# Appendices – Nature Net Zero Climate Risk to Carbon Stores

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# Appendices

## Appendix 1: Climate Change Exposure Scenarios

Maps of Spatial distribution over 3 climate change scenarios. It uses three Representative Concentration Pathways (RCP) scenarios: RCP 2.6 (+1.6°C), RCP 6.0 (+2.8°C), and RCP 8.5 (+4.3°C).

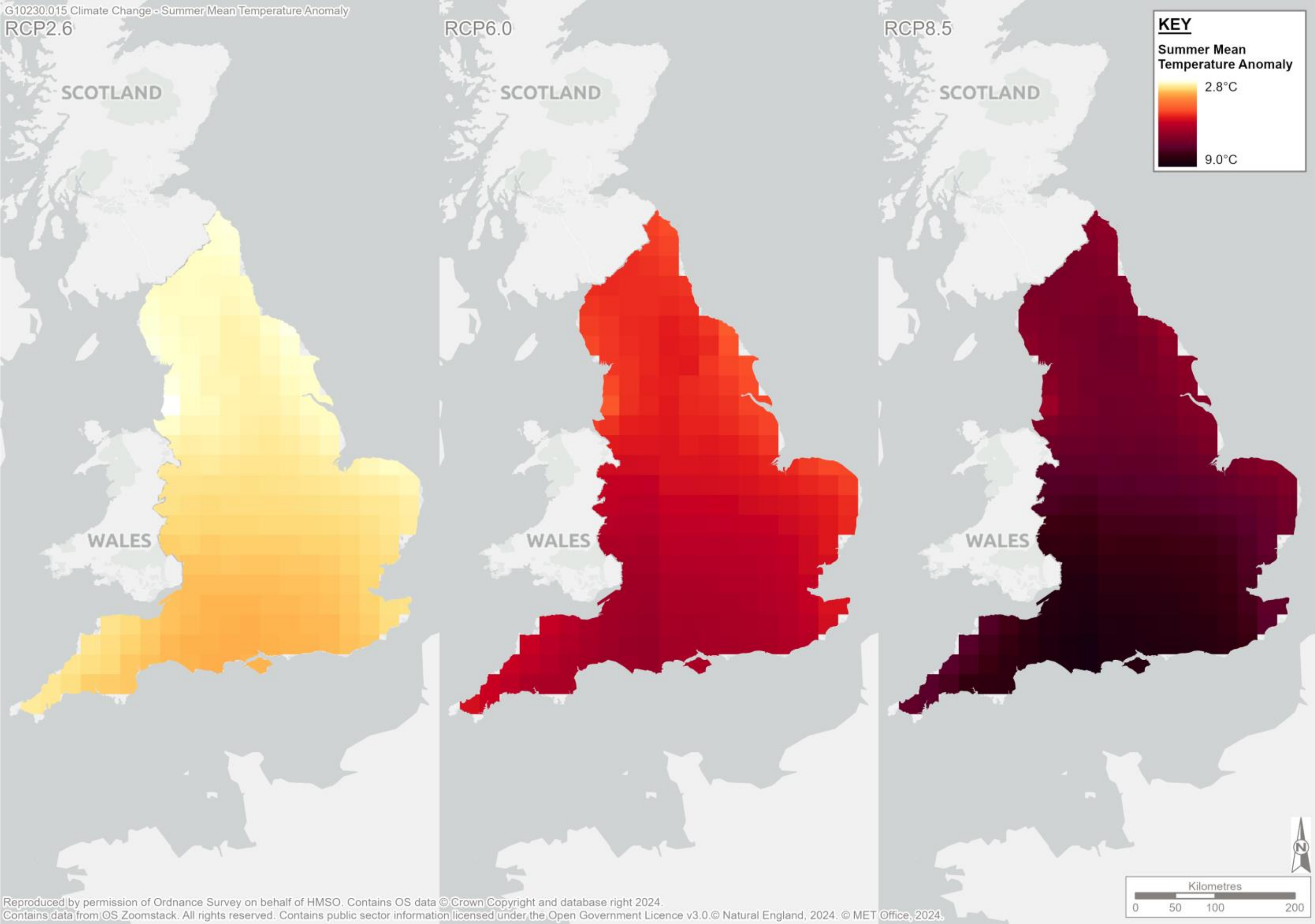


**Figure 1. Summer mean temperature anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

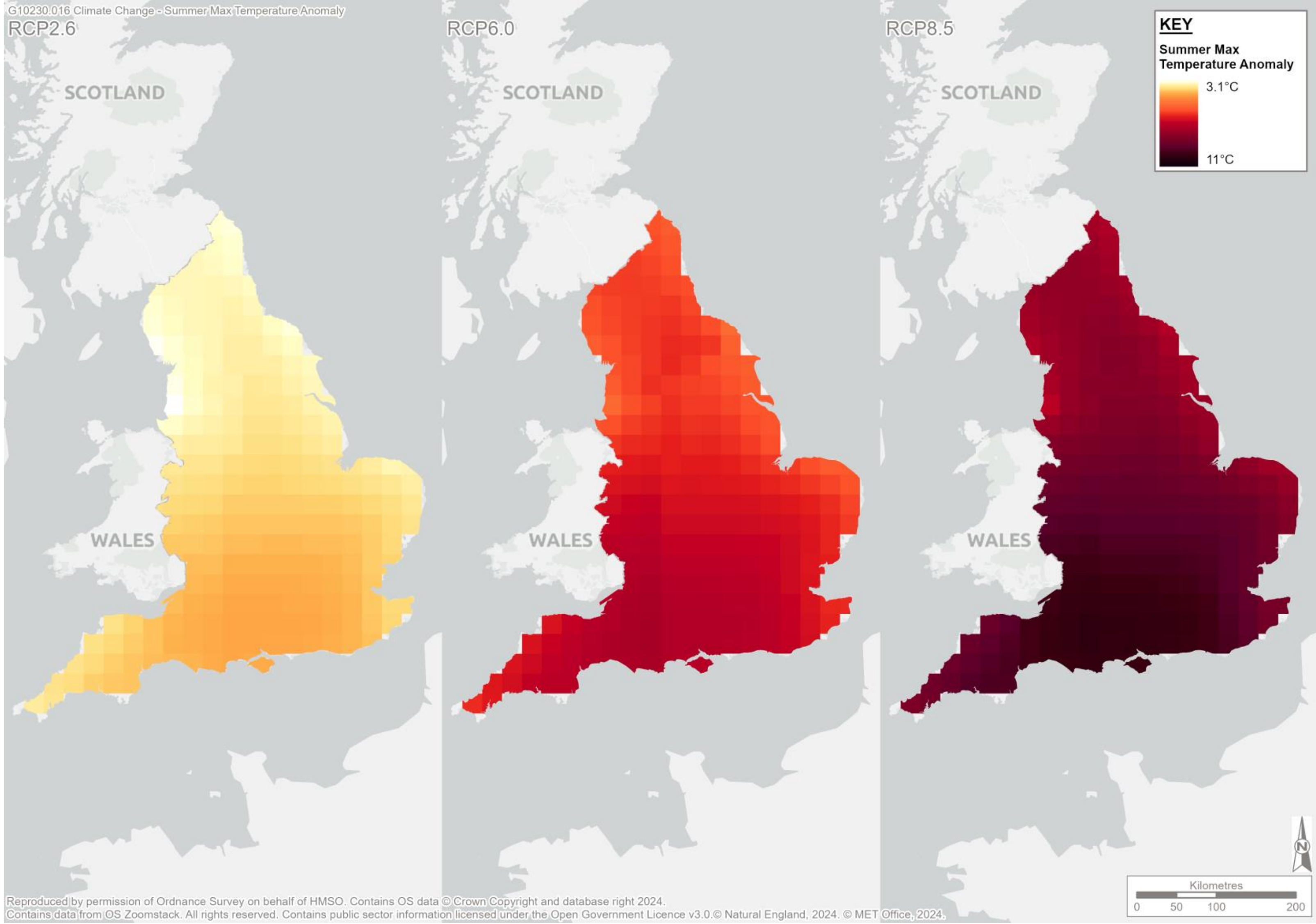


**Figure 2. Summer maximum temperature anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

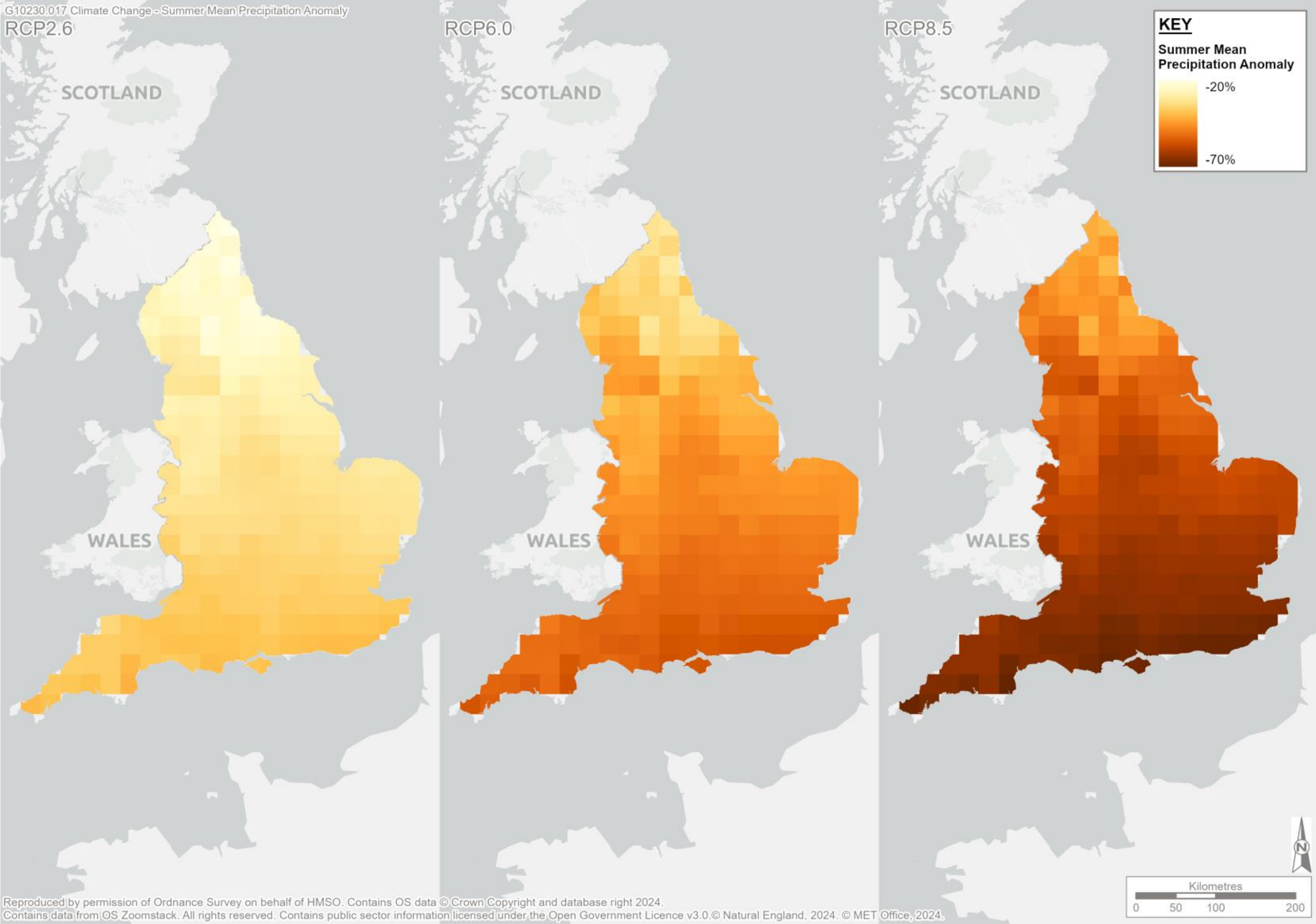


**Figure 3. Summer mean precipitation anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

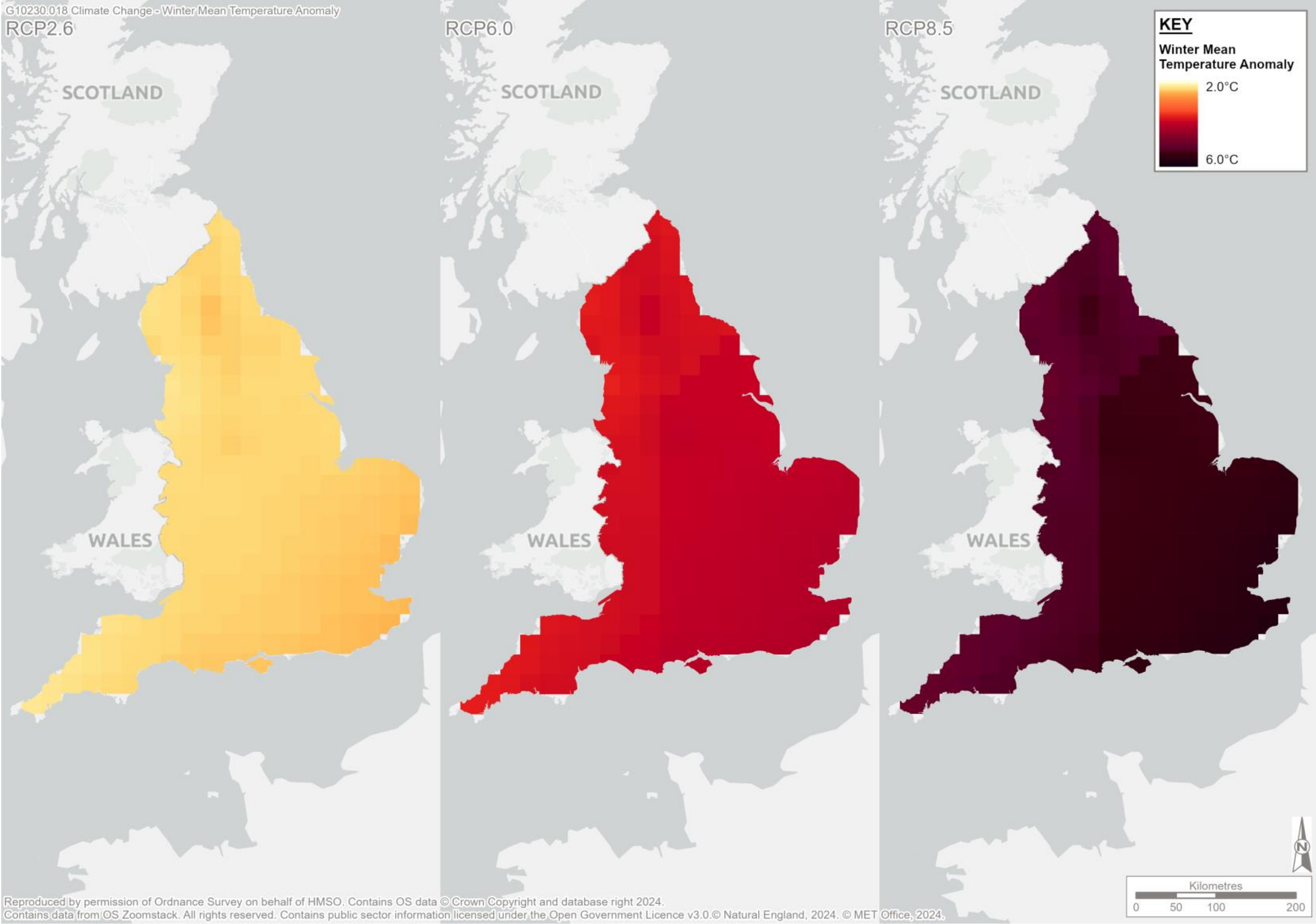


**Figure 4. Winter mean temperature anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

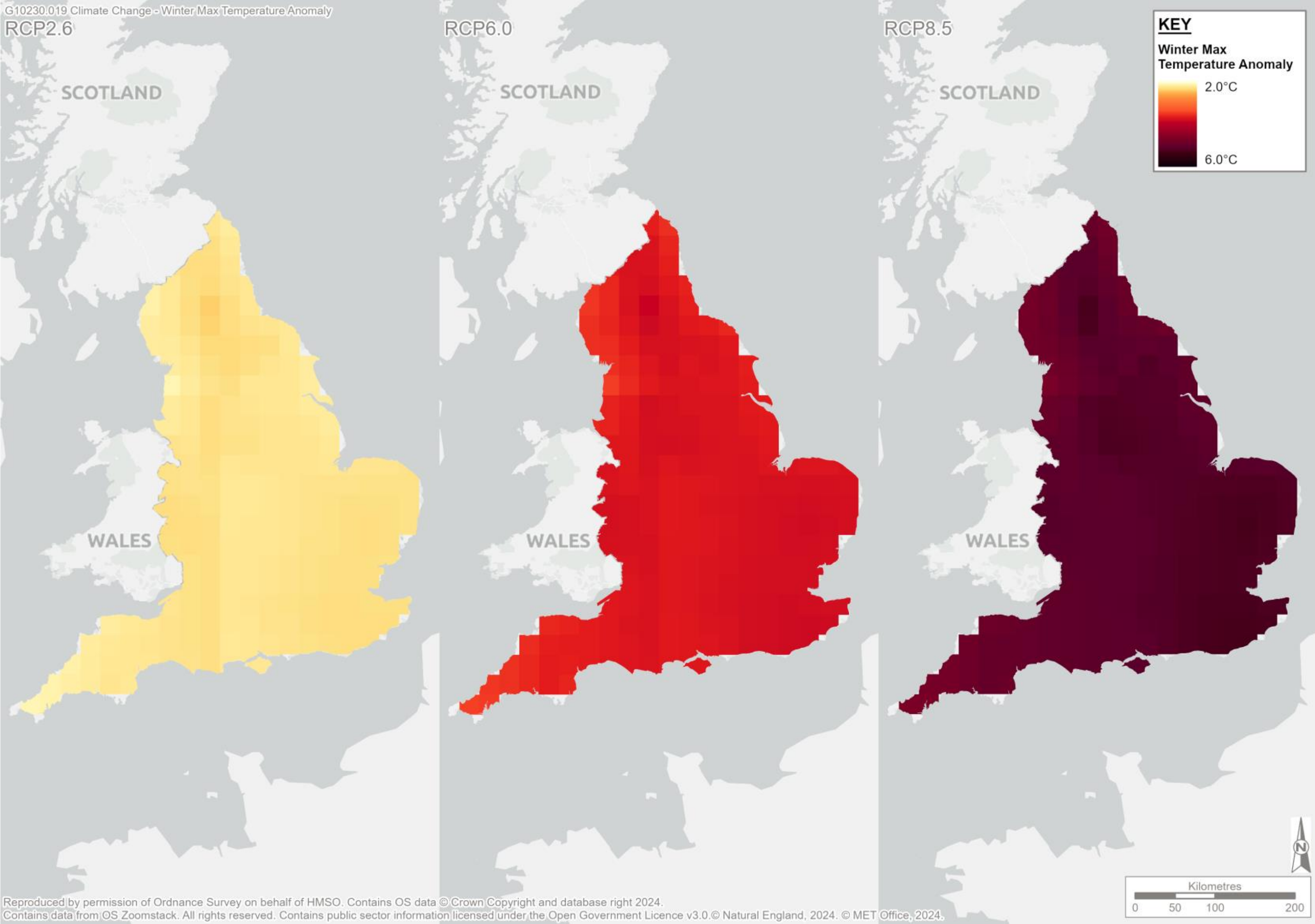


**Figure 5. Winter maximum temperature anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

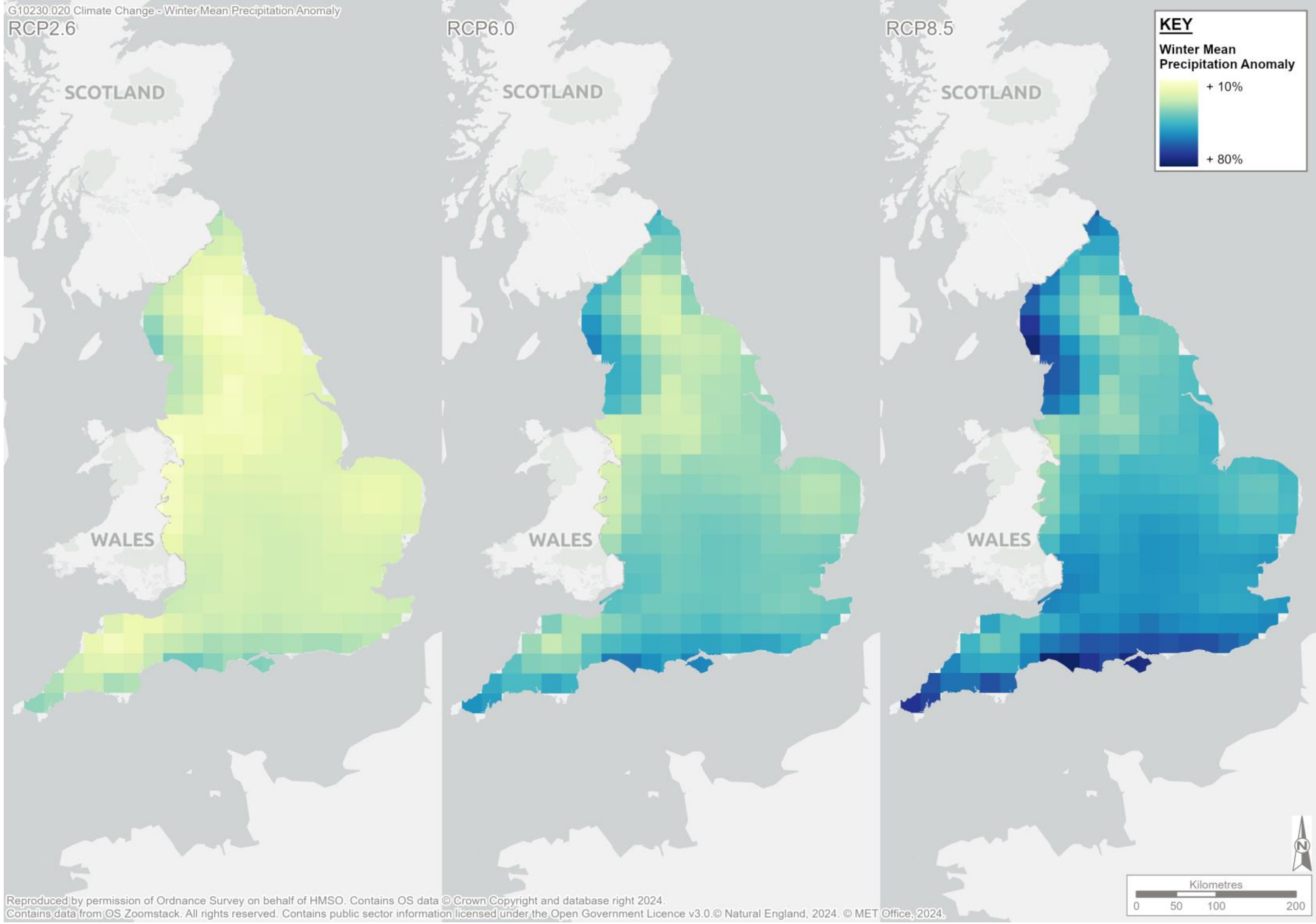


**Figure 6. Winter mean precipitation anomaly for England for three climate change scenarios (RCP2.6, RCP6.0 & RCP8.5)**

# Appendix 2: Influence of Climate Change on High Carbon Habitats

**Table 1. Influence of climate change on blanket bog**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Hydrologically controlled habitat so extreme heat detrimental through high evaporation and drying out of bog surface and wetter features. | High | Several adaptation strategies are recommended to increase the resilience of blanket bog habitats. Land management must be adjusted to prevent trampling, burning, and overgrazing, while re-vegetating bare peat and restoring natural water regimes by blocking drains and gullies.<br><br>Identifying and managing areas that can maintain suitable hydrological conditions is crucial for carbon storage and ecosystem function.