

## Design Manual for Roads and Bridges



Sustainability & Environment  
Appraisal

# LA 114 Climate

(formerly New)

Version 0.0.1

## Summary

This document sets out the requirements for assessing and reporting the effects of climate on highways (climate change resilience and adaptation), and the effect on climate of greenhouse gas from construction, operation and maintenance projects.

## Application by Overseeing Organisations

Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

## Feedback and Enquiries

Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: [Standards\\_Enquiries@highwaysengland.co.uk](mailto:Standards_Enquiries@highwaysengland.co.uk)

**This is a controlled document.**

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## Latest release notes

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114	0.0.1	June 2021	Core document, Scotland NAA	Incremental change to notes and editorial updates

This release is for the publication of updated requirements in the Scotland National Application Annex only.

## Previous versions

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114	0	October 2019		

## **Foreword**

### **Publishing information**

This document is published by Highways England.

This document makes provision for requirements outlined within EU Directive 2011/92/EU as amended by 2014/52/EU 2011/92/EU [Ref 1.N] (hereafter referred to as the EIA Directive) and the Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N].

### **Contractual and legal considerations**

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

## Introduction

### Background

The UK has made commitments to tackle the root cause of climate change by reducing emissions of greenhouse gases (GHG), as well as to increase the resilience of development and infrastructure to the changing climate.

The Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N] sets a target to reduce net GHG emissions by 100% from 1990 levels by the year 2050.

The effective assessment and management of impacts on climate, as well as the effects of climate change on projects offers the opportunity to:

- 1) improve the resilience of projects to future climate conditions, such as increased risk and severity of flooding, drought, heatwaves, intense rainfall events and other extreme weather events; and
- 2) reduce the impact of projects on climate by minimising the magnitude of GHG emissions as far as possible.

### Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 6.N] apply to this document.

## Abbreviations

Abbreviation	Definition
AADT	Average Annual Daily Traffic
CO <sub>2</sub> e	Carbon dioxide equivalent
GHG	Greenhouse gas
PAS2080	Publicly Available Specification (2080): Carbon Management in Infrastructure
tCO <sub>2</sub> e	tonnes of Carbon dioxide equivalent
UKCP	United Kingdom Climate Projections

## Terms and definitions

Term	Definition
Actual data	GHG emission data derived from recorded / observed activities (rather than predicted)
Adaptive management	A process that enables uncertainty to be included in operational decision-making.
Authorities likely to be concerned	Authorities or organisations (statutory or non-statutory) that have environmental responsibilities or local and regional competences (as defined by the relevant consenting regime)
Benchmarking	Comparison of project performance against other similar projects using consistent metrics
Carbon account	The UK's net carbon emissions
Carbon budgets	UK GHG targets over defined periods of time
Carbon emissions / CO <sub>2</sub> e	Shorthand for emissions of any of the seven greenhouse gases (GHGs) that contribute to climate change NOTE 1: Definition from the Kyoto Protocol UNFCCC [Ref 7.N] NOTE 2: Carbon emissions are usually expressed as CO <sub>2</sub> e (carbon dioxide equivalent).
Climate	Long-term weather conditions prevailing over a region NOTE: Measured in terms of average precipitation, maximum and minimum seasonal temperatures, and other factors, throughout a year
Construction GHG emissions	GHG emissions associated with the construction phase of a project
Decommissioning	The act of ceasing operation of an asset to a non-active status
Disruption: national level	Closure/partial /obstruction of a strategic route restricting/preventing movement across multiple regions/counties
Disruption: regional level	Closure/partial/obstruction of a strategic route restricting/preventing movement within a region or county
Embodied carbon	Carbon (GHG) emissions associated with energy consumption and chemical processes during the extraction, transport and/or manufacture of construction materials or products NOTE: Typical embodied carbon datasets are 'cradle-to-gate' (i.e. all emissions to the point of delivery from the factory gate) and expressed in kilograms of CO <sub>2</sub> e per kilogram of product or material.
Extreme weather	A weather event which is significantly different from the average or usual weather pattern
Future baseline	An outline of the likely evolution of the current state of the environment without implementation of the project
Greenhouse gas (GHG)	A gaseous compound that absorbs infrared radiation and traps heat in the atmosphere NOTE: Greenhouse gases are usually expressed in terms of carbon dioxide equivalents (see 'carbon emissions').

