



King's College Hospital
NHS Foundation Trust

Sustainable healthcare for all

CLIMATE READY KING'S

Our Climate Change Adaption Plan 2023-2026



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Foreword

Climate change is one of the most serious global health threats of the 21st century. The effects of climate change are real, and they are already happening.

Improving our ability to cope with projected climatic shifts is a key part of our Green Plan: Sustainable Healthcare for All, as well as our Strong Roots, Global Reach Strategy and the role we play as an anchor institution within the community. Improving the resilience of our infrastructure, services and supply chain against extreme weather and long-term climatic changes is vital to protect our local population, current and future patients and staff.

We are already realising the effects of climate change within south east London and across the UK, from changing rainfall patterns to more frequent heatwave events. Many of the actions set out in this plan bring tangible benefits in the present, such as greening our estate and improving patient experience through temperature controls. This plan goes hand-in-hand with our ambitions to achieve net zero carbon by 2040.

Whilst we are working to deliver a Greener NHS, the impacts of climate change may not be preventable, and these adaptations will therefore help the Trust cope with new risks and challenges presented by new climate patterns. This plan sets out our ambitions to empower staff, patients and the community to take action to adapt to climate change and raise awareness. We will continue to work alongside our partners at South East London Integrated Care System and with local Councils to embed climate literacy, action and preparedness at the heart of our strategies and planning.

With this plan, we are initiating our plans to embed climate change adaptation into daily practice across the Trust. Supported by guidance from the Greener NHS and NHS England and Improvement, we will continue to review the risks presented to King's assets, services and people and take action to ensure a climate-ready King's.

I encourage us all to consider how the projected impacts of climate change presented in this report will affect us and the Trust in years to come.



Lorcan Woods
Chief Financial Officer

Executive summary

Around the world, climate change is reported by the IPCC to have adversely affected both people's physical and mental health whilst equally having pervasive impacts on both human and natural systems (IPCC, 2022). Projections indicate that trends of increasing ill health because of climate change are expected to continue in the near- to long-term future and hence, it is important to recognise how these risks may manifest and takes steps to manage them.

Through the Sustainable Healthcare for All: A Green Plan for King's, climate change adaptation plays a crucial role. The need for such climate change adaptation has been supported in the UK by the Climate Change Act 2008 and the subsequent Climate Change Risk Assessment and National Adaptation Programme which are reported on every five years with the latest climate-risk data. Additionally, the need for climate change adaptation has been acknowledged within the healthcare sector by a series of NHS Health and Care Adaptation Reports, the most recent of which was published in 2021 and highlights the threat posed to health and the importance of adaptation for ensuring a high level of care is maintained.

The development of our Climate Change Adaptation Plan has been taken with a vision to enhance the adaptive capacity of our infrastructure, services and workforce to climate-related hazards and represents a key part of our Climate Ready King's adaptation plan. This plan identifies priority climate risk areas by assessing the current climate risks and the projections of climate change across each of our three sites at Denmark Hill, the Princess Royal University Hospital (PRUH) and Orpington Hospital in addition to considering the potential for local clinical risks and the broader implications of climate change on the national/international infrastructure and supply chains upon which we rely. Initial assessments have identified the following key messages:

- Across the three main sites, key risks have been identified as heat, surface flooding and air quality.
- Denmark Hill is currently associated with comparatively greater heat and flood risks than the PRUH and Orpington Hospital.
- Heat represents both a direct infrastructure risk with regard to increased difficulties in managing the internal temperatures of hospital buildings but also clinical risks as a result of increased climate-related illness amongst our patient community.
- Current air quality data indicates that whilst Denmark Hill is in an area of particularly high particulate matter concentrations, both PRUH and Orpington Hospital remain in areas where air pollution could worsen.

Following a preliminary review of the current actions on climate change adaptation across King's, multiple recommendations have been made in regard to developing resilience across our three sites in terms of our built infrastructure, our clinical services, our operational services and our workforce and community. These include:

- Embedding climate adaptation into our Estates strategy
- Carrying out flood risk assessments
- Conducting thermal monitoring of clinical areas
- Raising awareness and understanding on climate change adaptation
- Greater collaboration with local authorities, suppliers, and our regional NHS partners to better identify and fund adaptation measures

We recognise that the successful implementation and management of this plan requires strong governance and diligent reporting which will be achieved through the establishment of a Climate Adaptation Working Group who will be responsible for reporting quarterly progress to the Sustainability Steering Group (SSG).

Introduction

The climate challenge for the King's

The rate of change in the Earth's climate since the onset of the industrial revolution represents a significant threat to society which constitutes a global climate emergency. The magnitude and implications of this observed change vary spatially, but across the globe, the Climate Change Committee estimate that global surface air temperatures have increased by around 1.2°C compared to pre-industrial levels and this increase is expected to continue further into the 21st century.

Whilst the Earth has previously experienced changes in climate, the magnitude at which change is currently occurring exceeds that which is typically caused by natural variations such as cycles in the Earth's orbit and variations in the solar output of the sun. Responding to such changes therefore requires both climate change adaptation and mitigation. Climate change adaptation refers to the process of reducing vulnerabilities to the immediate and predicted impacts of climate change whilst increasing the capacity of communities to be resilient (UNFCCC, 2014). By contrast, climate change mitigation is the process through which efforts are made to generally enhance carbon sinks (for example peat restoration or forestation) or reduce carbon sources (for example reducing the burning of fossil fuels).

In this sense, mitigation and adaptation are intrinsically linked and are required as two simultaneous courses of action. Whilst successful mitigation actions should reduce the extent to which adaptation is required, observed warming already requires reaction whilst further shifts in climatic conditions are inevitable because of lag times in climatic processes. Consequently, the need for effective climate change adaptation is clear; to decrease the vulnerability of communities and the broader global population to climatic hazards. Therefore, King's College Hospital NHS Foundation Trust (the Trust) will continue to strive towards our 2040 net zero carbon emissions target; however, our climate is already changing. No matter how successful we are at reducing our greenhouse gas emissions, it will still be necessary to adapt to climate change because many impacts of past emissions are already locked-in and will lead to changes in our climate for decades to come.

This plan will look to assess the implications of climate change on the ability of King's College Hospital NHS Foundation Trust to provide healthcare services to our community. The identification of these risks will consequently allow us to develop an action plan that will outline the steps that we intend to take to increase our resilience to such events.

With this climate adaptation plan, we will outline the challenges the Trust faces in the short and medium term as a result of changes we expect in the future climate. We will also identify those solutions that, based on our present-day knowledge, appear to be most appropriate and set out a process for implementation and review of this plan and associated policy.

The global climate emergency

Research has ascertained that there is a clear relationship between increasing concentrations of greenhouse gases such as CO₂ in the atmosphere and the rising temperatures experienced on Earth (IPCC, 2014) as outlined in figure 1. These interlinked shifts in temperature and CO₂ can both be attributed to the consequence of human actions. Most notably, the burning of fossil fuels releases greenhouse gas emissions into the atmosphere which trap the sun's energy and are hence responsible for rising temperatures.