<br><br>Increased winter precipitation could help recharge peat soils vulnerable to summer drought if water is retained and erosion controlled.<br><br>Given the long restoration times and logistical challenges, prioritizing active restoration in the southwestern moors, which are most vulnerable to extreme climate changes, is essential. |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Long periods of higher temperatures may increase evapotranspiration and degrade peatland condition further where peatlands are already in poor condition. It may also lengthen the growing season with corresponding changes in species assemblage. | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Needs damp and frequent occult precipitation or frequent rainfall events to stay damp particularly through increasing summer dry periods. Resulting in drier ground conditions, increasing the oxidation rates of bare peat, increasing fire risk, and changing species composition. | High | |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Extreme winter heat may not have a major influence as these upland areas will still be cold places during winter | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline** | Winter snowfall and ice conditions may be reduced, leading to localised changes in snow patch vegetation. This may also increase the growing season of sphagnum moss compared with previous dormant | Medium | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **mean winter temperatures** | winter growth . Replacement of snow by greater damp wet conditions may not be a major issue through winter. | | |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Higher winter rainfall may increase surface water runoff, which may increase erosion risk where erosion features already exist. | Low/Medium | |
| **Sea Level Rise** | N/A – location well above coastal zone not effecting majority of sites. | N/A | |

**Table 2. Influence of climate change on deciduous woodland**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^{0}$C to 10.4 $^{0}$C greater than the baseline maximum summer temperature** | Extreme heat events impact leaf functions and reduce photosynthesis reducing available energy into the trees. Increased risk of fire may cause a decline in canopy cover and influence regeneration of woodland, as well as emitting carbon. | Medium | Adaptation responses for woodlands will vary across the country due to differing landscapes, woodland types, and climatic pressures. Within a single landscape, factors like winter rainfall and summer drought may impact different areas differently.<br><br>Woodland management should focus on reducing non-climatic pressures such as pests and diseases, increasing species and genetic diversity, and promoting natural regeneration by reducing grazing pressures and thinning canopies. |
| **Summer mean temperature anomaly: 2.8 $^{0}$C to 8.8 $^{0}$C greater than the baseline mean summer temperatures** | Increased mean summer temperatures may also increase the risk of fire as well as the risk of drought. Woodland types on thinner well drained soils will be at greater risk<br>Longer periods of higher temperatures may increase evapotranspiration and stress conditions, reduce wetland areas and how they function. With greater impact on some woodland types such as wet woodland. | Medium | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| | Drought may lead to competition with invasive species, change regeneration & seedling establishment patterns and alter species assemblage. | | Accepting and managing change will be crucial, with measures to reduce drought impact and ensure water availability becoming increasingly important. For new woodland planting and restocking, species and provenance selection must reflect future climatic conditions.