

# Climate Change Resilience

## Resilient

**Credit: 16**

**Points: 1**

## Outcome

The building has been built to respond to the direct and indirect impacts of climate change.

## Criteria

|                            |                |  |
|----------------------------|----------------|--|
| <b>Minimum Expectation</b> | <b>Nil</b>     | <ul style="list-style-type: none"> <li>The project team completes the climate change pre-screening checklist. The project team must communicate the building's exposure to climate change hazards, and any identified risks to the client/building owner.</li> </ul>   |
| <b>Credit Achievement</b>  | <b>1 Point</b> | <p>In addition to the <i>Minimum Expectation</i>:</p> <ul style="list-style-type: none"> <li>A project-specific Climate Change Risk Assessment has been developed and implemented in accordance with a recognised standard.</li> <li>A Climate Adaptation Plan has been developed and implemented, including solutions for the building design and construction that specifically address key risks identified in the Climate Change Risk Assessment.</li> </ul> |

## Additional information

### Stage implementation

| Strategy | Brief | Concept | Design | Tender | Construction | Handover | Use |
|----------|-------|---------|--------|--------|--------------|----------|-----|
|----------|-------|---------|--------|--------|--------------|----------|-----|

### Synergies with other credits

- Energy Use
- Lifecycle Impacts
- Operations Resilience
- Community Resilience
- Contribution to Place
- Impacts to Nature

### Sustainable Development Goals

- Goal 11 (Sustainable Cities and Communities)
- Goal 13 (Climate Action)

### Relevant reporting initiatives

- GRESB
- TCFD

## Requirements

### Minimum Expectation

The project must comply with the following criteria:

- Climate Change Pre-screening Checklist

### Climate Change Pre-screening Checklist

Project team members must consider potential impacts from climate change when completing the checklist in the submission form including, but not limited to:

- Direct damage or failure of project components
- Accelerated deterioration of project components or reduced design life
- Reduced operating capacity
- Climate hazard impacts to surrounding areas (e.g., impacting access and egress)
- Impacts to the health and wellbeing of building occupants and other relevant stakeholders
- Indirect risks from impacts to other interdependent systems and services (e.g., transport networks, power, water, telecommunications)

Both historic and future climate and hazard data (refer section 'Sourcing Climate Change Projections') should be used when completing the checklist. All rows and columns must be completed prior to detailed design. The Minimum Expectation is achieved on completion of the checklist and does not require identified risks to be treated.

The checklist must be signed off by a member of the project team and shared with key project stakeholders, including the client/building owner.

If the Credit Achievement for this credit is met, the requirement to complete the Climate Change Pre-screening Checklist is considered to have been met.

### Climate Change Pre-screening Checklist

| Criteria  | Criteria response<br>[Yes/No] | Criteria<br>[If answered yes, provide further explanation] |
|---|-------------------------------|--|
| Have future climate change projections for the project location been reviewed based on relevant national or local climate projections?                            |                               |  |
| Has the project area been impacted previously by extreme climate events? Please indicate which events.  |                               |  |
| Is the project located in or adjacent to a flood plain or flood prone area?   |                               |  |
| Is the project located adjacent to the coastline, tidally influenced waterway or within an area with potential for high or tidally influenced groundwater levels? |                               |  |

| Criteria  | Criteria response<br>[Yes/No] | Criteria<br>[If answered yes, provide further explanation] |
|---|-------------------------------|--|
| Is the project located in an area with potential bushfire risk?   |                               |  |
| Have risks to the building elements, operation or occupants been identified?  |                               |  |
| Have adaptation options been identified for any key risks? If yes, please describe design or operational measure.   |                               |  |
| Will the project accommodate occupants who may be vulnerable to the impacts of climate extremes? (e.g., children, elderly, low mobility, seeking medical treatment). Please indicate potential groups of vulnerable occupants and which hazards they are likely to be exposed to. |                               |  |
| In relation to maladaptation, are there examples in the area where specific design solutions have resulted in increased vulnerability to climate-related risks?   |                               |  |

\* Consider potential impacts from climate change including, but not limited to: Direct damage or failure of building elements or components; accelerated deterioration of building elements/components or reduced design life; reduced operating capacity; climate hazard impacts to surrounding areas (e.g. impacting access and egress); impacts to the health and wellbeing of building occupants and other relevant stakeholders; and indirect risks from impacts to other interdependent systems and services (e.g. transport networks, power, water, telecommunications).