(continued)

Term	Definition
H++ climate scenarios	Extreme climate change scenarios on the margins or outside of the 10th to 90th percentile range presented in the 2009 UK Climate Projections: Briefing Report UK CP18 [Ref 3.N]
Low carbon	Activities/assets which minimise carbon footprint
Material impact	An event/outcome that is a key decision making consideration
Net GHG emissions	The difference in GHG emissions between the do minimum and do something scenarios taking into consideration carbon reduction measures (i.e. mitigation measures)
Operational GHG emissions	GHG emissions associated with 1) the operation and maintenance of the asset, i.e. lighting, maintenance activities etc); and 2) users of the asset (i.e vehicle emissions)
Regional	Geographical regions in the United Kingdom Climate Projections as follows: 1) North East England; 2) North West England; 3) Yorkshire and the Humber; 4) East Midlands; 5) West Midlands; 6) East of England; 7) London; 8) South East England; 9) South West England; 10) Wales; 11) Scotland; and 12) Northern Ireland.
Resilience	The capacity of a project (or lack thereof) to withstand the adverse effects of climate change
Trans-boundary impacts	Any adverse effect on the environment resulting from human activity, the physical origin of which is situated wholly or in part within an area under the jurisdiction of another State
UKCP	The name given to the UK Climate Projections NOTE 1: provides the future climate projections and observed (historical) climate data for UK regions. NOTE 2: This will in turn be superseded by updates such as UK CP18 [Ref 3.N].
Vulnerability	The degree to which a system/asset is exposed and resilient to adverse effects of climate change

## 1. Scope

### Aspects covered

- 1.1 The requirements in this document shall be applied to the assessment, reporting and management of effects from projects on climate, along with the effects of climate on projects.
- 1.2 Environmental assessments must, as required by the EIA Directive 2011/92/EU [Ref 1.N], describe the likely significant effects of proposed projects on the environment resulting from the:
- 1) impact of the project on climate (GHG emissions); and,
  - 2) vulnerability of the project to climate change (adaptation).
- 1.3 The assessment of effects on climate shall be informed by relevant information collated by other environmental factors, notably material assets and waste.
- 1.4 The assessment of effects on climate shall be used to inform other environmental factors where appropriate.
- 1.5 The assessment of climate effects on the project shall be used to inform the assessment of project vulnerability to major accidents and disasters where appropriate.
- 1.6 An overview of the vulnerability of a project to major accidents and disasters (man-made and natural) shall be reported in environmental assessments within the description of the project.
- 1.7 Consequential changes in the predicted effects of a project on the environment as a result of major accidents and disasters shall be reported in relevant environmental topics.

### Implementation

- 1.8 This document shall be implemented forthwith on all schemes requiring an assessment of climate on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 6.N].

### Use of GG 101

- 1.9 The requirements contained in GG 101 [Ref 6.N] shall be followed in respect of activities covered by this document.

## 2. Principles and purpose

### Integration with consent procedures and planning policy

2.1 Projects shall use the assessment and design process to demonstrate their contribution to reduced GHG emissions in line with the EIA Directive 2011/92/EU [Ref 1.N] and the Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N].

*NOTE 1 The Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 10.N], sets out a target to reduce by 100% the net UK carbon account by 2050 when compared to the 1990 baseline, or the baseline of the relevant transposing national regulations.*

*NOTE 2 The assessment of GHG emissions early in the life cycle of a project offers the greatest potential for the reduction of GHGs.*

### Assessment and consultation

2.2 The assessment and reporting shall identify the scale and nature of GHG emissions across the whole project life cycle, taking into account design and mitigation measures already incorporated into the project.

2.2.1 The assessment should report on construction and operational (maintenance and user) GHG emissions.

2.3 Decommissioning associated with a proposed project shall be excluded from assessment of climate (for both impacts on climate and vulnerability of projects to climate change) due to the length of the asset operational phase.

2.3.1 The assessment of climate should report on demolition where an existing asset requires removal prior to construction of a proposed asset.

2.4 Projects shall minimise their vulnerability against the negative effects of projected climate change through appropriate design and mitigation measures.

2.5 The assessment and reporting of the effects on climate shall be undertaken in accordance with the sustainability principles outlined in GG 103 [Ref 4.N].

2.6 The assessment and reporting of the effects on climate shall be undertaken in accordance with the requirements in the four over-arching environmental assessment documents:

- 1) LA 101 [Ref 5.N] Introduction to environmental assessment;
- 2) LA 102 [Ref 9.N] Screening projects for Environmental Impact Assessment;
- 3) LA 103 [Ref 8.N] Scoping projects for environmental assessment;
- 4) LA 104 [Ref 2.N] Environmental assessment & monitoring.

2.7 The principles of PAS 2080:2016 specification on infrastructure carbon management PAS 2080 2016 [Ref 1.I] (with the exception of setting project level carbon reduction targets) shall be used to inform the assessment of projects on climate and supplement the guidance contained herein.

