ADEPT Local Highways Climate Adaptation Guide

for highway asset & network managers

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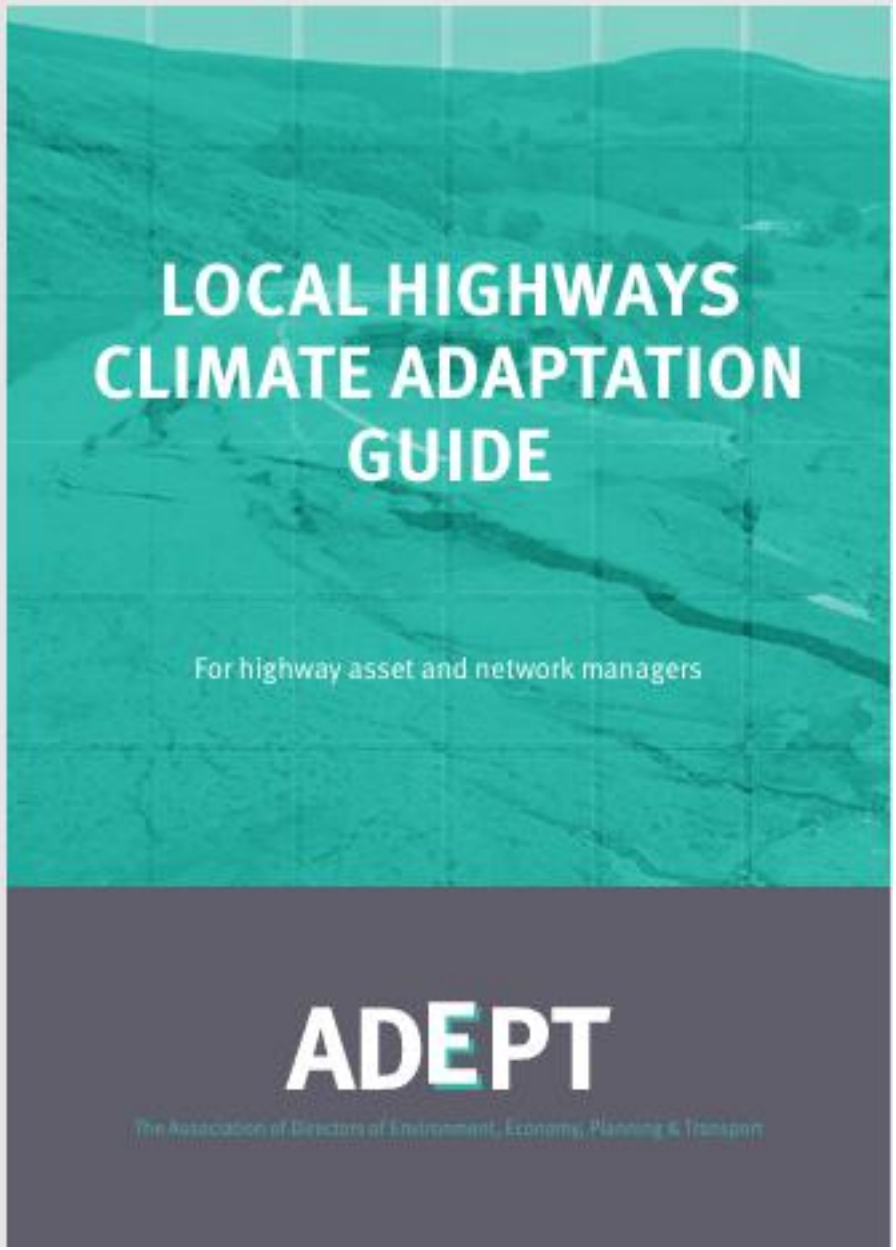

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definitions

Decarbonization aims at reducing greenhouse gas emissions by decreasing our reliance on fossil fuels. In 2019, the UK government has committed to reaching Net Zero greenhouse gas emissions by 2050, based on 1990 levels, as part of the Paris Agreement (*1).

Adaptation refers to actions or processes that adjust a system so it can cope with the expected impacts of climate change (*2). Adaptation measures are urgent specific actions taken to minimise and avoid the harmful effects of climate change. It is a local, context-dependent process to reduce vulnerabilities.