## Credit Achievement

The project must comply with the following criteria:

- Climate Change Risk and Adaptation Assessment and Adaptation Plan

## Climate Change Risk Assessment and Adaptation Plan

The Climate Change Risk Assessment and Climate Adaptation Plan should be completed and implemented prior to detailed design at the latest.

### Climate Change Risk Assessment

A suitably qualified professional (see Definitions) must undertake the Climate Change Risk Assessment based on a recognised approach. The Climate Change Risk Assessment must contain, as a minimum, the following information:

- Summary of the project's characteristics (site, location, climatic characteristics).
- Summary of locally relevant climate change projections and associated hazards. It is recommended that at a minimum project teams should use the Representative Concentration Pathway (RCP) 8.5 as specified in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report or any newer version, at two time horizons (e.g., 2050 and 2100) that are relevant to the project's anticipated lifespan (Development of the Climate Adaptation Plan). These projections should consider a range of climate-related hazards including, but not limited to:
  - Sea level and coastal inundation;
  - Increase rainfall and flooding;
  - Solar radiation;
  - Temperature increase (including heat island effect);

- Water or moisture ingress;
  - Extreme weather conditions - wind and storms;
  - Subsidence or ground movement;
  - Groundwater rise and potential for increased liquefaction vulnerability; and
  - Increase potential for fire weather and drought.
- Identification of the potential risks to the building, its operation, site infrastructure, dependant infrastructure, landscaping, and occupants. The risk assessment should consider a range of risk elements including, but not limited to those listed below.

**Risk elements**

**Further information**

Building envelope and building structure (e.g., cladding, glazing and roof)

Exposed building elements should be designed to limit direct damage, failure or accelerated deterioration, such as fading, distortion, corrosion, rotting and salt crystallisation. This can thereby reduce the frequency of replacements, repairs and maintenance through the lifecycle of the building.

Site infrastructure (e.g., stormwater, wastewater systems)

Site infrastructure (including wastewater and stormwater systems) should be designed to accommodate future climatic projections and not exacerbate any downstream or offsite impacts (e.g., stormwater pipes with capacity designed for predicted future flows).

Flood resilience (e.g., pluvial, fluvial or coastal flood risk)

Climate change is expected to increase the risk of flooding. Buildings that are within areas considered to be at high risk from flooding must build ground floor heights and access levels above the predicted flood levels. Project teams are required to consider local flood plains, coastal inundation zones which have been modelled based on RCP8.5 for relevant time horizons. Note, surface water management is important in reducing localised flooding and can be achieved by attenuation of run-off with green open space and green roofs.

Building operating systems (e.g., electrics, power and telecommunications, specialised electronic equipment)

Systems need to be designed to reliably operate in a more extreme and volatile climate.

Occupants

Project teams are required to demonstrate that the indoor environment is designed for appropriate thermal comfort (for occupants) using RCP8.5 and demonstrate that recommended operating temperatures can be achieved in the required future times horizons.

Landscaping/external space (e.g., heat island effect)

Project teams are required to assess climate impacts on any vegetated areas, green roofs and vegetated walls etc. Designs should enable airflow throughout the development, shaded public spaces and footpaths, external finishes that are designed to avoid heat absorption, site layout/orientation to maximise microclimatic cooling and interconnection of green spaces/corridors.

Dependant infrastructure

Project teams should assess indirect risks due to failure/damage to interdependent systems and services (e.g., transport networks, power, water, telecommunications).

- When identifying risks to the above elements, consider the following potential impacts:
  - Direct damage or failure of building elements or components, or infrastructure;
  - Durability or potential for accelerated deterioration of elements/components/ infrastructure or reduced design life;
  - Reduced operating capacity;
  - Climate hazard impacts to surrounding areas (e.g., impacting access and egress);

- Impacts to the health and wellbeing of building occupants and other relevant stakeholders; and
- Indirect impacts relating to other interdependent systems and services (e.g., failure/damage of transport networks, power, water, telecommunications).
- Based on the chosen risk assessment method, define and document this and the associated input tables / matrices used for the assessment (e.g., exposure and vulnerability, or likelihood and consequence).
- Assess risks in consultation with multidisciplinary representatives from within the project team, and relevant external stakeholders.
- Develop a risk register of risks to the building and related elements (see table above), capturing risk ratings, justifications for ratings, and related treatment options for 'high' and 'extreme' risks.
- Communicate the results of the assessment to the leads of all design disciplines.