<br><br>Adaptation options include encouraging a mix of native trees, increasing woodland structural diversity, managing veteran trees, and planning for new pests or disturbances. Additionally, planting in targeted locations to create habitat networks and considering the ecological roles of near-native species will be important. |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Reduced summer precipitation will exacerbate drought risk particularly on steeper slopes. | Medium | |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Increased maximum temperature in winter is likely to lead to earlier flowering of understorey species and variation in bud burst & flower times. | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline mean winter temperatures** | Increased in winter mean temperature may reduce winter chilling, leading to reduced seed germination of species. It may also cause earlier bud burst with increased later risk of frost damage. There may also be increased survival of pests, both mammal and insect, resulting in overabundance and pressure on existing trees and regeneration. | High | |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Increase water table in winter may increase humidity and winter flooding, increasing the risk of soil-borne pathogens, and increasing the likelihood of wind throw if root depth is influenced by water logging. Storms may pose a risk in areas adjacent to watercourses. | High | |
| **Increasing storm & extreme events** | Increasing wind speeds and extreme events is leading to greater wind blow of trees. | High | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
| --- | --- | --- | --- |
| **Sea Level Rise** | Unlikely to have widespread influence but may raise water level and increase salinity in low lying coastal woodlands | Low | |

**Table 3. Influence of climate change on upland heathland**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Extreme heat periods lead to an increased risk of wildfire resulting in an adjustment of the habitat structure. Drying out of shallow peat wet heath areas will increase making them harder to rewet over time. | High | Heathland faces pressures beyond climate change, such as habitat loss, fragmentation, recreation pressure, overgrazing, and poor management. Enhancing the resilience of upland heath by reducing these pressures is crucial.