

NHSScotland Climate Change Risk Assessments and Adaptation Plans: A Summary Report

**ASR500-
002**

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Executive Summary

Climate change significantly impacts the health system, posing threats to healthcare assets and the continuity of service provision. To address these challenges, NHS boards have developed Climate Change Risk Assessments (CCRAs) and Adaptation Plans for healthcare assets, identifying potential risks and outlining strategies to mitigate them. As of December 2024, twenty-two NHS boards have completed their CCRAs, and eighteen have developed Adaptation Plans.

The NHS boards assessed a variety of climate hazards, including higher average temperature and extended periods of hot weather, extended periods of dry weather and drought, heavy downpours and driving rain, storm surge, coastal inundation and coastal erosion, flooding, cold spells and combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud). These hazards not only pose immediate risks but are expected to increase in intensity and frequency in the coming years, making it essential for the NHS boards to act swiftly and proactively.

Historically, NHS boards have already experienced the damaging effects of climate hazards, which further underscores the need for timely and effective adaptation. The healthcare assets at risk range from hospitals, GP surgeries, and community health centres to offices, vehicles, laundries, and critical support services.

Climate hazards impact NHS boards in different ways. The ones that were frequently found in the NHS boards CCRAs are related to disruptions to transportation and site access, interruptions to essential supplies, damage to infrastructure and equipment, increased patient numbers, structural damage, and compromised emergency systems. Additionally, staff wellbeing is at risk, with the potential for decreased productivity and increased stress under more extreme conditions. Some of these potential impacts are:

Table 0.1 Potential climate change impacts on healthcare assets and services

Nature of Potential Impact	Potential Impacts
Transportation and site access	Access routes closures
Transportation and site access	Vehicles risk damage
Transportation and site access	Delayed tests results delivery
Transportation and site access	Cancellation of healthcare services
Essential supplies	Supply chain disruptions
Essential supplies	Water supply disruptions
Essential supplies	Power outages
Building components and equipment	Damage to critical building systems
Building components and equipment	Damage to critical equipment

Nature of Potential Impact	Potential Impacts
Building components and equipment	Damage to sewage system
Building components and equipment	Compromise backup power and generators
Building components and equipment	Building refurbishment
Increasing number of patients	Impacts on physical and mental health
Increasing number of patients	Increased service demand
Increasing number of patients	Delayed patient discharge
Structural	Building foundations damage
Structural	Superficial structural damage
Emergency systems	Increased strain on emergency services
Emergency systems	IT and communication performance impact
Emergency systems	Emergency services overloaded
Decreased staff wellbeing	Increased stress and staff fatigue
Decreased staff wellbeing	Loss of efficiency

The climate change potential impacts on NHSScotland that have highest risk exposure scores – and thus require urgent attention – are related to “emergency systems”, “increasing number of patients” and “building components and equipment”. Additionally, the highest average risk exposure scores are predominantly linked to “flooding”, indicating that this hazard is a critical concern across various NHS boards.

Following flooding, the next most pressing climate hazards are “combined climatic effects” and “heavy downpours and driving rain”. These events require focused attention on critical healthcare assets such as hospitals, GP surgeries, and essential services. Vulnerabilities in these areas can severely compromise service delivery during extreme weather events.

It's important to note that each NHS board has assigned different risk exposure scores to potential impacts based on their specific circumstances, meaning that prioritisation will vary. This highlights the need for a tailored, NHS board-specific approach to climate resilience.

Given these findings, the urgency of identifying and addressing vulnerabilities within healthcare assets becomes clear. NHSScotland must act now to strengthen its resilience to climate impacts, ensuring that critical healthcare services continue uninterrupted, even as environmental challenges intensify.

As part of this, NHS boards have developed adaptation plans, with proposed high-level actions to address the potential impacts identified. These actions include risk and vulnerability assessments, enhancing emergency preparedness, weather monitoring, infrastructure assessment and improvements, stakeholder coordination, the implementation of nature-based solutions, among others.

The NHS boards CCRA and Adaptation Plans for healthcare assets represent first important steps for NHSScotland in the adaptation process, not only aiming to enhance its adaptive capacity and increase its health system resilience but also contributing to broader environmental sustainability.

1. Introduction

- 1.1. Due to climate change, extreme weather events such as heatwaves, heavy rain, storms, wildfires, and others have increased in the last decade. The last Intergovernmental Panel on Climate Change (IPCC) report (AR 6) reported that climate change is already affecting many weather and climate extremes in every region across the globe (See ref 1). Additionally, the United Nations Office for Disaster Risk Reduction states that the number of extreme events per year, based on current trends, will almost triple between 2011 and 2030 (See ref 2).
- 1.2. According to the Met Office, in a high-emission scenario (Representative Concentration Pathway (RCP) 8.5), the UK is expected to experience warmer and wetter winters, hotter and drier summers, and more frequent and intense weather extremes. Hot summer days are projected to become 3.8°C to 6.8°C warmer under this scenario (See ref 3).
- 1.3. These extreme events have a direct impact on the morbidity and mortality of the population, and an indirect impact by fluctuating the distribution of vectors (such as mosquitoes, ticks, flies), the increase of pollen counts and also of air pollution (See ref 4). The increase of frequency and intensity of extreme weather events will also impact healthcare assets, and these impacts will have widespread effects on the health sector and its ability to provide healthcare to the population.
- 1.4. Recognising the seriousness of these challenges and prioritising climate change adaptation in NHSScotland is vital for service continuity. Adaptation not only safeguards the resilience of healthcare systems but also plays a critical role in ensuring the sustained provision of quality health services. From improving asset resilience to planning targeted interventions for emerging health risks, climate change adaptation in NHSScotland is a crucial strategy for safeguarding community well-being and enhancing the adaptive capacity of the healthcare system.
- 1.5. In that regard, NHS boards have completed Climate Change Risk Assessments (CCRAs) which identify healthcare assets and services that will be impacted by climate change and assess relevant climate hazards. Considering this information, NHS boards have developed adaptation plans with proposed measures to address the identified risks.
- 1.6. This report encompasses the results of the NHS boards' CCRA and Adaptation Plans for Healthcare Assets, providing a national picture of the potential impacts of climate change on NHSScotland and proposed actions to mitigate them and increase the resilience of our healthcare system. This report also contains recommendations to progress climate change adaptation in NHSScotland.

2. Climate change risk assessment and adaptation planning tool for healthcare assets

The tool

- 2.1. NHSScotland Assure, in collaboration with NHS boards, Adaptation Scotland and JBA Consulting, created the Climate Change Risk Assessment (CCRA) and Adaptation Planning Tool for Healthcare Assets, to assist NHS boards with the identification of the potential impacts of climate change on their healthcare assets and services, and to develop adaptation plans.
- 2.2. The process started in 2018, and workshops were conducted to help NHS boards learn how to use the tool to develop their CCRA and Adaptation Plans. The tool was developed for use by territorial and national NHS boards, and guidance has been published which addresses the needs of both. The tool can be utilised for all NHS sites, including NHS owned, Public-Private Partnership (PPP) sites and leased sites at the discretion of the NHS board. It also has an option to assess planned future assets.
- 2.3. To populate the tool, a combination of desk-based assessment and dialogue with both internal and external partners was used. Engaging with the right internal stakeholders was crucial for gaining support and ensuring the delivery of a realistic adaptation plan. Some of the NHS board teams that participated in the development of the CCRA and Adaptation Plans were the Sustainability, Estates, Resilience, Public Health, Laundry, Information Technology (IT), and Communications teams.
- 2.4. It is important to note that each NHS board applied its own methods to complete its CCRA and Adaptation Plan. The NHS boards also had varying levels of resources, differing expertise among those involved, and different approaches to interpreting and assessing risks.

Climate Change Risk Assessments (CCRA)

- 2.5. The aim of a CCRA is to recognise climate hazards that could impact NHS boards, identify which assets (existing and new) and services could be affected and assess the level of risk.
- 2.6. The CCRA contains information related to:
 - risk type
 - asset group (at risk)
 - climate hazards
 - historical impacts
 - assets at risk (specific information)

- nature of potential impact (examples: transportation, essential supplies)
- details of potential impact

Table 2.1 below illustrates the steps taken in developing a CCRA.

Table 2.1 - Steps for developing NHS boards' CCRA

Step number	Step description
1. Identification of climate hazards that are likely to affect assets	The NHS boards identified the climate hazards that could impact their healthcare assets. For example: Flooding, cold spells, storms.
2. Recognition of historical impacts	To identify historical impacts, the NHS boards discussed previous adverse weather events or incidents that affected their NHS boards and reviewed the following: <ul style="list-style-type: none"> • incidents reporting • health and safety reports • estates and facilities meeting minutes and the Planning and Asset Management Strategy (PAMS) • Local Authority Local Climate Impact Profiles (LCLIPs) • high level flood risk assessments produced for each NHS board • any other document or report available which is relevant to the CCRA
3. Identification of assets at risk	Identified specific assets based on: <ul style="list-style-type: none"> • review of relevant documentation and discussion with colleagues • previously affected by climate hazards • potential to have a significant impact if affected, for example: a hospital with a large catchment area
4. Description of potential impact	The NHS boards classified the nature of the potential impact and detailed its consequences by describing the impacts in their NHS boards.
5. Risk assessment = probability X consequence	A risk exposure score was calculated by: <ul style="list-style-type: none"> • scaling the “probability” (likelihood of occurrence) or a hazard, by assigning a value from 1 to 5, where 1 is “rare” and 5 is “most certain” • scaling the “consequence” (impact) if the climate hazard occurred, by assigning a value from 1 to 5, where 1 represents “negligible” and 5 represents “extreme” • the probability and consequence values were multiplied to obtain the risk exposure score

Adaptation plans

- 2.7. After identifying the climate change risks that might impact the NHS board's healthcare assets and services, Adaptation Plans were developed with proposed measures to address these risks. These high-level recommended adaptation actions represent an important initial step towards enhancing the resilience of the NHS board's health systems.
- 2.8. Figure 2.1 presents the sequence of steps followed by the NHS boards to develop their Adaptation Plans.

Figure 2.1 - Steps for developing Adaptation Plans



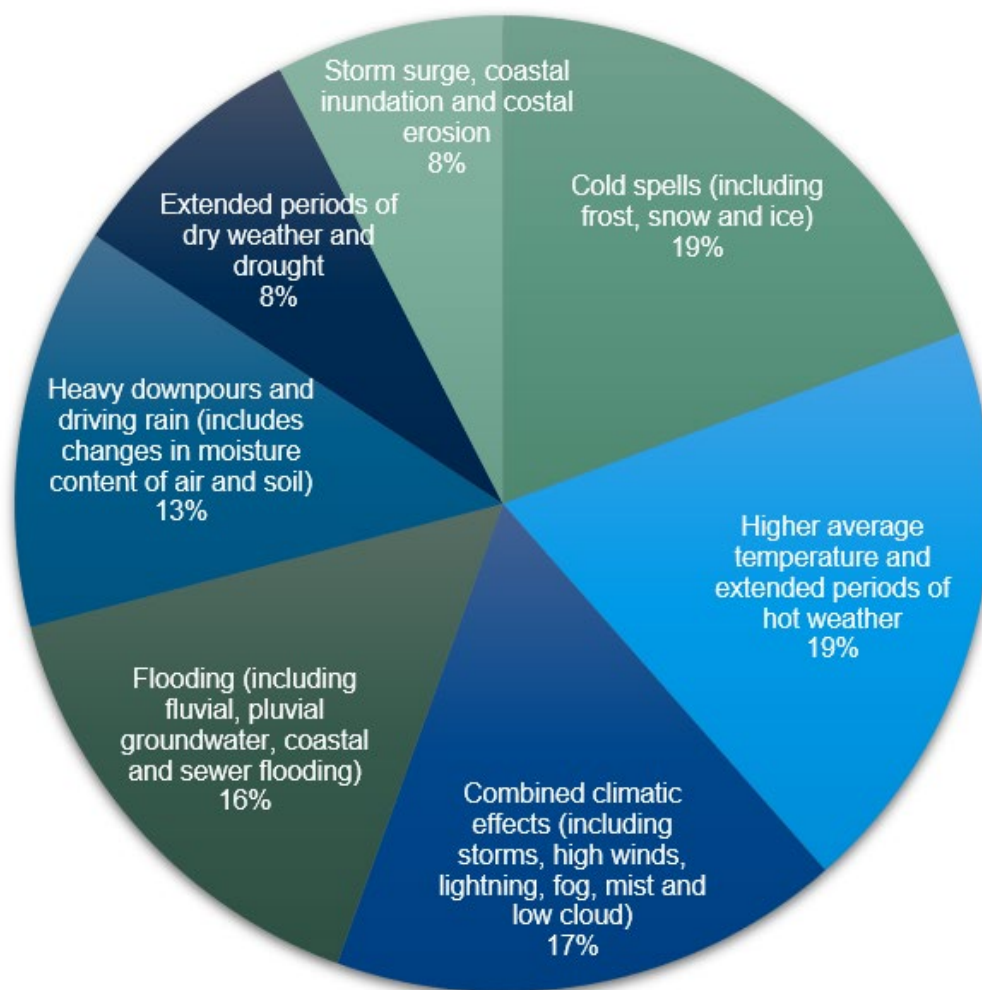
3. CCRA results

- 3.1. All twenty-two NHS boards (100% of the total) have completed their Climate Change Risk Assessments (CCRA). The following sections present the results of these assessments, highlighting the identified climate hazards, historical impacts, potential impacts, affected asset groups, and other important aspects.

Climate hazards

- 3.2. The climate hazards identified by the NHS boards are likely to affect Scotland's health system now or in the future include:
- higher average temperature and extended periods of hot weather (including heatwaves)
 - extended periods of dry weather and drought
 - heavy downpours and driving rain (including changes in moisture content of air and soil)
 - storm surge, coastal inundation and coastal erosion
 - flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)
 - cold spells (including frost, snow and ice)
 - combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)
- 3.3. Each NHS board has identified risks that could impact their assets and service provision, recognising a total of 952 potential climate change impacts across all twenty-two NHS boards. According to the potential impacts identified by the NHS boards, the hazards that have been most mentioned are "Higher average temperature and extended periods of hot weather" and "cold spells", followed by "combined climatic effects", and "flooding" (See Figure 3.1). The details of the number of risks identified per hazard for each NHS board are given in Appendix B .
- 3.4. It is important to note that the results of this analysis are based on individual NHS boards responses, which may be subjective and influenced by local circumstances, data availability and expertise.

Figure 3.1 - Percentage of risks identified by climate hazard



Historical impacts

- 3.5. During the development of the CCRA, the NHS boards recognised historical climate related impacts where climate hazards had affected their assets and the provision of health services. Identifying these historical impacts was crucial, as it underscored the tangible consequences of climate change on healthcare infrastructure and services, reinforcing the need for effective adaptation strategies.
- 3.6. Some examples of historical impacts mentioned by NHS boards in their CCRA are included in the Appendix A .

Asset groups at risk

- 3.7. The increasing frequency, intensity, and duration of climate hazards, along with the potential recurrence of historical impacts reported by NHS boards, pose significant threats to critical healthcare infrastructure.

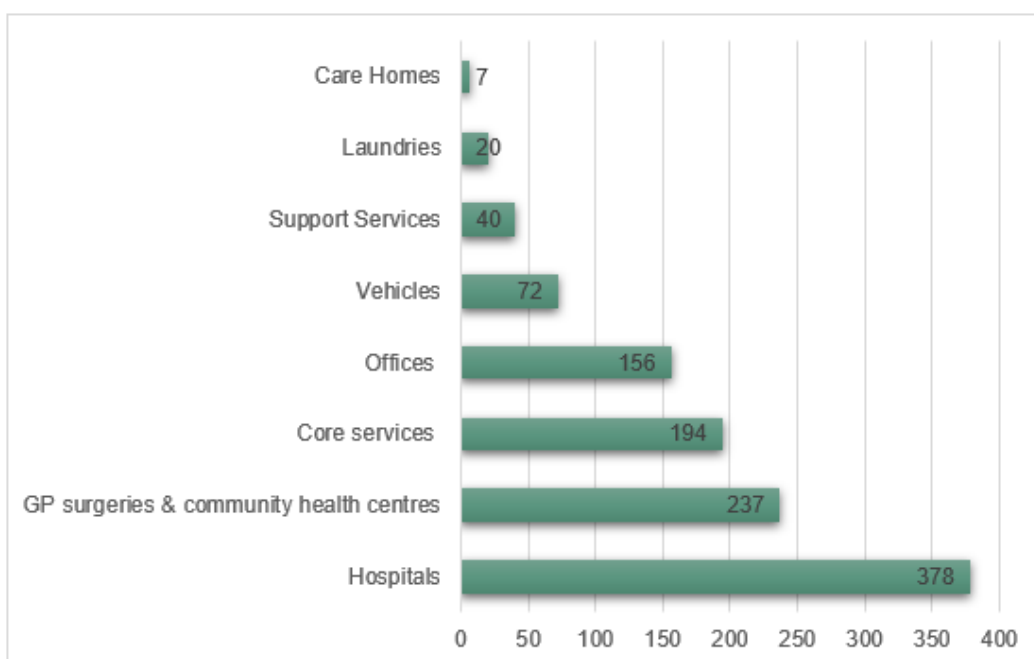
3.8. Different asset groups will be impacted by climate hazards in different magnitudes. It's important to note that these impacts vary in nature, ranging from structural components and equipment to transportation and site access. The asset groups that could be impacted by climate change, identified by NHS boards, include hospitals, core services, vehicles, among others (see Figure 3.2). More detail can be found in Appendix C .

Figure 3.2 - Asset groups potentially impacted by climate change



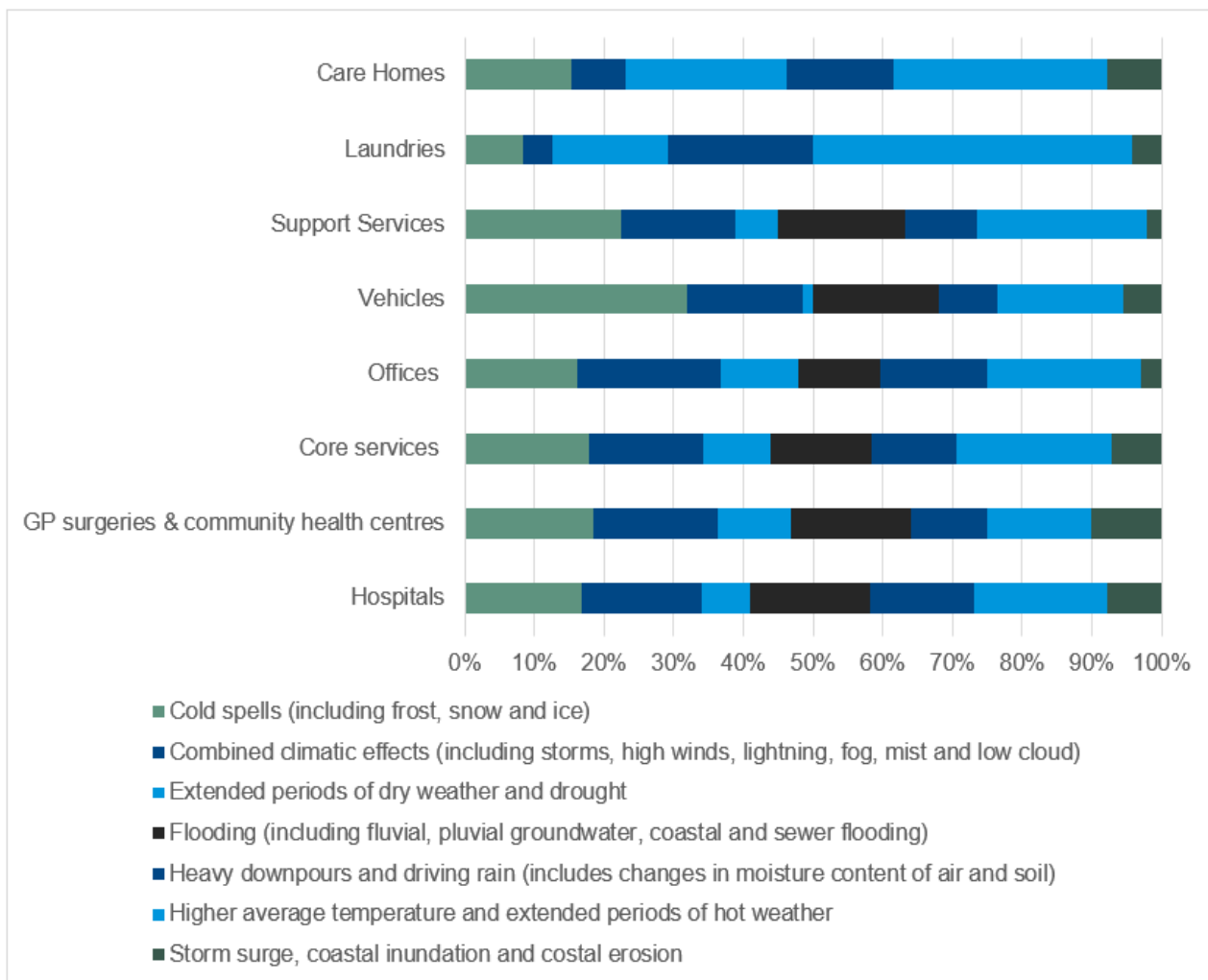
3.9. According to the assessment undertaken by each NHS board, the asset group with the most identified potential impacts are Hospitals, GP Surgeries and Community Health Centres, as seen in Figure 3.3.

Figure 3.3 - Asset Groups that appear most often in the NHS board's CCRA's



3.10. Figure 3.4 shows the breakdown of the risks identified by each asset group and climate hazard, presented as percentages.