### Sourcing Climate Change Projections

Prior to undertaking the assessment, climate change projections must be sourced for agreed RCP scenarios. It is recommended that, at a minimum, RCP 8.5 is used. The following should be considered:

- National Projections: The National Institute of Water and Atmospheric Research (NIWA) has developed a report detailing climate change projections for New Zealand, and a summary of the likely impacts. Link [here](#).
- Local Climate Projections: A number of Councils in NZ have developed regionally specific downscaled climate projections. Refer relevant Council websites for these. Use these local projects if available.
- High Intensity Rainfall Design System (HIRDS) rainfall data. The HIRDS has been developed by NIWA and contains rainfall data for a range of Annual Recurrence Interval (ARI) events, durations, RCP scenarios and time horizons. Link [here](#).

The project must justify the selection of the climate change projections and RCP scenario used (noting RCP 8.5 as a minimum should be used).

### Recognised Risk Assessment Approaches

For the purposes of this credit, the following approaches can be utilised to undertake the risk assessment:

- Ministry for Environment 2021: A Guide to Local Climate Change Risk Assessments. This guide was developed in alignment with the National Climate Change Risk Assessment (NCCRA) to enable local level risk assessments to be undertaken. The risk assessment methodology is based on an assessment of exposure, sensitivity and adaptive capacity. Link [here](#).
- Australian Standard 5334:2013 Climate change adaptation for settlements and infrastructure - A risk based approach. The risk assessment used in this guide is based on an assessment of likelihood and consequence. Link [here](#).
- Australian Greenhouse Office 2006 Climate Change Risks and Impacts: A Guide for Government and Business. The risk assessment used in this guide is based on an assessment of likelihood and consequence. Link [here](#).

Should project teams wish to demonstrate compliance using an equivalent alternate standard or framework, a Technical Question may be submitted to the NZGBC to confirm equivalency.

### Development of the Climate Adaptation Plan

A Climate Adaptation Plan outlines the responses to identified priority risks, or in other words, how resilience can be improved. Examples of approaches to improving adaptation / resilience include<sup>1</sup>:

- Resistance: Preventing damage or disruption by providing the strength or protection to resist the hazard or its primary impact.
- Reliability: The asset or systems are designed to operate under a range of set conditions and hence mitigate damage or loss from an event.
- Redundancy: The availability of backup installations or spare capacity to enable operations to be switched or diverted to alternative parts of the system in the event of disruption to ensure continuity of service.
- Response and recovery: Enabling a fast and effective response to and recovery from disruptive events.

A suitably qualified professional (see definitions below) must develop a project-specific Climate Adaptation Plan and it must contain as a minimum the following information:

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<sup>1</sup> BRE Global: Encouraging resilient assets using BREEAM

- The Climate Change Risk Assessment described in the Climate Change Risk Assessment section above;
- A risk register of all potential risks identified to the building, its operation, and occupants; and
- Specific adaptation design responses for all risks identified as 'high' or 'extreme', and associated responsibilities for action.
- Governance strategies to ensure the implementation of design specific adaptation measures are delivered upon.
- Details of stakeholder consultation that was undertaken during preparation of the Climate Adaptation Plan and how the issues raised have been incorporated.

If no 'high' or 'extreme' risks are identified, then this would indicate the build/project has been designed to an appropriate standard of climate resilience. The justifications for risk ratings should be captured and this will provide the necessary evidence required for this credit. In this instance, no adaptation design responses will be required.

## Submission content

### Submissions for this credit must contain:

- **Submission form**
- **Evidence** to support claims made in the submission

### Recommended evidence:

- Climate Change Risk Assessment and Adaptation Plan, including; local climate change projections, risk assessment criteria. Risk matrix, RCP and time horizon assumptions, any other assumptions significant in the development of the assessment, summary of key risks and adaptation responses.
- Climate Change Risk database / register.
- Evidence of the adaptation responses being incorporated into the project design.
- CV of the professional that developed the Climate Adaptation Plan.
- Drawings and specifications demonstrating design responses to the Climate Adaptation Plan.
- Commissioning report or other technical document demonstrating design responses to the Climate Adaptation Plan.

Alternate documentation can also be used by project teams to demonstrate compliance.

The recommended evidence listed above is applicable to the as built submission. See the *Design Assessment* section in the Introduction for more information on submitting evidence for the Design assessment.

The key requirement is that evidence is provided to support each claim made within the Submission form.