2.8 Where potential trans-boundary impacts are predicted, projects shall consult with the relevant planning authorities likely to be concerned.

### 3. Assessment methodology

#### Impact of projects on climate (GHG Emissions)

##### Scoping

- 3.1 The scoping assessment shall report on the likely additional and avoided GHG emissions at each life cycle stage of the project, in comparison with current and future baseline GHG emissions.
- 3.2 The scoping assessment shall report on the nature and scale of GHG emissions (positive, neutral or negative) and the likelihood of significant effects.
- 3.3 The scoping assessment shall report on the following questions to gain an understanding of the need to undertake further assessment:
- 1) are construction GHG emissions (or GHG-emitting activity), compared to the baseline scenario (i.e. when compared to GHG emissions and energy use associated with existing maintenance activities), increasing by >1%?;
  - 2) during operation, will roads meet or exceed any of the following criteria?
    - a) a change of more than 10% in AADT;
    - b) a change of more than 10% to the number of heavy duty vehicles; and
    - c) a change in daily average speed of more than 20 km/hr.
- 3.4 Where the response to one or more of the scoping assessment questions is 'yes', further assessment shall be undertaken.
- 3.5 The scoping assessment shall report on life cycle stage or sub-stages for which the GHG emissions are not likely to be significant.
- 3.5.1 The scoping assessment should address the following:
- 1) is there (or is there likely to be, within the timescales of the assessment) sufficient certainty on the availability of quantitative GHG emissions information?;
  - 2) will the availability of information allow the effects on climate resulting from GHG emissions to be assessed?
- 3.6 The scoping assessment shall identify the extent to which operational user GHG emissions are additional to the baseline in the absence of the project (do-minimum vs do-something), and the GHG emissions from traffic which are transferring from other roads in the surrounding area.
- 3.7 Where there is insufficient, reliable information for quantitative assessment for any life cycle stage of the project, a qualitative assessment of GHG emissions shall be completed in the early stages of project development.

##### Study area

- 3.8 For construction and operational maintenance, the study area shall comprise GHG emissions associated with project construction related activities/materials and their associated transport.
- 3.9 For operational road user GHG emissions, the study area shall be consistent with the affected road network defined in a project's traffic model.

##### Baseline scenario

- 3.10 The GHG emissions without the project shall be identified for the current and future baseline (do-minimum scenarios).
- 3.10.1 The boundary of the baseline GHG emissions should include current operational maintenance GHG emissions and operational user GHG emissions.
- 3.10.2 The baseline GHG emissions should be consistent with the study area outlined for the project.

**Data collection**

- 3.11 GHG emissions shall be calculated and reported for each of the project life cycle stages as required by the scope of the assessment to establish the 'do something' scenario.
- 3.11.1 Table 3.11.1 outlines the project life cycle stages and potential sources of GHG emission data that should be obtained to inform the assessment.

**Table 3.11.1 Sources and lifecycle stages for project GHG emissions**

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Examples of activity data
Construction stage	Product stage; including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Materials quantities.
	Construction process stage; including transport to/from works site and construction /installation processes.	Activities for organisations conducting construction work.	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode/distance. Area of land use change.
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.	Type and area of land subject to change in usage.
Operation ('use-stage') (to extend 60yrs in line with appraisal period)	Use of the infrastructure by the end-user (road user).	Vehicles using highways infrastructure.	Traffic count/speed by vehicle type for highway links.
	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.	Fuel/electricity consumption for vehicles, lighting and plant. Raw material quantities and transport mode/distance. Waste and arisings quantities, transport mode/distance and disposal fate.
	Land use and forestry.	Ongoing land use GHG emissions/ sequestration each year.	Type and area of land subject to change in usage. Net change in vegetation.
Opportunities for reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

**NOTE 1** The first life cycle stage is 'construction', which includes GHG emissions from the construction process and the manufacture/transport of materials.

**NOTE 2** The second life cycle stage is 'operation' which includes:

- 1) operation and maintenance, repair, replacement, refurbishment and land use changed (operational maintenance GHG emissions); and
- 2) emissions from end-users (operational user GHG emissions).

**NOTE 3** The third life cycle stage comprises opportunities to minimise production/use of GHG emissions i.e. the potential for reduction of GHG emissions through reuse and recycling during the construction of the scheme.

- 3.12 A proportionate approach shall be applied to calculating and reporting GHG emissions from changes in land use and forestry (i.e reporting only where there is likely to be a substantial change).
- 3.13 The GHG emissions calculation for the project life cycle shall be completed using an industry recognised carbon calculation tool(s) in accordance with the Overseeing Organisation requirements.
- 3.14 A proportionate approach shall be applied to capture the principal contributing factors associated with GHG emissions.
- 3.15 The assessment of projects on climate shall report the quantities of GHG emissions in metric tonnes of carbon dioxide equivalents (tCO<sub>2</sub>e).
- 3.16 An appropriate validated traffic model shall be used to estimate operational road user GHG emissions.
- 3.17 Emissions factor data for user GHG emissions shall enable assessment of the base year, opening year and design (future) year scenarios.