<br><br>Adaptation efforts should also focus on targeted habitat restoration and creation to address historical habitat loss and strengthen heathland networks.<br><br>Key adaptation options include developing fire contingency plans, managing erosion, allowing increased scrub and woodland cover for habitat heterogeneity, and identifying potential climate refugia within upland sites. Maintaining structural diversity in vegetation and adjusting designated site boundaries as habitats change are also important.<br><br>Conservation objectives should reflect the climatic gradients of heathland, accepting that species locations and management actions will shift with changing climates. |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Increased footfall due to better weather may increase erosion features in proximity to footpaths, as well as increasing wildfire risk. This may degrade shallow peat found in upland heath, thus releasing carbon into the atmosphere. Warmer temperatures may also increase nutrient cycling and cause changes in vegetation assemblage towards a more lowland & dryer vegetation structure | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Drier summers will cause more drought, with the potential of alternative species composition, increasing wild fire risk with resultant changes in carbon storage in the shallow peats and podsoils. | High | |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Unlikely to have much influence. | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline mean winter temperatures** | May increase the threat from certain pest species such as heather beetle. | Medium | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Increased surface runoff may exacerbate erosion features and cause further erosion, as well as interfere with management strategies such as spring burns and cause resultant changes in species composition. | Medium | |
| **Sea Level Rise** | N/A | N/A | |

