

Climate Change and Minerals Planning - Adaptation

Climate change adaptation is “Adjustments made to natural or human systems in response to the actual or anticipated impacts of climate change, to mitigate harm or exploit beneficial opportunities.”¹

Even with ambitious measures and actions to reduce greenhouse gas emissions, further climate change is inevitable. Therefore, measures to adapt to the forecast and potential effects of climate change is needed alongside mitigation. Even if global warming is limited to 1.5° by 2050 climate change impacts will occur. Adopting a ‘worst case’ scenario in terms of planning for potential impacts may therefore be prudent.

The 2021 UK Climate Change Risk Assessment (CCRA)² identifies risks and opportunities grouped into 5 categories, all of some relevance to minerals:

- Natural Environment and Assets
- Infrastructure
- Health, communities and the built environment
- Business and industry
- International dimensions

The 2021 CCRA also includes summaries for England, Scotland, Wales and Northern Ireland, and ‘sector’ briefings (which do not include the minerals or mining sector) including of most relevance: Business; Terrestrial biodiversity; Land use; and Transport.

The 2022 CCRA identifies 8 Priority Risk Areas requiring the most urgent UK-wide action as risks to:

- Viability & diversity of **habitats and species**
- **Soil health** from flooding & drought
- **Natural carbon stores** & sequestration from multiple hazards
- **Crops, livestock & forestry**
- Supply of food, goods & services due to **collapse of supply chains & distribution**
- People & economy from **power system failure**
- Human health, wellbeing & productivity from **exposure to heat**
- **Multiple risks from climate impacts overseas**

1 As defined in the National Planning Policy Framework for England <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

2 <https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/>

The top areas of inter-related climate change risks and opportunities for the UK of most relevance to minerals are:

- **Flooding & coastal change** risks to communities, businesses and infrastructure
- Risks to health, wellbeing and productivity from **high temperatures**;
- Risks of shortages in the **water supply** for, agriculture, energy generation and industry as well as the public;
- Risks to **natural capital**, including ecosystems, soils and biodiversity including pests and invasive species;
- Risks to domestic and international **food production and trade**.

From the CCRAs, the likely direct climate change-related threats that can be considered to be of most relevance to minerals planning and management are:

- increases in the **probability and severity of flooding** (fluvial, groundwater, surface);
- exposure to **high temperatures and heatwaves**; and
- shortages in **availability of water**.

The level of disruption to business will depend on the resilience of infrastructure including energy, telecoms and transport. There may be knock-on effects on supply chains and distribution and on staff (with business and reputational damage) with reduced productivity and potentially reduced access to capital.

Levels of flood risk will be location and site specific – and in the case of surface water in particular, may be difficult to predict. Managing risk from flooding may be possible and viable in some locations, while in some areas risks and costs of management will increase.

The Committee on Climate Change (CCC) Adaptation Sub-Committee³ set out measures that the UK is undertaking by delivering the National Adaptation Programme (NAP). This also concludes that flooding remains one of the most serious current and future risks, with better plans required to address risks from surface water flooding in particular. It also identifies that health impacts from higher temperatures are likely to increase with a growing and ageing population, and that water scarcity is an increasing issue with reform of abstraction licensing an urgent priority.

The CCC proposes an adaptation assessment toolkit⁴ that includes consideration of risks, exposure and vulnerability, identification of adaptation options and the impact of these. The UK Climate Impacts Programme 'Adaptation Wizard'⁵ provides a more detailed step-by-step process through which organisations can assess vulnerability to climate change and potential adaptive responses. This approach provides a logical way of considering vulnerabilities, risks and responses.