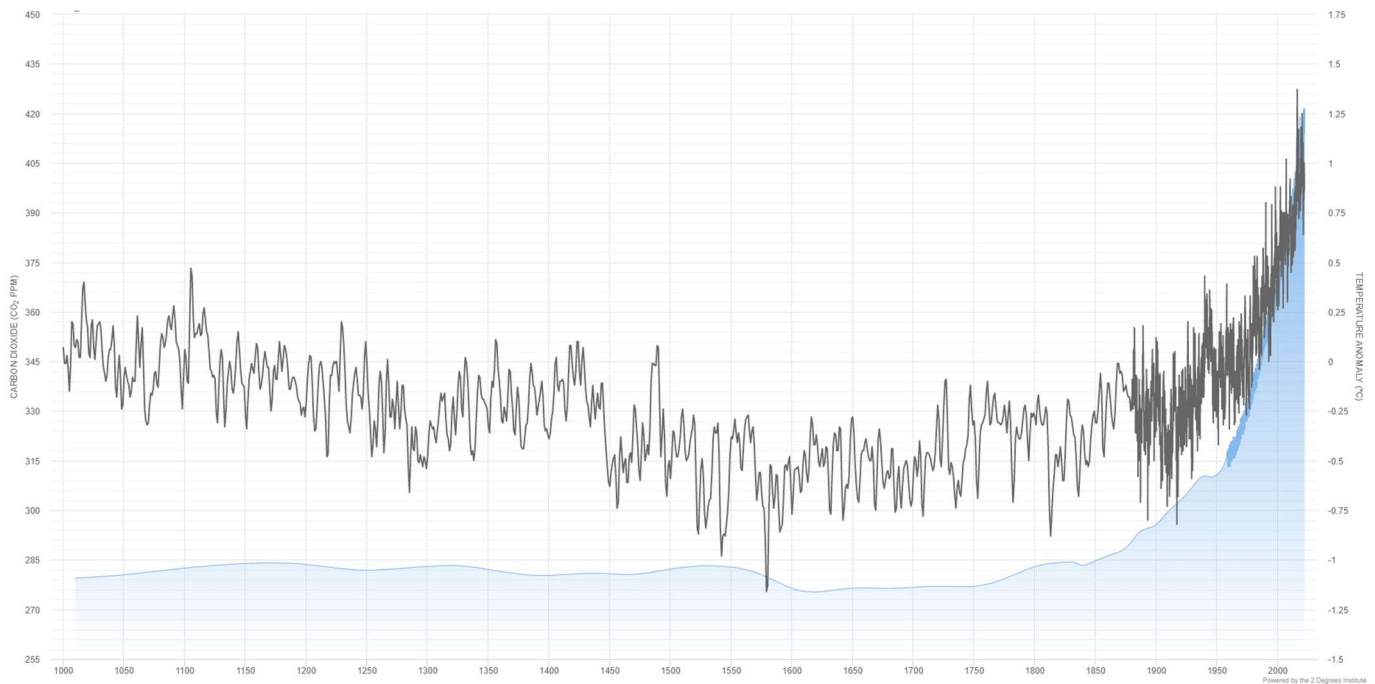


Figure 1: A graph to show changing CO₂ concentrations and temperature from 1000AD onwards (Ref: CO₂ Levels.org)

These long-term shifts in temperature also affect weather patterns and it is these collective changes that are referred to as climate change. Whilst such changes do occur naturally, human-caused climate change represents a global climate emergency regarding the rate of change and the magnitude of potential change because of the risks that this may expose us to and the challenges that it presents with regard to adaptation.

Within the context of healthcare, there are broad concerns regarding the multitude of risks that climate change poses. These come in the form of health risks, including potential changes in exposure to various vectors of disease, the direct impacts of increasing temperatures and air pollution on health, and both the physical and mental effects of extreme weather events. Additionally, risks to key infrastructure including access to water and energy at local, national, and international scales each have the potential to disrupt the ability of healthcare providers, including King's College Hospital NHS Foundation Trust to maintain the services we provide.

Our local changing climate

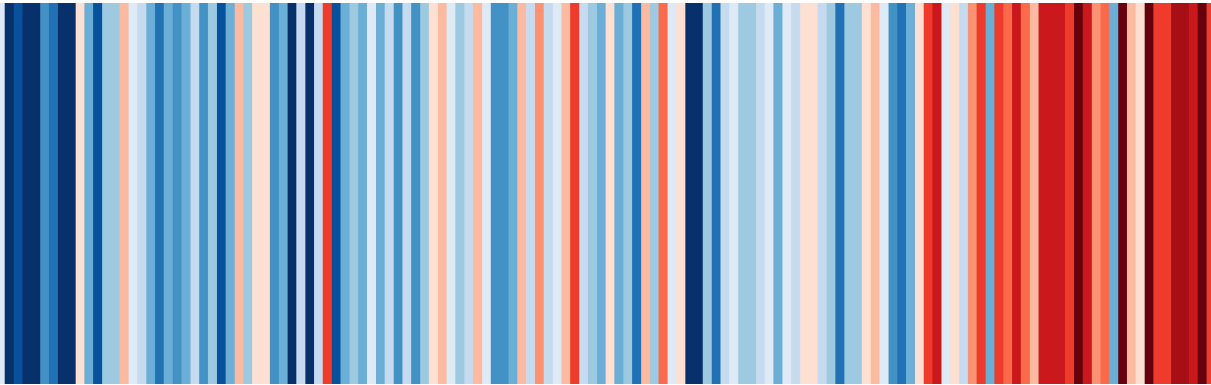


Figure 2: Climate Stripes of England – 1884-2021 (Ref: Hawkins, 2022)

Within England, the climate is already exhibiting signs of change with recent years consistently measuring warmer than the average across the latter part of the 20th century – see the climate stripes above. The hottest summer day of the past 30 years was 37°C, but this is also likely to increase under the future warming scenarios outlined below.

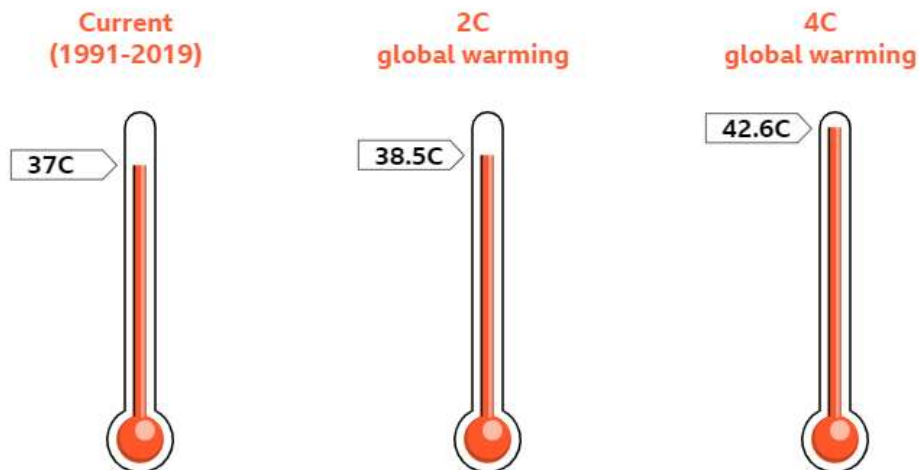


Figure 3: Projections of temperature at Denmark Hill under contrasting climate change scenarios (Ref: Dale and Stylianou, 2021)



In London, mean summer temperatures increased by approximately 1.9°C between 1961 and the early 21st century whilst the average peak temperature observed annually between 2008 and 2017 was 0.8°C warmer than the average between 1961 and 1990 (JCSC, 2019). Additionally, the UK’s top 10 warmest years since 1884 have all occurred since 2002 (The Met Office, 2019).



Between 2008 and 2017, average summer precipitation levels in the UK increased by 20% relative to 1961-1990 whilst extreme rainfall events have increased by around 17% (JCSC, 2019). Despite this, annual precipitation in London was observed to fall by 3.7% across the same period (JCSC, 2019) which emphasises the changing nature of weather patterns across this period.



These general trends have been accompanied by notable hazards. For example, three heatwave periods during the summer of 2020 are estimated to have caused more than 2,500 excess deaths across England (Public Health England, 2020) whilst extensive flash flooding occurred in London during the summer of 2021.

UK Climate Change Projections

As a result of the intrinsically interlinked relationship between anthropogenic activities and climate change, projections of future climate change within the UK exhibit a degree of variability regarding their magnitude. However, the UK Climate change Projections (UKCP18) utilise modern perceptions of feasible emissions pathways in addition to complex, peer reviewed outputs from Met Office Climate Models to project future climatic conditions across the UK.

The headline results of this research are outlined in figure 4 which clearly indicate that the impacts of climate change will increasingly vary spatially across the UK but equally that the magnitude of climate change will be largely dependent on the degree to which climate change mitigation is successful in reducing the emission of greenhouse gases.

