on North East Link.
Green Star Rating Tool	The Green Star Rating Tool assesses the sustainable design, construction and operation of buildings, fit outs and communities. This would be applied to drive sustainability in buildings constructed for North East Link.

Global drivers	
United Nations Sustainable Development Goals (SDGs)	The Sustainable Development Goals are a set of 17 globally agreed goals under the 2030 Agenda for Sustainable Development to end poverty, protect the planet and ensure prosperity for all. NELP supports the achievement of the goals and has considered them in the sustainability approach for North East Link.
United Nations Global Compact (UNGC)	The Global Compact aims to create a sustainable and inclusive global economy that delivers lasting benefits to all people, communities and markets. The 10 universal sustainability principles of the Global Compact provides a framework for demonstrating corporate commitment and leadership.

Appendix C Climate change projections

Variable	Annual historic trend	Climate change projections	RCP 8.5 2030 scenario		RCP 4.5 2090 Scenario		RCP 8.5 2090 scenario	
Weather station: Viewbank ⁶ Latitude:37.74 Degrees South Longitude:145.10 Degrees East Elevation: 66 m			Most likely – 50 th percentile (10 th – 90 th percentile)	Degree of confidence	Most likely – 50 th percentile (10 th – 90 th percentile)	Degree of confidence	Most likely – 50 th percentile (10 th – 90 th percentile)	Degree of confidence
Mean maximum daily temperature (°C) ¹	20.9	Absolute change	+0.8 (+0.6 to +1.2)	Very high model agreement on substantial increase	+1.6 (+1.1 to +2.1)	Very high model agreement on substantial increase	+3.5 (+2.5 to +4.3)	Very high model agreement on substantial increase
Mean minimum daily temperature (°C) ¹	9.9	Absolute change	+0.8 (+0.5 to +1.1)	Very high model agreement on substantial increase	+1.4 (+1 to +1.8)	Very high model agreement on substantial increase	+2.9 (+2.4 to +3.8)	Very high model agreement on substantial increase
Mean number days above 35 °C (Melbourne) ²	14.2	Absolute change	13 (12 to 15) (RCP 4.5)	n/a	+16 (+15 to +20)	Very high confidence that projected warming will result in more frequent, and hotter, hot days	+24 (+19 to +32)	Very high confidence that projected warming will result in more frequent, and hotter, hot days
Highest recorded temperature (°C) ³	46.7 (7 th of Feb 2009)	N/A	Very high confidence in a substantial increase in the temperature reach on the hottest days, the frequency of hot days and the duration of warm spells					

Variable	Annual historic trend	Climate change projections	RCP 8.5 2030 scenario		RCP 4.5 2090 Scenario		RCP 8.5 2090 scenario	
Severe fire danger days per year (FFDI > 50) (Melbourne) ⁴	1.0 (1995 baseline)	Absolute change	1.2	There is high confidence that climate change will result in harsher fire weather in the future. Low confidence in the magnitude of the change to fire weather	1.4	There is high confidence that climate change will result in harsher fire weather in the future. Low confidence in the magnitude of the change to fire weather	2.1	There is high confidence that climate change will result in harsher fire weather in the future. Low confidence in the magnitude of the change to fire weather
Average number of frost risk days per year ²	0.9 (1981-2010)	Absolute change	+0.6 (+0.8 to +0.4) (RCP 4.5)	High confidence in a decrease in the frequency of frost risk days	+0.2 (+0.3 to +0.1)	High confidence in a decrease in the frequency of frost risk days	0.0 (0.0 to 0.0)	High confidence in a decrease in the frequency of frost risk days
Rainfall (mm) ¹	656.3	Percentage change	-1 (-7 to +2)	High model agreement on little change	-3 (-10 to +3)	Low model agreement on the direction of change	-5 (-19 to +5)	Medium model agreement on decrease
Rainfall intensity ⁵	N/A	N/A	High confidence that the intensity of heavy rainfall events will increase in the cluster, but magnitude of change, and the time when any change may be evident against natural fluctuations, cannot be reliably projected					
Evapotranspiration (%) ¹	N/A	Percentage change	+4.3 (+2.2 to +6.1)	Very high model agreement on substantial increase	+6.9 (+4.3 to +10.1)	Very high model agreement on substantial increase	+14.4 (+9.5 to +22.2)	Very high model agreement on substantial increase
Mean 9 am relative humidity (%) ¹	75	Percentage change	-0.5 (-1.1 to 0)	High model agreement on	-0.9 (-1.7 to -0.1)	Medium model agreement on	-1.3 (-2.9 to +0.8)	High model agreement on

Environment Effects Statement

Variable	Annual historic trend	Climate change projections	RCP 8.5 2030 scenario		RCP 4.5 2090 Scenario		RCP 8.5 2090 scenario	
Mean 3 pm relative humidity (%) ¹	53	Percentage change		decrease		substantial decrease		substantial decrease
Mean 9 am wind speed (km/h) ¹	11.3	Percentage change	+0.4 (-2.1 to +2.4)	Medium model agreement on little change	-0.6 (-2.1 to +1.5)	Medium model agreement on little change	+0.3 (-2.5 to +2.9)	Medium model agreement on little change
Mean 3 pm wind speed (km/h) ¹	17.2	Percentage change						
Solar radiation (%) ¹	N/A	Percentage change	+1.3 (+0.1 to +2.4)	Medium model agreement on substantial increase	+1.9 (+0.1 to +3.5)	High model agreement on substantial increase	+3.1 (+0.3 to +6.8)	High model agreement on substantial increase
Soil moisture (%) ¹	N/A	Percentage change	-2.9 (-4.9 to -0.5)	High model agreement on substantial decrease	-3.6 (-5.9 to -0.7)	High model agreement on substantial decrease	-6.8 (-13.7 to -3.4)	High model agreement on substantial decrease

Notes

- ¹ Projection data obtained from Climate Change in Southern Slopes, CSIRO & BOM 2015. Figures obtained from Appendix, Table 1
- ² Projection data obtained from Climate Change in Australia Southern Slopes (projection for Melbourne), CSIRO & BOM 2015. Figures obtained from Box 4.3. Confidence statement sourced from pg. 4.
- ³ Qualitative projection analysis obtained from Climate Change in Australia Southern Slopes, CSIRO & BOM 2015 Introduction Hotter and more frequent hot days. Page 4
- ⁴ Baseline and projection data obtained from Climate Change in Australia Southern Slopes Cluster Report, CSIRO & BOM 2015. Figures obtained from Table 4.10.1. Fire weather is estimated using the McArthur Forest Fire Danger Index (FFDI); where FFDI exceeds 50, fire weather is deemed 'severe'. Confidence statement sourced from p 6.
- ⁵ Qualitative projection analysis obtained from Climate Change in Australia Southern Slopes, CSIRO & BOM 2015 sourced from p 4.
- ⁶ Annual historic trend data obtained from Viewbank Weather Station (Site number 086068). Data available at <www.bom.gov.au/climate/averages/tables/cw_086068.shtml>, accessed April 23 2018