## Guidance

### Staging

The Climate Change Risk Assessment should be undertaken as early during the project's design phase as possible, such as in the concept or preliminary design phase, to allow maximum benefit and opportunity to inform design decisions and implement appropriate and meaningful adaptation responses.

### Resilience

Resilience should be seen as a risk management mechanism, where the physical climate change risks are identified and mitigated, and adaptation measures are implemented. This process may decrease compliance risks and potential insurance costs. Assessing and identifying the risks early is critical, and it should involve assessing their potential impact to building and site elements, building systems, interdependent infrastructure, and occupants (BRE Global: Encouraging resilient assets using BREEAM).

### Risk Assessment

Priority should be given to incorporate enterprise risk management or project-specific risk assessment criteria to enable climate change risks to be incorporated into the project's broader risk management processes.

### Relevant External Stakeholders

Examples of relevant external stakeholders include known tenants, government officials, emergency services, and utilities, or as determined by the Suitably Qualified Professional.

### Base building vs Tenant Scope

By undertaking the Climate Change Risk Assessment during project design, opportunities to incorporate adaptation responses in the base building can be maximised, thereby improving the resilience of the building for tenant use. Additional non-physical adaptation responses, including emergency management plans and information on how to cope during extreme climate events, should be communicated to tenants and used to inform relevant tenant agreements (e.g., agreements with tenants to mandate use of blinds and shading to reduce thermal load, reduce energy consumption and reuse water to reduce reliance on mains supply).

## Definitions

### Climate Change

A change in the state of the climate that can be identified (e.g., through statistical tests) by changes or trends in the mean and/or the variability of its properties, and that persists for an extended period, typically decades to centuries. Climate change may be due to natural internal climate processes or external forcings such as variations in solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014a).

### Hazard

The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC, 2014a).

### Maladaptation

Maladaptation refers to actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished well are, now or in the future. Most often, maladaptation is an unintended consequence (IPCC, 2014a).

### Representative Concentration Pathway (RCP)

A suite of four future scenarios of additional radiative heat forcing at the Earth's surface by 2100 (in Watts per square metre), which is the net change in the balance between incoming solar radiation and outgoing energy radiated back up in the atmosphere. These include RCPs 2.6, 4.5, 6 and 8.5. Each RCP can be expressed as a greenhouse gas concentration (not emissions) trajectory adopted by the IPCC for its Fifth Assessment Report (AR5) in 2014 (IPCC, 2014a).

### Risk

The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems.

### Resilience

The capacity of built assets and infrastructure to endure acute shocks and chronic stresses while successfully adapting to long term changes (BREEAM).

### Suitably qualified professional

A suitably qualified professional is required to develop a project-specific Climate Change Risk Assessment and develop a project-specific Climate Change Adaptation Plan. For the purposes of this credit, a suitably qualified professional is defined as someone in a relevant field such as Environmental Science, Environmental Engineering, Planning or similar qualification, with at least three years' **practical** experience in climate change risk assessments, or an individual supervised by a suitably qualified practitioner or a Business with verified practitioner capability.

## Supporting information

The following resources support this credit:

- AS 5334-2013 Climate Change Adaptation for Settlements and Infrastructure – A risk based approach

- Australian Greenhouse Office (AGO), Climate Change Impacts & Risk Management: A Guide for Business and Government 2006, <https://www.environment.gov.au/system/files/resources/21c04298-db93-47a6-a6b0-eaaaae9ef8e4/files/risk-management.pdf>
- Environment Design Guide (EDG) 66 MSa 2011 – Climate Change Adaptation for Building Designers: An Introduction, ap-nid72346.pdf
- ISO 31000-2009 – Risk Management – Principles and Guidance
- New Zealand's Framework for Adapting to Climate Change, INFO 723, August 2014 [www.mfe.govt.nz](http://www.mfe.govt.nz)
- Adapting to Climate Change – Lessons from Natural Hazards Planning, B.C. Glavovic, G.P. Smith (eds.), May 2014 [www.nzclimatechange.org](http://www.nzclimatechange.org) Impacts of Climate Change on Urban Infrastructure and the Built Environment: Toolbox Handbook, NIWA, MWH, GNS and BRANZ (2012) [www.niwa.co.nz](http://www.niwa.co.nz)
- Auckland Council Climate Adaptation Guidelines, Auckland Council, May 2014 [www.theplan.theaucklandplan.govt.nz](http://www.theplan.theaucklandplan.govt.nz)