3 Committee on Climate Change, 2017. *How the UK is preparing*. [online] <https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/how-the-uk-is-preparing/>

4 <https://www.theccc.org.uk/wp-content/uploads/2013/03/ASCindicator-framework-2.jpg>

5 UKCIP, 2020. *Getting started*. [online] <https://www.ukcip.org.uk/wizard/getting-started/>

The key stages to identifying adaptation measures are:

- **Assess current vulnerability:**
 - experience of how previous weather events have affected the organisation (or site, service etc),
 - how it coped
 - adaptive capacity, and
 - consideration of thresholds which, if exceeded, would cause unacceptable consequences.
- **Assess future climate vulnerability:**
 - considering how the climate is likely to change (as described previously)
 - the main direct and indirect impacts likely,
 - the risks these will pose and
 - what are the priorities that require a response. The types of risks will vary but include those to infrastructure, operations, legal and regulatory changes, and financial. The Wizard provides examples of impacts on business functions⁶ and sectors⁷ which are relevant to waste management both as a function and service.
- **Adaptation options:**
 - Identifying the range of options (accepting risk, offsetting damage, avoiding or reducing exposure, identifying new opportunities, building capacity to adapt) and whether these are temporary or permanent, managerial or technical, strategic or local
 - Evaluate options on effectiveness, efficiency, flexibility, no/low regrets etc
 - Develop implementation plan and implement selected appropriate adaptation

Taking account of the national and regional climate projections, and the national CCRA and NAP, and applying this logical approach, the following issues summarised in the tables below are likely to be relevant to the minerals sector:

6 UKCIP, 2020. *Business functions*. [online] <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacliat/business-functions/>

7 UKCIP, 2020. *Sector Examples*. [online] <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacliat/sectoral-examples/>

Table 1. Summary examples of Vulnerability, Impacts and Adaptation options

Minerals Operation	Vulnerability & Impacts	Adaptation option
Extraction	<ul style="list-style-type: none"> • Health & safety of operatives • Severe weather e.g. intense rainfall, with flooding constraining access to reserves or stockpiles, lost extraction & days • Prolonged hot dry periods in summer 	<ul style="list-style-type: none"> • Stockpiling outside of flood prone areas • Covering of conveyors • Timing of collections/shifts • Dust management
Processing & Manufacture	<ul style="list-style-type: none"> • Flood risk – surface, and depending on location fluvial or groundwater • Dust generation 	<ul style="list-style-type: none"> • Site layout including location of stockpiles, access & drainage • Containment of plant and materials in buildings • Sweeping and dousing • Sheeting loads
Transport to market	<ul style="list-style-type: none"> • Multiple impacts (flooding, heat, landslips, storm damage) disrupting transport routes, options and networks 	<ul style="list-style-type: none"> • Resilient access/egress routes • Routeing flexibility • Capacity for storage/stockpiling product
Restoration	<ul style="list-style-type: none"> • Influence over viable after-use including built development or open landscape/ biodiversity/ agriculture 	<ul style="list-style-type: none"> • Deliver and demonstrate benefit to: <ul style="list-style-type: none"> - water / flood storage with off-site, up- and down-stream flood management benefits - carbon sequestration by soils & habitats - biodiversity & wider ecosystem services
Built facilities	<ul style="list-style-type: none"> • Flood risk – surface, and depending on location fluvial or groundwater • Increased odour and dust • H&S of operatives • Water availability • Fire risk – stored materials 	<ul style="list-style-type: none"> • Site drainage/layout with contingency capacity • Flood resilient layout & design – raising services and vulnerable uses above flood level, accessibility to stockpiles, accessibility to egress/transport routes • Dust suppression • Enclose/cover storage and processes • Water efficiency & recycling for processes and site management • Fire Prevention & Response Plans

Table 2. Summary of UK Climate Change Risk Assessment and National Adaptation Programme of relevance to Minerals

Potential Climate Change effect	CCRA Potential impact	Risks and Impacts for Minerals	NAP (Planning; Business & Industry)
Increased frequency & severity of flooding (fluvial, coastal, surface, groundwater, sewer)	Coastal infrastructure, esp ports, at risk from rising sea levels and storms.	Risk to imports, landing of marine dredged aggregates, exports	NPPF requirements for local plans and decisions to take account of climate change including ensuring resilience of communities and infrastructure.
	High waves accelerate erosion	Damage to property	
	Infrastructure near rivers esp. bridges, cables and pipelines will become vulnerable	Risk to imports, marine dredged aggregates, exports	Assess cumulative impacts of flood risk.
	Increased frequency and severity of flooding of buildings/property in risk areas	Disruption to operations, supply and ability to supply, transport	Minimise new building in areas at high flood and erosion risk. Invest in flood and coastal defences.
	Disruption to communities and services	Disruption to operations (including workforce availability), supply and transport. Potential for enhanced flood / water storage through restoration of sites.	Ensure land use decisions reflect the level of current and future flood risk. Greater use of natural flood management solutions including SuDS. Design and layout of property and infrastructure to be resilient to withstand flooding and be able to recover quickly.