**Significance criteria**

- 3.18 An assessment of project GHG emissions against UK government or Overseeing Organisation carbon budgets shall be undertaken and presented as follows:

**Table 3.18 Project GHG emissions against relevant carbon budgets**

Project stage	Estimated total carbon over carbon budget (tCO <sub>2</sub> e) ('Do something' Scenario)	Net CO <sub>2</sub> project GHG emissions (tCO <sub>2</sub> e) (Do something - Do minimum)	Relevant carbon budget		
Construction					
Operation					
Total					

- 3.19 Where a project stage extends over multiple carbon budget periods, the projects GHG emissions shall be reported against each carbon budget for each project stage.

**NOTE 1** National policy states that "It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets".

**NOTE 2** In the context of NOTE 1, it is considered unlikely that projects will in isolation conclude significant effects on climate.

- 3.20 The assessment of projects on climate shall only report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets.
- 3.20.1 Where assessment conclusions indicate that there is likely to be a 'material impact' on the Government's carbon reduction targets, evidence to support this conclusion should be submitted to the Overseeing Organisation.
- 3.21 Bench marking of project performance shall be undertaken by comparing GHG emissions to other highway projects.

- 3.21.1 In comparing highways projects, GHG emissions should be normalised to take account of differences in size and scale.

### **Design and mitigation**

- 3.22 Projects shall seek to minimise GHG emissions in all cases to contribute to the UK's target for net reduction in carbon emissions.

- 3.22.1 Projects should apply and develop the following options:

- 1) avoid / prevent:
  - a) maximise potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required, and/or explore alternative lower carbon options to deliver the project objectives (i.e. shorter route options with smaller construction footprints);
  - b) identify through projects and delivery programmes opportunities to influence user GHG emissions;
- 2) reduce:
  - a) apply low carbon and/or reduced resource consumption solutions (including technologies, materials and products) to minimise resource consumption during the construction, operation, and at end of life;
- 3) remediate:
  - a) identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration.

*NOTE 1 Minimising GHG emissions through design is a core principle of the Government's Infrastructure Carbon Review and the Specification on infrastructure carbon management PAS 2080 2016 [Ref 1.I].*

*NOTE 2 Offsetting and sequestering can include measures such as adoption of renewable energy technologies or the creation of new habitats or employment of technologies with the capacity to absorb carbon.*

- 3.23 Where carbon offsetting/sequestration is employed to reduce GHG emissions, projects shall agree the long term viability of the scheme with the Overseeing Organisation.

## **Vulnerability of projects to climate change**

### **Scoping**

- 3.24 The scoping assessment shall identify whether anticipated changing climate conditions and weather events are likely to have significant adverse effects on the project (or elements of the project) during construction and operation.

*NOTE 1 Scoping will focus on identification of any likely significant climate changes and likely project exposure to these changes.*

*NOTE 2 Scoping will identify vulnerable elements of a project that require further assessment.*

### **Study area**

- 3.25 The study area for assessing a project's vulnerability to climate change shall be based on the construction footprint/project boundary (including compounds and temporary land take).

### **Baseline scenario**

- 3.26 The assessment of a project's vulnerability to climate change shall use published historical regional weather data to demonstrate the current climate impacts on a study area.

*NOTE The Met Office provides information on observed and future climate change relative to the baseline period of 1961-1990, based on the latest scientific understanding UK CP18 [Ref 3.N].*

- 3.26.1 Recent weather patterns and extreme weather events should be identified, to provide an indication of how the project will account for climate change in the immediate future i.e. during construction.

- 3.27 Historical events as a result of weather patterns and extreme weather events, i.e. landslides after heavy rainfall, shall be identified to provide an indication of past vulnerability.
- 3.28 To identify the future changes to the climate baseline, the following factors shall be identified and used in the assessment:
- 1) the life span of the project (including timescales for construction and operational life cycle stages);
  - 2) climate trends associated with the UKCP high emissions scenario (50% probability) projection (using the latest available projections);
  - 3) the environmental baseline under future projected climate conditions.

*NOTE UKCP provides probabilistic projections for the whole of the UK, at regional level and at local level UK Climate Projections.*

- 3.29 The relevant climate variables shall be identified and included in the assessment.