Resilience is the property of a system to absorb, adapt to, or quickly recover from disruptive events. It involves anticipating and coping with shocks from hazardous climate events and recovering from their impacts efficiently (*3). Resilience builds resistance and recovery capability over time to cope with impacts and reduce risks, such as the ones associated with climate change, while adaptation is but one of the processes that helps improve resilience. (*4) Building resilience is an ongoing process that enhances the ability to respond flexibly to extreme events and can only be fully understood within the specific local context.

This guide is focused on the management of highway infrastructure assets.

Complimentary ADEPT guides include:

ADEPT Live Labs 2, Decarbonising Local Roads in the UK

ADEPT Rapid Adaptation Pathways Assessment for flood and coastal erosion risks

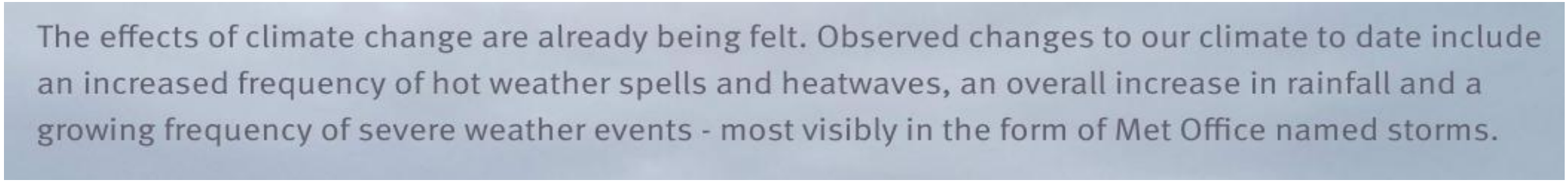
There are also various tools used in conjunction with Emergency Planning/Local Resilience forum.

(1) The Paris Agreement | UNFCCC
(2) Intergovernmental Panel on Climate Change (IPCC) SYRAR5-Glossary_en.pdf (ipcc.ch)
(3) What is the difference between climate change adaptation and resilience? - Grantham Research Institute on climate change and the environment (lse.ac.uk)
(4) Cañavera- Herrera, 2019, Roads to adaptation: Understanding adaptation planning of urban road infrastructure

UKCP18

Met Office's UK Climate Projections (UKCP18). These projections use cutting-edge climate science to provide updated observations and climate change projections out to 2100. This data shows that by the end of the twenty-first century:

- All areas of the UK are projected to be warmer
- Summers will be, on average, hotter and drier
- Winters will be, on average, milder and wetter
- Extreme weather will become more common
- ~~Lying snow will disappear almost entirely;~~ and
- Sea levels will rise, and the increase will be greater in the south and east



adaptation timelines

	Baseline	By 2039	By 2069
Heatwave	0	5	8
Dry spells	1	1	3
Prolonged rain	1.4	8.5	15.2

Scale of Adaptation

- **Severe weather events**
  E.g. storms, significant impact over several **hours**
  Review response provision including training and kit
  Review resilient route network to prioritise response
  After the storm: inspect asset condition – update asset management strategy
- **Extreme weather events**
  E.g. heatwaves, prolonged rainfall, widescale impact over several **days/weeks**
  Need to prioritise adaptation interventions by risk assessment
  Review asset condition monitoring to address emerging risks e.g. retaining walls
  Consider alternatives to capital interventions e.g. change in service standards
- **Gradual climate change**
  E.g. change in soft estate growing season measured over **years,** land drainage etc.
  Review asset management strategies, maintenance management plans, contracts

key climate changes

rainfall

heatwave

storm

key asset resilience risks

drainage

structures

earthworks

pavements

risk assessment

1. Planning
   Define scope, brief stakeholders, agree mandate

2. Current climate risks

3. Future climate risks

4. Adaptation options

5. Evaluate interdependencies
   delivery: fuel, energy, communications
   impact: water companies
   use: emergency services, public transport

Pavement

Key climate risks:

- Rainfall (prolonged) leading to early life pavement failure.
- Rainfall (intense) leading to flooding and accelerated deterioration (potholes, joint failures).
- Heat leading to deformation.