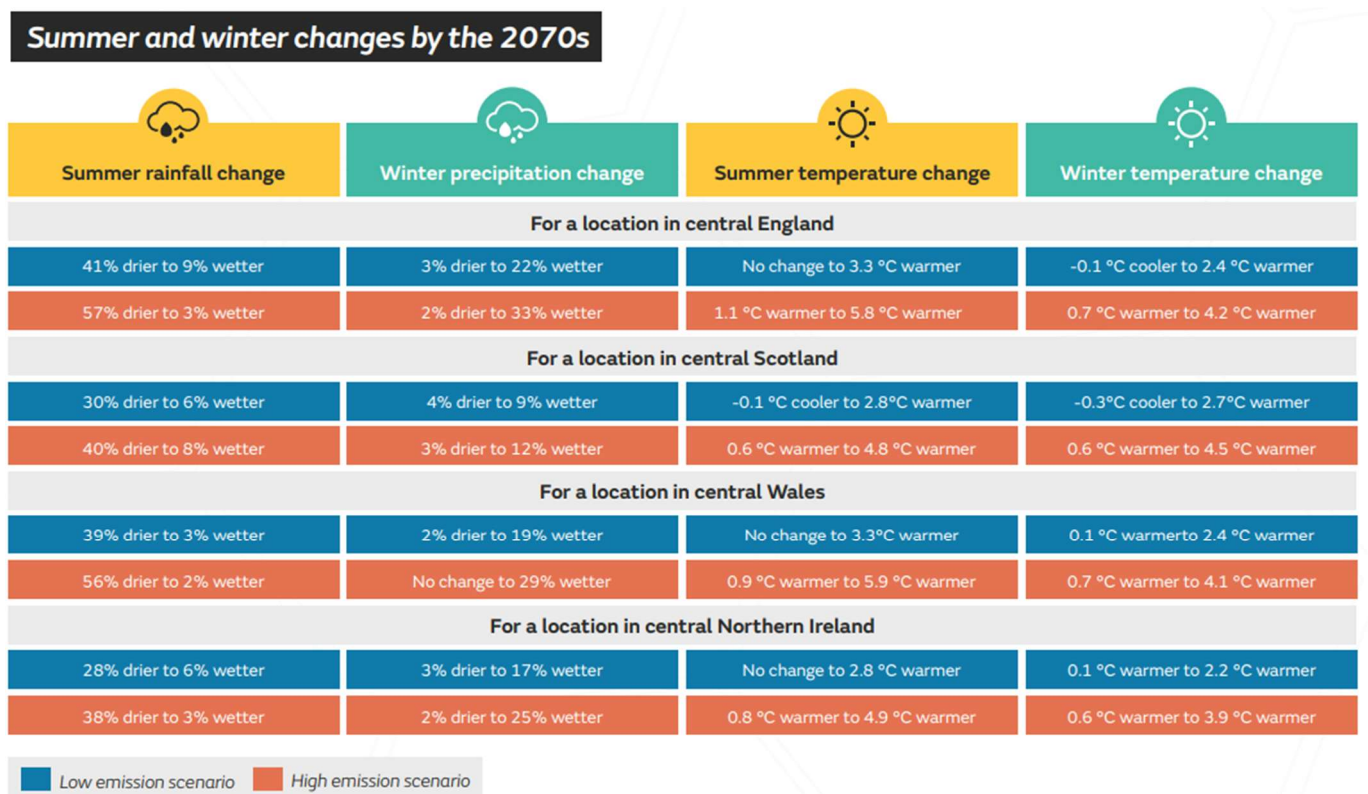


Figure 4: Headline findings for the projected impacts of climate change across the United Kingdom (Ref: The Met Office, 2021a)

However, from figure 4 it is evident that across all areas of the UK, temperatures are generally expected to increase with hot summers expected to increase in frequency. This is expected to coincide with a general summer drying but an increase in the intensity of heavy summer rainfall events. As such, it is important that our Climate Change Adaptation Plan recognises the range of possible climate impacts in order to ensure that the necessary steps are taken to minimise the potential impact of any such risks.

Scope of the plan

Vision

“To enhance the adaptive capacity and resilience of our infrastructure, services and workforce to climate-related hazards, with a view to contributing to sustainable development; and ensuring an adequate adaptation response in the context of the goal of holding average global warming well below 2°C and pursuing efforts to hold it below 1.5°C”

Purpose

The purpose of this plan is to ensure that operationally, King's can adapt to ensure it is ready for future climate change. The policy applies to all King's employees but focuses on changes and awareness within Pharmacy, Capital, Estates and Facilities. The Climate Change Adaptation Plan undertakes the following tasks:

1. Builds understanding of the current climate risks and climate of the future
 - a. Analyses the current weather-related risks of south east London and our three sites via a baseline risk assessment at Denmark Hill, the Princess Royal University Hospital and Orpington Hospital
 - b. Uses projections from climate models to identify how climate change may accentuate existing risks and create new risks in the future
 - c. Prioritises the key climate risks and opportunities for King's
2. Maps adaptation for King's, providing a framework that:
 - a. Identifies the scale, or scales at which to tackle the risks
 - b. Facilitates action by highlighting where collaborative working with Councils, NHS Trusts and wider stakeholder partners will increase the efficiency and effectiveness of any action
 - c. Identifies and prioritises the critical gaps where further work is required to understand the climate and its impacts before actions can be defined
 - d. Establishes a strategic process by which Our Healthier South East London Integrated Care System can put in place the measures necessary to adapt to future climate change
 - e. Improves education, awareness-raising and Trust capacity on climate change mitigation, adaptation, impact reduction and early warning
 - f. Provides a roadmap to resilience through a clear and resources implementation plan with set timeframes for delivery
3. Demonstrates how King's can become a national and regional exemplar on adaptation

Stakeholder engagement

To ensure the successful development and subsequent implementation of this Climate Change Adaptation Plan, we have prioritised engagement with a variety of stakeholders throughout the development process. Roundtable discussions have been carried out with members of the Trust across multiple disciplines to inform them of the scope of this project and ensure that the importance of adapting to climate change is well-understood. Further engagement has also been achieved through one-to-one planning and alignment meetings in which a greater collective understanding of existing measures and variations between site could be identified.

Feedback has also been sought from staff as part of a peer review process to assess the climate change risk assessment. Such engagement has been crucial in so far as the need to accurately capture unique vulnerabilities

faced by certain departments in addition to both the measures that have already been implemented to manage these risks and also opportunities for further intervention that have already been identified.

We have also recognised the benefits of collaborating with local stakeholders including the councils and other organisations with the aspiration to build the resilience of local people and infrastructure to the impacts of climate change.

Considerations in preparing for a changing climate

Climate change adaptation requires a flexible and dynamic management approach. As the climate changes across multiple scales, for example locally and internationally, it is important to recognise that additional climate change adaptation measures may need to be taken which differ from those originally foreseen and consequently climate change adaptation will be an ever-evolving process.

Furthermore, in determining the need for and the scope of future adaptation measures, an evidence-based decision making process should be utilised which considers the best understanding of how climate change is projected to affect the Trust and its community. Such work should involve the consideration of both the probability of an event and how this may change (e.g., climate change may increase the likelihood of heat waves) and also the consequence of an event being allowed to occur (e.g., how many people will be exposed to an event and whether they have the adaptive capacity to manage such risks and recover). Such data can inform the decision-making process so that the Trust is better able to identify where the cost of inaction will exceed that of taking forward-thinking adaptation measures.

Additionally, given that the impacts of climate change will be experienced across multiple scales, benefits can also be realised by emphasising the need for collaboration between actors at these different scales to ensure that the indirect effects of any adaptation measures are considered. Whilst such thinking is naturally of vital importance within climate change adaptation planning, integration with broader planning strategies should also be targeted so as to ensure that all future developments can minimise their climate risk and are integrated within the process of adjusting any future plans to climate change adaptation.

Background and drivers

The importance of action on climate change, regarding both mitigation and adaptation has been highlighted by a series of acts, policies and reports that range from the international and national level contexts, down to NHS wide, and Trust-specific policies regarding aims for more sustainable practices.

Statutory requirements and reports

The basis for the integration of action on climate change into policy in the UK was detailed by the Climate Change Act 2008. This act outlines the need for reductions in the emission of greenhouse gases such as CO₂ and set a target of reducing greenhouse gas emissions by 80% by 2050 compared to 1990 levels. Subsequently the ambition of this target has been increased with the aim of achieving net zero (100%) in the same time frame. In addition to this, the Climate Change Act also requires that every 5 years, the UK government carries out a Climate Change Risk Assessment (CCRA) and a National Adaptation Programme (NAP). The need for such proactive action on climate change has been supported most recently by the IPCC's sixth assessment report on Climate Change 2022: Impacts, Adaptation and Vulnerability (IPCC, 2022) which states that climate change will significantly increase ill health and premature deaths from the near- to long-term future.

The most recent technical report for the UK Climate Change Risk Assessment (CCRA3) was published in June 2021 and sets out the risks and opportunities that the UK faces due to climate change. Consequently, this report provides the evidence that is used to inform decision making regarding the need for climate change adaptation. Within this most recent report, it is noted that health and social care systems across the UK, are expected to become increasingly vulnerable to extreme weather events including both extreme heat and flooding which are expected to impact people, buildings and infrastructure networks. This therefore represents an increasing risk to our ability to provide essential services and therefore emphasises the need for adaptation measures to reduce these impacts.

The most recent National Adaptation Programme (NAP) was published by Defra in 2018 and outlines the national strategy over the next five years for adapting to both observed and projected climate change. This report similarly recognises that climate change poses multiple risks to health that are likely to increase, most notably from overheating and flooding. Consequently, the NAP emphasises the importance of health systems adapting to protect people against the impacts of climate change and reiterates that adaptation should be embedded into daily practice in the health sector by the end of 2023 and hence that all NHS Trusts have an adaptation plan in place.

Other notable policies have also helped to direct the resilience of King's College Hospital's estate. The NHS Emergency Preparedness, Resilience and Response (EPRR) Framework distils our requirements under the Civil Contingencies Act 2004, NHS Act 2006, Health and Social Care Act 2012 and NHS Standard Contract. The Civil Contingencies Act requires that NHS organisations, and providers of NHS-funded care, to demonstrate their ability to maintain the provision of their services despite emergencies such as extreme weather events. Furthermore, specific additional updates to the requirements placed on the NHS in terms of emergency preparedness, resilience and response (EPRR) were outlined in the Health and Social Care Act 2012.