*NOTE UKCP includes a range of different climate variables (e.g. mean daily temperature for summer and winter, mean daily maximum temperatures for summer and mean daily minimum temperatures for winter).*

- 3.30 Assessments shall use the H++ climate scenarios to test the sensitivity of vulnerable safety critical features, to ensure that such features will not be affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections.
- 3.31 The assessment of a project's vulnerability to climate change shall take the life span of the project to be 60 years.
- 3.32 The life cycle stages being assessed shall determine the relevant period over which the projections are selected (e.g. short term 2030, medium term 2050, long term 2080), and the extent to which they will change in comparison to the baseline.
- 3.33 For projects which are expected to remain in operation beyond the last period of projections, the assessment shall continue to use the last available period for the remainder of the design life of the project.

#### **Data collection**

- 3.34 Following identification of the future climate scenarios, the project receptors within the study area which are vulnerable to climate change shall be identified as below:
- 1) the construction process (e.g. workforce, plant, machinery etc);
  - 2) the assets and their operation, maintenance and refurbishment (e.g. pavements, structures, earthworks and drainage, technology assets, etc);
  - 3) end-users (e.g. members of public, commercial operators etc).
- 3.35 The vulnerability of the project to future climate scenarios shall be identified and reported for each phase of the project life cycle.

*NOTE Examples of climate change events and associated impacts that can be assessed during construction and operation are presented in Table 3.35N (not exhaustive).*

**Table 3.35N Examples of potential climate impacts during construction and operation**

Climate event	Impact
<b>Construction</b>	
Increased frequency of extreme weather.	1) Damage, delay, health and safety impacts, increased costs.
Increased temperatures, prolonged periods of hot weather.	1) Warm and dry conditions exacerbate dust generation and dispersion, health risks to construction workers.
Increased precipitation, and intense periods of rainfall.	1) Flooding of works and soil erosion; 2) Increased risk of contamination of waterbodies; 3) Disruption to supply of materials and goods; 4) Landslides
<b>Operation</b>	
Increased precipitation, especially in Winter.	1) Flooding; 2) Water scour causing structural damage; 3) Weakening or wash-out of structural soils; 4) Change in ground water level and soil moisture.
Gales.	1) Damage from wind borne debris; 2) Additional or uneven loading of structures; 3) Disruption and potential danger to crossing users (including pedestrians and cyclists); 4) Damage to trees / landscaping.
Temperature extremes / dry periods.	1) Stress on structures and technology; 2) Stress on surfaces e.g. difficulties with maintaining required texture depth during construction and operation; 3) Challenges for maintenance regimes.

**Table 3.35N Examples of potential climate impacts during construction and operation (continued)**

Climate event	Impact
Increased sea level rise and wave height.	1) Flooding, increased corrosion potential/impact stress of structures supporting water crossings.
Increased frequency of extreme weather events.	1) Increased requirement for maintenance and Opt repair, danger to road users; 2) Increased costs.

**Significance criteria**

- 3.36 Where the climate change impact on project receptors is potentially significant, a risk assessment shall be undertaken.
- 3.37 The risk assessment shall assess the likelihood and consequence of the impact occurring to each receptor, leading to evaluation of the significance of the effect.
- 3.38 The assessment of significance shall be carried out in accordance with the following steps:
- 1) the identification of hazards and benefits;
  - 2) assessment of likelihood and consequences;
  - 3) evaluation of significance.
- 3.39 Once the climate change impacts (hazards and opportunities) have been identified, a risk assessment of those impacts on the operational phase project shall be undertaken using the following framework in Table 3.39a (likelihood categories) and Table 3.39b (measure of consequence).

**Table 3.39a Likelihood categories**

Likelihood category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very low	The event can occur once during the lifetime of the project (60 years).

**Table 3.39b Measure of consequence**

Consequence of impact	Description
Very large adverse	Operation - national level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	Operation - national level disruption to strategic route(s) lasting more than 1 day but less than 1 week or regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Operation - regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Operation - regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Operation - disruption to an isolated section of a strategic route lasting less than 1 day.

- 3.40 For the construction phase, a qualitative description of disruption risk shall be reported.

**Evaluation of significance**

- 3.41 The likelihood and consequence of each impact shall be combined in the form of a matrix to identify the significance of each impact as outlined in table 3.41.

**Table 3.41 Significance matrix**

		Measure of likelihood				
		Very low	Low	Medium	High	Very high
Measure of consequence	Very large	NS	S	S	S	S
	Large	NS	NS	S	S	S
	Moderate	NS	NS	S	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

**NOTE** NS = Not significant; S = Significant.

3.42 Significance conclusions for each impact shall be based on and incorporate confirmed design and mitigation measures.