Structures

Key climate risks:

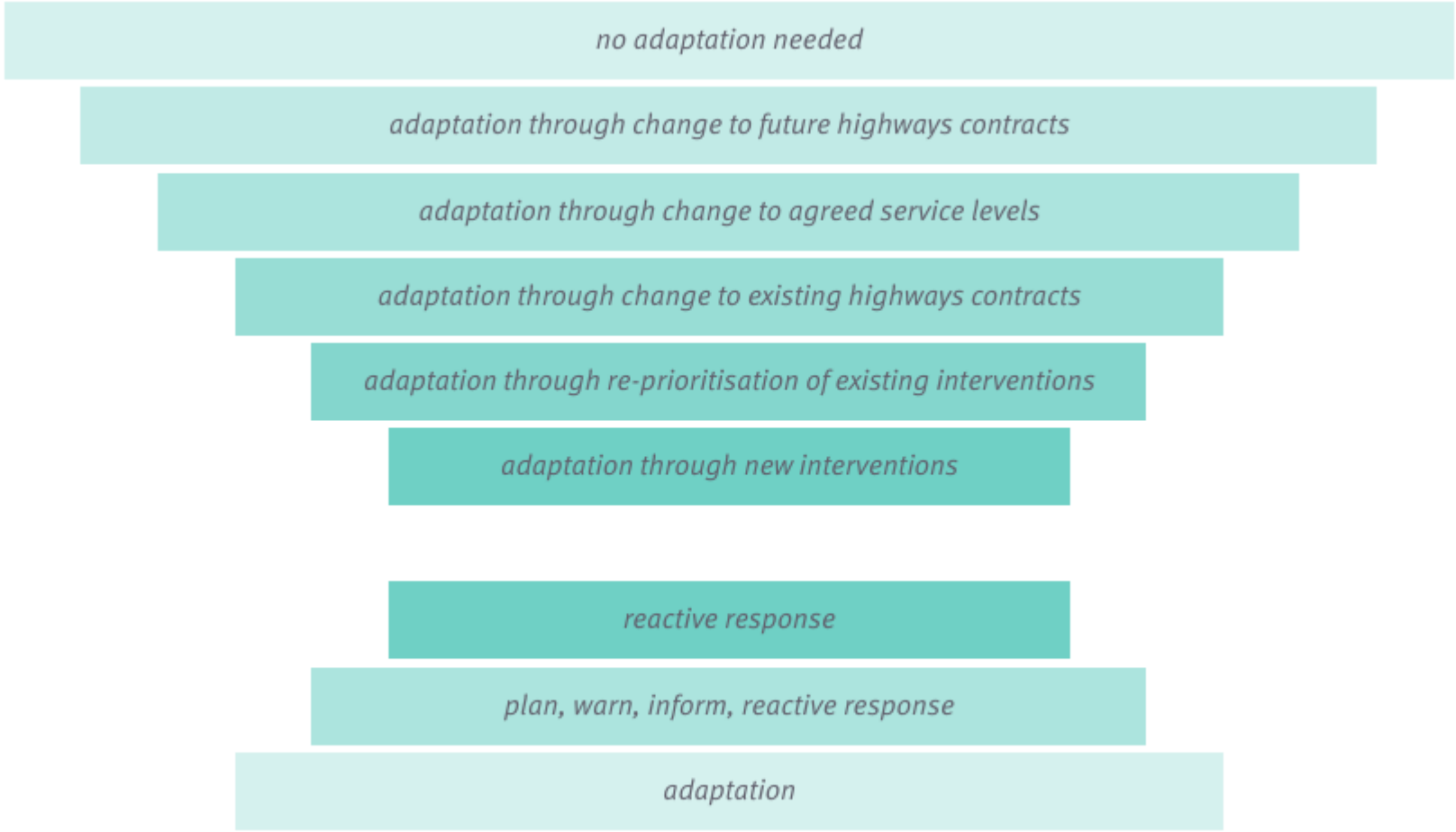
- Rainfall (intense) leading to flooding and scour.
- Heat leading to deformation (joints).