Figure 3.4 - Percentage of risks identified by Climate Hazard and Asset Group



Nature of potential impact

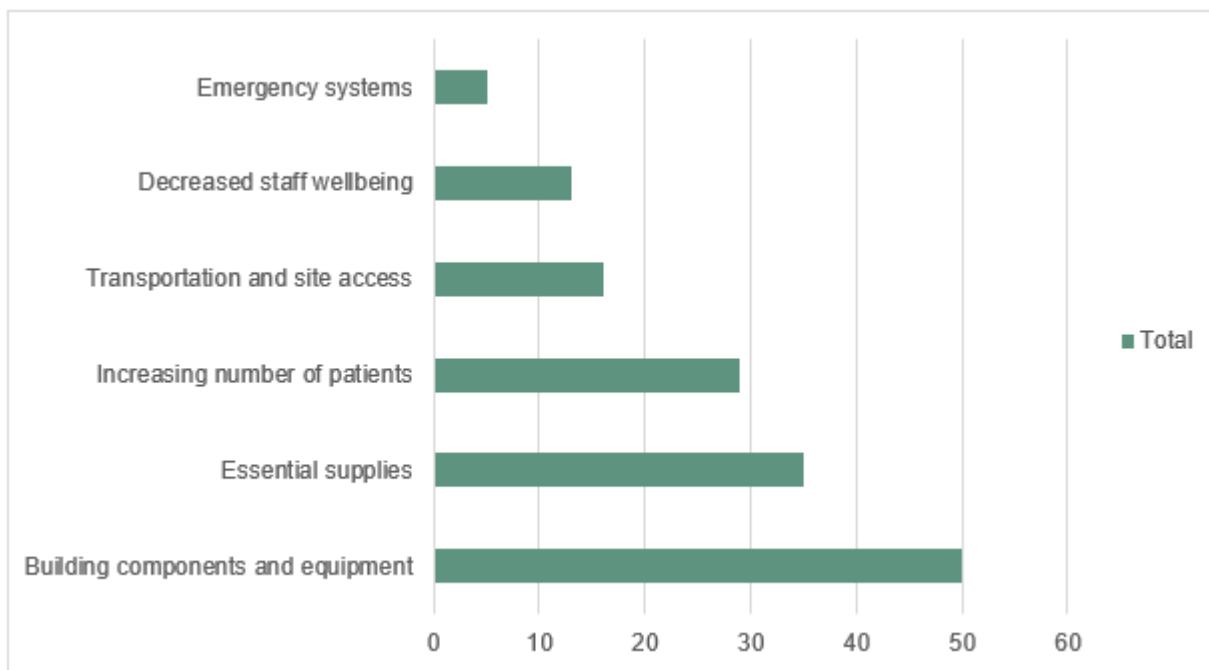
3.11. Potential impacts have been categorised according to their nature. For instance, higher average temperatures can strain cooling systems in healthcare facilities, which falls under the category of “building components and equipment”. This strain leads to increased energy demand and operational costs, categorised under “other knock-on impacts”. Additionally, this hazard poses potential health risks for patients and staff which are categorised under “increased number of patients” and “decreased staff wellbeing”. Similarly, increased flooding can disrupt access to healthcare service, categorised under “transportation and site access”; and damage critical infrastructure, which is categorised as “structural”.

3.12. When analysing the nature of potential impacts by climate hazards, the results are as follows (the details of each of the potential impacts are specified in Appendix D).

Higher average temperature

3.13. According to the NHS boards responses, when there is a “Higher Average Temperature”, potential impacts on “Building components and equipment” come up more frequently (See Figure 3.5).

Figure 3.5 - Higher average temperature’s potential impacts count in all NHS boards



3.14. The main potential impacts identified by NHS boards are:

Table 3.1 - Higher average temperature's potential impacts identified by NHS boards

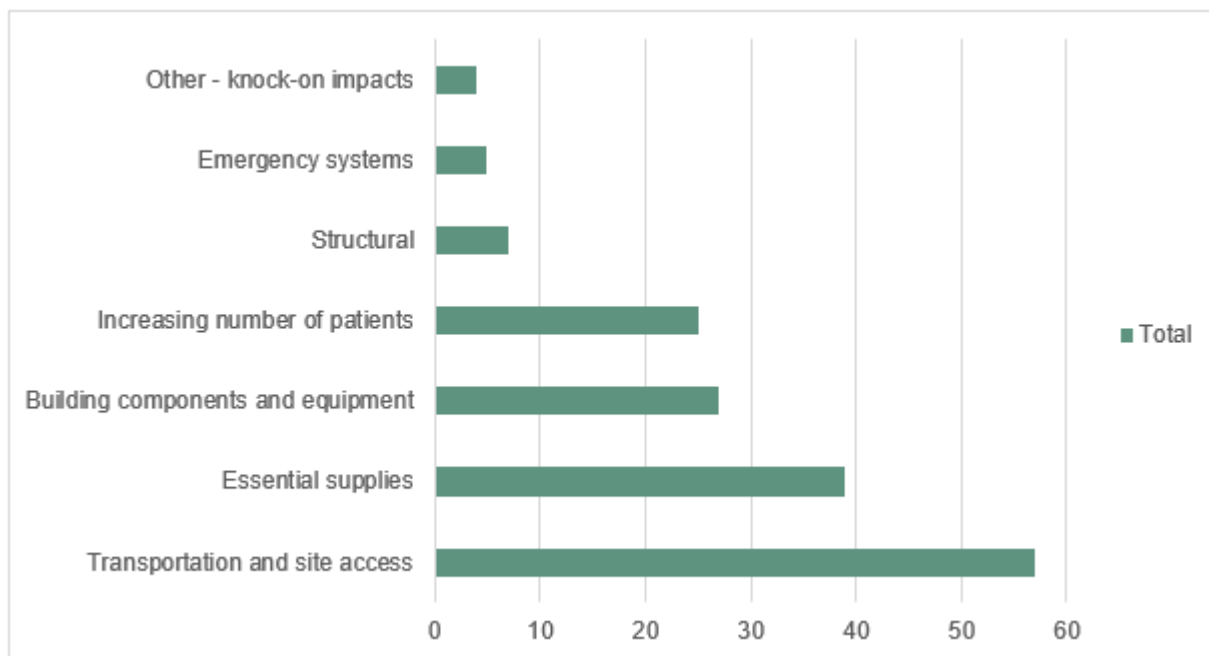
Nature of potential impact	Potential impacts
Transportation and site access	Vehicle damage
Transportation and site access	Electric Vehicles (EVs) decreased efficiency
Transportation and site access	Vehicle overheating
Transportation and site access	Impacts on service delivery
Transportation and site access	Car park surface damage
Essential supplies	Food preservation and safety compromised
Essential supplies	Adverse impacts on water supply and quality
Essential supplies	Increasing energy costs and power supply
Essential supplies	Increased demand for refrigeration contractors
Essential supplies	Waste management challenges

Nature of potential impact	Potential impacts
Building components and equipment	Draining systems drying up and blockages
Building components and equipment	Higher maintenance demands on cooling systems and ventilation
Building components and equipment	Temperature and infection risk
Building components and equipment	Strain on electrical infrastructure
Building components and equipment	Drug storage overheating
Building components and equipment	Overheating air conditioning (AC) systems
Building components and equipment	Overheating wards
Building components and equipment	Increased solar gain
Building components and equipment	Technical difficulties of electrical equipment
Building components and equipment	Overheating risks of electrical equipment and infrastructure
Increasing number of patients	Increased heat-related diseases
Increasing number of patients	Worsening respiratory conditions
Increasing number of patients	Increasing vector-borne diseases
Increasing number of patients	Food and waterborne illnesses increase
Increasing number of patients	Negative impacts on vulnerable populations
Structural	Damage to building fabric
Structural	Maintenance challenges
Emergency systems	Disruption in critical care
Emergency systems	Digital system disruptions
Emergency systems	Network disruptions
Emergency systems	IT performance impact
Emergency systems	Increased energy costs
Decreased staff wellbeing	Decreased staff health and wellbeing
Decreased staff wellbeing	Hydration and safety challenges
Decreased staff wellbeing	Uniform and Personal Protective Equipment (PPE) discomfort
Decreased staff wellbeing	Loss of efficiency

Cold spells

3.15. During periods of “Cold Spells”, NHS boards most frequently mentioned potential impacts on “Transportation and site access”, followed by impacts on “Essential supplies” (See Figure 3.6).

Figure 3.6 - Cold spells' potential impacts count in all NHS boards



3.16. The main potential impacts identified by NHS boards are:

Table 3.2 - Cold spells' potential impacts identified by NHS boards

Nature of Potential Impact	Potential Impacts
Transportation and site access	Closure of critical access routes for staff, patients and emergency services
Transportation and site access	Closure of access routes for waste vehicles
Transportation and site access	Impacts on car parking
Transportation and site access	Impacts on emergency vehicles
Transportation and site access	Potential accidents
Essential supplies	Restricted access for service providers and suppliers
Essential supplies	Impacts on batteries and power supply
Essential supplies	Increased energy costs
Building components and equipment	Potential failures of heating systems
Building components and equipment	Vulnerabilities in plant and equipment

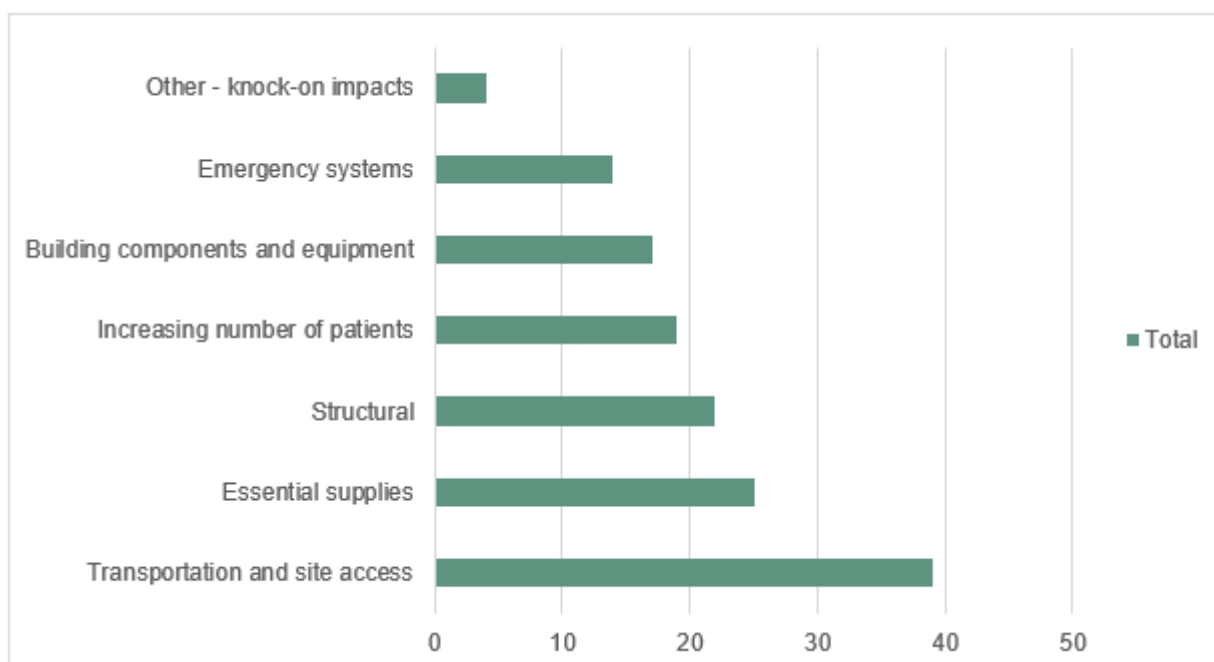
Nature of Potential Impact	Potential Impacts
Increasing number of patients	Increased service demand due to falls and cold related diseases
Increasing number of patients	Cancelled outpatient appointments
Increasing number of patients	Increased waiting times
Increasing number of patients	Impact on vulnerable populations
Increasing number of patients	Accessibility issues
Increasing number of patients	Delayed patient discharge
Structural	Damage to water infrastructure
Structural	Disruption to maintenance
Structural	Damage to above ground infrastructure
Structural	Damage to roofs
Emergency systems	Network disruptions
Other knock-on impacts	Additional washing required
Other knock-on impacts	Reduced staffing due to no childcare or locum availability
Other knock-on impacts	Increment of financial costs
Other knock-on impacts	Decontamination issues

3.17. A particular consideration was identified in the impacts recognised. Some NHS boards mentioned that they could be significantly affected by cold spells and concerns were raised regarding the suitability of EVs for all services and these being particularly vulnerable to power outages. Therefore, they highlighted a potential conflict between complying with the Government's net zero directives and ensuring the resilience of the NHS boards' fleets.

Combined climatic effects

3.18. In the case of “Combined Climatic Effects”, potential impacts on “Transportation and site access” appear with increased frequency in NHS boards CCRA (See Figure 3.7).

Figure 3.7 - Combined Climatic Effects' potential impacts count in all NHS boards



3.19. The main potential impacts identified by NHS boards are:

Table 3.3 - Combined climatic effects' potential impacts identified by NHS boards

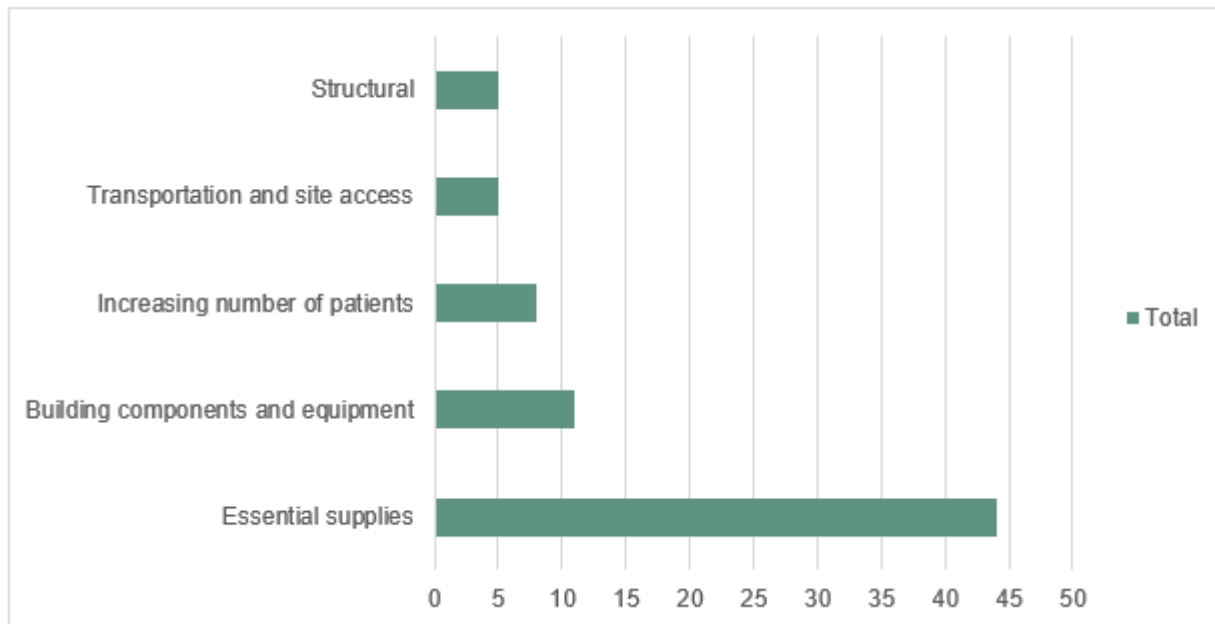
Nature of Potential Impact	Potential Impacts
Transportation and site access	Transportation disruptions
Transportation and site access	Service delivery impacts
Transportation and site access	Limited public transport capabilities
Transportation and site access	Remote and rural community accessibility challenges
Transportation and site access	Helicopter operations affected
Transportation and site access	Impact on vehicles and maintenance
Transportation and site access	Patient access and appointment disruptions
Essential supplies	Power outages and disrupted operations
Essential supplies	Restricted access for service providers and suppliers
Building components and equipment	Damage to above ground infrastructure
Building components and equipment	Damage to IT infrastructure
Building components and equipment	Disruption to power supply
Building components and equipment	Building and equipment damage

Nature of Potential Impact	Potential Impacts
Building components and equipment	Increased pressure on infrastructure
Building components and equipment	Maintenance challenges
Building components and equipment	Reduced serviceable lifespan of equipment
Building components and equipment	Damage to communication systems
Increasing number of patients	Cancellation and disruption of medical services
Increasing number of patients	Increased service demand
Increasing number of patients	Impacts on elderly populations
Increasing number of patients	Mental health impacts
Increasing number of patients	Impact on routine operations
Increasing number of patients	Shifting baselines for service demand
Structural	Roof damage
Structural	Impacts on glass panelling and external features
Structural	Building fabric damage due to water ingress
Structural	Risks to structural integrity
Emergency systems	Increased strain on back-up generators
Emergency systems	Tripping of uninterruptible power supply (UPS)
Emergency systems	Failure of IT/ phone systems
Emergency systems	Loss of telehealth and communication
Emergency systems	Data centres at risk
Emergency systems	Impacts on emergency services and response
Decreased staff wellbeing	Safety risks for commuting staff
Decreased staff wellbeing	Fatigue and mental health impacts
Decreased staff wellbeing	Health and safety concerns
Other Knock-on impacts	Impact on routine operations
Other Knock-on impacts	Operational impact on staff
Other Knock-on impacts	Reduced staff availability

Extended periods of dry weather and drought

3.20. For the climate hazard “Extended Periods of Dry Weather and Drought”, potential impacts on “Essential supplies” are highlighted by NHS boards (See Figure 3.8).

Figure 3.8 - Extended periods of dry weather and drought’s potential impacts count in all NHS boards



3.21. The main potential impacts identified by NHS boards are:

Table 3.4 - Extended periods of dry weather and drought’s potential impacts identified by NHS boards

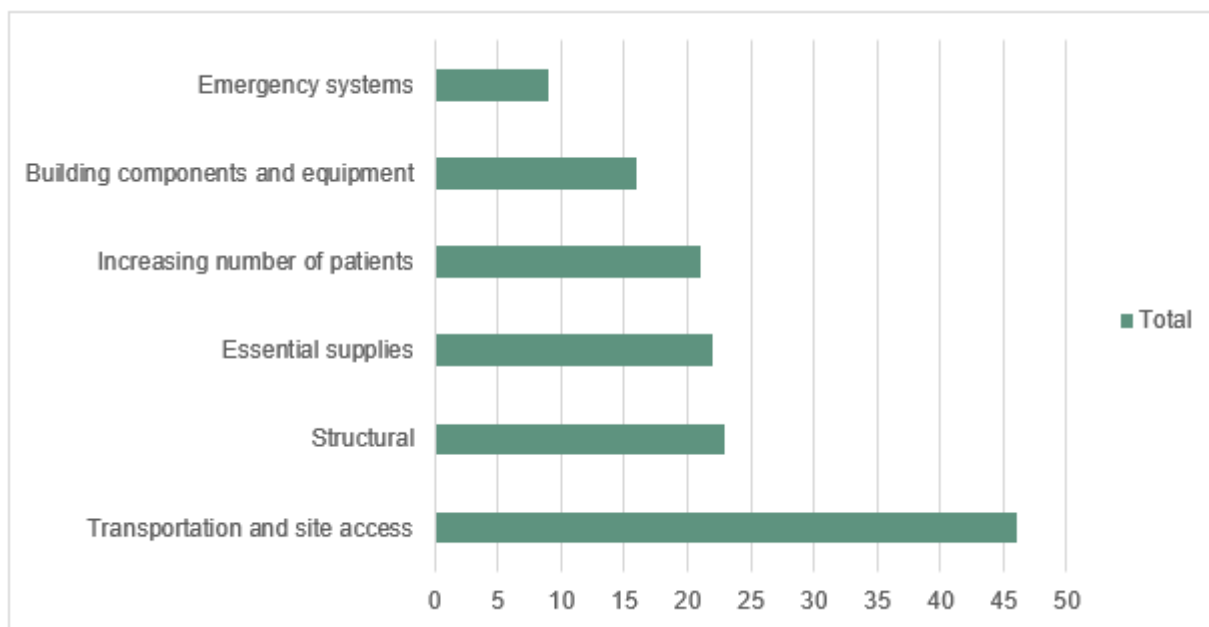
Nature of Potential Impact	Potential Impacts
Essential supplies	Impacts on laundry services
Essential supplies	Impacts on energy generation
Essential supplies	Impact on food supply
Essential supplies	Reduced water quality
Essential supplies	Potential health and safety risks
Essential supplies	Impacts on hygiene and hydration
Transportation and site access	Impacts on vehicle cleaning
Building components and equipment	Lack of water supply and pressure
Building components and equipment	Damage and maintenance of drainage systems
Building components and equipment	Damage and maintenance of equipment
Building components and equipment	Greenspace deterioration

Nature of Potential Impact	Potential Impacts
Increasing number of patients	Reduced air quality
Increasing number of patients	Contaminated water supply
Increasing number of patients	Increase of dehydration cases
Increasing number of patients	Poor nutrition
Increasing number of patients	Legionella risk
Increasing number of patients	Mental health impacts on farming communities
Structural	Roof collapse
Structural	Increasing needs of building maintenance
Structural	Impact on construction
Decreased staff wellbeing	Increased stress and staff fatigue
Decreased staff wellbeing	Limited access to drinking water

Flooding

3.22. In the case of “Flooding”, NHS boards most frequently mention potential impacts on “Transportation and site access” (See Figure 3.9).