Changes in temperature and rainfall	Risk of buckling railway track, sagging of electricity cables, softening road tarmac, over heating signalling causing disruption to transport.	Disruption to material supply and movement.	
	Water demand exceeding supply [and implications for permitting and abstraction licensing].	Availability of water for use on site & processes. Water abstraction licensing reducing amount available for operations	Encourage water saving and reducing wastage. Strengthening resilience of water supply.
	Embankment failures and landslides, resulting in damage and disruption.	Disruption to material supply and movement.	
	Overheating of buildings and public transport.	Productivity of workers – may be reduced through operation design. Increased risk of dust generation – may be reduced through dust management measures.	Green infrastructure
	Longer growing season	Site maintenance and restoration	
Increased wind speeds and storms	Overhead power cable damage and disruption	Security of power supply	
	Transport disruption – fallen trees, high sided vehicles	Disruption to material supply and movement	

Table 3. Risk Assessment & Adaptation Options for Minerals Development

Climate Variable	Likely impacts	Potential effect	Risk & vulnerability	Adaptation Options
Temperature	Hotter mean and summer temperatures	Heat stress	<ul style="list-style-type: none"> • Poor working conditions, health & safety of operatives • Increased dust arising and blow • Demand for water for processes and site management e.g. dust suppression 	<ul style="list-style-type: none"> • Site layout and design, covering/enclosure of operations where possible, to reduce effect of heat on processes and personnel • Dust suppression on plant and within site • Rainwater harvesting and recycling of greywater for use on site
	Milder winters	Less frost/snow longer growing season	<ul style="list-style-type: none"> • Potential for less disruption to extraction, supply and transport (countered by potential for intense rainfall and flooding) 	
Precipitation & humidity	Wetter winters Intense rainfall events	High river & groundwater levels	<ul style="list-style-type: none"> • Flooding (fluvial, groundwater, surface, sewer) of sites, facilities and infrastructure with associated disruption to processes • Flooding and damage to transport infrastructure, disruption to collection, supply, processing and export of materials from facilities • Increase risk of pollution if site drainage systems get overwhelmed • Erosion, slope/face stability of site 	<ul style="list-style-type: none"> • Flood resilient and resistant site and facility design e.g. raising of services and vulnerable uses above flood level • Flood Management Plans for sites and facilities demonstrating safe operation, storage and containment of materials in event of flooding • Sizing of drainage systems with climate change contingency and retention arrangements if required • Contingency plans for delivery and export including routes avoiding areas prone to flooding • Monitoring of site integrity • Sediment capture

	Drier Summers	Water shortages Subsidence	<ul style="list-style-type: none"> • Abstraction licensing reducing supply • Disruption to processes requiring water 	<ul style="list-style-type: none"> • Water efficiency in processes and site management including rainwater harvesting and recycling of greywater for use on site
Storminess	Extreme events	Intense rainfall & surface flooding High winds	<ul style="list-style-type: none"> • Surface water/flash flooding • Increased litter blow from street collection and sites • Increase risk of pollution if site drainage systems get overwhelmed • Reliability of collection frequency/service • Erosion 	<ul style="list-style-type: none"> • Incorporation of adequate and sustainable drainage and flood storage on site where feasible • Sizing of drainage systems with climate change contingency and retention arrangements if required • Enclosure of operations & secure boundary treatment • Monitoring of site integrity • Sediment capture and monitoring of run-off
Sea level rise		Coastal erosion and flooding	<ul style="list-style-type: none"> • Flooding and damage to facilities, infrastructure, communities • Disruption to transport 	<ul style="list-style-type: none"> • Flood resilient planning of site working

The Mineral Products Association is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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