**Design and mitigation**

3.43 The environmental assessment shall identify how the project can be adapted to protect it from future climate scenarios.

**NOTE** *Early engagement between design engineers and environmental assessment professionals is the most effective way of eliminating and reducing impacts on the project from climate, thereby reducing the need for additional / subsequent design and mitigation measures.*

3.44 Where an effect has been concluded to be significant, the design and mitigation hierarchy outlined within LA 104 [Ref 2.N] shall be re-assessed to reduce the significance of impacts to an acceptable level (not significant).

3.45 Where residual (non-significant) climate impacts have been identified in the environmental assessment, measures to manage the ongoing risks shall be identified.

## 4. Monitoring

### Impact of projects on climate

- 4.1 Quarterly GHG emission returns required on projects during the construction and operation stages shall be reported in accordance with the Overseeing Organisation's requirements.
- 4.2 Actual data provided for the GHG returns shall be evaluated to inform any ongoing monitoring of GHG emissions and also feed back into future assessment of projects during design development and planning approval.

### Vulnerability of projects to climate change

- 4.3 Once a project is operational, asset data shall be managed, maintained and monitored to ensure the project design is operating as intended.

*NOTE* Asset management measures can evolve (adaptive management) once the asset is operational as an appropriate response to climate impacts.

- 4.3.1 Where a design issue is identified, an assessment should be made to determine if corrective action is required, i.e. drainage amendments to rectify a flooding hotspot that was not anticipated at design stage.

## 5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2011/92/EU, 'Assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014'
Ref 2.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 3.N	UK Met Office. UK CP18 , ' <a href="https://www.metoffice.gov.uk">https://www.metoffice.gov.uk</a> '
Ref 4.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 5.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 6.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 7.N	United Nations. United Nations Framework Convention on Climate Change. UNFCCC, 'Kyoto Protocol'
Ref 8.N	Highways England. LA 103, 'Scoping projects for environmental assessment'
Ref 9.N	Highways England. LA 102, 'Screening projects for Environmental Impact Assessment'
Ref 10.N	The National Archives. <a href="http://legislation.gov.uk">legislation.gov.uk</a> . SI No. 1056 CCA 2008, 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'

## 6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.1	HM Treasury . Construction Leadership Council. PAS 2080, 'Carbon Management in Infrastructure' , 2016
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Sustainability & Environment  
Appraisal

## LA 114

# England National Application Annex to LA 114 Climate

Revision 0

### **Summary**

There are no specific requirements for Highways England supplementary or alternative to those given in LA 114.

### **Feedback and Enquiries**

Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: [Standards\\_Enquiries@highwaysengland.co.uk](mailto:Standards_Enquiries@highwaysengland.co.uk)

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## Design Manual for Roads and Bridges



Sustainability & Environment  
Appraisal

# LA 114

# Northern Ireland National Application Annex to LA 114 Climate

Revision 0

## Summary

There are no specific requirements for Department for Infrastructure Northern Ireland supplementary or alternative to those given in LA 114.

## Application by Overseeing Organisations

Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

## Feedback and Enquiries

Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: [Standards\\_Enquiries@highwaysengland.co.uk](mailto:Standards_Enquiries@highwaysengland.co.uk)

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0	Oct 2019	Department for Infrastructure, Northern Ireland National Application Annex to LA 114.

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Sustainability & Environment  
Appraisal

## LA 114 SNAA

# Scotland National Application Annex to LA 114 Climate

(formerly New)

Version 1.0.0

### **Summary**

This National Application Annex sets out Transport Scotland's specific requirements for the assessment and management of the impacts that road projects can have on, and experience from, climate change.

### **Feedback and Enquiries**

Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Transport Scotland team. The email address for all enquiries and feedback is: [TSSStandardsBranch@transport.gov.scot](mailto:TSSStandardsBranch@transport.gov.scot)

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## Latest release notes

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
LA 114 SNAA	1.0.0	June 2021	Scotland NAA	Change to policy, major revision, new document development

(June 2021) Transport Scotland requirements for LA 114 created and published.

## Previous versions

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
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## **Foreword**

### **Publishing information**

This document is published by Highways England on behalf of Transport Scotland.

### **Contractual and legal considerations**

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

## **Introduction**

### **Background**

This National Application Annex outlines the Transport Scotland-specific requirements related to the assessment and management of the impacts that road projects can have on, and experience from, climate change in the context of Directive 2014/52/EU (hereafter referred to as the EIA Directive) 2014/52/EU [Ref 1.N].

### **Assumptions made in the preparation of this document**

The assumptions made in GG 101 [Ref 5.N] apply to this document.