Figure 3.9 - Flooding's potential impacts count in all NHS boards



3.24. The main potential impacts identified by NHS boards are:

Table 3.5 - Flooding's potential impacts identified by NHS boards

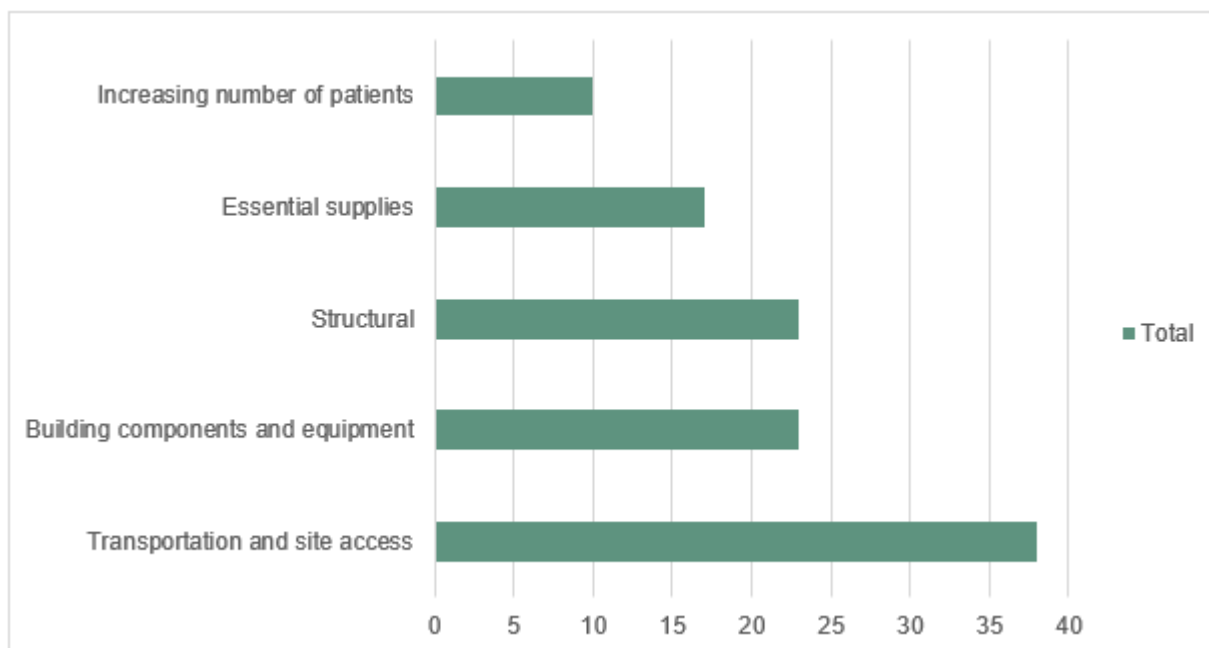
Nature of Potential Impact	Potential Impacts
Transportation and site access	Access routes closures
Transportation and site access	Disruption on air and ferry services
Transportation and site access	Contractor access issues
Transportation and site access	Vehicles risk damage
Transportation and site access	Flooded car parks
Transportation and site access	Public transport interruptions
Transportation and site access	Mail service disruptions
Transportation and site access	Delayed pathology and lab tests results
Transportation and site access	Cancellation of healthcare services
Essential supplies	Supply chain disruptions
Essential supplies	Water supply disruptions
Essential supplies	Service impacts
Essential supplies	Medical treatments disruptions
Essential supplies	Power outages
Essential supplies	No heating
Building components and equipment	Damage to critical building systems
Building components and equipment	Damage to equipment
Building components and equipment	Sewage system damage
Building components and equipment	Underground infrastructure damage
Building components and equipment	Compromised backup power and generators
Building components and equipment	Building refurbishment
Increasing number of patients	Diversion of services
Increasing number of patients	Impacts on physical health
Increasing number of patients	Impacts on mental health
Increasing number of patients	Increase of waterborne diseases
Increasing number of patients	Worsening housing conditions
Increasing number of patients	Issues on infection control
Increasing number of patients	Delayed patients discharge

Nature of Potential Impact	Potential Impacts
Structural	Building foundations and walls damage
Structural	Superficial structural damage
Emergency systems	Increased strain on emergency services
Emergency systems	IT and communication systems disruptions
Emergency systems	Emergency services overloaded
Emergency systems	Decreased emergency response capabilities
Other Knock-on impacts	Threatened data centres

Heavy downpours and driving rain

3.25. When there are “Heavy Downpours and Driving Rain”, potential impacts on “Transportation and site access” are mentioned with increased frequency by NHS boards (See Figure 3.10).

Figure 3.10 - Heavy downpours and driving rain potential impacts count in all NHS boards



3.26. The main potential impacts identified by NHS boards are:

Table 3.6 - Heavy downpours and driving rain potential impacts identified by NHS boards

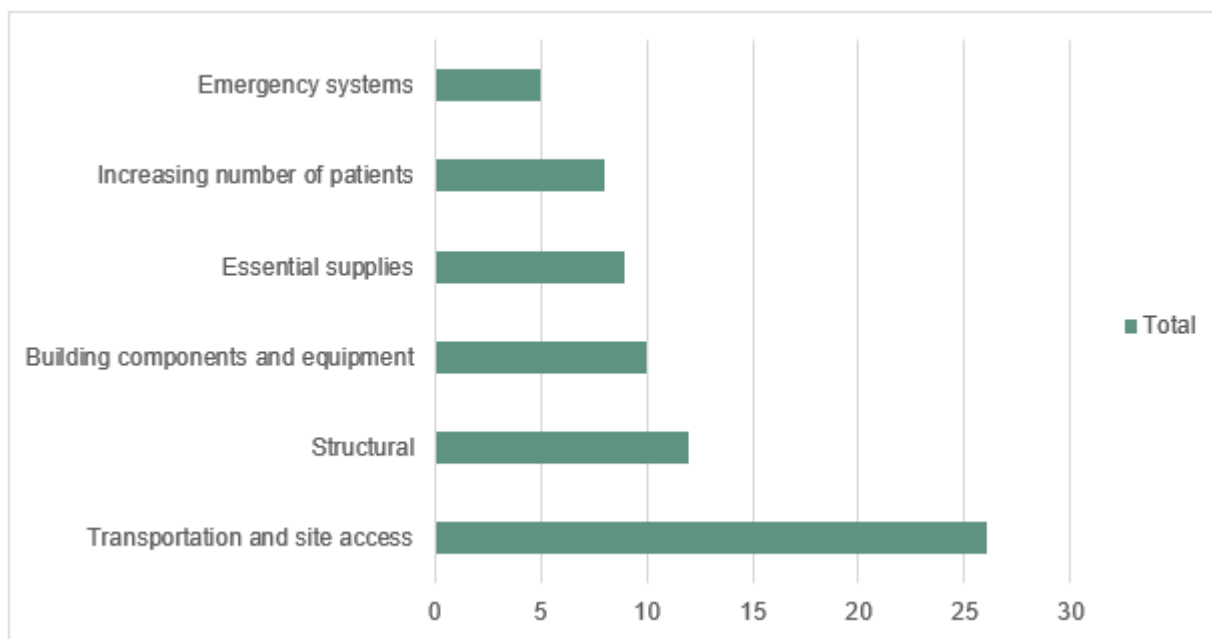
Nature of Potential Impact	Potential Impacts
Transportation and site access	Transport disruption for patients
Transportation and site access	Staff access to sites issues
Transportation and site access	Disruption to the ambulance transport system

Nature of Potential Impact	Potential Impacts
Transportation and site access	Car parking availability reduced
Essential supplies	Disruption to essential supplies
Essential supplies	Mail service disruption
Essential supplies	Short-term supply issues
Essential supplies	Electrical disruptions
Building components and equipment	Above ground infrastructure damage
Building components and equipment	Damage in basements
Building components and equipment	Reduced lifespan of building elements
Building components and equipment	Maintenance challenges
Building components and equipment	Drainage and Sewerage Systems
Building components and equipment	Impacted ventilation filters
Building components and equipment	Impacted office locations
Increasing number of patients	Changes in demand patterns
Increasing number of patients	Impact on patient discharge rates
Increasing number of patients	Mental health services increasing demand
Increasing number of patients	Home-based patients' admissions
Increasing number of patients	Increment of water-related diseases
Increasing number of patients	Community incidents or accidents
Structural	Buildings damage
Structural	Degradation of building fabric
Structural	Internal fabric and electrical components damage
Structural	Increasing maintenance requirements
Structural	Foundations of lighting and CCTV columns damaged
Increasing number of patients	Community incidents or accidents
Structural	Buildings damage
Emergency systems	Damage to server rooms and data centre
Decreased staff wellbeing	Humidity and air quality issues

Storm surge, coastal inundation and coastal erosion

3.27. For the climate hazard “Storm Surge, coastal inundation and coastal erosion”, the NHS boards have identified with increased frequency potential impacts related to “Transportation and site access” (See Figure 3.11).

Figure 3.11 - Storm surge, coastal inundation and coastal erosion potential impacts count in all NHS boards



3.28. The main potential impacts identified by NHS boards are:

Table 3.7 - Storm surge, coastal inundation and coastal erosion potential impacts identified by NHS boards

Nature of Potential Impact	Potential Impacts
Transportation and site access	General transport issues
Transportation and site access	Appointment cancellations
Transportation and site access	Restricted emergency service access
Transportation and site access	Impacts on vehicles
Essential supplies	Power disruptions
Essential supplies	Internet connection issues
Essential supplies	Supply chain disruptions
Essential supplies	Mail services disruptions
Building components and equipment	Damage to essential building components
Building components and equipment	Drainage issues

Nature of Potential Impact	Potential Impacts
Increasing number of patients	Increasing emergency service demand
Increasing number of patients	Increasing mental health services demand
Increasing number of patients	Home-based patients admissions
Structural	Structural damage
Emergency systems	Loss of emergency backup energy supply

- 3.29. The diverse array of climate change risks identified by NHS boards, detailed in Appendix D , underscores the multifaceted ways in which climate change could impact our healthcare assets and disrupt the continuity of service provision.
- 3.30. It is important to note that certain impacts, such as road closures or disruptions to the supply chain, are common across various climate hazards and, therefore, result in similar consequences. Consequently, when we implement adaptation measures for these types of impacts, we are not only addressing the potential effects of a single hazard but also mitigating the consequences of multiple hazards with similar outcomes. This approach allows for more efficient and comprehensive adaptation strategies, enhancing our overall resilience to a range of climate-related challenges. These considerations, along with other critical aspects, will be addressed in the “Adaptation Plans Outputs” section of this report.

Risk exposure score

- 3.31. After identifying the potential impacts, each NHS board assigned probability and consequence scores to determine the risk exposure for each impact. These scores were based on NHS board-specific criteria, taking into account the likelihood of the impact occurring, ranging from rare to almost certain, and the severity of its potential consequences, ranging from negligible to extreme.
- 3.32. An overall analysis of the average risk exposure scores shows that flooding is the hazard that has the highest average risk exposure score, followed by combined climatic effects and heavy downpours and driving rain (See Table 3.8).

Table 3.8 - Climate Hazard and Average Risk Exposure Score in all NHS boards

Climate Hazard	Average of Risk Exposure Score
Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	13
Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	12

Climate Hazard	Average of Risk Exposure Score
Heavy downpours and driving rain (includes changes in moisture content of air and soil)	12
Higher average temperature and extended periods of hot weather	11
Storm surge, coastal inundation and coastal erosion	11
Cold spells (including frost, snow and ice)	10
Extended periods of dry weather and drought	9
Grand Total	11

- 3.33. The highest risk exposure scores assigned to the climate hazards by NHS boards are presented in Table 3.9 (more details are provided in Appendix E). This information indicates that territorial NHS boards have generally assigned higher risk exposure scores to potential impacts, likely due to the nature of their assets, such as hospitals and GP surgeries, and the critical services they provide to the population.

Table 3.9 - Highest average risk exposure score per NHS board and climate hazard

NHS Board	Climate Hazard	Average Risk Exposure Score
Ayrshire & Arran	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	17.28
Greater Glasgow & Clyde	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	17.00
Highland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	16.54
Western Isles	Storm surge, coastal inundation and costal erosion	16.00
Lothian	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	16.40
Borders	Higher average temperature and extended periods of hot weather	15.75
Orkney	Storm surge, coastal inundation and costal erosion	15.00
Grampian	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	15.20
Tayside	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	15.15

NHS Board	Climate Hazard	Average Risk Exposure Score
NHS 24	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.45
Shetland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	15.86
Lanarkshire	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	14.36
Forth Valley	Higher average temperature and extended periods of hot weather	13.00
Golden Jubilee University National Hospital	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.00
Golden Jubilee University National Hospital	Higher average temperature and extended periods of hot weather	13.00
State Hospital Board for Scotland	Cold spells (including frost, snow and ice)	14.67
Public Health Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	12.00
Fife	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	11.75
National Services Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	10.00
Scottish Ambulance Service (SAS)	Higher average temperature and extended periods of hot weather	9.00
Dumfries & Galloway	Higher average temperature and extended periods of hot weather	7.86
Health Improvement Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	8.00
NHS Education for Scotland	Cold spells (including frost, snow and ice)	4.00

- 3.34. As shown in Table 3.9, there is no single common hazard with the highest risk exposure score across all NHS boards. However, hazards such as flooding, heavy downpours, combined climatic effects and higher average temperatures frequently appear among those

with the highest average risk exposure scores. This observation aligns with the hazards most frequently mentioned by the NHS boards when identifying potential impacts, as shown in Figure 3.1.

4. Adaptation plans outputs

- 4.1. 18 NHS boards have developed Adaptation Plans. These plans contain recommended adaptation measures to address the risks identified in the Climate Change Risk Assessments (CCRAs) and recognise risk owners and delivery partners. They also include approximate costs, timelines, and monitoring approaches.
- 4.2. The following sections present information about the proposed adaptation measures included in the NHS boards' Adaptation Plans, as well as other important aspects.

Proposed adaptation measures in NHS boards' adaptation plans

- 4.3. NHS boards' Adaptation Plans include high-level adaptation measures involving a wide variety of actions, from weather monitoring and temperature management to the implementation of nature-based solutions.
- 4.4. As mentioned in the paragraph 3.29, common climate change impacts have been identified across various climate hazards. This overlap enables the implementation of measures that address these impacts across multiple hazards simultaneously. Therefore, the recommended adaptation actions to address climate change risks that were the most incorporated by NHS boards in their Adaptation Plans have been summarised and classified by nature of potential impact below. Where an adaptation measure pertains to a specific type of hazard, it has been specified.

Transportation and site access

- 4.5. The recommended adaptation measures to address impacts related to transportation and site access, focus on enhancing emergency preparedness, weather monitoring, infrastructure resilience, stakeholder coordination, risk assessments, and nature-based solutions. These measures are detailed below (see Table 4.1).

Table 4.1 - Recommended adaptation measures by NHS boards for transportation and site access

Theme	Recommended Adaptation Measures
Emergency preparedness	Establish alternative routes and rapid mass rerouting for ambulances and essential vehicles.
Emergency preparedness	Create alternative staff parking plans during surface flooding.
Emergency preparedness	Include activities that guarantee access to sites during adverse weather events in Business Continuity Plans.
Weather monitoring and response activation	Monitor Met Office warnings and guidance to activate response plans and ensure that all staff are kept informed.

Theme	Recommended Adaptation Measures
Weather monitoring and response activation	Promote agile, flexible working policies and explore opportunities for non-essential staff to work remotely during adverse weather.
Weather monitoring and response activation	Maximise virtual appointments to minimise travel disruptions.
Infrastructure and resource resilience	Ensure backup energy supplies for vehicles with mobile energy storage solutions, such as battery storage systems.
Infrastructure and resource resilience	Implement a rapid response service to transport critical staff to hospitals.
Infrastructure and resource resilience	Ensure vehicles are best equipped for extreme weather (3-peak rated, wet weather specialist tyres or appropriate all-terrain tyres depending on the location).
Stakeholder coordination and response	Collaborate with Scottish Ambulance System.
Stakeholder coordination and response	Work with local authorities to provide water pumps and assist in floodwater removal.
Stakeholder coordination and response	Coordinate with institutions (police, local authorities, community transport associations) to help in the transfer of patients or staff.
Risk assessments	Develop Flood Risk Assessments for access routes.
Risk assessments	Collaborate with local authorities and partners for monitoring public transportation and developing risk assessments for identifying vulnerable access points and alternative routes.
Nature-based solutions	Investigate natural flood attenuation using greenspace.
Nature-based solutions	Implement nature-based flooding solutions for resilience and potential mental health benefits.

Building components and equipment

- 4.6. The recommended adaptation measures to enhance the resilience of building components and equipment, emphasise the importance of equipment maintenance, temperature management, business continuity, sustainable building design, and lessons learned documentation. These measures are detailed below (see Table 4.2).

Table 4.2 - Recommended adaptation measures by NHS boards for building components and equipment

Theme	Recommended Adaptation Measures
Equipment maintenance and resilience	Enhance preventive maintenance by increasing equipment inspections and prioritising essential minor repairs. Ensure drainage is always kept clear.
Equipment maintenance and resilience	Assess equipment resilience to increased temperatures and identify vulnerable items (considering age, location, usage patterns, heat tolerance).
Equipment maintenance and resilience	Conduct cost-benefit analyses for upgrading vulnerable equipment, such as assessing the impact of refrigerator failures on vaccine and drug storage.
Temperature and ventilation management	Upgrade ventilation systems in healthcare facilities.
Temperature and ventilation management	Installation of temperature monitoring equipment and/or enhance sensitivity of internal sensors.
Temperature and ventilation management	Assess air circulation and ventilation and possible strategies for improvements.
Business continuity and IT resilience	Ensure business continuity plans address IT and equipment outage scenarios.
Business continuity and IT resilience	Evaluate monitoring systems for server rooms overheating.
Building design and sustainability	Review and contemplate updating building design models and engaging in dynamic simulation modelling (DSM).
Building design and sustainability	Explore the investment in full integration or upgrade of Building Energy Management Systems (BEMS).
Building design and sustainability	Integrate Sustainable Drainage Systems (SuDS) into greenspaces and projects, enhancing water management, reducing flood risks, and promoting environmental sustainability.
Lessons learned and documentation	Establish a register for documenting experiences and lessons learned from adverse weather events.

Essential supplies

- 4.7. The adaptation measures proposed for disruption to essential supplies focus on enhancing energy resilience, emergency preparedness, supply chain resilience, environmental monitoring, and waste management to mitigate the impacts of climate change on healthcare systems. These measures are detailed below (see Table 4.3).

Table 4.3 - Recommended adaptation measures by NHS boards for disruption to essential supplies

Theme	Recommended Adaptation Measures
Energy resilience and efficiency	Cost-benefit analysis of deploying additional backup generators and resilient power sources.
Energy resilience and efficiency	Improve building efficiency and insulation to reduce energy consumption.
Energy resilience and efficiency	Enhance data monitoring and management to identify energy consumption peaks and manage them, reducing overall demand during critical events.
Energy resilience and efficiency	Consider potential investment in on-site renewable energy generation.
Energy resilience and efficiency	Update priority registers with Distribution Network Operators for healthcare facilities and domestic users.
Emergency preparedness and supply chain resilience	Develop strategic emergency delivery networks for extreme weather conditions.
Emergency preparedness and supply chain resilience	Implement or enhance stock control systems for monitoring inventory and supply levels.
Emergency preparedness and supply chain resilience	Explore procurement strategies to ensure supply during disruptions.
Emergency preparedness and supply chain resilience	Establish mutual aid agreements with other organisations (including local authorities) for essential supply transfer.
Emergency preparedness and supply chain resilience	Ensure that contingency plans acknowledge the effects of rising temperatures and climate change impacts on the healthcare system and include strategies to mitigate these impacts.
Emergency preparedness and supply chain resilience	Evaluate the adequacy of current onsite stock storage capacity limitations and consider the cost-benefits of maintaining a stockpile.
Emergency preparedness and supply chain resilience	Explore the possibility of implementing on-site water saving projects for avoiding water supply disruptions.
Emergency preparedness and supply chain resilience	Consider the implementation of pilot projects for drone-driven medicine delivery.
Environmental monitoring and water quality	Monitor water quality and temperature during extreme weather events.
Environmental monitoring and water quality	Assess cost-benefits of implementing Property Flood Resilience (PFR) measures for flood-prone pharmacies and community centres.
Environmental monitoring and water quality	Explore options including enhancing water tank insulation and increasing the filtration levels for bacteria to avoid increased water temperature.

Theme	Recommended Adaptation Measures
Environmental monitoring and water quality	Coordinate with Scottish Water to explore the possibility of upgrading pipe insulation at vulnerable sites.
Enhanced waste management	Ensure there is appropriate storage on site for waste, check storage limits and time restrictions with Scottish Environment Protection Agency (SEPA).

Increasing number of patients

4.8. Recommended adaptation measures for the potential increase in the number of patients needing healthcare services due to climate change, focus on patient care and capacity management, community engagement, emergency preparedness, environmental and public health initiatives, and staff training (see Table 4.4) has been included in the table below.

Table 4.4 - Recommended adaptation measures by NHS boards for an increasing number of patients

Theme	Recommended Adaptation Measures
Patient care and capacity management	Assess the capacity of key facilities that may be affected by an influx of patients and expand maximum capacity where feasible.
Patient care and capacity management	Evaluate the maximum staff capacity of key sites and consider increasing onsite staff during extreme weather periods.
Patient care and capacity management	Maximise online patient support.
Community engagement and education	Climate-related anxiety training and wellbeing initiatives.
Community engagement and education	Explore community education opportunities in collaboration with local authorities.
Community engagement and education	Engage in community planning partnerships and educational initiatives.
Emergency preparedness and response	Establish Business Continuity Plans for pharmacies and care homes within health and social care partnerships.
Emergency preparedness and response	Monitor Met Office weather warnings and implement response measures
Emergency preparedness and response	Development of NHS boards Heat Management Plans.
Environmental and public health initiatives	Develop centralised, community-based care systems, such as warming centres for winter storms.
Environmental and public health initiatives	Implement air quality initiatives in collaboration with community planning partners.