For a Greener NHS

The NHS Long Term Plan recognises that a significant level of action is required to align the NHS with the expectations of the Climate Change Act 2008 and consequently set out plans to improve efficiencies, reduce waste and increase resilience amongst healthcare systems and services.

The Greener NHS programme has expanded on this work to recognise the importance of collaboration between NHS staff, hospitals and partners in reducing the impact of climate change on public health and the environment. This is communicated by the Delivering a Net Zero National Health Service report (NHS, 2020) which outlines an ambitious trajectory for achieving net zero carbon within the NHS at a rate greater than expected by the Climate Change Act. Additionally, the Delivering a Net Zero National Health Service report also emphasises the link between mitigation and adaptation, and consequently the ongoing importance of adaptation as part of the NHS’ response to climate change.

To support the direction of the Delivering a Net Zero National Health Service report, the 2021/22 NHS Standard Contract (NHS, 2021a) requires all NHS providers to produce and continually update a [Green Plan](#) which outlines the approach of individual Trusts in achieving net zero.

At King’s, we published our Green Plan in September 2021 which outlined our emissions baseline and ten key areas of focus with clear targets and the actions that we will take to achieve them. Climate adaptation is identified as one of these key focus areas whilst the development of both a Climate Change Adaptation Plan and a Climate Change Risk Assessment are recognised as key deliverables to ensure public health risks associated with climate change are suitably reported.

Notably, in December 2021, the NHS Third Health and Care Adaptation Report was published which outlined progress made since the publication of the previous report in 2015, key climate change hazards (figure 5) and the next steps to suitably assess risks and build resilience. These next steps include highlighting the need for long-term planning that relies on the identification to sites at risk from events such as overheating and flooding.

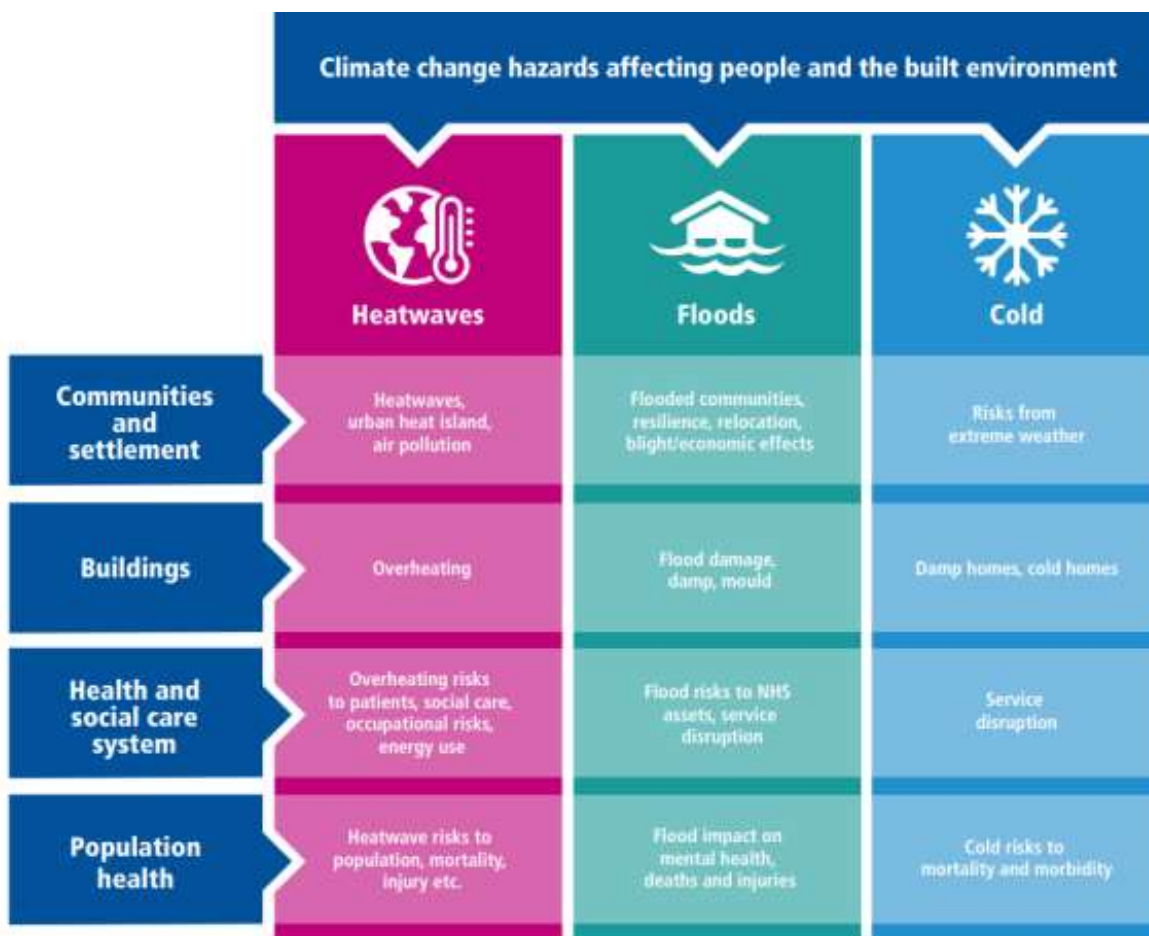


Figure 5: climate change hazards affecting people and the built environment, (Ref: NHS, 2021b)

Sustainable Development Goals

We have developed a set of four key areas of focus for the Climate Change Adaptation Plan which are shown in figure 6 below alongside the outcomes and Sustainable Development Goals (SDGs) they aim to contribute towards. By linking to both the United Nations SDG's and the NHS' Third Health and Care Adaptation Report, our plan aims to promote co-benefits, and integrates adaptation into the Trust's wider Green Plan, policy development and service delivery.