## Abbreviations

### Abbreviations

Abbreviation	Definition
CAT	Carbon account for transport
CCRA	Climate Change Risk Assessment for Scotland
CMS	Carbon Management System
EIA	Environmental impact assessment
GHG	Greenhouse gas
UKCP	UK climate projections

## Terms and definitions

### Terms

Term	Definition
Baseline scenario	The baseline is the level of GHG emissions against which future GHG emissions are compared.
Boundary	The boundary determines which GHG emissions are accounted for and reported in relation to the project.
Climate change adaptation	Adapting to current and future impacts of climate change to reduce the negative impacts and exploit opportunities.
Climate change mitigation	Reducing GHG emissions in order to slow or stop global climate change.
Direct GHG emissions	These are GHG emissions that originate from sources that are owned or controlled by the project.
Indirect GHG emissions	Indirect emissions are GHG emissions that are a consequence of the project, but that occur at sources owned or controlled by another entity.
GHG emissions	The six main anthropogenic GHGs are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Principles for sustainable land use	Reflect Scottish Government's policies on the priorities which should influence land use choices SG/2016/6 [Ref 8.N].
Significant effect	A project is reported as having significant effects on climate where the assessment identifies increases in carbon emissions that will have a material impact on the ability of the Scottish Government to meet its carbon targets.
Tonne of carbon dioxide equivalent	This refers to one metric tonne of carbon dioxide or an amount of any other greenhouse gas with an equivalent global warming potential, as calculated in accordance with international carbon reporting practice.

## **S/1. The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 (additional to LA 114)**

### **Identification, description and assessment of climate impacts**

S/1.1 The significant direct and indirect effects of the construction and operation of the proposed project on climate (for example the nature and magnitude of greenhouse gas (GHG) emissions) shall be identified.

#### **Data collection**

S/1.2 A carbon management or measurement tool shall be agreed with Transport Scotland in advance of data collection.

S/1.2.1 Transport Scotland's Carbon Management System (CMS), which was created to support the use of data in Transport Scotland project appraisal and design decisions, should be used to ensure that GHG emissions across a project's life-cycle are assessed in a consistent manner.

*NOTE 1 The Transport Scotland Project Carbon Tool, a component of the CMS, can be used to support the assessment and reporting of GHG emissions across the whole project lifecycle and recommends:*

- 1) a boundary for GHG emissions mapping for road projects, including with regard to embodied carbon (material resourcing, processing and manufacturing);*
- 2) transport of materials to site, transport of waste; and*
- 3) maintenance activities.*

*NOTE 2 The CMS:*

- 1) supports the identification and categorisation of emissions in relation to the 'activities' that are responsible for generating them;*
- 2) is based on established measurement protocols that allow for quantification of climate impacts using a carbon dioxide equivalent approach; and*
- 3) lists dimensions and assumptions associated with specific elements of road projects.*

S/1.3 The climate change principles for sustainable land use introduced in the Land Use Strategy for Scotland SG/2016/6 [Ref 8.N] shall be applied in the assessment of projects that will have a significant effect on the use of land.

*NOTE 1 The Land Use Strategy SG/2016/6 [Ref 8.N], states that 'land-use decisions can be informed by an understanding of the opportunities and threats brought about by the changing climate.' Greenhouse gas emissions associated with land use can be reduced so that land can continue to contribute to delivering climate change adaptation and mitigation objectives.*

*NOTE 2 The climate change effects identified in assessments can reflect the potential for decisions that affect land-use to create an impact, including on natural systems, many miles away.*

#### **Significance criteria**

S/1.4 Following the assessment of a project's GHG emissions using the criteria in LA 114 [Ref 2.], the relevant carbon budget shall be assessed against the emissions envelope's within the Scottish Government's Climate Change Plan SG RPP3 [Ref 3.N].

*NOTE The Scottish Government's targets identified in the Climate Change Plan were established using the TIMES model with envelopes calibrated by Scottish specific data and sector intelligence.*

#### **Vulnerability of projects to climate change**

S/1.5 The Climate Change Risk Assessment 2017 (CCRA) ASC (2016) [Ref 9.N] and The UK Climate Projections (UKCP) UK CP18 [Ref 4.N] shall inform the environmental assessment's assessment of project vulnerability to climate change in Scotland.

- NOTE 1* CCRA 2017 ASC (2016) [Ref 9.N] describes, and where possible quantifies over 130 impacts from climate change that Scotland will experience until 2100 and it is updated every five years.
- NOTE 2* The UK Climate Projections (UKCP) UK CP18 [Ref 4.N] is an analysis tool designed to help decision makers assess the risk exposure of a project to climate. The projections are updated on a 9 year basis.
- NOTE 3* The (CCRA) 2017 ASC (2016) [Ref 9.N], provides a robust basis for understanding the impacts of climate change and for adaptation planning.