Theme	Recommended Adaptation Measures
Staff training and awareness	Educate staff to raise awareness of policies and procedures for handling flooding events and avoid disrupted service provision.
Staff training and awareness	Enhance media campaigns on heat-related health risks, ensuring widespread public awareness and providing practical advice for staying safe during extreme weather events.

Structural

- 4.9. The recommended adaptation measures for potential climate change impacts related to structural damage, focus on enhancing building maintenance and repairs, infrastructure assessment and improvements, and flood risk management and environmental sustainability. These measures are listed below (see Table 4.5).

Table 4.5 - Recommended adaptation measures by NHS boards for structural damage

Theme	Recommended Adaptation Measures
Building maintenance and repairs	Increase the frequency of preventive maintenance of buildings, roofs, pipe networks, gulleys, and so on and prioritise minor repairs.
Building maintenance and repairs	Continue regular inspections of roofs, windows, and other vulnerable areas to identify and address potential leaks before they escalate.
Infrastructure assessment and improvements	Assess drainage infrastructure comprehensively.
Infrastructure assessment and improvements	Review pipe locations and explore the cost-benefits of installing trace heating as a solution for freezing pipes.
Infrastructure assessment and improvements	Implement necessary repairs or upgrades to the drainage system.
Infrastructure assessment and improvements	Regularly review points of vulnerability among the pipe networks.
Infrastructure assessment and improvements	Conduct regular surveys to assess building conditions.
Flood risk management and environmental sustainability	Develop comprehensive Flood Risk Assessments for priority sites.
Flood risk management and environmental sustainability	Review opportunities to integrate SuDS into greenspaces or ongoing projects to avoid flooding and reduce water discharge into sewer networks.

Emergency systems

- 4.10. The recommended adaptation measures to mitigate the impacts of climate change on emergency systems, emphasise the importance of IT-based care, infrastructure monitoring, IT and energy resilience, and emergency preparedness. These measures are detailed below (see Table 4.6).

Table 4.6 - Recommended Adaptation measures by NHS boards for impacts on emergency systems

Theme	Recommended Adaptation Measures
IT-based care and infrastructure monitoring	Monitor IT systems and electrical infrastructure resilience against severe storms.
IT-based care and infrastructure monitoring	Ensure all IT-based care and monitoring infrastructure is recognised as at risk and included in Business Continuity planning.
IT-based care and infrastructure monitoring	Review and enhance maintenance of smaller UPS systems.
IT and energy resilience	Consider buying and select new electrical equipment that complies with cooling/ventilation standards from countries with warmer climates.
IT and energy resilience	Set up quick hook-up points for generators to ensure rapid deployment of backup power during outages.
IT and energy resilience	Conduct a flood resilience review of equipment in basements and lower levels of flood-prone buildings.
IT and energy resilience	Equip vulnerable buildings with appropriate PFR measures and explore the utility of temporary barriers to protect critical equipment.
Emergency preparedness	Consider getting more staff to accommodate the increased number of calls likely to arise during climate-induced emergencies.

Staff wellbeing

- 4.11. The recommended adaptation measures to better handle potential climate change impacts on staff wellbeing focus on environment, resilience and preparedness, health and safety education, operational efficiency, and temperature management. These measures are listed below (see Table 4.7).

Table 4.7 - Recommended adaptation measures by NHS boards for staff wellbeing

Theme	Recommended Adaptation Measures
Staff Wellbeing and Environment	Evaluate the cost-benefits of expanding accessible greenspaces to improve staff wellbeing and maximise the benefits of natural temperature regulation.

Theme	Recommended Adaptation Measures
Staff Wellbeing and Environment	Provide lighter-weight summer uniforms for staff to mitigate overheating consequences during heatwaves.
Staff Wellbeing and Environment	Consider adjusting working hours to ensure staff wellbeing during extreme weather.
Resilience and Preparedness	Ensure that Resilience/ Contingency Plans incorporate considerations for rising temperatures and other climate-related hazards.
Health and Safety Education	Enhance heat-health education among staff. This includes disseminating information on outdoor work practices, staying hydrated, appropriate attire, self-care during hot weather, and understanding temperature differences within key buildings.
Operational Efficiency	Train additional staff on essential machinery for increased operational resources during extreme weather conditions, thereby relieving strain on maintenance personnel.
Temperature Management	Establish temperature thresholds for when staff should not work in the area beyond a specified temperature limit (coordination with national level).
Staff Wellbeing and Environment	Evaluate the cost-benefits of expanding accessible greenspaces to improve staff wellbeing and maximise the benefits of natural temperature regulation.

Risk owners

- 4.12. The effective implementation of adaptation plans depends on the active participation and collaboration of NHS board’s internal stakeholders. Each risk owner plays a critical role in proposing and executing adaptation actions to mitigate potential impacts on assets and services within their respective areas of responsibility. These individuals/ teams bring their expertise and insights to the table, ensuring that adaptation measures are both comprehensive and practical.
- 4.13. Below is a list of the risk owners who have been instrumental in the development of these adaptation plans. It's important to note that the names and presence of risk owners in the adaptation plans may vary across different boards, depending on organisational structures and regional needs:
- Sustainability Teams
 - Finance
 - Planning and Service Design (PSSD)
 - Primary Care Teams
 - Infection Control
 - Site leads

- Public Health
- IT/ eHealth
- Capital Planning
- Procurement
- Resilience
- Operational Service Managers
- Maintenance Teams
- Energy Managers
- Environmental Managers
- Information and Communication Technology (ICT)
- Communications (Comms)
- Logistics
- Facilities and Estates
- Pharmacy Department
- Fleet Management
- Ward Managing Nurses
- Public-Private Partnerships

Delivery partners

- 4.14. NHSScotland recognises that engaging stakeholders is crucial for the successful implementation of adaptation measures. The importance of collaboration cannot be overstated, as it ensures a comprehensive and coordinated response to the challenges posed by climate change. Stakeholders identified as essential delivery partners vary across NHS boards, reflecting local authorities and partners within their regional and national contexts.
- 4.15. Below is a list of some of the stakeholders recognised in the adaptation plans, each played a pivotal role in fostering resilience and sustainability:
- Scottish Fire and Rescue Service (SFRS)
 - Police Scotland
 - Local Authorities
 - SEPA (Scottish Environment Protection Agency)
 - Scottish Water
 - Scottish Ambulance Service (SAS)
 - NHSScotland Assure

- Met Office
- NatureScot
- Regional Transport Partnerships
- Scottish and Southern Energy (SSE)
- Scottish Power Energy Networks
- Transport Scotland
- National Vehicle Design and Equipment Group
- Uniform User Group
- Climate Emergency Response and Sustainability Group
- Local Resilience Partnerships
- Business Stream
- Private Finance Initiative (PFI) Providers
- Scottish Fuels
- Contractors
- National Networks
- Third Sector Organisations

4.16. This list highlights the various stakeholders that should be involved in addressing climate change risks within the NHS board, indicating a broad collaboration across multiple sectors and levels of operation.

Timelines

4.17. Timelines for completing climate change adaptation measures in NHS boards varies due to several factors; each influencing the urgency, complexity, and feasibility of implementing these measures. Some of the reasons for the variation in timelines might be due to a combination of level of risk, resource availability, data availability, stakeholder engagement, and the scale of required adaptations (such as small-scale interventions to large-scale projects). In that sense, the timelines per recommended adaptation measures in the plans vary from:

- 1 to 2 years
- 2 to 4 years
- more than 5 years
- ongoing

Financial costs

- 4.18. Financial costs associated with proposed adaptation actions were assessed and agreed upon by the teams involved in developing the adaptation plans. Utilising the adaptation planning tool, the teams identified and categorised costs per adaptation measure where known, ranging from less than £50k to over £1 million. The ranges of estimated costs were:
- <£50k
 - £50k - £100k
 - £100k - £500k
 - £500k - £1m
 - Over £1m
- 4.19. As the adaptation plans provided cost estimates in ranges rather than precise figures, an exact cost for each adaptation action – and therefore the total cost of the plans – cannot be determined. However, these estimates offer a preliminary financial framework for undertaking the proposed adaptation measures. It is anticipated that NHS boards will refine these estimates and report the "actual costs" as they gather more precise financial data during the implementation of their adaptation plans. It is important to note that whilst costs for adaptation may seem high, the cost of "doing nothing" is far greater (see ref 5).

Monitoring approach

- 4.20. NHS boards have identified an ongoing monitoring regime per adaptation measure, with frequencies ranging from monthly to yearly, depending on the specific activity. This continuous monitoring process is crucial for tracking progress, ensuring accountability, and making necessary adjustments during the implementation of the proposed adaptation actions.

5. Conclusions and recommendations

For immediate action

- 5.1. The "Historical Impacts" section illustrates that various climate hazards have affected healthcare infrastructure and services. These impacts, including road closures, site flooding, staff collapsing during heatwaves, and increased demand for healthcare services, highlight the urgent need to address their root causes. This historical data provides insight into how such impacts could affect the NHS health system and underscores the potential severity of the consequences. However, this has been collated in an inconsistent manner, and there is no visibility of climate change impacts, at a national level, for NHSScotland as a whole. As climate change leads to more frequent, intense, and prolonged extreme weather events, proactive measures are essential to monitor and mitigate these risks. Any IT systems procured or developed should work with local databases by integrating information from NHS boards, including data from Risk Registers, Datix, and Incident Reporting and Investigation Centre (IRIC), to create comprehensive and accurate national dataset which will enhance long term, strategic decision making about sites.
- **recommendation 1:** Scottish Government to consider establishing an IT system (new or existing one) for recording and reporting the impacts of adverse weather events in healthcare assets and services
- 5.2. The NHS boards' Climate Change Risk Assessments (CCRAs) and Adaptation Plans mark a significant step forward in identifying the potential climate change impacts on healthcare assets and services. The variety of these impacts highlights the pressing need to implement adaptation measures that effectively mitigate these impacts and increase the resilience of our healthcare system. Nevertheless, the NHS boards' CCRAs and Adaptation Plans have not been published and there is lack of awareness among the healthcare workforce regarding the impacts of climate change on the health system. Thus, it is important that the potential impacts identified in the CCRAs are communicated to decision-makers and NHS staff to ensure awareness and informed decision-making.
- **recommendation 2:** NHS boards to consider sharing and/or publishing their CCRAs and Adaptation Plans
- 5.3. The potential climate change impacts identified in the CCRAs, along with the varying risk exposure scores assigned, differ across NHS boards, reflecting their unique contexts and needs. Therefore, the prioritisation of risks for undertaking adaptation actions should be tailored to the specific impacts, risk exposure scores, and requirements of each NHS board. This customised approach ensures that relevant risks are addressed effectively, considering the distinct vulnerabilities and needs of each NHS board.
- **recommendation 3:** NHS boards to consider reviewing risks and prioritising them according to their risk exposure scores, resource availability, timelines and context

- 5.4. Due to the overarching nature of the NHS board's CCRAs, detailed information for every site was not included. However, some NHS boards have highlighted in their CCRAs historical impacts on specific sites. This shows the need to identify specific issues, vulnerabilities and risks, which could be achieved by developing climate risk assessments per site. This focused approach will ensure that particular risks are thoroughly assessed and addressed.
- **recommendation 4:** It is advised that NHS boards consider developing site-specific CCRAs, and/or "Vulnerability Assessment in healthcare facilities" (see ref 6) to identify specific issues for a tailored, site-specific approach to climate resilience. Where critical issues and vulnerabilities have been identified, it is recommended to undertake overheating assessments or flood risk assessments
- 5.5. Adaptation is an ongoing process, with climate patterns evolving over time and the needs of NHS boards shifting alongside. Thus, CCRAs and Adaptation Plans should be regularly reviewed and updated to ensure that adaptation strategies remain relevant and effective in addressing emerging challenges, as advised by the Environment Agency (see ref 7).
- **recommendation 5:** All NHS boards to consider reviewing their CCRAs and Adaptation Plans annually – or sooner if significant factors influence the plan.

For future action

- 5.6. The internal and external stakeholders, through their proactive engagement and collaborative efforts, are pivotal in translating adaptation plans into tangible actions. Their commitment and expertise ensure that NHS boards are not only prepared to face the challenges of climate change but are also positioned to thrive in a more sustainable future.
- **recommendation 6:** NHS boards to continue engaging stakeholders to implement their adaptation plans
- 5.7. The present report is instrumental in determining the specific guidance and tools that should be disseminated to NHS boards, facilitating a strategic and targeted approach. Additionally, it presents an opportunity to explore the integration of ecosystem-based adaptation strategies within NHS boards, aligning environmental considerations with adaptive healthcare measures.
- **recommendation 7:** NHSScotland Assure to review the results of this report to provide the necessary tools and guidance to NHS boards
- 5.8. Some proposed adaptation measures in the NHS boards' Adaptation Plans were found to potentially undermine mitigation efforts. Additionally, some NHS boards identified a conflict between complying with the Government's net-zero directives and enhancing the resilience of their healthcare assets and services (as stated in page 16, paragraph 5.14). It is crucial to ensure that adaptation measures are implemented in a way that supports, rather than conflicts with, ongoing mitigation efforts. This is crucial for maximising climate resilience and sustainability and ensuring long term provision of healthcare in a changing climate.

- **recommendation 8:** Scottish Government to consider a holistic approach, either through Whole Systems Infrastructure Planning or Business Continuity Planning work, that seamlessly integrates both adaptation and mitigation strategies
- 5.9. The NHS boards' CCRA have highlighted significant risks to healthcare assets, including structural damage, disruption to essential supplies (including energy security and resilience), and damage to building components and equipment. To ensure these facilities continue to function effectively amid extreme weather events, it is crucial to reinforce them against potential threats. By doing so, healthcare facilities can remain operational during power outages, floods, and other climate-related disruptions.
- **recommendation 9:** NHS boards to consider regular maintenance, investment in renewables, integration of reliable backup energy systems and generators such as battery storage systems and the adoption of climate-resilient architectural designs and nature-based solutions
- 5.10. The Scottish Fiscal Commission, in their report (published on 14 March 2024), [Fiscal Sustainability Perspectives: Climate Change | Scottish Fiscal Commission](#) advised that climate change brings risks of further financial pressures, however, the cost of recovery from damage done to assets by not putting in place necessary adaptation measures will be significantly higher. They also advised that it was a financial risk that adaptation costs are currently unknown. As all NHS boards have a legal duty to manage risks, it would be considered best practice for NHS boards to include Climate Change risks and relevant mitigation on their risk register.
- **recommendation 10:** All NHS boards to include climate change as a risk on the NHS board's risk register (Director Letter (DL)38)
 - **recommendation 11:** All NHS boards to undertake a costing exercise for adaptation plans and highlight them to senior management so that decision making can be supported
- 5.11. Climate change impacts present risks to business continuity, NHS board assets, and also to the health and safety of staff and patients. As NHS boards to include only high-level detail of risks on risk registers, a structured and consistent approach is required to monitor, assess and manage all climate change risks; this can be done through the NHS board's Environmental Management Systems (EMS). EMS offers a framework and structure to managing environmental risks, and as per the DL38 [A policy for NHS Scotland on the climate emergency and sustainable development](#), each NHS board should have one.
- **recommendation 12:** All NHS boards to include site specific details of climate change risks on to their EMS Aspects and Impacts, and also risk register

Appendix A Historical impacts mentioned by the NHS boards in their CCRA

A.1 The following are examples of how climate hazards have impacted NHS boards in various ways over the past few years. These examples were mentioned in their Climate Change Risk Assessments (CCRA), though most are not recorded in any IT system.

Cold spells

- The 'Beast from the East' (2018) impacted every service delivery and provision element in the NHS board.
- In winter and with the 'Beast from the East', external factors affected access routes. With access blocked in surrounding areas, it had a knock-on effect on transport services, patients and staff accessing the hospitals, and ambulance services.
- During extreme snow, the NHS board has been unable to get home care workers to people's homes. This is manageable for 2-3 days; however, it becomes more difficult to manage when it continues longer.
- Increased attendance at the Emergency Departments (ED) due to slips and trips on the ice created a particular challenge, increasing almost double the patient attendance.
- In the past, police stations opened to allow people to recharge medical equipment.
- Boats have been able to transport patients during heavy snow in the past, unless there are high winds. A previous event (a combination of factors – high winds and a cold spell) led to horizontal snow, which caused drifting and ice patches.
- Snow and ice have disrupted waste management services and deliveries, and pipes have burst where they are above ground. There have been increased numbers of patients due to slips, trips, and falls.
- Legacy organisations were impacted by previous extreme snow/cold weather events, restricting access to office sites to maintain services.

Combined climatic effects

- Buildings have had roof damage (56mph threshold for wind damage) and lightning strike damage above ground. Air ambulances are not able to fly.
- Infrastructure became increasingly fragile following Storm Arwen (2021), and even yellow warning storms create more damage (trees falling over, and so on).
- A lot of external insulation is now torn and gets blown off in storms, as do roof tiles. Many things get blown off roofs, as Grampian's estate has many tall buildings.
- Difficulty transferring patients from islands to the Scottish mainland during extreme weather.
- Staff have been prevented from coming to work due to high winds, and energy supplies have been disrupted for several days. Gale-force winds occur about 50 days of the year.

- In the past, small rivers of water have been created by driving rain coming through a small hole, causing significant fabric and structural damage.
- More severe storms result in localised impact on power and broadband networks, resulting in key staff being unable to fulfil their role supporting priority services in a hybrid or home working environment.
- History of increased staff absences during periods of extreme weather due to transport challenges or family obligations/ care requirements due to school closures.

Extended periods of dry weather and drought

- During periods of drought, difficult decisions had to be made to conserve water for patients. As a result, the laundry and the Central Decontamination Units (CDUs) were switched off.
- Low or poor water levels, often caused by damage, have previously impacted laundries by allowing silt to block filters.
- Water quality issues during extended dry weather have affected the water quality for scope washers and the decontamination unit.

Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)

- Some site's car parks were flooded and had access problems.
- Access routes were closed due to road flooding. This had a knock-on effect on transport services, patients and staff accessing the hospitals, and ambulance services.
- Some site entrances had sewer flooding, affecting site access and egress.
- External factors impacted access routes such as M74 and M8. With access blocked in surrounding areas, the floods impacted access routes.
- During previous flooding, the Scottish water drainage system was overwhelmed, leading to a water supply cutoff for an entire postcode. The severity of the flooding delayed the discovery of the water leak by two days. Bottled water and other stored water resources became essential. The lack of water increased panic within the community and impacted the hospital's water supply reserves, leading to a water ration.
- During previous storm events, patients from the islands have been stuck at the hospital and unable to leave due to suspension of train and ferry services. Staff have also had a similar problem.

Heavy downpours and driving rain (include changes in moisture content of air and soil)

- Following periods of heavy downpours, localised flooding has resulted in transport disruption and premises flooding.

- There have been leaks in some hospital's roofs. This is an issue specially in older hospitals, causing issues in theatres and other areas.
- The city's culvert was overwhelmed, so any low-lying areas were affected by surface water flooding.
- Patient transportation has been disrupted due to heavy rainfall.
- Flooded pharmacies and care home sites.
- Manhole covers have been blown off because the drains couldn't cope with the amount of incoming water.
- Some health Centres have issues with water ingress.

Higher average temperature and extended periods of hot weather

- The air conditioning (AC) units prove inadequate during every summer. During the last incident, load had to be redistributed across different cabinets, and additional fans were brought in to mitigate the heat.
- Dental clinics have also raised issues of overheating.
- One year (2019) before the COVID-19 pandemic, the region faced a near-crisis due to extreme heat. All sites were either at full capacity or exceeded it.
- During previous heatwaves, numerous staff members collapsed at work, leading to an increase in Accident and Emergency (A&E) visits due to injuries sustained from fainting.
- The water supplied by Scottish Water has come in at ~23-25°C for the last several summers, which is higher than it should be for clinical Health and Safety reasons.
- The Legionella threshold was exceeded due to the increased temperature of cold-water supply in the buildings.
- Increasing heat over time has altered the composition of water sources, leading to higher manganese levels in the supply from water sources and lochs. This has created infectious disease control issues. Although filtration systems have been installed in hospitals to prevent manganese contamination, the risk remains.
- In the summer heatwave of 2021, laboratory analysers were overheated. There were changes to cooling arrangements that could be brought in due to infectious disease control limitations. The laboratory analysers and fridges were struggling to function.
- During the same heatwave, the water supply system overheated, which introduced infectious disease control issues and impacted the air ventilation system. Heat surges impacted air circulation, comfort cooling, and the cooling system. The temperature change impacted the pressure of the water supply.
- Some new build accommodations are highly energy efficient (airtight) and lack appropriate ventilation.
- Increased number of patients attending primary care and community services during heatwaves.

- Issues of wards overheating in previous years and clinics being cancelled as a result of the heat.
- Previous maladaptation occurred when windows in the mental health hospital were replaced with mesh windows. While this change removed ligature risks, it did not improve ventilation, reflecting the competing priorities within the organisation.
- Orthopaedic surgeries have been cancelled due to the cement used in casts not setting properly. Situations like this have increased complaints.
- High temperatures have led to uncomfortable working conditions for staff.
- History of staff fainting while working in the orthopaedic reception greenhouse areas of the hospital during previous heat waves.
- Challenges maintaining drug fridge temperatures during past heatwaves/ sustained periods of high heat.
- The wards and offices regularly overheat for two weeks each year.