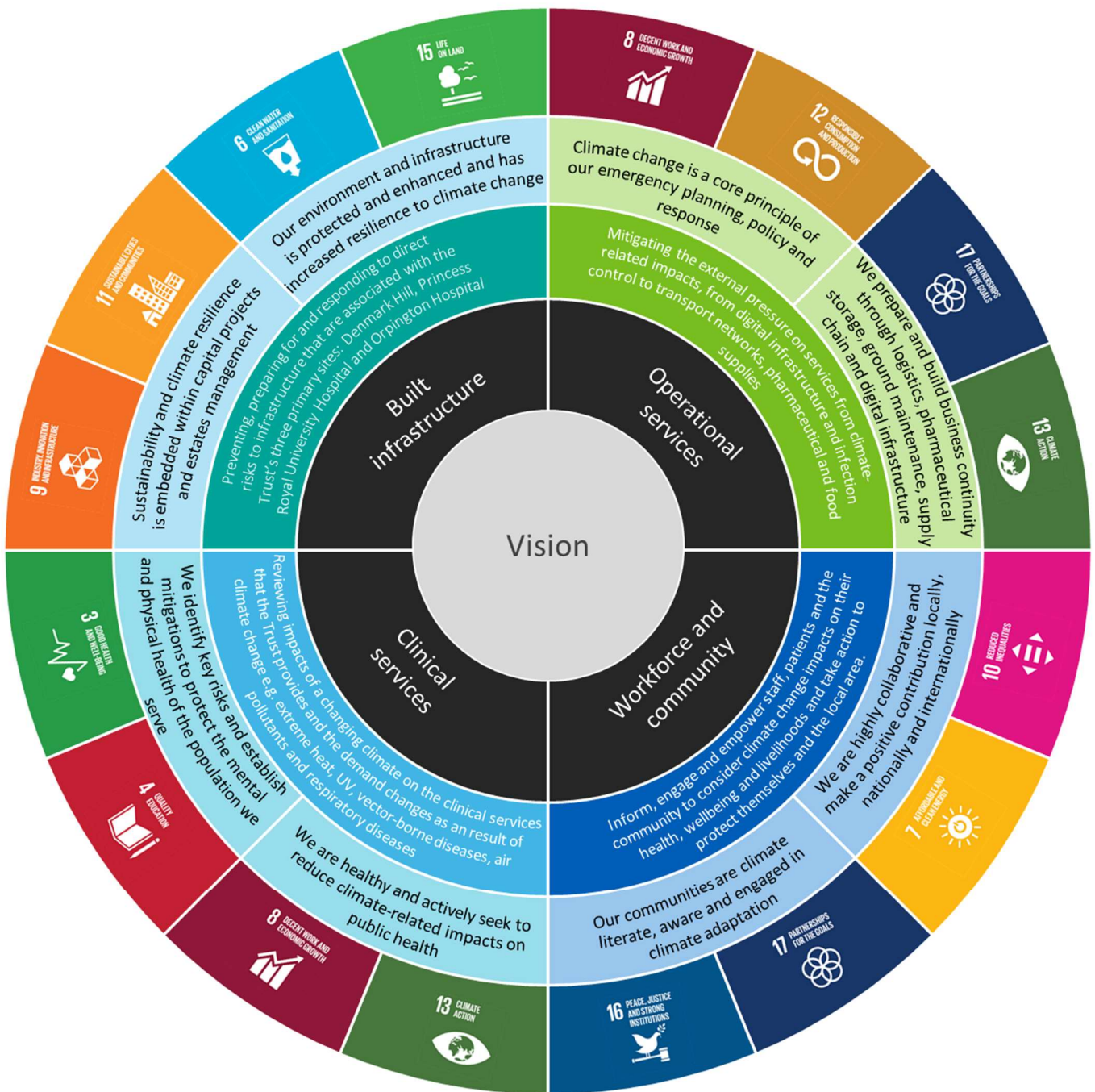


Figure 6: SDGs aligned with King's CCAP

Existing strategy and policy

Our focus is on preventing climate hazards from occurring via our Green Plan and other mitigation strategies. Additionally, we have in place a number of emergency plans. These include examples which are applicable to all sites in addition to others which are site specific in recognition of varying contexts of risk and risk management. We will build resilience to vulnerability and consider how adaptation can be integrated further into existing Trust strategies, pathways and policies, for example:

- Our **Strong Roots, Global Reach strategy** sets our BOLD vision: to have brilliant people, provide outstanding care for patients, to be leaders in research, innovation and education, and to have diversity, equality and inclusion at the heart of everything we do. The strategy highlights the role we play as an anchor institution in improving population health outcomes, boosting the local health economy, and actively improving our environmental sustainability.
- Our **Estates Strategy** reflects the future development and management of the Trust's estate based on the current and future healthcare service needs of our local population and the current condition of our estate.
- **Emergency Preparedness, Resilience and Response (EPRR)**: the NHS needs to plan for, and respond to, a wide range of incidents and emergencies that could affect health or patient care. These could be anything from extreme weather conditions to an outbreak of an infectious disease or a major transport accident. The Civil Contingencies Act (2004) requires NHS organisations, and providers of NHS-funded care, to show that they can deal with such incidents while maintaining services.
- **Heatwave Escalation Plan** (2020) recognises the increasing risk of climate change as a threat to population health and outlines general areas of responsibility for taking actions to manage varying levels of heat-associated risk.
- **Cold Weather Plan** forms the Trust's approach to dealing with a prolonged period of cold weather and all staff are required to read and be aware of the contents of the Trust guidance.
- **Business Continuity Plan** which outlines how operational services should be maintained in a number of cases including as a result of losing access to electricity, water, heat, and medical gases.
- **Inclement Weather Transport Disruption Plan** outlines the general procedures to be taken in the event of an Inclement Weather disruption affecting the Trust's critical priorities. The Plan also outlines the procedures to be taken in the event of an inclement weather disruption affecting large numbers of staff getting to or leaving the Trust (transport disruption).
- **Fuel Disruption Plan** focuses on disruption to fuel supplies which may be adversely impacted by extreme weather events by disrupting global supply chain and transport networks.

Local Councils

The need for action regarding climate change adaptation is similarly being driven by action at the local council level but in co-operation with broader city-level aspirations for action on climate change. This is important given that in 2020, the Mayor accelerated plans for carbon neutrality from 2050 to 2030.

Across all of King's College Hospital NHS Foundation Trust's sites, there is the opportunity for engagement with four London borough councils: Lambeth, Southwark, Lewisham, and Bromley. Across these councils, evidence already exists of actions being taken to achieve greater sustainability, including in terms of carbon neutrality.

Notably, in 2019, Lambeth was the first London borough to declare a climate emergency. To set out priorities with the hope of achieving the goal of net zero by 2030, a citizens' assembly on the climate crisis was conducted in 2021 which repeatably highlighted engagement with the NHS as an important step in achieving climate change action.

Similarly, both Southwark and Lewisham Councils have aligned themselves with this 2030 net zero target and have declared climate emergencies. Southwark Council is also leading the Resilient and Green London' action plan and has further outlined that engagement with local NHS Trust's as part of a borough partnership is one way in which collaboration can help identify opportunities to reduce carbon emissions. Lewisham Council has further emphasised the importance of adaptation in increasing resilience to climate change through the development of a Strategic Flood Risk Management Strategy with further plans to promote sustainable urban drainage solutions to mitigate surface water flooding.

In 2019, Bromley Council outlined a ten-year plan to achieve net zero emissions by 2029 and has similarly identified the need to further adapt to an increasing risk of flooding whilst also improving water efficiency measures to manage the borough's severe water stress.

Understanding the climate of the future

Whilst uncertainty surrounds the precise magnitude of future climate change projections, historical anthropogenic greenhouse gas emissions in addition to the continued emission of greenhouse gases in the 21st century will cause inevitable long-term changes to the climate system (IPCC, 2018). Across England, observed trends of increasing mean land temperature and mean rainfall are expected to intensify (Slingo, 2021) alongside escalations in both temperature and precipitation extremes (as outlined in the following section). However, the implications of such climatic change can be reduced through the development and application of effective climate change adaptation planning by facilitating the installation of measures which work to increase the capacity of a population to cope with climatic hazards. To effectively increase the resilience of a population in this way, it is important for adaptation plans to recognise the various climatic threats that they face and the underlying vulnerability of the population.

Within the context of healthcare, climate change represents a multi-faceted and inter-linked threat (figure 7). This is in the sense that the clinical impacts of climate change are multiple and occur through different mechanisms, with the potential to result in a shifting pattern of disease, but that climate change also has the potential to impact the infrastructure that a health service requires to operate.

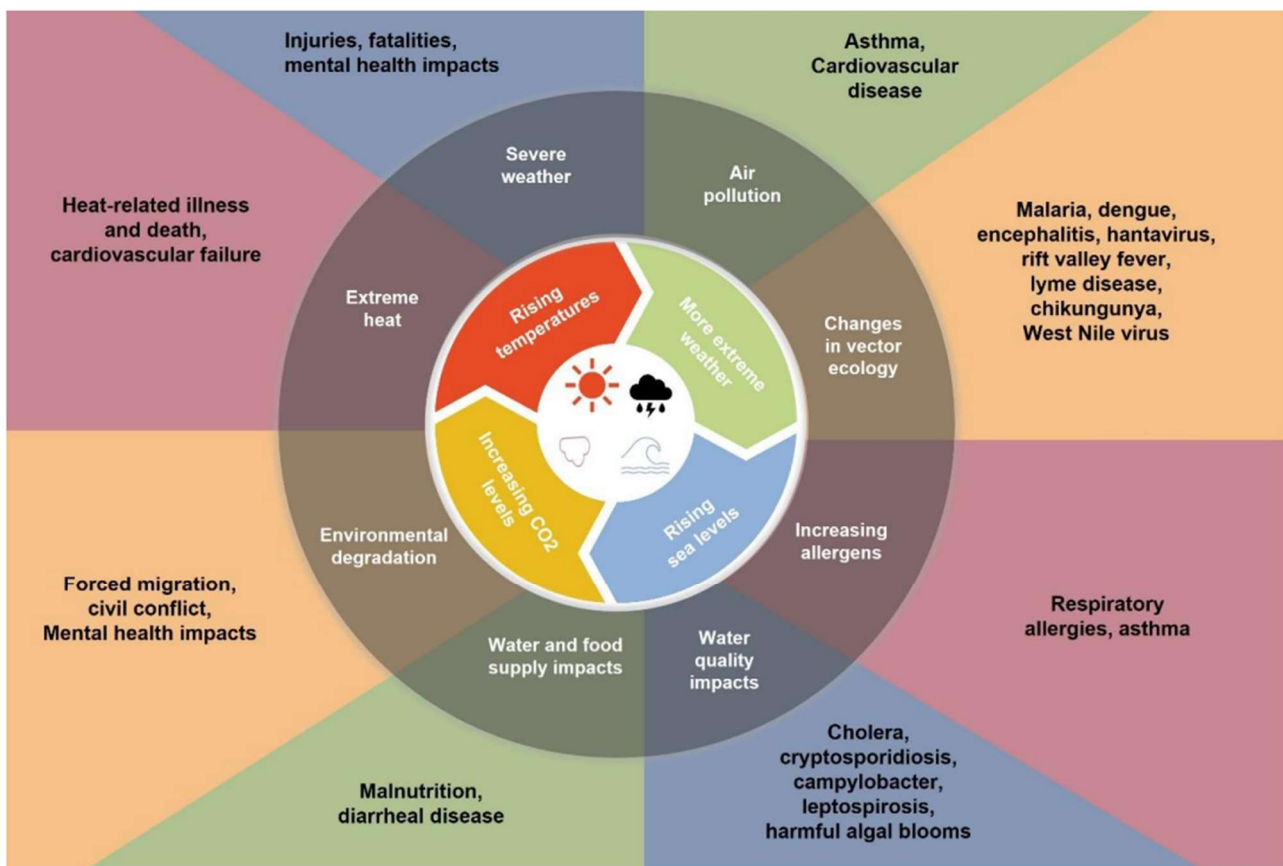


Figure 7: Impacts of climate change on human health, (Ref: NHS, 2021b)