Drainage

Key climate risks:

- Rainfall (intense) leading to flooding and blockage.

risk assessment



asset management plan: strategic planning

Adaptation should be part of the strategy for transport asset management. For example, policy alignment should be developed through ensuring asset management policies reference climate resilience as a core objective.

For example, some Climate Emergency declarations include preparedness for heat, flooding and storms. Consideration should also be given to alignment with corporate policies relating to resilience of service delivery.

Asset managers should also consider linking their policies with corporate policies designed to ensure service delivery is resilient.

- Objective Setting:
  Set clear, measurable objectives relating to climate adaptation (for example reducing flood-related disruptions).
- Lifecycle Planning:
  Incorporate climate risks into lifecycle planning, including maintenance and renewal.

By integrating adaptation into these objectives' highway authorities can proactively manage climate risks rather than reactively responding to incidents.

asset management plan: data

Local risk assessments will require inventory and ideally condition data for those assets which face significant risks, including pavements, bridges, drainage, structures and geotechnical assets.

Many local authorities do not have the information relating to assets such as embankments, retaining walls, smaller culverts and underground drainage. It may be necessary to review how much information is available and the opportunity to gather the relevant data.

Asset inventory data

The asset inventory should include where the asset is, what type of asset it is (for example which form of pavement construction), and totals for each type of asset. Information about sub-surface drainage assets may be limited.

Asset condition data

- For pavements, standard surface condition monitoring information about the condition of the components of structures (for example deck, joints, bearings) should be recorded.
- Information about drainage and soil and rock condition may be limited.
- Current weather-related impacts should also be recorded (for example location, duration, frequency and impact of flooding).

design standards

growth account focus: National Highways

NH third adaptation report under Climate Change Act

Key Risks

Overwhelming of drainage due to fluvial (river) and pluvial (surface) and groundwater flooding

- **Fluvial flooding and high river flows.**
- Ground saturation affecting stability of geotechnical assets
- Destabilisation of earthworks due to standing water
- Waterlogging of pavement surface

Reviewed, updated, and published the DMRB standards across different asset classes

- **CD529**: Design of outfall and culvert details, which requires culverts conveying a public watercourse to be discussed and agreed with the Environment Agency.
- **CG501**: Design of highway drainage assets, which focuses on reducing risk through increasing drainage capacity, and this now requires a climate change allowance of 20% in design with a sensitivity test to 40%.
- **LA113**: Road drainage and water environment. This requires that all new schemes are supported by a Flood Risk Assessment to assess flood risk to and from the scheme, including the latest allowances for climate change.
- **CD522**: Drainage of runoff from natural catchments includes references to climate allowances.
- **CS641**: Managing the maintenance of highways geotechnical assets, which includes a risk-based approach to asset management and maintenance, encompassing a range of factors including flood risk; and
- **CD356**: **Design of highway structures for hydraulic action, which includes scour assessment requirements and guidance including requirements to apply climate change allowances.**

growth account focus: National Highways

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Key Risks

Temperature Changes

- Concrete “blow ups” on pavements => replacement programme so no adaptation needed
- Failure of bridge expansion joints and bearings => current standards provide mitigation, older assets vulnerable
- Melting/deformation of asphalt pavement => within current design standards ranges but will restrict working window for construction

Reviewed, updated, and published the DMRB standards across different asset classes

- **HD 32**: Maintenance of concrete roads
- **HD 38:** Concrete surfacing and materials
- **CD227:** Design for pavement maintenance, with supporting information in MCHW

ISO 14090:2019

ISO 14090:2019

Adaptation to climate change principles, requirements and guidelines

Specifies principles, requirements and guidelines for adaptation to climate change. This includes the integration of adaptation within or across organizations, understanding impacts and uncertainties and how these can be used to inform decisions. It supports the development of sector-, aspect- or element-specific climate change adaptation standards.

Draft New PAS

To specify the requirements for developing and applying adaptation pathways within the infrastructure sector to aid adaptation decision-making in the context of climate and uncertainty, including:

- Guidance on choosing appropriate climate change scenarios;
- Guidance on overcoming design life constraints as set out in many design codes;
- A methodology for establishing the co-benefits of adaptation activity alongside net-zero and sustainability considerations;
- Requirements for governance, including roles, responsibilities, metrics and key data to determine adaptation pathways.

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