Storm surge, coastal inundation and coastal erosion

- Damage to coastal roads and road closures prevent patients and staff from accessing the islands. Ferry services have been closed.
- Patients have struggled to reach a pharmacy, only to discover that the local suppliers were unable to reach it to restock it. This created significant community disruption.
- Hospital basements have flooded during storm surges in the past, and there have been drainage issues.
- High winds coupled with high tides can shut many causeways around the Islands. Coastal flooding of the main spinal road from Stornoway results in restricted access to hospitals.

Appendix B Climate hazards

- B.1 Figure B.1 details the number of risks identified per hazard for each NHS board, highlighting the hazards with the most numbers of recognised impacts that could potentially affect their assets. For example, NHS Lanarkshire has identified more risks as consequences of higher average temperatures while NHS Tayside has identified more risks related to flooding.

Figure B.1 - Distribution of number of risks identified by Climate Hazard and NHS board

NHS Board	Hazard							Total
	Cold spells	Higher average temperature	Combined climatic effects	Flooding	Heavy downpours and driving rain	Extended periods of dry weather and drought	Storm surge, coastal inundation and coastal erosion	
Lanarkshire	16	19	15	14	11	12		87
Tayside	13	12	13	16	4	7	11	76
Grampian	13	19	9	6	10	6	5	68
Ayrshire & Arran	16	2	12	18	3	1	15	67
Highland	9	5	11	13	1	5	11	55
Public Health Scotland	8	8	11	7	11	5		50
NHS 24	9	6	11	9	6	2	5	48
Orkney	14	10	6		11		6	47
Fife	8	10	8	6	7	3	3	45
Borders	8	12	7	8	4	4		43
Forth Valley	7	9	7	7	8	3	2	43
Dumfries & Galloway	7	7	7	6	5	5	3	40
Golden Jubilee	7	10	6	10	3	1	1	38
Lothian	6	10	1	10	4	6	1	38
Western Isles	9	7	11		6	1	2	36
Shetland	6	6	7	2	6	5	3	35
Greater Glasgow and Clyde	4	7	2	9	10	2		34
National Services Scotland	6	8	5	2	4	2		27
Health Improvement Scotland	8	7	3		3	2		23
Scottish Ambulance Service	3	4	3	3	3	4	3	23
State Hospital Board for Scotland	6	4	5		6	1		22
NHS Education for Scotland	1	1	2	1	1	1		7
Total	184	183	162	147	127	78	72	952

B.2 Out of the identified risks, 81% pertain to existing assets while 19% are projected for future assets (see Figure B.2). Table B.1 provides a breakdown of the count of risk types in existing and future assets, identified per climate hazard.

Figure B.2 - Risk Types

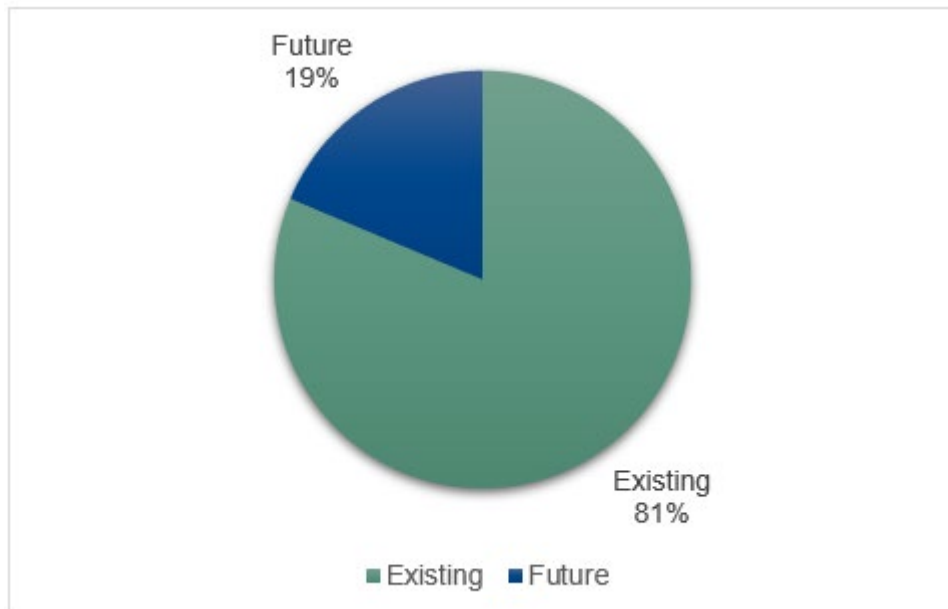


Table B.1 - Count of risk types per climate hazard

Climate Hazard and Risk Type (with breakdown of the total count by whether risk affects existing or future assets)	Count of Risk Type
Cold spells (including frost, snow and ice): <ul style="list-style-type: none"> existing - 166 future - 18 	184
Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud): <ul style="list-style-type: none"> existing - 138 future - 24 	162
Extended periods of dry weather and drought: <ul style="list-style-type: none"> existing - 57 future - 21 	78
Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding): <ul style="list-style-type: none"> existing - 119 future - 28 	147
Heavy downpours and driving rain (includes changes in moisture content of air and soil): <ul style="list-style-type: none"> existing - 103 future - 24 	127

Climate Hazard and Risk Type (with breakdown of the total count by whether risk affects existing or future assets)	Count of Risk Type
Higher average temperature and extended periods of hot weather: <ul style="list-style-type: none"> • existing - 141 • future - 42 	183
Storm surge, coastal inundation and coastal erosion: <ul style="list-style-type: none"> • existing - 50 • future - 21 	71



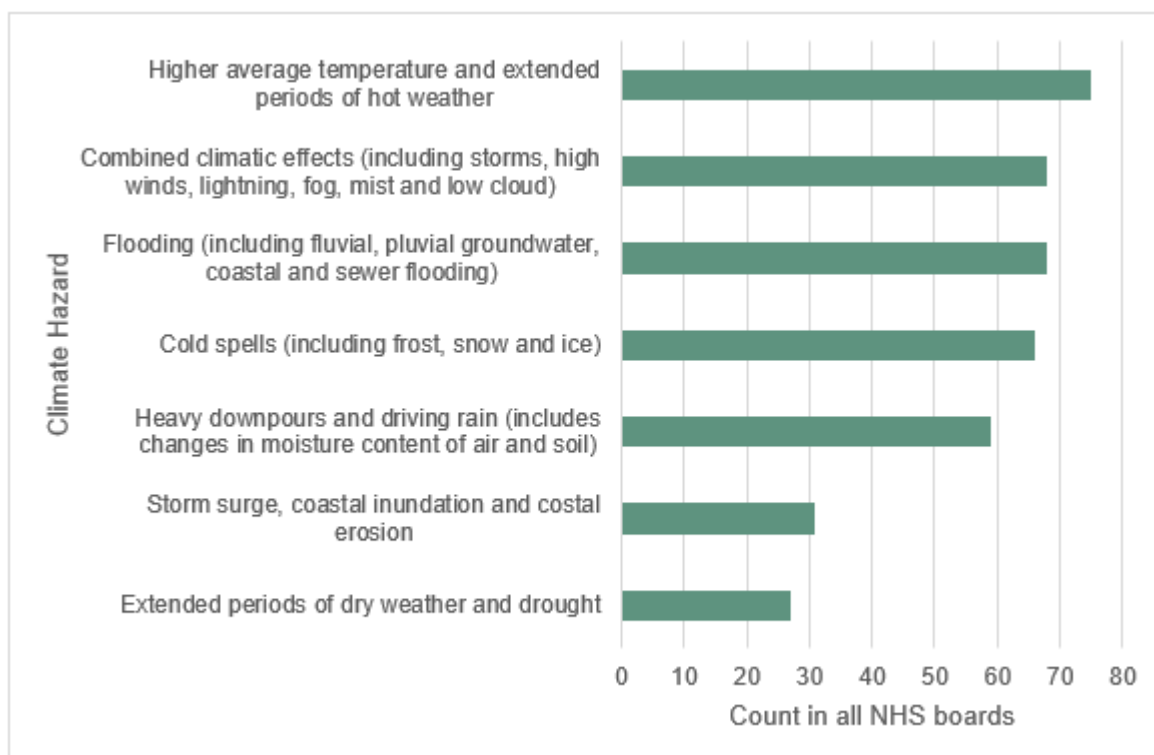
Appendix C Assets and services at risk

C.1 The following paragraphs provide detailed information about the number of risks identified per “asset group” and “climate hazard”. Additionally, they include examples, found in the NHS boards Climate Change Risk Assessments (CCRAs), of how climate change can potentially impact them.

Hospitals

C.2 In this asset group, the potential impacts that NHS boards have identified are related to higher average temperatures and extended periods of hot weather, combined climatic effects, flooding and cold spells (See Figure C.1).

Figure C.1 - Hospitals and Climate Hazards



C.3 Examples of potential impacts in NHS boards CCRAs:

- a reduction in Scottish Water reservoir levels could result in reduced supply. There could be water quality issues (ageing network). Additional charges for water will impact the funds available for other services
- the Legionella threshold could be exceeded due to increased temperature levels of the cold-water supply to the building
- increased hospital admissions for heat-related illness, cardiovascular, and respiratory disorders. Increased heat-related deaths. Increased incidence of heat stroke, sunburns, and skin cancer. Increased disease spread through spoilt food and/ or insects.

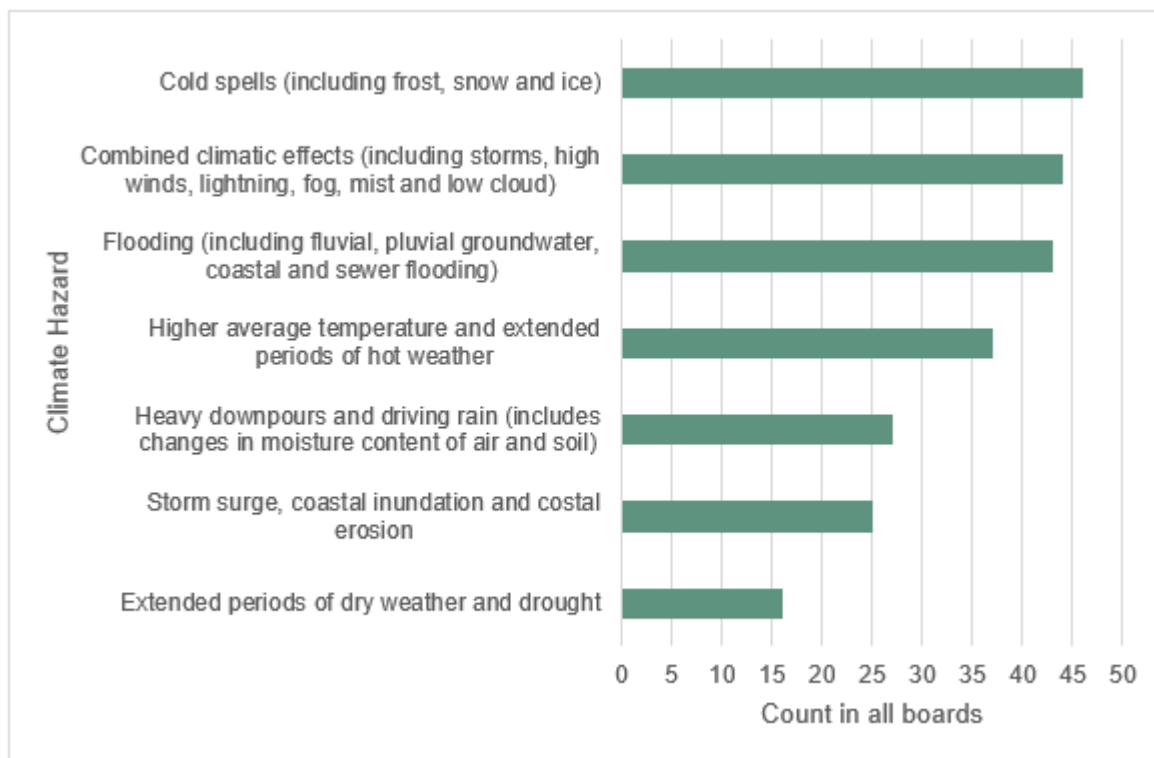
Increased vector-borne, tropical, and mosquito-borne diseases and an increased risk of pandemics are exacerbated by a noteworthy lack of public awareness of these matters

- high winds can create dangerous driving conditions, requiring vehicles to be taken off the roads. The risk of bridge closures can cut off access to sites
- a surface water flood caused by blocked drainage could impact access to the hospital, limiting service entering the facilities

GP surgeries and community health centres

C.4 For the asset group “GP Surgeries and Community Health Centres”, the climate hazard that appears most often is cold spells followed by combined climatic effects and flooding (Figure C.2).

Figure C.2 - GP Surgeries and Community Health Centres and Climate Hazards



C.5 Examples of potential impacts in NHS boards CCRA:

- access routes may be closed due to snow and ice, preventing patients and staff from travelling to and from the building. Consequently, patients may be unable to access essential medications
- snow and ice could lead to burst pipes, increasing the risk of outages and leaks. There may be a potential need to implement a program for upgrading the internal network of aging pipelines
- combined climatic effects could damage ‘above-ground’ infrastructure, such as masts, aerials, overhead wires, cables, communication systems, roof-mounted air conditioning and ventilation systems. This could cause damage to IT infrastructure and phone/ internet outage

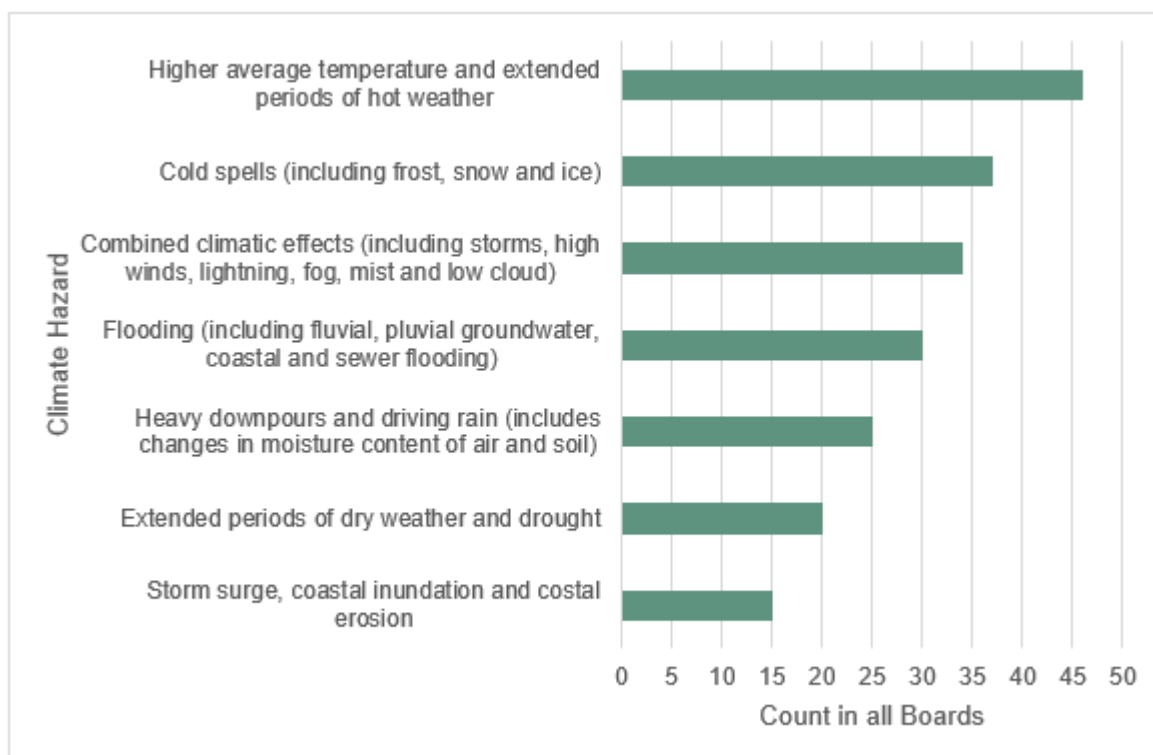
- due to high winds or fog, patients may not be able to be transferred and access services, from outer islands

building fabric and fittings could degrade due to water ingress, which may increase the maintenance burden. This includes issues such as roughcasting and plaster rendering to mitigate damp problems, as well as leaks from flat roofs and window seams. Buildings could deteriorate more rapidly due to wind and rainfall. Water infiltrating cracks in the building could widen them, exposing the structure to external elements and potentially causing rust or affecting electrical systems. Increased wear and tear could affect the usability of facilities and ultimately limit service provision

Core Services

C.6 In the category of assets “Core Services”, the potential impacts identified by NHS boards mostly pertain to higher average temperature and extended periods of hot weather followed by cold spells and combined climatic effects (See Figure C.3).

Figure C.3 - Core Services and Climate Hazards



C.7 Some examples of potential impacts in NHS boards CCRA are:

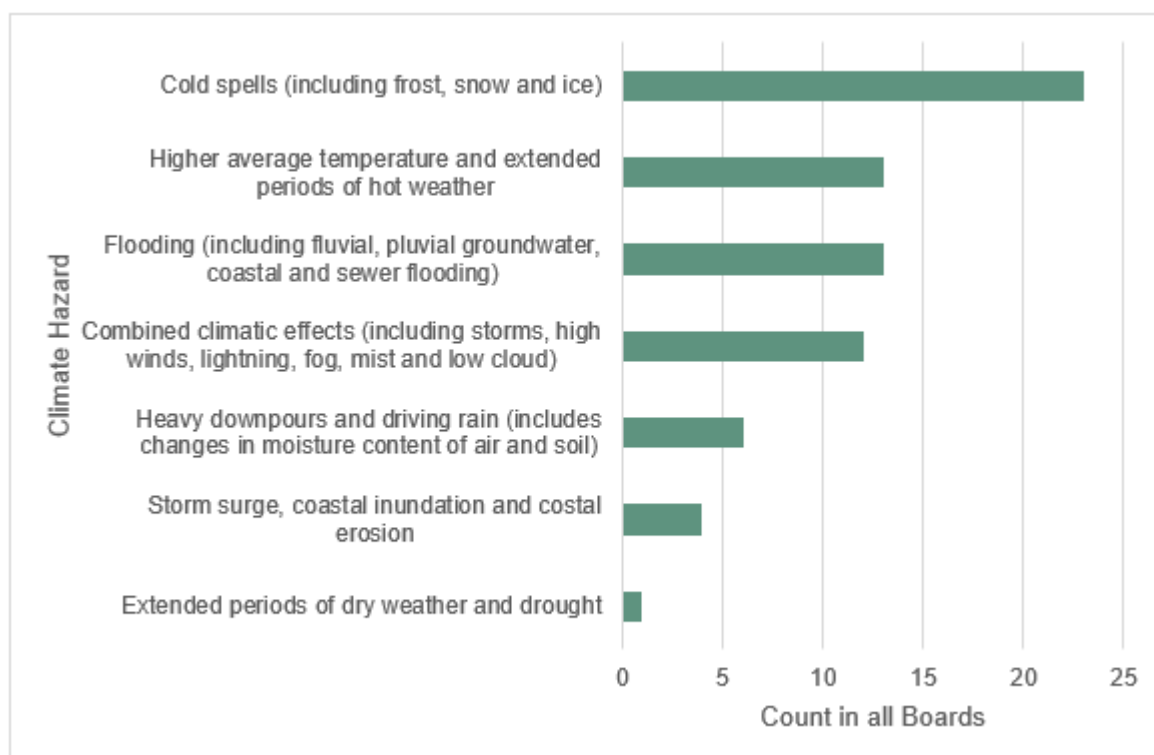
- reduced staff well-being due to overheating. An increase in Emergency Department attendance because of high temperatures leads to reduced staff wellbeing and higher stress levels. Rooms may become too hot, leading to working from home
- overheating poses short-term challenges for teams tasked with resolving issues, given the reactive nature of current approaches to managing overheated wards and work areas

- potential disruptions to essential supplies during combined climatic effects. Issues with power supply backups, including the provision of fuel for backup generators, further compound this risk. The potential for island-wide power cuts during extreme weather emergencies poses a significant threat. These disruptions could lead to knock-on effects, affecting service demand due to energy constraints in domestic settings

Vehicles

C.8 For the asset group “Vehicles”, the climate hazard that appears most often is cold spells (See Figure C.4).