Whilst overall climate risk varies between site (see appendix A), for King’s, the key organisational risks from climate change include:

- Influx of patients resulting in increased activity

- Rise in mortality rates and/or poorer patient recovery from illness/injury/surgery
- Impact on caseload (e.g., patients not attending appointments – gone out for the day as the weather is good or increase in requests for appointments/visits due to health impacts of climate change e.g. effects of heat, cold, sun burn, infectious diseases, skin cancers, respiratory impacts)
- Staff unable to work in overheated conditions and/or increase in staff absenteeism due to illness, school closures or caring for relatives during times of extreme weather events
- Failure of utilities due to excessive demand, local problem or problem onsite as a result of extreme weather, flooding etc.
- Maintaining a comfortable environment for patients
- Maintaining business continuity throughout a heatwave or flooding
- Medicine being stored outside of permitted temperature ranges
- Local flooding could mean that hospital discharges can't get home, patients are prevented from attending appointments, staff either stranded at work or cannot get to work. There may also be supply chain issues.
- Flooding on one or more of our sites
- Transport disruptions resulting in medicine and critical supply issues and patient/emergency transport implications

The following section of the Plan will further outline the known potential impacts and risks of climate change on the Trust's services under the headings of infrastructure and clinical impacts.

Infrastructure

This section will outline the direct risks to local infrastructure that are associated with the Trust's three main sites: Denmark Hill, Princess Royal University Hospital and Orpington Hospital.

Overheating

Public Health England (2012) report that increasing temperatures, particularly in the summer will increase the risk of buildings overheating and consequently exacerbate the health risk associated with extreme temperatures.

For example, even if global mean temperatures can be limited to less than 2°C relative to pre-industrial levels, in line with the Paris Agreement, then research suggests that peak summer temperatures could increase from 36.2°C to 37.8°C at each of Orpington Hospital and Princess Royal University Hospital whilst at Denmark Hill, peak summer temperatures could increase from 37 to 38.5°C (Dale and Stylianou, 2021). Furthermore, under the same 2°C scenario, the number of summer days exceeding 25°C per month is expected to increase by 5 at each of our sites; to a total of 10 at each of Orpington Hospital and Princess Royal University Hospital and to 11 at Denmark Hill (Dale and Stylianou, 2021).

Additionally, projections indicate that urban heat island intensity will increase as a result of climate change, with night temperatures in particular increasing at a rate of between 0.45 and 0.55°C per decade in cities during the 21st century (Slingo, 2021). Consequently, this will place further strain on the Trust's infrastructure to keep buildings cool and may lead to overheating which effects patient and staff comfort and may also effect key infrastructure such as IT.

Such potential increases in temperature are further significant in the context of the overheating pressures that already exist at King's. Table 1 indicates that over the five years in which such data has been recorded, the number of overheating events has increased dramatically, particularly in 2020/21. This could suggest that existing

infrastructure is already operating at the limit of its temperature tolerance. This is further illustrated by reports that our Denmark Hill site is already situated within an area of high heat risk (Bloomberg Associates and the Greater London Authority (GLA), 2021) as illustrated by figure 8.

Table 1: The number of overheating events recorded at King’s College Hospital NHS Foundation Trust by year.

Year	Overheating events
2020/21	25
2019/20	4
2018/19	4
2017/18	2
2016/17	0

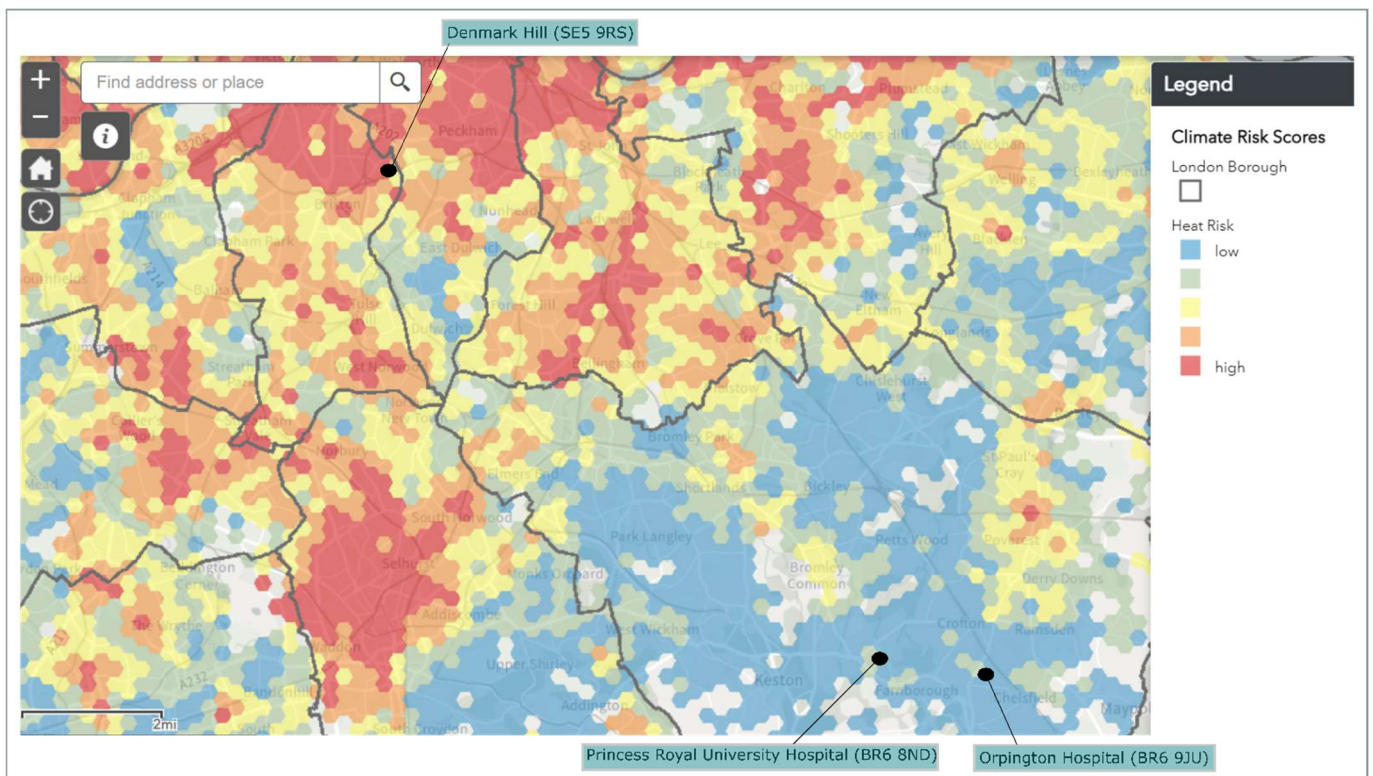


Figure 8: A map to show the heat risk associated with King’s College Hospital’s sites and the surrounding area (Bloomberg Associates and the GLA, 2021)

Flooding

Assessments of the Trust’s current flood risk indicate that vulnerability varies between sites. Notably, the GLA report that Denmark Hill is currently an area of relatively high flood risk whilst Orpington and Princess Royal University Hospitals are each located within areas of relatively low flood risk (see figure 9). Flood risk maps indicate that exposure to coastal and fluvial (river) flooding is currently very low at Denmark Hill and Orpington Hospital although somewhat higher at the Princess Royal University Hospital (see appendices B, C and D) (The Environment Agency, 2019). However, the GLA’s assessment of higher overall flood risk at Denmark Hill may be a product of comparatively greater vulnerability to surface water flooding which occurs when drains are overwhelmed, and rainwater collects on the surface. Such vulnerability to surface water flooding is theoretically higher at Denmark Hill because of a higher density of impermeable surfaces (e.g., little green space) which causes increased surface runoff

and also because it has a comparatively more dense and thus potentially vulnerable population (see appendix E). However, further investigations would be required to fully understand the nature of this risk at each site.

