Design Manual for Roads and Bridges

Sustainability & Environment Appraisal

LA 114 Climate

Revision 0

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

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Oct 2019	LA 114 document created to set 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. This full document has been written to comply with the new Highways England drafting rules.

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 [Ref 2.N] (hereafter referred to as the EIA Directive) and the Climate Change Act 2008 [Ref 1.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 [Ref 1.N], [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

Abbreviations

Abbreviation	Definition
AADT	Average Annual Daily Traffic
CO2e	Carbon dioxide equivalent
GHG	Greenhouse gas
PAS2080	Publicly Available Specification (2080): Carbon Management in Infrastructure
tCO2e	tonnes of Carbon dioxide equivalent
UKCP	United Kingdom Climate Projections

Terms and definitions

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).
Bench marking	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 / CO2e	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 CO2e (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 CO2e 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.

Terms and definitions (continued)

Term	Definition
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').
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 UKCP18 [Ref 11.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 UKCP18 [Ref 11.N].

Terms and definitions (continued)

Term	Definition
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 [Ref 2.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 [Ref 2.N] and the Climate Change Act 2008 [Ref 1.N], [Ref 10.N].

NOTE 1 *The Climate Change Act 2008 [Ref 1.N], [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 3.N] Environmental assessment & monitoring.

2.7 The principles of PAS 2080:2016 specification on infrastructure carbon management PAS 2080:2016 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 (tCO2e).

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 (tCO2e) ('Do something' Scenario)**	**Net CO2 project GHG emissions (tCO2e) (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 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 UKCP18 [Ref 11.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
Construction	
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
Operation	
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 0pt 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 3.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	HMSO. UK Parliament. 'Climate Change Act 2008'
Ref 2.N	'Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the 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 3.N	Highways England. LA 104, 'Environmental assessment and monitoring'
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	legislation.gov.uk. 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'
Ref 11.N	https://www.metoffice.gov.uk/research/collaboration/ukcp/. UKCP18, 'UKCP18'

6. Informative references

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

Ref 1.I	HM Treasury . Construction Leadership Council. PAS 2080:2016, 'Carbon Management in Infrastructure' , 2016

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

This is a controlled document.

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0	Oct 2019	Highways England National Application Annex to LA 114.

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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.

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Revision 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: TSStandardsBranch@transport.gov.scot

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Foreword

Publishing information

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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 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.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

S/1. Applicability of the document

S/1.1 Transport Scotland shall be contacted for the application of LA 114.

NOTE *The email address is: TSStandardsBranch@transport.gov.scot.*

S/2. 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	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

Llywodraeth Cymru
Welsh Government

Sustainability & Environment
Appraisal

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
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 Welsh Government team. The email address for all enquiries and feedback is: Standards_Feedback_and_Enquiries@gov.wales

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Oct 2019	Welsh Government National Application Annex to LA 114.