Figure C.4 - Vehicles and Climate Hazards



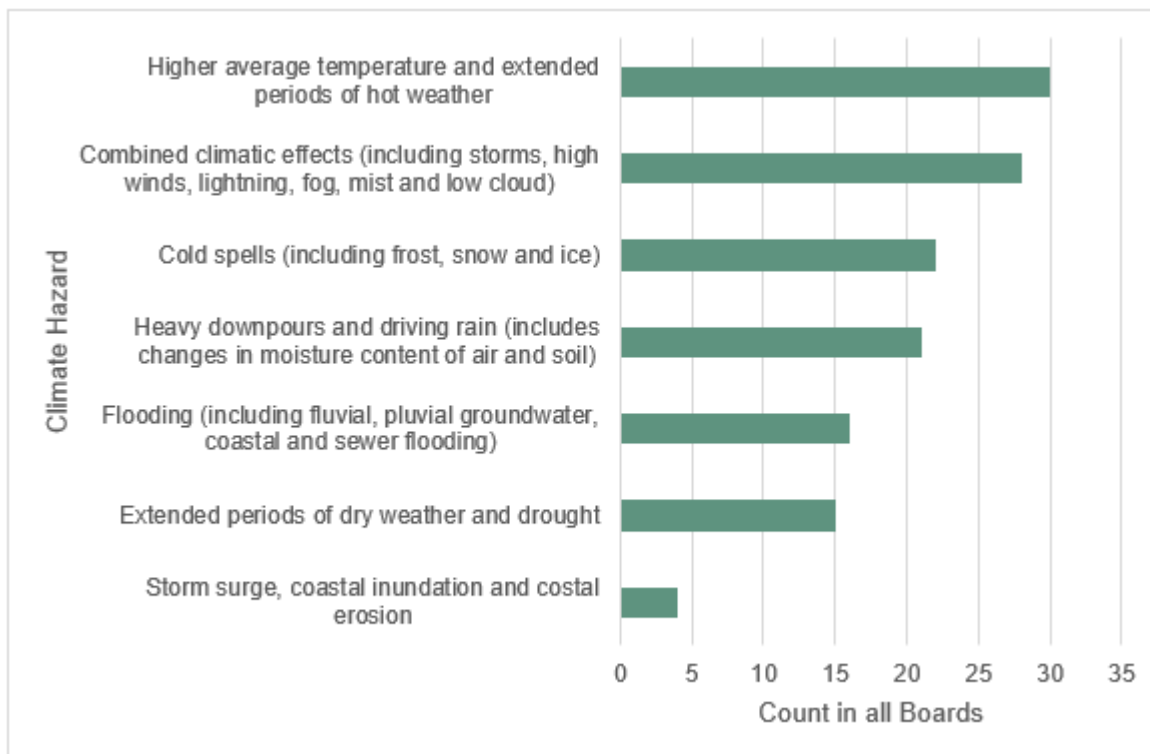
C.9 Examples of potential impacts in NHS boards CCRA:

- extreme cold may decrease the efficiency and range of electric vehicles. Charging times may also be affected and will be vulnerable to power outages
- the increased risk of accidents due to snow and ice can lead to higher recovery and repair costs and increased vehicle downtime, impacting the safety of staff and patients alike
- cold may impact the functionality/ decrease the battery life of electric vehicles (potential changes to vehicle range during extreme cold). By 2025, all new cars are expected to be powered by renewable sources and will most likely be electric. Existing sites may not be able to meet additional cold weather charging requirements
- increased 999 calls and strain on emergency response vehicles (Off-road 4 x 4s) due to snow and ice

Offices

- C.10 The asset group “Offices”, according to the NHS boards, could be mostly affected by potential impacts related to higher average temperature and extended periods of hot weather, followed by combined climatic effects (See Figure C.5).

Figure C.5 - Offices and Climate Hazards

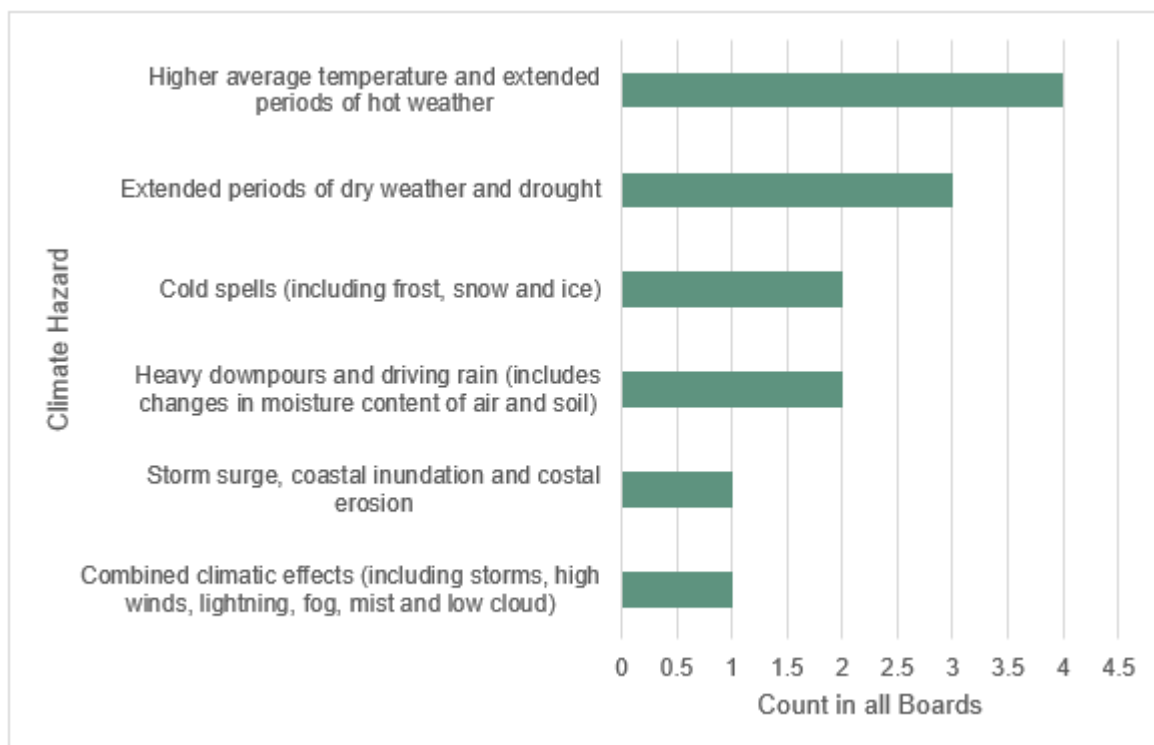


- C.11 Examples found in NHS boards CCRA:
- air temperatures outside of their optimum operating temperatures and capacities may impact some building components and equipment. Changing demands on building services (such as the need for increased cooling to maintain thermal comfort) may place additional strain on building services
 - risks of decreased electrical equipment function during extreme heat periods (inc. computers, servers, and so on). Vulnerability to technological malfunctions or damage - intermittency and unpredictability can significantly impact service delivery
 - due to heavy snow, public transport could be cancelled for safety reasons, affecting rail and bus travel
 - adverse weather conditions could affect the viability of power and broadband supplies, which will have a direct effect on the delivery of services. Staff will not be able to work from either an office or home location

Care homes

- C.12 For this asset group, the potential impacts that NHS boards identified mostly pertain to higher average temperature and extended periods of hot weather, followed by extended periods of dry weather and drought (See Figure C.6).

Figure C.6 - Care Homes and Climate Hazards

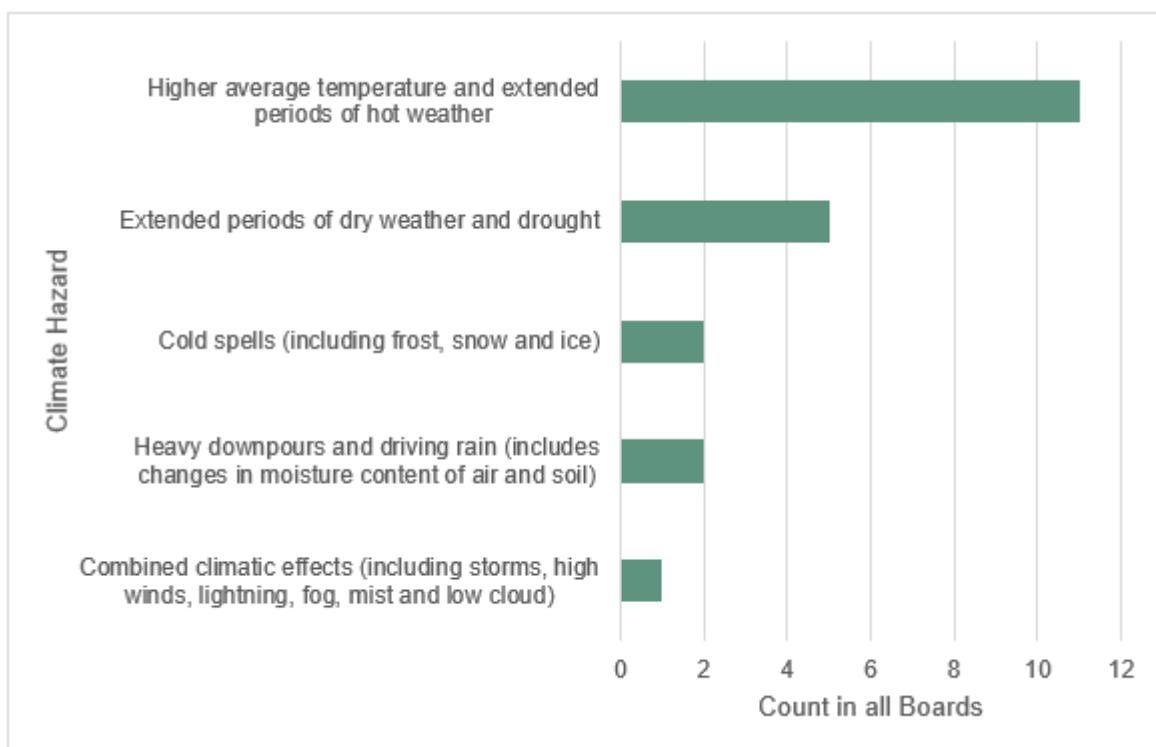


- C.13 Some examples of potential impacts in NHS boards CCRA are:
- increased cooling costs over the summer months and increased/inefficient energy use if windows are left open
 - vulnerable people exposed to high temperatures in hospitals and care homes are of particular concern given the limited options available for reducing their exposure, as they are difficult to move to other locations
 - extended periods of dry weather and droughts could impact drainage, cleanliness, and hydration and result in contamination issues
 - the lack of water will impact care homes by affecting drainage systems, reducing cleanliness, compromising infection control measures, limiting staff and patient hydration, and increasing contamination risks

Laundries

- C.14 For the asset group “Laundries”, the climate hazard that appears most often is higher average temperature and extended periods of hot weather (See Figure C.7).

Figure C.7 - Laundries and Climate Hazards



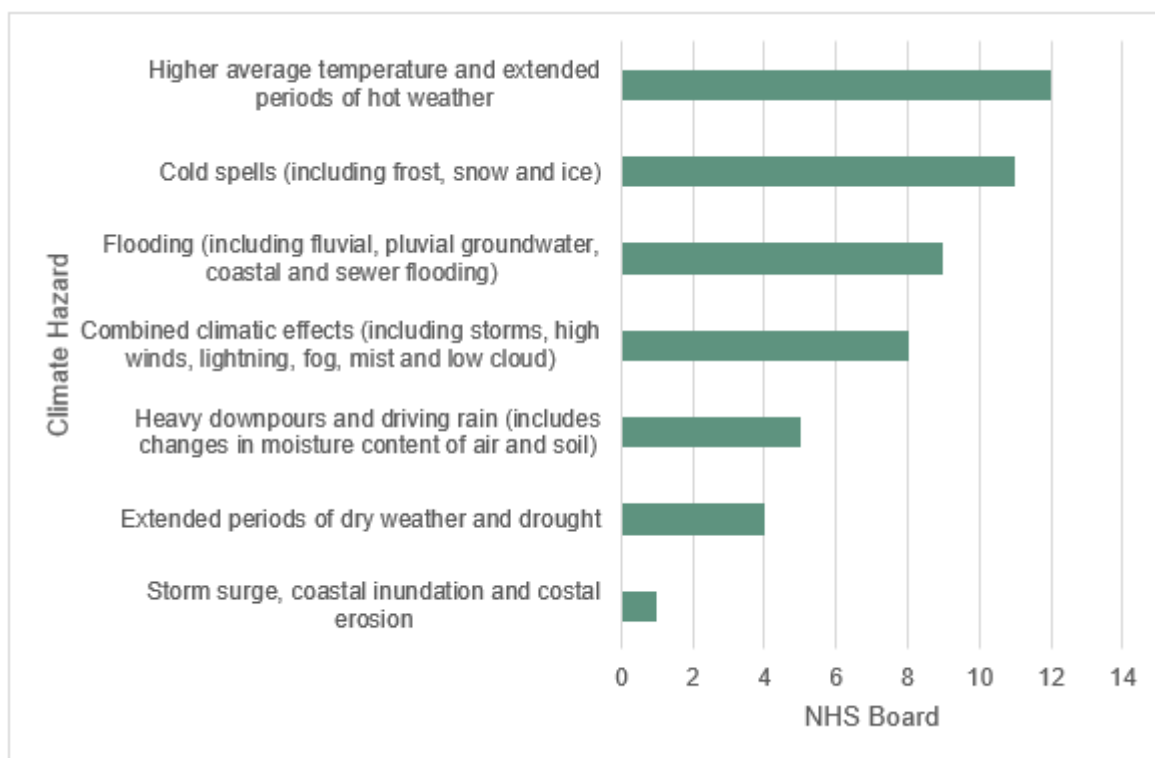
C.15 Examples found in NHS boards CCRA:

- water loss affecting laundry sites, which are not considered priority locations, poses a significant risk. This may face suspension to preserve water for patient care during severe drought conditions. This interruption could lead to cascading effects, impacting the availability of surgical equipment and clean linens in wards, thus affecting business continuity
- due to rising temperatures, there could be an increased need for additional washing. Staff requiring lighter scrubs further impact the laundry demands. All laundry must be kept on-site to meet specific standards and adhere to infection control regulations

Support Services

C.16 In the category of assets “Support Services”, the potential impacts identified by NHS boards mostly pertain to higher average temperature and extended periods of hot weather followed by cold spells (See Figure C.8).

Figure C.8 - Support services and Climate Hazards



C.17 Examples of potential impacts in NHS boards CCRA:

- digital systems could be disrupted due to overheating electrical equipment and hardware/ servers
- increased pressure on servicing and repairing plant and biomass boilers. Plant damage, where ventilation and chilling systems are not designed for extended periods of high temperatures. Increased maintenance on air conditioning (AC) and ventilation in general, as well as increased requests for maintenance. Increase in Ventilation Safety Group (VSG) meetings
- cold spells could impact food supply. Disruptions to catering supplies impact the ability to get meals to patients
- potential disruption to the tele-health and tele-care systems within home settings. Network disruptions can also complicate remote working

C.18 It's important to note that these examples were selected to illustrate the range of potential impacts on healthcare assets and services. This does not imply that asset groups, such as hospitals and GP surgeries, could not be similarly affected by climate change.

C.19 A comparative analysis of the identified potential impacts reveals several common challenges across all NHS boards. These include the closure of access routes, decreased water quality, disrupted IT systems, increased pressure on service delivery, loss of efficiency, and numerous health and safety concerns. These are just a few examples of the widespread impacts that NHS boards have recognised, highlighting how climate change will affect the health system. All the potential impacts identified from the NHS boards' Climate

Change Risk Assessments (CCRAs) have been comprehensively summarised in Appendix D

Appendix D Details of potential Impacts per climate hazards

D.1 The following table summarises the climate change potential impacts recognised by the NHS boards in their Climate Change Risk Assessments (CCRAs).

Table D.1 - Details of potential Impacts per Climate Hazards

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
1	Cold spells (including frost, snow and ice)	Transportation and site access	Closure of critical access routes for staff, patients and emergency services	Patients, staff and emergency responders unable to travel to and from sites.
2	Cold spells (including frost, snow and ice)	Transportation and site access	Closure of critical access routes for staff, patients and emergency services	Longer travel times are required due to difficulties accessing sites.
3	Cold spells (including frost, snow and ice)	Transportation and site access	Closure of critical access routes for staff, patients and emergency services	Impacts on public transport function.
4	Cold spells (including frost, snow and ice)	Transportation and site access	Closure of critical access routes for staff, patients and emergency services	Reduce access to site for staff, emergency services and essential deliveries.
5	Cold spells (including frost, snow and ice)	Transportation and site access	Closure of access routes for waste vehicles	Waste vehicles may be impacted by transport routes and/ or access to site delaying waste uplifts.
6	Cold spells (including frost, snow and ice)	Transportation and site access	Impacts on car parking	There is a risk that heavy snowfall impacts the availability of car park clearance services and there may be an inability to use the car park for a period of time.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
7	Cold spells (including frost, snow and ice)	Transportation and site access	Impacts on emergency vehicles	Pressure on emergency response and 4x4 vehicles due to increased 999 calls. Difficulties for carers reaching patients' homes.
8	Cold spells (including frost, snow and ice)	Transportation and site access	Potential accidents	Increased accident risk from snow and ice, associated recovery and repair costs, impact of vehicle downtime and safety to staff and patients.
9	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Restricted access for service providers and suppliers due to snow and ice.
10	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Disruption of inward goods deliveries.
11	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Delivery of drugs may be delayed or unable to reach the site.
12	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Cold weather impacts waste service collection.
13	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Disruptions to catering supplies, impacting the ability to get meals to patients.
14	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Disruptions to laundry deliveries
15	Cold spells (including frost, snow and ice)	Essential supplies	Restricted access for service providers and suppliers	Inability for offices to receive essential supplies to maintain welfare facilities.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
16	Cold spells (including frost, snow and ice)	Essential supplies	Impacts on batteries and power supply	Battery functionality may reduce during cold spells (affecting essential medical equipment, electric vehicle charging times, and so on).
17	Cold spells (including frost, snow and ice)	Essential supplies	Impacts on batteries and power supply	Grid vulnerable to blackouts or disrupted energy generation due to significant snow and ice.
18	Cold spells (including frost, snow and ice)	Essential supplies	Impacts on batteries and power supply	Loss of electricity and requirements for back-up generators.
19	Cold spells (including frost, snow and ice)	Essential supplies	Increased energy costs	Increased consumption to meet heating requirements, increasing costs causing ratchet charges due to high peak consumption.
20	Cold spells (including frost, snow and ice)	Essential supplies	Increased energy costs	Risk of decreased efficiency of air source heat pumps.
21	Cold spells (including frost, snow and ice)	Building components and equipment	Damage to equipment	Heavy snow can accumulate on roofing structures, damaging equipment or creating a health and safety hazard if it falls.
22	Cold spells (including frost, snow and ice)	Building components and equipment	Potential failures of heating systems	Potential for heating systems to fail due to excess of demand.
23	Cold spells (including frost, snow and ice)	Building components and equipment	Vulnerabilities in plant and equipment	Equipment is not designed to cope with extreme cold temperatures, increasing the possibility of damage
24	Cold spells (including frost, snow and ice)	Building components and equipment	Vulnerabilities in plant and equipment	Laminar flows, Wi-Fi, and many other electrical or battery-based equipment fail or have decreased functionality during periods of significant cold weather.
25	Cold spells (including frost, snow and ice)	Increasing number of patients	Increased service demand due to falls and cold related diseases	Increase in the number of patients requiring specialist or community health care services due to cold-related accidents, illnesses, and deaths.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
26	Cold spells (including frost, snow and ice)	Increasing number of patients	Increased service demand due to falls and cold related diseases	Increased presentation in emergency departments, straining the system.
27	Cold spells (including frost, snow and ice)	Increasing number of patients	Cancelled outpatient appointments	Increased cancelled outpatient clinic appointments.
28	Cold spells (including frost, snow and ice)	Increasing number of patients	Increased waiting times	Poor access to face-to-face services and increased wait times.
29	Cold spells (including frost, snow and ice)	Increasing number of patients	Impact on vulnerable populations	Elderly population more at risk of getting ill during cold spells. Increase in call volumes.
30	Cold spells (including frost, snow and ice)	Increasing number of patients	Impact on vulnerable populations	Current cost of living crisis exacerbating health risks and inequalities.
31	Cold spells (including frost, snow and ice)	Increasing number of patients	Impact on vulnerable populations	People forced to choose between heating and nutritious food, leading to health problems and increased service demand.
32	Cold spells (including frost, snow and ice)	Increasing number of patients	Impact on vulnerable populations	Increased risks of hyperthermia and illnesses exacerbated by prolonged cold.
33	Cold spells (including frost, snow and ice)	Increasing number of patients	Impact on vulnerable populations	Impacts on households with the very young and very old particularly vulnerable.
34	Cold spells (including frost, snow and ice)	Increasing number of patients	Accessibility issues	Cancellations and poor access may lead to cancelled outpatient clinics, increasing patient waiting times and future pressure on available beds.
35	Cold spells (including frost, snow and ice)	Increasing number of patients	Delayed patient discharge	Disruption to the Ambulance transport system, which could cause delays in discharging patients.
36	Cold spells (including frost, snow and ice)	Structural	Damage to water infrastructure	Potential impacts on internal network upgrades, especially for aging pipelines.
37	Cold spells (including frost, snow and ice)	Structural	Damage to water infrastructure	Damage to water supply pipes where not buried deeply enough underground.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
38	Cold spells (including frost, snow and ice)	Structural	Damage to water infrastructure	Possibility of burst water pipes.
39	Cold spells (including frost, snow and ice)	Structural	Disruption to maintenance	Inability to access maintenance and repair services.
40	Cold spells (including frost, snow and ice)	Structural	Damage to above ground infrastructure	Damage from the weight of snow and/ or ice to above ground infrastructure (masts, antennae, switch boxes, aerials, overhead wires and cables).
41	Cold spells (including frost, snow and ice)	Structural	Damage to roofs	Snow build-ups on roofs can cause them to collapse.
42	Cold spells (including frost, snow and ice)	Emergency systems	Network disruptions	Potential disruptions to tele-health and tele-care systems, complicating remote working and patient care at home.
43	Cold spells (including frost, snow and ice)	Other Knock-on impacts	Additional washing required	Inpatient areas are too cold overnight, requiring more bedding and thus increasing laundry needs.
44	Cold spells (including frost, snow and ice)	Other Knock-on impacts	Reduced staffing due to no childcare or locum availability	School closures force staff to stay home to care for children, leading to staffing shortages
45	Cold spells (including frost, snow and ice)	Other Knock-on impacts	Increment of financial costs	Additional expenses for heating repairs and temporary heaters due to prolonged cold weather
46	Cold spells (including frost, snow and ice)	Other Knock-on impacts	Mortuary capacity impacted	Transport limitations for bodies due to icy road conditions leading to overflow in mortuaries
47	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Transportation disruptions	Road closures and restrictions due to adverse weather (high winds, fog) impede staff and patient access to healthcare facilities, affecting service provision and emergency response capabilities.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
48	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Service delivery impacts	Disruptions to ambulance transport systems delay patient discharges and critical patient transport, exacerbating healthcare service delivery challenges.
49	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Limited public transport capabilities	Power outages during weather events limit public transport capabilities and impact staff commuting abilities.
50	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Remote and rural community accessibility challenges	Remote and rural areas face heightened vulnerability with difficulties in accessing healthcare services during extreme weather, affecting both staff and patient mobility.
51	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Helicopter operations affected	Extreme weather conditions like fog prevent helicopters from landing, impacting critical medical transport such as organ deliveries and time-sensitive patient transfers.
52	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Impact on vehicles and maintenance	Increased risk of vehicle accidents and damage due to weather conditions add to maintenance and repair costs, potentially affecting service delivery and fleet availability.
53	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Transportation and site access	Patient access and appointment disruptions	Patients face barriers in attending appointments or accessing community services due to weather-related travel difficulties and transport disruptions.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
54	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Essential supplies	Power outages and disrupted operations	Risk of emergency grid interruptions or blackouts impacting essential equipment and services.
55	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Essential supplies	Power outages and disrupted operations	Power cuts could necessitate the use of backup generators, affecting energy use and heating
56	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Essential supplies	Restricted access for service providers and suppliers	Disruptions in transportation due to extreme weather events (such as fog, high winds) affect the delivery of essential supplies, including medical equipment and fuel.
57	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Essential supplies	Restricted access for service providers and suppliers	Disruptions in waste management services due to transportation issues can lead to waste buildup, affecting sanitation and operational efficiency.
58	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Essential supplies	Restricted access for service providers and suppliers	Disruptions in delivery of essential supplies such as catering and laundry.
59	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Damage to above ground infrastructure	Above-ground infrastructure such as masts, aerials, overhead wires, cables, communication systems, and roof-mounted air conditioning and ventilation systems are susceptible to damage from high winds, storms, and lightning.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
60	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Damage to IT infrastructure	IT infrastructure and phone/internet systems are vulnerable to outages, impacting communication and operational efficiency.
61	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Disruption to power supply	Power outages can lead to the loss of refrigerated vaccines and necessitate reliance on backup systems for heating, with potential restrictions on energy use.
62	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Building and equipment damage	Water ingress from heavy downpours can damage the internal fabric, electrical components, carpeting, walls, and paintwork, leading to health and safety concerns.
63	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Building and equipment damage	Increased humidity and dampness compromise air quality and the lifespan of building components like window seals and downpipes.
64	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Building and equipment damage	Structural elements such as lifts, access systems, and lighting may be affected by power outages.
65	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Increased pressure on infrastructure	Pumping stations, booster pumps, and monitoring mechanisms face increased pressure during extreme weather events