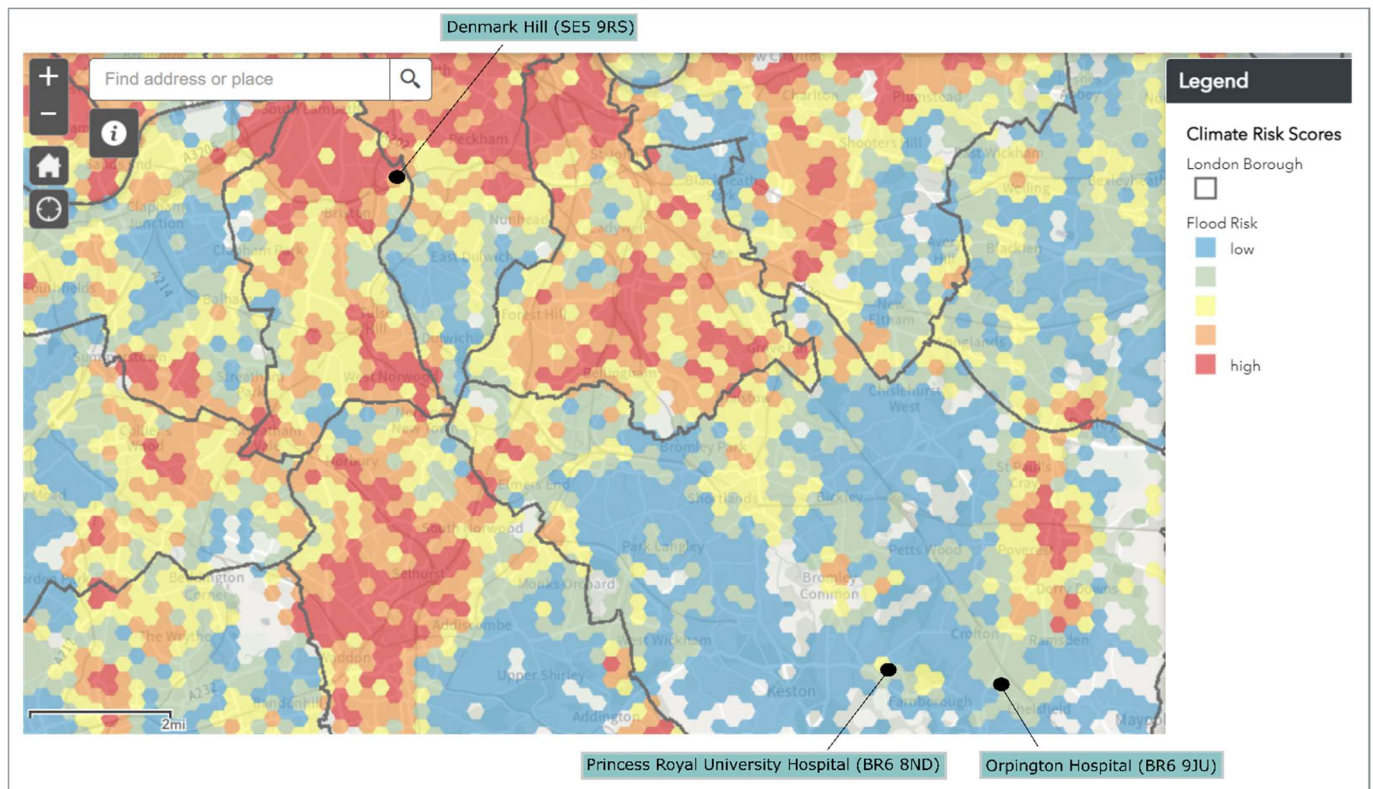


Figure 9: A map to show the current Flood Risk across King's College hospitals sites (Ref: Bloomberg Associates and the GLA, 2021)

Flood risk may also be expected to change over time. The Climate Change Committee (2021) have projected increases in average winter rainfall and heavy rainfall under multiple climate change scenarios. The Met Office (2021b) have reported that such changes in heavy rainfall are expected to have particularly significant implications on surface water flooding in urban areas. Additionally, increasing winter rainfall is likely to cause greater ground saturation and consequently increase the rate of runoff into rivers. It has consequently been suggested that such changes will therefore likely increase the proportion of healthcare assets that will be exposed to flooding events nationally (Landeg et al, 2019).

Within the context of King's, climate projections in line with both 2 and 4°C of warming relative to preindustrial temperatures indicate that the magnitude of peak summer rainfall events could increase at each of the Trust's three major sites (Dale and Stylianou, 2021). Combined with a continually growing population (ONS, 2022) and aging drainage systems, it is therefore feasible that flood risk will increase across the Trust. Further work is required to understand the nature of this changing flood risk across our sites and explore the enhancements we can make to our flood management systems.

National and international infrastructure risks

This section will outline indirect climate change risks to the King's in terms of threats to national and international infrastructure which may threaten the operation of health care services.

Energy

Access to energy is critically important for the provision of all kinds of healthcare services and therefore it is vital for the Trust and the NHS generally to establish a sustainable energy supply. This has been outlined broadly by the NHS commitment to achieve net zero carbon from direct emissions by 2040.

Globally, energy demand is rapidly increasing as a result of population growth and global development. However, the current energy system is largely reliant on fossil fuels which are a primary cause of anthropogenic climate change and are also finite. Furthermore, energy security is complicated by reliance on third party countries for energy due to the implications that political tensions can have on the affordability and reliability of these energy sources. For example, the Department of Business, Energy and Industrial Strategy (BEIS) reported that in 2020, 28% of UK energy was imported and this represented a dramatic and likely unsustainable drop compared to 2019 as a result of the impact of the Covid-19 pandemic on energy demand (BEIS, 2021).

Within the Trust, the energy we obtain from the national grid faces increasing risk from multiples stressors which include the more frequent occurrence of extreme weather events, both within the UK and internationally. For example, increasing temperatures in permafrost regions could destabilise energy infrastructure whilst rising sea levels may inundate coastal areas where energy facilities are commonly located (IAEA, 2019). Equally, more frequent, and intense storms will affect key infrastructure such as power stations and electricity substations (Mikellidou et al, 2018) and the increasing electrification of the UK's energy system is expected to increase the vulnerability of the population to such system failures (HM Government, 2022). Therefore, an increasing frequency of extreme weather events may inhibit the energy sector in a variety of ways and so represents a risk to the supply of energy for King's.

Transport

King's is reliant on transport infrastructure to deliver healthcare services in a multitude of senses and consequently, any disturbance to the transport network represents a risk to the services the Trust can deliver. For example, whilst a flooding event may not directly affect the Trust's estate, it may represent a challenge to the operation of Emergency Response vehicles and Non-Emergency Patient Transport which would consequently affect our ability to deliver care. Similarly, both staff and patients may face barriers in accessing Trust sites because of the impact of extreme weather on transport infrastructure.

Water supply

Maintaining access to a reliable and clean water supply is vitally important in the provision of healthcare and the maintenance of healthcare estates. This is due to not only the fundamental use of water for hydration and its use in certain equipment and procedures but equally because contaminated water systems can transmit waterborne infections such as Legionnaires' disease (CDC, 2016) which is of particular concern amongst hospital patients who are commonly immunosuppressed.

The Environment Agency (2020) estimate that climate change will reduce the national water supply by around 400 million litres per day between 2025 and 2050 because of changes in rainfall patterns. Alongside projections of population growth which will further increase demand for water, it is therefore expected that water scarcity may represent an increasing risk to the UK.

The south-east is the only region of England recognised as having a present-day nominal water deficit (Sustainability West Midlands, 2021). Further projections indicate that without additional adaptation measures, the supply-demand balance will likely imbalance further across the country under both 2°C and 4°C scenarios. Consequently, given the water deficit already present in the south-east, further reductions in water availability may

affect our ability at to access sufficient water supplies at King's and so actions should be taken to improve our resilience to such events.

Food supply

Within the global community, food insecurity is widely recognised as a significant issue, and this is demonstrated by its position as one of the UN Sustainable Development Goals for 2030. It is thought that in recent years, climate change has driven increasing hunger and occurrences of severe food crises (Molotoks et al., 2021). Such evidence of this is present in the UK where changeable weather has affected food yields. For example, potato yields were reduced by 20% as a result of the hot and dry summer of 2018 whilst wheat yields were reduced by 40% in 2020 as a result of a wet winter (Sustainability West Midlands, 2021).

It is expected that further increases in extreme weather, including changes in rainfall and temperature will likely have an impact on the prevalence of bacteria, viruses, and fungi which consequently affect crop yields and potentially pose a direct risk to human health. However, the magnitude of change in climatic conditions is uncertain and in some parts of the world, observed changes in temperature and precipitation have increased crop yields (Kukul and Irmak, 2018). Despite this, it is expected that climate change will become increasingly detrimental to crop productivity (Mbow et al, 2019). Furthermore, the UN Food and Agriculture Organisation (2012) predicted that because of increasing populations and a global shift from grain-based to more meat-based diets, food production would need to increase by 60% by 2050 in order to ensure sufficient food availability.