**Table 4. Influence of climate change on coastal floodplain and grazing marsh**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Increased evapotranspiration and the influence of drought will impact on these wetland areas. | High | Coastal grazing marshes will require active management of flood defences and drainage systems for adaptation, combined with off-site planning consideration of coastal habitats.<br><br>Adaptation actions should be integrated with shoreline management planning. Ensuring a consistent water supply and control over water levels is essential.<br><br>Key adaptation strategies include reducing non-climatic harm such as pollution and visitor impact, achieving desirable water levels, managing grazing flexibly to avoid over- or under-grazing, expanding grazing marsh areas, increasing structural heterogeneity, controlling invasive species, planning for the landward movement of marshes, and adjusting site boundaries to create larger functional units as coastal landscapes evolve. |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Increased risk of drought may favour certain species and could cause degradation of areas of underlying peat, releasing carbon as areas become dryer.. | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline** | Drought periods will have a high impact on freshwater and wetland components, with potential long term changes.<br>Reduced rainfall in summer may cause an increased risk of drought and lowered water table, with changes in species composition. | High | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
| --- | --- | --- | --- |
| **summer mean precipitation** | | | |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Some effects, including early flowering or changes in hibernating, breeding & nesting patterns. Effects to riparian species that live in cooler waters | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline mean winter temperatures** | Warmer winters may influence flowering patterns and germination of certain species, influencing species assemblage. | Medium | |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Flooding resulting from increased rainfall in winter will alter erosion patterns and sediment changes. Increase in possible intrusion by invasive species through upstream disturbance. Flooding may also increase the risk of pollution and low nutrient status needed to maintain the habitat interests with corresponding changes to species assemblage. | High | |
| **Sea Level Rise** | Sea level rise may cause certain areas to become inundated more often or permanently, changing habitat characteristics from freshwater to brackish and eventually salt based habitats. This may also contribute to coastal squeeze, where areas of coastal floodplain grazing marsh are pushed up against flood defences or urban areas, resulting in habitat loss. | High | |

**Table 5. Influence of climate change on lowland raised bogs**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^{0}$C to 10.4 $^{0}$C greater than the baseline maximum summer temperature** | These hydrologically controlled habitats will be effected by extreme heat through high evaporation and drying out of bog surface and wetter features. Sphagnum moss will bleach and dry out as a natural adaptive response to dryer conditions.<br>Increased evapotranspiration will reduce the water table | High | Lowland raised bogs face degradation due to cutting, drainage, overgrazing, and pollution, leading to decreased functionality as rain-fed systems and increased vulnerability to groundwater changes. Bogs in already poor condition are susceptible to drying out, as they are already too dry and will be at greater risk of degrading further and so need full restoration as an urgent priority.<br><br>Restoring high water tables will become increasingly important as climate change progresses, benefiting habitat resilience and ecosystem services like carbon sequestration and flood risk management. While maintaining active blanket bogs in climatically marginal areas may become challenging, habitat restoration and resilient management should remain priorities. Key actions include ceasing peat cutting, restoring natural hydrology, removing invasive species, reviewing off-site drainage impacts, re-vegetating bare peat, and identifying alternative objectives for impaired areas.<br><br>Understanding hydrology is essential for expanding lowland raised bog areas through habitat restoration or creation.<br><br>Raising water tables and restoring surrounding lagg-fen habitats will increase resilience to sea level rise. Fully- functioning raised bogs that cover the whole |
| **Summer mean temperature anomaly: 2.8 $^{0}$C to 8.8 $^{0}$C greater than the baseline mean summer temperatures** | A longer growing season may result in peat building bog vegetation such as sphagnum moss becoming less dominant, influencing peatland condition. | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Reduced summer rainfall may cause drought conditions and hence cause the water table to fall. This may change the vegetation assemblage and degrade peatland condition. The habitat may also be more susceptible to fire damage, increased oxidation rates and erosion, becoming a carbon source. | High | |
| **Winter maximum temperature anomaly: 2.2 $^{0}$C to 5.3 $^{0}$C greater than the baseline maximum winter temperature** | Unlikely to have a large impact. | Low | |
| **Winter mean temperature anomaly: 2.6$^{0}$C to 5.7$^{0}$C greater than the baseline mean winter temperatures** | May extend the growing season, allowing greater sphagnum growth in winter and increasing soil microbial activity as winter soil temperature increase. | Low | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Wetter winters will increase surface water flooding and run-off pathways, making restoration more complex. | Medium | peat body will be better able to adapt to these impacts. Whole ecosystem approach to a wider area around these habitats is needed to reduce these impacts in the longer term. |
| **Sea Level Rise** | Raised bogs are often located often in low-lying estuary locations, where wetland areas have developed over time into raised bog ecosystems. As such they may well be influenced by saline intrusion at the edge of the bogs and lagg -fen areas surrounding them.<br>Increases in salinity, which may influence species assemblage at these bog edges. | Medium | |

**Table 6. Influence of climate change on lowland fens**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^{0}$C to 10.4 $^{0}$C greater than the baseline maximum summer temperature** | Higher probability of evapotranspiration resulting in dryer surface & drought conditions as well as higher concentrations of nitrogen in water, which may lead to eutrophication. | High | Maintaining and improving water quality and quantity is paramount for adaptation in wetland habitats. Existing drivers like the Water Framework Directive and sustainable abstraction programs can be integrated into plans considering climate change risks and pressures on fens.<br><br>Flexible management regimes for grazing and cutting, adjusting to seasonal rainfall variations, are crucial. Reducing pressures like groundwater abstraction and nutrient enrichment is critical, alongside restoring natural hydrological processes to enhance resilience.<br><br>Successional processes of wetland communities may need active management to maintain desired states.<br><br>Potential adaptation options include comprehensive characterization of water regimes and restoration feasibility, appropriate habitat management, restoring floodplain function, evaluating and managing drainage, controlling invasive species, protecting areas with assured water quality and quantity, and integrating fen habitat restoration into flood management planning. |
| **Summer mean temperature anomaly: 2.8 $^{0}$C to 8.8 $^{0}$C greater than the baseline mean summer temperatures** | An increased growing season may change the species assemblage on fens as will changing water table through the summer months. | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Reduced rainfall in summer may contribute to drought and as such lead to changes in species composition and oxidation of peatland & organic rich soils, making the habitat a source of carbon. | High | |
| **Winter maximum temperature anomaly: 2.2 $^{0}$C to 5.3 $^{0}$C greater than the baseline maximum winter temperature** | Increased maximum temperature in winter is likely to lead to earlier flowering of and variation in nesting, feeding & flower times. | Low | |
| **Winter mean temperature anomaly: 2.6$^{0}$C to 5.7$^{0}$C greater than the baseline mean winter temperatures** | May alter the growing season of plant species and lead to changes in the species assemblage of vegetation. | Low | |
| **Winter mean precipitation anomaly: 9%- 77% more** | Wetter winters may cause increased run-off and possible issues relating to pollution. | Medium | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **rainfall than the baseline winter mean precipitation** | There will also be increased flooding frequency leading to changes in species composition, erosion of peat, and nutrient enrichment. | | |
| **Sea Level Rise** | Where lowland fens are close to the coast, sea level rise may cause saline intrusion and cause a shift toward a salt marsh type habitat, away from lowland fen characteristics. | Medium | |