**Design and mitigation**

- S/1.6 Impacts of climate change to a project shall take into account the Climate Ready Scotland: Scottish Climate Change Adaptation Programme 2019-2024 SG/2014/83 [Ref 7.N], which sets out policies and proposals to prepare Scotland for the challenges that we face as our climate continues to change in the decades ahead.
- NOTE 1* The Scottish Climate Change Adaptation Programme is a requirement of the Climate Change (Scotland) Act 2009 and addresses the risks set out in the CCRA 2017 ASC (2016) [Ref 9.N], published under section 56 of the UK Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 6.N].
- NOTE 2* The Scottish Climate Change Adaptation Programme sets strategic principles that can underpin approaches to climate change adaptation and related measures, relating to direct and indirect effects of climate change impacts to road infrastructure .

**S/2. Scottish Government climate change targets (additional to LA 114)**

- S/2.1 The assessment of projects on climate shall only report substantial effects where increases in GHG emissions will have a significant impact on the environment and the Scottish Government's ability to meet its carbon emission targets CCA(S) 2009 [Ref 2.N].
- S/2.2 The GHG emission reduction targets set by Scottish Ministers, as mandated by The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N] shall be taken into account with the respective contributions towards meeting the GHG reduction targets for the industry sector SG Climate policy [Ref 3.I].
- NOTE 1 *The significance criteria set out in LA 114 [Ref 2.I] will be used to assess project GHG emissions, however this will be assessed against Scottish Government sector targets set in the updated Climate Change Plan SG RPP3 [Ref 3.N] (due to be published).*
- NOTE 2 *The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N], which is the statutory framework for addressing climate change in Scotland, details a target to reduce GHG emissions to net-zero by 2045 on the baseline (which is either 1990 or 1995 depending on the GHG) in line with that of the UK's Climate Change Act 2008 SI No. 1056 CCA 2008 [Ref 6.N].*
- NOTE 3 *The Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 2.N] employs the unit 'tonnes of carbon dioxide equivalent for measurement and calculation of GHG emissions, and reductions thereof, as calculated in accordance with international carbon reporting practice.*
- NOTE 4 *The Carbon Account for Transport (CAT) TS CAT [Ref 1.I], which is published by Transport Scotland annually, outlines the contribution of Scotland's transport sector to achieving Scotland's GHG emission reduction target (it reports on the 'reducing emissions' strategic outcome for Scotland's National Transport Strategy) and can be used for comparative purposes.*

### S/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2014/52/EU, 'Assessment of the effects of certain public and private projects on the environment'
Ref 2.N	CCA(S) 2009, 'Climate Change (Scotland) Act 2009'
Ref 3.N	Scottish Government. <a href="https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/">https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/</a> . SG RPP3, 'Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)'
Ref 4.N	UK Met Office. UK CP18 , ' <a href="https://www.metoffice.gov.uk">https://www.metoffice.gov.uk</a> '
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	The National Archives. <a href="http://legislation.gov.uk">legislation.gov.uk</a> . SI No. 1056 CCA 2008, 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'
Ref 7.N	SG/2014/83, 'The Scottish Government (2014) Climate Ready Scotland: Scottish Climate Change Adaptation Programme. SG/2014/83 [laid before the Scottish Parliament under Section 53 of the Climate Change (Scotland) Act 2009]'
Ref 8.N	SG/2016/6 , 'The Scottish Government (2016) Getting the best from our land. A Land Use Strategy for Scotland 2016 – 2021. SG/2016/6 [in pursuance of Section 57 of the Climate Change (Scotland) Act 2009].'
Ref 9.N	Committee on Climate Change, London. Adaptation Sub-Committee. ASC (2016), 'UK Climate Change Risk Assessment 2017, Evidence Report, Summary for Scotland'

## S/4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Transport Scotland. <a href="https://www.transport.gov.scot/publication/carbon-account-for-transport-no-12-2020-edition/">https://www.transport.gov.scot/publication/carbon-account-for-transport-no-12-2020-edition/</a> . TS CAT, 'Carbon Account for Transport (CAT)'
Ref 2.I	Highways England. LA 114, 'Climate'
Ref 3.I	Scottish Government. <a href="https://www.gov.scot/policies/climate-change/">https://www.gov.scot/policies/climate-change/</a> . SG Climate policy, 'Climate Change policy'

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Sustainability & Environment  
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## LA 114

# Wales National Application Annex to LA 114 Climate

Revision 0

### Summary

There are no specific requirements for Welsh Government supplementary or alternative to those given in LA 114.

### Feedback and Enquiries

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