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
66	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Maintenance challenges	Adverse weather conditions prevent safe maintenance, as high winds and storms can halt necessary repair work, increasing the risk of further damage.
67	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Maintenance challenges	Mobile units and exposed equipment, including emergency generators on roofs, are at risk of damage during extreme weather.
68	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Reduced serviceable lifespan of equipment	The serviceable lifespan of various equipment and building components is reduced due to continuous exposure to extreme weather conditions, leading to frequent repairs or replacements.
69	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Building components and equipment	Damage to communication systems	Damage to masts, aerials, overhead wires, and cables can disrupt communication systems, including IT and phone services
70	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Cancellation and disruption of medical services	Routine outpatient appointments and non-urgent elective operations are often cancelled due to extreme weather, affecting patient care continuity.
71	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Cancellation and disruption of medical services	Emergency evacuations and patient transfers become challenging, leading to increased pressure on healthcare services.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
72	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Increased service demand	Extreme weather events lead to a higher number of patients seeking emergency services, GP consultations, and out-of-hours care
73	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Increased Service Demand	Higher incidence of road traffic collisions due to adverse weather conditions.
74	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Impacts on elderly populations	An increase in elderly hospitalizations due to weather-related injuries and health issues, as the aging population is more vulnerable
75	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Mental health impacts	Mental health services see increased demand due to climate anxiety and weather-related mental health issues.
76	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Mental health impacts	The long-term distress caused by climate impacts can lead to repeated admissions for mental health conditions.
77	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Impact on routine operations	Patients unable to attend scheduled treatments or access supplies face worsening health conditions.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
78	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Increasing number of patients	Shifting baselines for service demand	Climate change is shifting the baseline for what is considered 'normal' service demand, as extreme weather events become more frequent.
79	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Roof damage	Combined climatic effects pose significant risks to roofs, particularly flat or slate roofs. These conditions can lead to leaky roofs, damaged roof tiles, and blown-off roofs, especially in older buildings not designed to withstand such forces.
80	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Impacts on glass panelling and external features	High winds and storms can damage glass window panes, cladding, external wall insulation, and other external building features.
81	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Building fabric damage due to water ingress	Heavy rain can cause water to seep into cracks, leading to structural deterioration, rust, and increased maintenance costs. Water ingress can damage the internal fabric, such as carpets, walls, and paintwork.
82	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Building fabric damage due to high winds	High winds can dislodge guttering, lightning conductors, and cladding. Risks include falling debris, such as roof tiles and tree branches, which can block roads and damage buildings.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
83	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Risks to structural integrity	High winds, storms, and lightning can cause significant damage to office structures, boundary walls, fences, and building cladding, necessitating inspections and repairs to maintain safe working conditions.
84	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Structural	Risks to structural integrity	Repeated exposure to extreme weather increases the wear and tear on buildings, reducing their serviceable lifespan. Maintenance requirements and costs escalate due to the need for more frequent repairs.
85	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Increased strain on back-up generators	During power outages, back-up generators are subjected to increased load, which can lead to potential failure or reduced efficiency, especially if the outage is prolonged or the generators are not well-maintained.
86	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Tripping of uninterruptible power supply (UPS)	In critical care areas, UPS systems are essential to provide immediate power during the transition to generator backup. However, these systems can trip, causing momentary loss of power which can be critical for life-supporting equipment.
87	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Failure of IT/phone systems	Failure of IT and phone systems can cause significant delays in the processes of admitting and discharging patients, impacting overall hospital operations.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
88	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Failure of IT/phone systems	Disruptions can affect emergency (999) calls, complicating response times and coordination, especially if critical infrastructure is damaged by fire or extreme weather events.
89	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Loss of telehealth and communication	The loss of telehealth services can prevent remote consultations and monitoring, which are especially critical for patients in isolated areas.
90	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Loss of telehealth and communication	On-site loss of mobile networks hampers communication among staff, further complicating patient care and emergency response coordination.
91	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Data centres at risk	Power loss at key data and digital infrastructure sites can lead to temporary or permanent data loss, and physical damage to IT equipment.
92	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Emergency systems	Impacts on emergency services and response	Increased strain on emergency vehicles and higher demand for 999 calls during and after storms.
93	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Decreased staff wellbeing	Safety risks for commuting staff	Dangers such as falling debris, poor visibility, and hazardous road conditions pose significant risks to staff commuting during extreme weather.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
94	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Decreased staff wellbeing	Fatigue and mental health impacts	The stress of working during extreme weather events, combined with the pressure of maintaining operations during community power outages, can severely impact staff mental health and well-being.
95	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Decreased staff wellbeing	Health and safety concerns	Water damage and increased humidity levels pose health and safety risks within buildings, affecting the indoor environment quality
96	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Other Knock-on impacts	Impact on routine operations	The cancellation of routine appointments and non-elective operations due to weather disruptions affects the overall healthcare service delivery.
97	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Other Knock-on impacts	Operational impact on staff	Power outages affecting domestic premises of staff working from home can disrupt access to critical systems and impact their ability to work safely and effectively.
98	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	Other Knock-on impacts	Reduced staff availability	Extreme weather can lead to increased staff absenteeism, further straining already limited resources.
99	Extended periods of dry weather and drought	Essential supplies	Impacts on laundry services	Water shortages can halt laundry services, impacting the availability of clean surgical equipment and linens.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
100	Extended periods of dry weather and drought	Essential supplies	Impacts on energy generation	Drought can reduce the water supply needed for gas turbine electricity generation, leading to higher energy costs and potential heating and cooking disruptions.
101	Extended periods of dry weather and drought	Essential supplies	Impact on food supply	Water shortages can lead to disruptions in food procurement, affecting the availability of food for patients and staff.
102	Extended periods of dry weather and drought	Essential supplies	Reduced water quality	Post-drought heavy rainfall can cause runoff that alters the water supply's potential of hydrogen (pH), affecting water quality.
103	Extended periods of dry weather and drought	Essential supplies	Potential health and safety risks	Lack of water to flush systems increases the risk of water-borne pathogens such as Legionella and Pseudomonas, creating potential health and safety risks for staff and patients.
104	Extended periods of dry weather and drought	Essential supplies	Impacts on hygiene and hydration	Critical for maintaining hygiene and hydration in healthcare settings, a shortage could impact patient care and increase infection risks.
105	Extended periods of dry weather and drought	Transportation and site access	Impacts on vehicle cleaning	Inadequate water supply can hinder the ability to clean vehicles, impacting hygiene and operational readiness.
106	Extended periods of dry weather and drought	Building components and equipment	Lack of water supply and pressure	Reduced water pressure can affect the functionality of equipment dependent on consistent water flow, such as in operating theatres, renal units, and laboratories.
107	Extended periods of dry weather and drought	Building components and equipment	Damage and maintenance of drainage systems	Lack of water impacts drainage systems, potentially leading to sanitation issues and increased contamination risks.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
108	Extended periods of dry weather and drought	Building components and equipment	Damage and maintenance of equipment	Insufficient water supply can disrupt maintenance activities by reducing the efficiency of machinery, leading to increased risks of overheating.
109	Extended periods of dry weather and drought	Building components and equipment	Greenspace deterioration	Water conservation measures during droughts can lead to the deterioration of available greenspaces, with grass and plants dying due to lack of water, impacting the environment and aesthetics of healthcare facilities.
110	Extended periods of dry weather and drought	Increasing number of patients	Reduced air quality	Extended drought can lead to poor air quality, increasing the incidence of acute respiratory illnesses
111	Extended periods of dry weather and drought	Increasing number of patients	Contaminated water supply	Loss of safe drinking water, especially for those reliant on private water supplies, can lead to a rise in illnesses caused by chemical and biological contaminants.
112	Extended periods of dry weather and drought	Increasing number of patients	Increase of dehydration cases	Low-level dehydration due to insufficient water intake can lead to increased patient frailty
113	Extended periods of dry weather and drought	Increasing number of patients	Poor nutrition	Droughts can increase food prices, making nutritious food less affordable. This can lead to poor nutrition, especially in vulnerable populations, resulting in increased nutrition-related health issues.
114	Extended periods of dry weather and drought	Increasing number of patients	Legionella risk	Reduced water supply can increase the risk of Legionella outbreaks due to stagnation and increased temperatures in water systems

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
115	Extended periods of dry weather and drought	Increasing number of patients	Mental health impacts on farming communities	Farmers and rural populations may experience significant mental health impacts due to the adverse effects of drought on their livelihoods.
116	Extended periods of dry weather and drought	Structural	Roof collapse	Extended dry periods can weaken structural components, increasing the risk of roof collapse due to compromised building integrity.
117	Extended periods of dry weather and drought	Structural	Increasing needs of building maintenance	Extended periods of water shortages and drought can accelerate wear and tear on buildings. Reduced water availability may impact the ability to maintain facilities adequately, leading to increased maintenance requirements and costs.
118	Extended periods of dry weather and drought	Structural	Impact on construction	Water shortages can delay construction projects that require water for mixing materials like plaster and concrete. This can result in project delays and increased costs.
119	Extended periods of dry weather and drought	Decreased staff wellbeing	Increased stress and staff fatigue	Working under extreme conditions with limited resources can lead to increased stress and fatigue among healthcare workers.
120	Extended periods of dry weather and drought	Decreased staff wellbeing	Limited access to drinking water	Staff may face challenging working conditions with limited access to drinking water, affecting hydration, hygiene, and infection prevention and control measures.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
121	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Access routes closures	Essential roads, bridges and critical access routes may be closed, restricting access to sites and critical supply routes. This affects both staff and patients, impacting the delivery of services and treatments.
122	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Disruption on air and ferry services	Disruptions to these services can isolate regions, limiting access to medical facilities and emergency services.
123	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Contractor access issues	Difficulties in reaching sites for waste collection and other essential services can lead to operational disruptions.
124	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Vehicles risk damage	Vehicles risk damage from entering flood water or aquaplaning, increasing maintenance costs and reducing vehicle availability.
125	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Flooded parking lots	This can restrict hospital access and use, affecting staff, patients, and emergency services.
126	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Public transport interruptions	Buses and rail services could be halted, limiting access for those reliant on public transportation.
127	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Mail service disruptions	Flooding and coastal storm surges can disrupt mail services, affecting the delivery of essential documents and supplies.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
128	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Delayed pathology and lab tests results	Flooding can delay the transport of lab tests and pathology samples to offsite analysis centres, increasing waiting times for test results.
129	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Transportation and site access	Cancellation of healthcare services	Cancellation of routine out-patient appointments and non-urgent elective operations may be necessary to manage emergency care demand.
130	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	Supply chain disruptions	Flooding can interrupt the delivery of essential supplies such as Personal Protective Equipment (PPE), medicines, and consumables, impacting hospitals' operational capabilities.
131	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	Water supply disruptions	Flooding can hinder the transportation of alternate water supplies, crucial for hospital operations.
132	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	Service impacts	Limited water supply can severely impact all hospital services, from sanitation to patient care.
133	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	Medical treatments disruptions	Disruptions can decrease patient compliance with treatment plans, especially for drug therapies.
134	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	Power outages	Flooding can lead to blackouts and power interruptions