**Table 7. Influence of climate change on wood pasture and parkland**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Sun scorching may lead to bark-death in beech species, and increased evapotranspiration may contribute to drought. | Medium | The historic and current management of wood pasture and parkland offers flexibility in designing adaptation strategies and managing change. Management decisions should consider landscape and cultural values, especially in historic parklands.<br><br>Preserving veteran trees is crucial for maintaining ecological continuity, focusing adaptation on promoting their longevity and ensuring the regeneration of appropriate species. Flexibility in grazing and effective contingency plans for climatic variations and extreme events are essential. |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Prolonged warmer summers will contribute to drought. | High | |
| **Summer mean precipitation anomaly:** | Reduced rainfall in summer may contribute to drought, causing an increased loss of mature and veteran trees, | High | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **22%- 70% less rainfall than the baseline summer mean precipitation** | with beech being particularly vulnerable. This may also cause changes in ground flora. There may also be a greater risk of fire and the corresponding loss of trees and habitat features, releasing carbon consequently. | | Potential adaptation options include reducing non-climatic pressures, adjusting grazing levels, protecting mature trees, ensuring tree regeneration, managing veteran trees, introducing pollarding, preserving deadwood, developing fire management plans, incorporating wetland elements, planning for new pests and diseases, selecting appropriate species for planting, and encouraging natural regeneration and expansion of existing sites.<br><br>These actions aim to preserve the ecological and cultural significance of wood pasture and parkland while enhancing their resilience to climate change |
| **Winter maximum temperature anomaly: 2.2 $^{0}$C to 5.3 $^{0}$C greater than the baseline maximum winter temperature** | Unlikely to have much influence. | Low | |
| **Winter mean temperature anomaly: 2.6$^{0}$C to 5.7$^{0}$C greater than the baseline mean winter temperatures** | Average warmer winters may lead to fewer frost events, as such result in increased survival of mammalian and insect pests causing overabundance and pressure. | High | |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Wetter winters may cause a raised water table with risks of floodings. This may cause wind throw where tree-root depth is compromised and may alter species assemblage. | High | |
| **Increasing storm & high winds** | Increasing wind speeds and extreme events is leading to greater wind blow of trees. | High | |
| **Sea Level Rise** | n/a | n/a | |

**Table 8. Influence of climate change on lowland heathland**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Abnormally high summer temperatures increase the risk of wildfire and, as well as a change in species assemblage resulting from site becoming drier. | High | Heathland faces numerous non-climate-related pressures like habitat loss, fragmentation, recreation pressure, and inadequate management. Addressing these pressures is crucial for enhancing the resilience of remaining heathland areas.<br><br>Strategic tree cover can offer wildlife benefits and fire risk reduction, although maintaining a balance to preserve heathland species diversity is essential. Given the diverse impacts of climate change on heathland systems, flexible management of existing sites is necessary. Targeted habitat restoration and creation are also vital for improving heathland network resilience.<br><br>Adaptation options include optimizing management practices like grazing, cutting, and burning to maintain vegetation structure, adjusting management intensity to changing growth characteristics, developing fire contingency plans, ensuring management capacity to respond to changing conditions, considering localized broadleaved woodland for firebreaks, identifying potential climate refugia within sites, maintaining structural diversity, conserving hydrological conditions, and expanding existing habitat through targeted re-creation and restoration efforts.<br><br>Adaptive management is particularly required to mitigate against fire risk, for example incorporating firebreaks and |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Continual hotter summers may lead to increased evapotranspiration and the potential for increased visitor numbers. This may cause changes in species assemblage, erosion and vegetation damage, and drying out of peat which may become a carbon source as it oxidises. | High | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Reduced summer rains may result in drought conditions and the associated changes to vegetation composition and habitat condition. | High | |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Unlikely to have significant impact | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline mean winter temperatures** | Grass species may become more dominant due to increased nutrient availability, altering the habitat towards acid grassland. Bracken may also become more prevalent. | Medium | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Increased surface runoff resulting from increased winter precipitation may cause erosion, flooding, and increased nitrogen deposition. This may change species assemblage and influence management practises. | Medium | fire ponds, restricting access, and allowing greater levels of scrub in some areas such as stream sides. |
| **Sea Level Rise** | Local impacts may be observed in low lying coastal heathlands and on dune heaths. | Low | |

**Table 9. Influence of climate change on coastal saltmarsh**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^0$C to 10.4 $^0$C greater than the baseline maximum summer temperature** | Increased evaporation may lead to increased salinity in the upper zones of marshes and thus lead to changes in species composition. | Medium | Adaptation strategies typically focus on maintaining natural coastal processes that support sediment supply to saltmarshes. This involves ensuring space for natural saltmarsh development and inland migration, as well as identifying areas for managed realignment to offset habitat loss.<br><br>Potential adaptation options include reducing non-climate-related erosion, managing recreational pressure, minimizing surface erosion through flexible grazing management, ensuring hard defences do not disrupt coastal dynamics, implementing coast-wide management plans, planning for landward marsh movement, promoting sediment supply through |
| **Summer mean temperature anomaly: 2.8 $^0$C to 8.8 $^0$C greater than the baseline mean summer temperatures** | Increased evaporation may lead to increased salinity in the upper zones of marshes and thus lead to changes in species composition. | Medium | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall** | Increased evaporation may lead to increased salinity in the upper zones of marshes and thus lead to changes in species composition. Drought may also | Medum | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **than the baseline summer mean precipitation** | lead to vegetative dieback and competition from grassy species. | | strategic coastal planning, and adjusting protected site boundaries to accommodate coastal evolution. |
| **Winter maximum temperature anomaly: 2.2 $^0$C to 5.3 $^0$C greater than the baseline maximum winter temperature** | Unlikely to have significant impact as coastal areas have less temperature variation due to the influence of the sea. | Low | |
| **Winter mean temperature anomaly: 2.6$^0$C to 5.7$^0$C greater than the baseline mean winter temperatures** | Unlikely to have significant impact | Low | |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Coinciding with increased intensity of winter storms, increased rainfall in winter may lead to flooding and change species assemblage. There will also be issues from erosion during high flows and new areas of saltmarsh developing where deposition is much higher | Medium | |
| **Sea Level Rise** | Sea level rise is the primary risk from climate change to costal saltmarsh, wit changes to sediment load, waterlogging, erosion and the construction of additional flood defences to protect urban areas. This may lead to habitat loss where salt marsh is gradually pushed back, changes in species composition, fragmentation of habitat, and erosion of the habitat due to increased wave energy. | High | |