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
135	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Essential supplies	No heating	Loss of power results in no heating, affecting patient comfort and increasing health risks, especially in colder seasons.
136	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Damage to critical building systems	Ingress of water into pipes and cabling can damage critical building systems, including medical gases, water, steam, and fire sprinkler systems.
137	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Damage to equipment	Flooding can damage emergency equipment and facilities, disrupting procedures and emergency responses.
138	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Sewage system damage	Flooding can dislodge or break essential pipe systems, causing sewage back-ups and blockages, posing health risks and operational challenges.
139	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Underground infrastructure damage	Flooding can damage underground infrastructure, impacting pipes and electrical systems, leading to service disruptions and costly repairs.
140	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Underground infrastructure damage	Critical systems below flood elevations are at risk, requiring robust flood defences and proactive maintenance.
141	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Compromised backup power and generators	Flooding can damage backup generators, crucial for maintaining power supply during outages.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
142	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Building components and equipment	Building refurbishment	Flood-damaged facilities may require refurbishment, impacting service delivery and increasing operational costs.
143	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Diversion of services	Flooding can cause significant diversions of existing services to other buildings, straining resources and staff.
144	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Diversion of services	An increased number of patients will require access to emergency services, specialist care, and community health services during and after flood events.
145	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Impacts on physical health	Flooding can lead to increased injuries and fatalities, necessitating immediate medical attention and emergency care.
146	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Impacts on physical health	Damp conditions post-flooding can exacerbate chest problems, increasing the number of patients seeking medical attention.
147	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Impacts on mental health	Flooding has significant psychological impacts, leading to increased stress, anxiety, and long-term mental health issues within affected communities.
148	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Increase of waterborne diseases	Floodwaters can contaminate water supplies, increasing the incidence of waterborne illnesses and complicating infection control.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
149	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Worsening housing conditions	Worsening housing conditions due to flooding can further degrade community health and increase healthcare needs.
150	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Issues on infection control	Increased presentation of illnesses due to water contamination may create knock-on infection control issues.
151	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Increasing number of patients	Delayed patients discharge	The ability to transfer patients between sites may be limited, impacting discharge rates and overall hospital capacity.
152	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Structural	Building foundations and walls damage	Flooding can severely damage foundations and bearing walls, compromising the structural integrity of healthcare buildings.
153	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Structural	Building foundations and walls damage	Repeated flooding can degrade ground conditions and structural integrity, impacting building components.
154	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Structural	Superficial structural damage	Frequent flooding accelerates wear and tear on buildings and infrastructure, limiting the use of facilities and impacting service delivery.
155	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	Increased strain on emergency services	Limited access routes heighten the pressure on emergency response vehicles, making it challenging to provide timely assistance.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
156	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	Increased strain on emergency services	Flooded roads hinder the movement of ambulances and other emergency vehicles, delaying patient care and discharge, leading to system back-ups.
157	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	IT and communication systems disruptions	Loss of power can disrupt IT and communication systems, critical for hospital operations and emergency response coordination.
158	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	Emergency services overloaded	A surge in emergency calls (999) is expected, requiring enhanced coordination and resource allocation.
159	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	Emergency services overloaded	Increased demand for out-of-hours emergency care, GP, and nurse consultations due to flood-related incidents.
160	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Emergency systems	Decreased emergency response capabilities	Flooding may damage operating theatres and other critical areas, hindering the hospital's ability to perform surgeries and emergency procedures.
161	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	Other Knock-on impacts	Threatened data centres	More frequent and severe flooding events can threaten data centres, crucial for maintaining healthcare services.
162	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Transportation and site access	Transport disruption for patients	Community disruption affects patients' ability to access services, with risks to patient safety during travel in extreme rainfall.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
163	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Transportation and site access	Staff access to sites issues	Disruptions due to heavy rainfall impact staff mobility
164	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Transportation and site access	Disruption to the ambulance transport system	Delays in discharging patients, leading to backups and increasing patient waiting times, reducing available bed space.
165	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Transportation and site access	Car parking availability reduced	Flooded spaces reduce available car parking.
166	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Essential supplies	Disruption to essential supplies	Can delay deliveries of food, fuel, drugs, and other essential supplies.
167	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Essential supplies	Disruption to essential supplies	Flooding can disrupt pharmacies and other community services, leading to decreased patient compliance with treatments due to supply issues.
168	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Essential supplies	Mail service disruption	Surface water flooding can reduce mail delivery services.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
169	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Essential supplies	Short-term supply issues	Limited short-term supply issues may arise, either affecting local buildings or national supply distribution.
170	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Essential supplies	Electrical disruptions	Potential electrical disruptions and health and safety concerns due to leaks.
171	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Above ground infrastructure damage	Masts, antennae, switch boxes, aerials, overhead wires, and cables are at risk of damage from heavy precipitation.
172	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Above ground infrastructure damage	High humidity can lead to condensation and potential short-circuiting, reducing the serviceable lifespan of equipment.
173	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Damage in basements	Risk of flooding that could damage equipment stored in basements.
174	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Reduced lifespan of building elements	Reduced lifespan of building elements like window seals and downpipes.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
175	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Maintenance challenges	Heavy downpours may prevent maintenance vehicles from operating safely, impacting building and infrastructure upkeep.
176	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Drainage and Sewerage Systems	Risk of drainage and sewer systems being overwhelmed by heavy rainfall or flooding, with concerns about whether existing systems can cope.
177	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Impacted ventilation filters	Horizontal rain can impact ventilation filters and limit access to the ventilation plant, affecting infection control.
178	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Building components and equipment	Impacted office locations	Potential for water ingress affecting the ability to work from office bases or home locations.
179	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Changes in demand patterns	Demand patterns and volumes are likely to change during heavy downpours or flooding.
180	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Impact on patient discharge rates	Short-term impact on patient discharge rates, potentially limiting the ability to transfer patients between sites.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
181	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Mental health services increasing demand	Flooding can increase pressure on mental health services both in the short and long term due to community risks and impacts on livelihoods.
182	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Home-based patients' admissions	Vulnerable home-based patients may need admission due to flooding in their homes or widespread power outages, increasing system capacity pressure.
183	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Increment of water-related diseases	Increased presentation of illnesses due to water contamination, potentially creating knock-on infection control issues.
184	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Increasing number of patients	Community incidents or accidents	Excessive rain can cause incidents or accidents within the community, leading to an increase in patient numbers.
185	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Buildings damage	Buildings, offices, or wards may suffer water damage, potentially leading to equipment damage and the need to vacate wards if the damage is severe.
186	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Buildings damage	Risk of leaks causing structural damage or damp, particularly in buildings with flat roofs.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
187	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Degradation of building fabric	Degradation of building fabric and fittings due to water ingress, leading to damp, condensation, and mold.
188	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Internal fabric and electrical components damage	Increased building deterioration due to wind and heavy rainfall. Water seeping into cracks can expand and increase exposure to the elements, rust, and impact electrical systems, leading to higher maintenance requirements and costs.
189	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Increasing maintenance requirements	Water ingress can damage building fabric and fittings, increasing maintenance requirements (such as roughcasting, plaster, damp, and flat roofs).
190	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Structural	Foundations of lighting and CCTV columns damaged	Foundations of lighting and CCTV columns may be impacted by waterlogging.
191	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Emergency systems	Damage to server rooms and data centre	Potential for water ingress to key IT infrastructure sites, such as data centres and data servers, damaging equipment.
192	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	Decreased staff wellbeing	Humidity and air quality issues	Increased humidity and dampness can compromise air quality, posing health and safety risks.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
193	Higher average temperature and extended periods of hot weather	Transportation and site access	Vehicle damage	High temperatures can cause road surfaces to soften and tar to melt leading to increased risk of vehicle damage and liability issues.
194	Higher average temperature and extended periods of hot weather	Transportation and site access	Vehicle damage	Increased tyre wear and increased braking distances in extreme heat events
195	Higher average temperature and extended periods of hot weather	Transportation and site access	Electric Vehicles (EVs) decreased efficiency	Extreme heat reduces the efficiency and range of EVs leading to increased frequency of charging, longer charging times due to battery temperature management, reduced reliability of EVs for transportation.
196	Higher average temperature and extended periods of hot weather	Transportation and site access	Vehicle overheating	Overheating vehicles are more prone to breakdowns.
197	Higher average temperature and extended periods of hot weather	Transportation and site access	Impacts on service delivery	Overheated vehicles can impact patient transport and service reliability and the overall transport efficiency and safety.
198	Higher average temperature and extended periods of hot weather	Transportation and site access	Car park surface damage	Possible warping and degradation of car park surfaces, impacting site access and waste management.
199	Higher average temperature and extended periods of hot weather	Essential supplies	Food preservation and safety compromised	Negative impacts on food longevity and preservation, compromising food hygiene.
200	Higher average temperature and extended periods of hot weather	Essential supplies	Adverse impacts on water supply and quality	Reduction in reservoir levels affecting water supply.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
201	Higher average temperature and extended periods of hot weather	Essential supplies	Adverse impacts on water supply and quality	Higher incoming water temperatures require flushing, incurring additional costs.
202	Higher average temperature and extended periods of hot weather	Essential supplies	Adverse impacts on water supply and quality	Overheated water supplies impact hospital environment and safety protocols, requiring bottled water.
203	Higher average temperature and extended periods of hot weather	Essential supplies	Adverse impacts on water supply and quality	Increased risk of microbial growth, such as Legionella, in warmer water.
204	Higher average temperature and extended periods of hot weather	Essential supplies	Increasing energy costs and power supply	Higher energy costs for cooling during summer months.
205	Higher average temperature and extended periods of hot weather	Essential supplies	Increasing energy costs and power supply	Additional cooling requirements may exceed current electrical supply capacity.
206	Higher average temperature and extended periods of hot weather	Essential supplies	Increased demand for refrigeration contractors	Increased demand for refrigeration contractors to manage drug fridges.
207	Higher average temperature and extended periods of hot weather	Essential supplies	Waste management challenges	Increased odour from waste in warmer weather, impacting staff and patients, if there is disruption to service collection due to adverse events.
208	Higher average temperature and extended periods of hot weather	Building components and equipment	Draining systems drying up and blockages	Risk of drying up and blockages during prolonged hot weather, exacerbated by subsequent heavy rainfall.
209	Higher average temperature and extended periods of hot weather	Building components and equipment	Higher maintenance demands on cooling systems and ventilation.	Higher maintenance demands on cooling systems and ventilation.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
210	Higher average temperature and extended periods of hot weather	Building components and equipment	Temperature and infection risk	Cold water pipes and storage tanks heating above 20°C increase Legionella risk.
211	Higher average temperature and extended periods of hot weather	Building components and equipment	Strain on electrical infrastructure	Existing infrastructure may be insufficient for increased cooling loads, leading to higher maintenance needs.
212	Higher average temperature and extended periods of hot weather	Building components and equipment	Drug storage overheating	Potential overheating of drug fridges
213	Higher average temperature and extended periods of hot weather	Building components and equipment	Overheating AC systems	Older and undersized AC units overheat, reducing service life and air quality.
214	Higher average temperature and extended periods of hot weather	Building components and equipment	Overheating AC systems	Increased strain and failure rates of AC systems.
215	Higher average temperature and extended periods of hot weather	Building components and equipment	Overheating wards	Difficulties controlling temperatures in wards, with restricted window openings and limited cooling systems.
216	Higher average temperature and extended periods of hot weather	Building components and equipment	Increased solar gain	Buildings with outdated designs struggle to maintain comfortable temperatures.
217	Higher average temperature and extended periods of hot weather	Building components and equipment	Technical difficulties of electrical equipment	Increased vulnerability of IT and medical equipment, reducing their lifespan and reliability.
218	Higher average temperature and extended periods of hot weather	Building components and equipment	Overheating risks of electrical equipment	Overheating of laboratory analysers and fridges impacts infectious disease control and drug storage.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
219	Higher average temperature and extended periods of hot weather	Building components and equipment	Overheating risks of electrical equipment	Potential invalidation of equipment warranties and increased fire risks.
220	Higher average temperature and extended periods of hot weather	Increasing number of patients	Increased heat-related diseases	Heat-related illnesses such as heatstroke, exhaustion, sunburn, dehydration, and exacerbation of respiratory diseases like asthma.
221	Higher average temperature and extended periods of hot weather	Increasing number of patients	Increased heat-related diseases	Increased hospital admissions for cardiovascular and respiratory disorders.
222	Higher average temperature and extended periods of hot weather	Increasing number of patients	Increased heat-related diseases	Higher incidence of heat-related deaths, skin cancer, and sunstroke.
223	Higher average temperature and extended periods of hot weather	Increasing number of patients	Worsening respiratory conditions	Decreased air quality and pollution trapped near the ground worse respiratory conditions.
224	Higher average temperature and extended periods of hot weather	Increasing number of patients	Increasing vector-borne diseases	Rise in diseases spread by insects (such as Lyme disease, mosquito-borne illnesses).
225	Higher average temperature and extended periods of hot weather	Increasing number of patients	Increasing vector-borne diseases	Emergence of tropical diseases and an increased risk of pandemics.
226	Higher average temperature and extended periods of hot weather	Increasing number of patients	Food and waterborne illnesses increase	Increased disease spread through spoiled food and contaminated water.
227	Higher average temperature and extended periods of hot weather	Increasing number of patients	Negative impacts on vulnerable populations	Elderly and vulnerable population have reduced resilience to prolonged heat, leading to higher morbidity and mortality.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
228	Higher average temperature and extended periods of hot weather	Structural	Damage to building fabric	Increased sunlight reduces the lifespan of internal furnishings and external cladding, including flooring, cabinetry, paintwork, and overall building fabric.
229	Higher average temperature and extended periods of hot weather	Structural	Damage to building fabric	Temperature variations cause expansion and contraction of building materials, leading to structural cracks and vulnerability to water ingress during heavy rainfall.
230	Higher average temperature and extended periods of hot weather	Structural	Damage to building fabric	Historical roofing materials are particularly vulnerable to heat stress, causing issues with water ingress.
231	Higher average temperature and extended periods of hot weather	Structural	Maintenance challenges	Temperature-induced expansion and contraction can accelerate the degradation of building components, necessitating more frequent repairs and maintenance.
232	Higher average temperature and extended periods of hot weather	Structural	Tarmac and car park surfaces damage	High temperatures can damage tarmac roads and car park surfaces, impacting access to key sites and hospitals.
233	Higher average temperature and extended periods of hot weather	Structural	Tarmac and car park surfaces damage	Shortened lifespan for estate surfaces, leading to more potholes and crumbling road networks.
234	Higher average temperature and extended periods of hot weather	Emergency systems	Disruption in critical care	Increased temperatures in wards can disrupt critical care services, posing risks to patient safety and treatment efficacy.
235	Higher average temperature and extended periods of hot weather	Emergency systems	Digital system disruptions	Overheating of electrical equipment and servers can cause disruptions in digital systems, affecting their reliability and functionality.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
236	Higher average temperature and extended periods of hot weather	Emergency systems	Network disruptions	Potential for disruption in tele-health and tele-care systems in home settings due to network issues
237	Higher average temperature and extended periods of hot weather	Emergency systems	IT performance impact	Prolonged hot weather can impact data centre and IT equipment performance, potentially causing system failures if satisfactory temperatures are not maintained.
238	Higher average temperature and extended periods of hot weather	Emergency systems	Increased energy costs	Overheating can impact Information and Communication Technology (ICT) and telephony systems, necessitating increased maintenance and higher energy costs.
239	Higher average temperature and extended periods of hot weather	Decreased staff wellbeing	Decreased staff health and wellbeing	Extreme heat negatively affects employee health and well-being.
240	Higher average temperature and extended periods of hot weather	Decreased staff wellbeing	Decreased staff health and wellbeing	Limited ventilation in specific areas like laundries or workshops leads to staff overheating.
241	Higher average temperature and extended periods of hot weather	Decreased staff wellbeing	Hydration and safety challenges	Ensuring adequate hydration for staff and patients becomes challenging.
242	Higher average temperature and extended periods of hot weather	Decreased staff wellbeing	Uniform and PPE discomfort	Heavy uniforms, scrubs and PPE contribute to staff overheating and fatigue, impacting morale and patient care.
243	Higher average temperature and extended periods of hot weather	Decreased staff wellbeing	Loss of efficiency	Challenging conditions lead to staff fatigue and absences, impacting service delivery.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
244	Storm surge, coastal inundation and coastal erosion	Transportation and site access	General transport issues	Closure of roads, air, and ferry services impacting critical access routes for patients, staff, and service providers.
245	Storm surge, coastal inundation and coastal erosion	Transportation and site access	Appointment cancellations	Cancellation of routine outpatient appointments and non-urgent elective operations due to access issues.
246	Storm surge, coastal inundation and coastal erosion	Transportation and site access	Restricted emergency service access	Restricted access for emergency vehicles due to road closures and flooding.
247	Storm surge, coastal inundation and coastal erosion	Transportation and site access	Impacts on vehicles	Increased maintenance costs and impact on vehicle availability due to potential damage to vehicles entering flood waters or aqua-planning.
248	Storm surge, coastal inundation and coastal erosion	Essential supplies	Power disruptions	Coastal erosion and flooding causing power disruptions, impacting the functionality of healthcare facilities.
249	Storm surge, coastal inundation and coastal erosion	Essential supplies	Internet connection issues	Vulnerability of electrical supply and internet connection to disruptions if the power network and infrastructure are impacted by flooding or coastal surges.
250	Storm surge, coastal inundation and coastal erosion	Essential supplies	Internet connection issues	Digital poverty may be exacerbated by coastal flooding, impacting the ability of patients and staff to communicate and access digital services.
251	Storm surge, coastal inundation and coastal erosion	Essential supplies	Supply chain disruptions	Inability of service providers and suppliers to access buildings due to coastal flooding.
252	Storm surge, coastal inundation and coastal erosion	Essential supplies	Supply chain disruptions	Disruption to deliveries of essential supplies, including consumables and welfare facilities, impacting the entire supply chain.

N	Climate Hazard	Nature of potential impact	Potential Impacts	Details of potential impact
253	Storm surge, coastal inundation and costal erosion	Essential supplies	Mail services disruptions	Reduced delivery of mail services due to flooding or coastal storm surges, causing delays in receiving critical documents and communications.
254	Storm surge, coastal inundation and costal erosion	Building components and equipment	Damage to essential building components	Coastal flooding can cause significant damage to essential energy infrastructure, disrupting the supply of electricity, gas, and other critical utilities.
255	Storm surge, coastal inundation and costal erosion	Building components and equipment	Drainage issues	Flooding during storm surges and surface water flooding due to drainage issues can cause extensive water damage to buildings.
256	Storm surge, coastal inundation and costal erosion	Increasing number of patients	Increasing emergency service demand	Storm damage and accidents will lead to a higher volume of emergency calls and urgent care needs.
257	Storm surge, coastal inundation and costal erosion	Increasing number of patients	Increasing mental health services demand	Flooding can exacerbate mental health issues, increasing the demand for both short-term and long-term mental health support due to community impacts and disruptions to livelihoods.
258	Storm surge, coastal inundation and costal erosion	Increasing number of patients	Home-based patients' admissions	Vulnerable home-based patients may need to be admitted if their homes are affected by flooding or widespread power outages.
259	Storm surge, coastal inundation and costal erosion	Structural	Structural damage	Potential damage to foundations and bearing walls, leading to the need for emergency evacuation and patient relocation.
260	Storm surge, coastal inundation and costal erosion	Emergency systems	Loss of emergency backup energy supply	A loss of emergency backup energy supply can critically impact heating systems.

Appendix E Climate hazards' average risk exposure score per NHS board

Table E.1 - Climate Hazards' Average Risk Exposure Score per NHS board

NHS Board	Climate Hazard	Average of Risk Exposure Score
Ayrshire & Arran	Cold spells (including frost, snow and ice)	12.75
Ayrshire & Arran	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.33
Ayrshire & Arran	Extended periods of dry weather and drought	9.00
Ayrshire & Arran	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	17.28
Ayrshire & Arran	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.33
Ayrshire & Arran	Higher average temperature and extended periods of hot weather	9.00
Ayrshire & Arran	Storm surge, coastal inundation and coastal erosion	12.93
Greater Glasgow and Clyde	Cold spells (including frost, snow and ice)	14.00
Greater Glasgow and Clyde	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	16.00
Greater Glasgow and Clyde	Extended periods of dry weather and drought	16.00
Greater Glasgow and Clyde	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	13.11
Greater Glasgow and Clyde	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	17.00
Greater Glasgow and Clyde	Higher average temperature and extended periods of hot weather	8.86
Highland	Cold spells (including frost, snow and ice)	12.89
Highland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.45
Highland	Extended periods of dry weather and drought	9.60

NHS Board	Climate Hazard	Average of Risk Exposure Score
Highland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	16.54
Highland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	15.00
Highland	Higher average temperature and extended periods of hot weather	9.00
Highland	Storm surge, coastal inundation and costal erosion	14.18
Western Isles	Cold spells (including frost, snow and ice)	10.11
Western Isles	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	14.18
Western Isles	Extended periods of dry weather and drought	12.00
Western Isles	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	15.00
Western Isles	Higher average temperature and extended periods of hot weather	14.86
Western Isles	Storm surge, coastal inundation and costal erosion	16.00
Lothian	Cold spells (including frost, snow and ice)	8.83
Lothian	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	6.00
Lothian	Extended periods of dry weather and drought	13.83
Lothian	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	16.40
Lothian	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.50
Lothian	Higher average temperature and extended periods of hot weather	12.70
Lothian	Storm surge, coastal inundation and costal erosion	9.00
Borders	Cold spells (including frost, snow and ice)	11.38

NHS Board	Climate Hazard	Average of Risk Exposure Score
Borders	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.14
Borders	Extended periods of dry weather and drought	9.50
Borders	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	11.63
Borders	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.50
Borders	Higher average temperature and extended periods of hot weather	15.75
Orkney	Cold spells (including frost, snow and ice)	13.57
Orkney	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	14.67
Orkney	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	12.36
Orkney	Higher average temperature and extended periods of hot weather	8.90
Orkney	Storm surge, coastal inundation and costal erosion	15.00
Grampian	Cold spells (including frost, snow and ice)	10.69
Grampian	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	15.00
Grampian	Extended periods of dry weather and drought	9.83
Grampian	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	15.00
Grampian	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	15.20
Grampian	Higher average temperature and extended periods of hot weather	11.42
Grampian	Storm surge, coastal inundation and costal erosion	10.80
Tayside	Cold spells (including frost, snow and ice)	11.92

NHS Board	Climate Hazard	Average of Risk Exposure Score
Tayside	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	15.15
Tayside	Extended periods of dry weather and drought	9.57
Tayside	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	14.06
Tayside	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	12.75
Tayside	Higher average temperature and extended periods of hot weather	12.58
Tayside	Storm surge, coastal inundation and coastal erosion	7.45
NHS 24	Cold spells (including frost, snow and ice)	11.56
NHS 24	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.45
NHS 24	Extended periods of dry weather and drought	12.00
NHS 24	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	12.00
NHS 24	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.33
NHS 24	Higher average temperature and extended periods of hot weather	11.33
NHS 24	Storm surge, coastal inundation and coastal erosion	12.00
Shetland	Cold spells (including frost, snow and ice)	7.50
Shetland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	15.86
Shetland	Extended periods of dry weather and drought	13.20
Shetland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	7.50
Shetland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	12.67

NHS Board	Climate Hazard	Average of Risk Exposure Score
Shetland	Higher average temperature and extended periods of hot weather	12.50
Shetland	Storm surge, coastal inundation and coastal erosion	11.00
Lanarkshire	Cold spells (including frost, snow and ice)	9.06
Lanarkshire	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	11.20
Lanarkshire	Extended periods of dry weather and drought	10.42
Lanarkshire	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	14.36
Lanarkshire	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.00
Lanarkshire	Higher average temperature and extended periods of hot weather	12.58
Forth Valley	Cold spells (including frost, snow and ice)	7.71
Forth Valley	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	10.86
Forth Valley	Extended periods of dry weather and drought	7.33
Forth Valley	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	12.29
Forth Valley	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.29
Forth Valley	Higher average temperature and extended periods of hot weather	13.00
Forth Valley	Storm surge, coastal inundation and coastal erosion	8.00
Golden Jubilee University National Hospital	Cold spells (including frost, snow and ice)	11.29
Golden Jubilee University National Hospital	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	13.00

NHS Board	Climate Hazard	Average of Risk Exposure Score
Golden Jubilee University National Hospital	Extended periods of dry weather and drought	8.00
Golden Jubilee University National Hospital	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	8.80
Golden Jubilee University National Hospital	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	9.00
Golden Jubilee University National Hospital	Higher average temperature and extended periods of hot weather	13.00
Golden Jubilee University National Hospital	Storm surge, coastal inundation and coastal erosion	8.00
State Hospital Board for Scotland	Cold spells (including frost, snow and ice)	14.67
State Hospital Board for Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	9.60
State Hospital Board for Scotland	Extended periods of dry weather and drought	12.00
State Hospital Board for Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	10.00
State Hospital Board for Scotland	Higher average temperature and extended periods of hot weather	8.25
Public Health Scotland	Cold spells (including frost, snow and ice)	9.50
Public Health Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	12.00
Public Health Scotland	Extended periods of dry weather and drought	5.60
Public Health Scotland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	7.43
Public Health Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.18
Public Health Scotland	Higher average temperature and extended periods of hot weather	11.50

NHS Board	Climate Hazard	Average of Risk Exposure Score
Fife	Cold spells (including frost, snow and ice)	8.00
Fife	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	11.75
Fife	Extended periods of dry weather and drought	7.00
Fife	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	10.33
Fife	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	11.43
Fife	Higher average temperature and extended periods of hot weather	9.90
Fife	Storm surge, coastal inundation and coastal erosion	6.00
National Services Scotland	Cold spells (including frost, snow and ice)	8.67
National Services Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	9.40
National Services Scotland	Extended periods of dry weather and drought	3.00
National Services Scotland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	6.00
National Services Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	10.00
National Services Scotland	Higher average temperature and extended periods of hot weather	8.38
Scottish Ambulance Service (SAS)	Cold spells (including frost, snow and ice)	8.00
SAS	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	8.00
SAS	Extended periods of dry weather and drought	8.25
SAS	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	6.00

NHS Board	Climate Hazard	Average of Risk Exposure Score
SAS	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	8.00
SAS	Higher average temperature and extended periods of hot weather	9.00
SAS	Storm surge, coastal inundation and coastal erosion	6.00
Dumfries & Galloway	Cold spells (including frost, snow and ice)	7.14
Dumfries & Galloway	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	6.14
Dumfries & Galloway	Extended periods of dry weather and drought	2.80
Dumfries & Galloway	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	5.17
Dumfries & Galloway	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	4.60
Dumfries & Galloway	Higher average temperature and extended periods of hot weather	7.86
Dumfries & Galloway	Storm surge, coastal inundation and coastal erosion	1.67
Health Improvement Scotland	Cold spells (including frost, snow and ice)	6.00
Health Improvement Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	8.00
Health Improvement Scotland	Extended periods of dry weather and drought	4.00
Health Improvement Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	5.00
Health Improvement Scotland	Higher average temperature and extended periods of hot weather	4.00
NHS Education for Scotland	Cold spells (including frost, snow and ice)	4.00
NHS Education for Scotland	Combined climatic effects (including storms, high winds, lightning, fog, mist and low cloud)	1.50

NHS Board	Climate Hazard	Average of Risk Exposure Score
NHS Education for Scotland	Extended periods of dry weather and drought	1.00
NHS Education for Scotland	Flooding (including fluvial, pluvial groundwater, coastal and sewer flooding)	1.00
NHS Education for Scotland	Heavy downpours and driving rain (includes changes in moisture content of air and soil)	1.00
NHS Education for Scotland	Higher average temperature and extended periods of hot weather	1.00

Glossary of Terms

Adaptation - is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (See ref 8).

Assets - in this report, refers to buildings and other physical entities owned, managed or used by NHS boards in delivering their services.

Climate change - is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural climate variability, observed over comparable time periods (See ref 8).

Hazard - is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Annotation: Hydrometeorological hazards are of atmospheric, hydrological or oceanographic origin. Examples are floods, drought, heatwaves, cold spells, and coastal storm surges (See ref 9).

Impact - in this report, is a specific change in a system caused by its exposure to climate change. Impacts may be harmful (threat) or beneficial (opportunity).

Measures - in this report, refers to interventions to help adapt to climate change.

Probability - in this report, refers to the likelihood of a threat, hazard or general outcome occurring where this can be estimated probabilistically.

Residual risk - in this report, refers to the risk that remains after interventions have been implemented.

Resilience - is the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner (See ref 8).

Risk - in this report, is the probability of something happening multiplied by the impact it could have if it occurred.

Abbreviations

AC:	Air conditioning
AR:	Assessment Report
A&E:	Accident and Emergency
BEMS:	Building Energy Management System
CDU:	Central Decontamination Unit
CCRA:	Climate Change Risk Assessment
DL:	Director Letter
DSM:	Dynamic Simulation Modelling
ED:	Emergency Departments
EMS:	Environmental Management Systems
EV:	Electric vehicle
ICT:	Information and Communication Technology
IPCC:	Intergovernmental Panel on Climate Change
IRIC:	Incident Reporting and Investigation Centre
ISO:	International Organization for Standardization
PAMS:	Planning and Asset Management Strategy
PFI:	Private finance initiative
PFR:	Property Flood Resilience
PPE:	Personal Protective Equipment
PPP:	Public-Private Partnership
PSSD:	Planning and Service Design
RCP:	Representative Concentration Pathway
SAS:	Scottish Ambulance Service
SEPA:	Scottish Environment Protection Agency
SSE:	Scottish and Southern Energy
SFRS:	Scottish Fire and Rescue Service
SuDS:	Sustainable Drainage Systems

UPS: Uninterruptible power supply

VSG: Ventilation Safety Group

WHO: World Health Organisation

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