**Table 10. Influence of climate change on upland flushes, fens and swamps**

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
|---|---|---|---|
| **Summer maximum temperature anomaly: 3.1 $^{0}$C to 10.4 $^{0}$C greater than the baseline maximum summer temperature** | Higher maximum temperatures may lead to increased evaporation and increase the risk of drought. | Medium | These habitats often suffer from fragmentation and isolation, hindering species movement and increasing habitat risks. Thus, priority adaptation strategies include habitat restoration to enhance size and connectivity. Degraded habitats with pre-existing drainage features may be more at risk of drought and erosion, and as such can be mitigated against by restoring the habitat.<br><br>Potential options involve restoring natural hydrological functions by blocking drainage and reinstating more natural hydrological regimes such as valley mires and springs and flush systems, managing grazing to prevent overgrazing and eutrophication, controlling scrub encroachment, and considering species translocation to bolster habitat resilience, particularly for isolated flushes. |
| **Summer mean temperature anomaly: 2.8 $^{0}$C to 8.8 $^{0}$C greater than the baseline mean summer temperatures** | Warmer temperatures may shift species assemblage to favour more southerly species and could lead to increased nutrient loading through acceleration decomposition, leading to possible eutrophication. | Medium | |
| **Summer mean precipitation anomaly: 22%- 70% less rainfall than the baseline summer mean precipitation** | Drought may cause a lowered water table, altering species composition and drying out the habitat. The oxidation or peat may cause the habitat to become a carbon source. | High | |
| **Winter maximum temperature anomaly: 2.2 $^{0}$C to 5.3 $^{0}$C greater than the baseline maximum winter temperature** | Unlikely to have significant impact | Low | |
| **Winter mean temperature anomaly: 2.6$^{0}$C to 5.7$^{0}$C greater than the baseline mean winter temperatures** | Unlikely to have significant impact | Low | |

| RCP Variable | Effect on Habitat | Risk [H,M,L] | Adaptation Strategy |
| --- | --- | --- | --- |
| **Winter mean precipitation anomaly: 9%- 77% more rainfall than the baseline winter mean precipitation** | Heavier rain events in winter may lead to peat slippage and erosion, degrading peatland condition. | Medium | |
| **Sea Level Rise** | n/a | n/a | |

# References

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# Glossary

| Term | Definition |
| --- | --- |
| **Adaptation** | A change in natural or human systems in response to the impacts of climate change. These changes moderate harm or exploit beneficial opportunities and can be in response to actual or expected impacts. |
| **Adaptive capacity** | The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, take advantage of opportunities, or cope with the consequences. Adaptive capacity can be an inherent property of the system, i.e., it can be a spontaneous or autonomous response. Alternatively, adaptive capacity may depend upon policy, planning and design decisions carried out in response to, or in anticipation of, changes in climatic conditions. |
| **Climate change scenario** | A plausible description of the change in climate by a certain time in the future. These scenarios are developed using models of the Earth's climate, which are based upon scientific understanding of the way that the land, ocean and atmosphere interact and their responses to factors that can influence climate in the future, such as greenhouse gas emissions. |
| **Climate variable** | Surface variables such as temperature, precipitation, and wind. |
| **Climate Hazard** | The potential occurrence of a climatic or weather event or climatic trend that may cause impacts to exposed features such as damage, death or changes in condition. |

| Term | Definition |
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| **Climate Risk** | The potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard. Risk results from the interaction of vulnerability (of the affected feature), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence. |
| **Climate Impact** | In the context of climate change, an effect of climate change on the environment. This may be detrimental or beneficial and may be either as a direct consequence of climate change, or as a result of a human response to climate change. |
| **Exposure** | The presence of a feature in places and settings that could be adversely affected by a climate hazard. |
| **High-carbon habitat** | A habitat with the potential to sequester and store large amounts of carbon. |
| **Mitigation (of climate change)** | A human intervention to reduce emissions (such as those resulting from burning fossil fuels) or enhance the sinks (such as forests and soil) of greenhouse gases. |
| **Priority Habitat** | Priority habitats cover a wide range of semi-natural habitat types, and were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). |

| Term | Definition |
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| **Projection** | A plausible description of the future and the pathway that leads to it. Projections are not predictions. Projections include assumptions, for example, on future socio-economic and technological developments, which might or might not happen. They therefore come with some uncertainties. |
| **Representative concentration pathway (RCP)** | Representative Concentration Pathways (RCPs) outline four distinct trajectories for greenhouse gas (GHG) emissions, atmospheric concentrations, air pollutant emissions, and land-use throughout the 21st century. These pathways encompass a stringent mitigation plan (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0), and one scenario characterized by very high GHG emissions (RCP8.5). Baseline scenarios, which do not involve additional efforts to limit emissions, fall within the range of pathways between RCP6.0 and RCP8.5. RCP2.6 represents a scenario where global warming is limited to below 2°C above pre-industrial levels. |
| **Resilience** | The ability of a social or ecological system to absorb disturbances while retaining the same basic ways of functioning, and a capacity to adapt to stress and change. |
| **Sensitivity** | The degree to which a system is affected, either adversely or beneficially, by climate variability or change. |
| **Vulnerability** | In this context, the degree to which an individual, environmental feature or a system is susceptible to the adverse effects of climate change. Vulnerability is influenced by the system's sensitivity and |

| Term | Definition |
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| | its adaptive capacity, as well as the magnitude of the change. |