Given that in 2019, 45% of food consumed in the UK originated from abroad (Defra, 2020), the potential effects of climate change on food production both within the UK and internationally represent a risk to UK food security. Additionally, these pressures on food security may be exacerbated because of the UK's decision to leave the European Union which may cause increases to the cost of importing food.

The effect of climate change on food security therefore represents a risk to King's in terms of our ability to supply food to patients but equally in that it may increase the burden that malnutrition amongst the community places on the Trust's services. Such pressures have been recognised by the London Food Strategy (2018) which highlights the need to increase the resilience of London's food systems against pressures such as climate change and how the NHS can directly play a role in the purchase of healthy and sustainable foods.

Medical and pharmaceutical supplies

Increases in the magnitude and frequency of extreme weather events such as flooding pose a logistical threat to the production, transportation and delivery of supplies which may undermine the NHS' ability to meet patient demands. Medical supply issues are already being realised at King's following the impact of Brexit coupled with the COVID-19 pandemic.

Such climatic risks to procurement are present both inside and outside of the UK given the often-international scope of supply chains (NHS, 2021b). For example, some suppliers may be located in particularly vulnerable locations and climate change may reduce the availability of certain climate-sensitive raw materials. Furthermore, given the previously noted implications of climate change on risks to energy and water security, these vulnerabilities equally represent threats to the production processes of medical and pharmaceutical supplies.

Whilst the NHS Supply chain's existing emergency plans cover the risk of extreme weather on supply chains (NHS 2021b), they currently fail to ensure that their suppliers carry out sufficient adaptation measures. This therefore has the potential to result in NHS Trust's, including King's, having insufficient supplies for the provision of essential services.

Clinical risks

This section will outline the perceived impacts of a changing climate on the clinical services that the Trust provide or may be required to provide in the future.

Extreme heat

The Adaptation Sub Committee reported in 2014 that heat contributed to approximately 2,000 premature deaths per year in the UK whilst research in one study has indicated that 37% of heat-related deaths across 43 countries could be attributed to human-induced climate change (Vicedo-Cabrera et al, 2021). This direct link between extreme heat and morbidity was observed recently in that more than 2,500 excess heat-related deaths were recorded during the 2020 summer heatwave in England (Public Health England, 2020). The effects of severe heatwaves on health are also evident in reference to August 2003 when excess deaths because of extreme heat exceeded 20,000 across Europe.

Such heat-related deaths are commonly associated with heat stroke which occurs when the body loses its ability to regulate temperature and so uncontrolled rises occur. This can result in organ damage, including to the heart, lungs, kidneys, intestines, and the liver and can be particularly severe for those with pre-existing medical conditions such as cardiovascular issues (Ebi et al., 2021b).

Under a global 2°C scenario, peak summer temperatures are projected to increase by 1.6° compared to present day to 37.8°C at both Orpington Hospital and Princess Royal University Hospital and by 1.5°C to 38.5°C at Denmark Hill. Similarly, the number of summer days exceeding 25°C is expected to increase across all three sites. It is therefore evident that the frequency and severity of heatwaves is likely to increase by the end of the century and consequently have a knock-on effect on human health (Anderson et al, 2019). Simultaneously, the UK population is expected to age and therefore become increasingly vulnerable to heat related clinical risks.

Consequently, increasingly frequent occurrences of extreme heat will likely represent a clinical risk to King's and may place an increased demand and therefore pressure on certain services. It is therefore important that climate change adaptation occurs in order to manage this clinical risk and ensure that relevant services are prepared to manage the effects of warming temperatures.

Ultraviolet (UV) radiation

Research indicates that across parts of Europe, climate change may be causing shifts in cloud cover associated with observations of particularly high monthly UV Index (UVI) values (Bernhard et al, 2020). Furthermore, it is thought that increasing temperatures as a result of climate change may also encourage people to spend more time outside.

Consequently, the combination of these factors means that climate change may increase the exposure of the general public to UV radiation. This is significant as a clinical risk for King's as excessive exposure to UV is well documented as have damaging effects on both the eyes and skin and is notably considered a significant risk factor for several different skin cancers. Consequently, demand on certain services such as cancer care may increase.

Extreme cold

The NHS' Third Health and Care Adaptation Report (2021) highlights that occurrence of extreme cold remains one of the primary threats to population health. In 2014, the Adaptation Sub Committee reported that although cold-related mortality is likely to decline with rising temperatures, it is still expected to remain the largest weather-related risk to health in England with approximately 40,000 excess deaths annually by 2050. This is partially

because an ageing population is expected to increase population vulnerability to health impacts such as pneumonia, strokes, and heart attacks given that the elderly are generally less effective at temperature regulation.

It is therefore important that adaptation measures to mitigate the effect of cold on health are continually implemented but equally that any adaptation measures do not conflict with the need to manage other climate risks such as extreme heat.

Changes in vector ecology

Diseases such as malaria, dengue and the Zika virus are labelled as vector-borne due to their reliance on vectors such as ticks and mosquitos to transmit between human hosts. Climate change is already reported to have affected the transmission and spread of some vector-borne diseases worldwide (Caminade et al, 2019) and this trend is expected to continue to increase into the future because of anticipated shifts in climatic conditions.

However, uncertainty surrounds the exact implications of climate change on vector-borne diseases given that the precise relationships between vectors, diseases and the climate are often complex whilst changes in precipitation and ecosystems are also relatively uncertain. However, it is certain that the geographic range of certain vectors is limited by cooler temperatures and therefore, there are concerns that as the Earth's climate warms, vectors such as mosquitos will spread to higher latitudes and altitudes and consequently increase the prevalence of the diseases they transmit (Rocklöv and Dubrow, 2020).

Whilst there is similar uncertainty surrounding the precise effects of climate change on vector-borne diseases in England, it is widely recognised that climate change will likely affect our exposure to disease, although such changes will be interlinked with globalisation and land use changes (Medlock and Leach, 2015). Therefore, within King's, demands on services may increase because of potential shifts in disease and so adaptation is required to ensure resilience is developed to such risks.

Respiratory diseases

Respiratory diseases including chronic obstructive pulmonary disease, pneumonia and asthma currently affect around one in five people in England. These lung conditions represent a strain on existing health services that is thought to cost the NHS around £9.9 billion annually (Public Health England, 2019). There are multiple mechanisms through which climate change may affect rates of respiratory disease.

Air pollution refers to the release of pollutants or particulate matter into the air and there is considerable evidence that it can act as a cause of respiratory disease (Akasha, Ghaffarpasand and Pope, 2021). The World Health Organisation (WHO) estimate that 99% of the global population live in places where WHO air quality guidelines are not met whilst ambient (outdoor) air pollution is estimated to cause 4.2 million premature deaths per year (WHO). The source of such pollutants can vary, but one common example is associated with the production of energy through the burning of fossil fuels which additionally releases climate change inducing greenhouse gases.

Aeroallergens are airborne substances such as pollen and spores which can trigger allergic reactions associated with multiple illnesses including asthma, atopic dermatitis (eczema), and allergic rhinitis (hay fever) (Reid and Gamble, 2009). The prevalence of aeroallergens including pollen and fungal spores are projected to increase because of climate change with some location-specific studies already having revealed increases in peak pollen concentration (Beggs, 2021). Some studies suggest that this may be a consequence of changing carbon dioxide concentrations and temperatures whilst other work has suggested that air pollution can act in a synergistic manner with ozone and nitrogen dioxides, increasing the abundance of aeroallergens (Beggs, 2021). As a result of this, the impacts of climate change on allergic respiratory diseases are expected to increase with the severity of future climate change scenarios.

Similarly, ground-level ozone is a pollutant gas that acts as a respiratory irritant with significant impacts on human morbidity. Ozone is formed at ground level by reactions involving heat, ultraviolet radiation, hydrocarbons, and nitrogen dioxide (Demain, 2018). Historic records indicate that ground level ozone levels correlate with summers that have the highest number of hot days (Demain, 2018). Therefore, because of warming temperatures and the potential for increasing UV levels as a result of climate change, it could be expected that ground-level ozone concentrations will also increase and so this may increase the number of respiratory conditions faced by healthcare services generally, including at King's.

Within the context of King's specifically, assessments of air pollutants, including particulate matter and nitrogen dioxide indicate that the relative risk of respiratory diseases currently varies between sites. For example, figure 10 indicates that particulate matter concentrations are higher at Denmark Hill compared to Orpington Hospital and the Princess Royal University Hospital. However, these particulate matter concentrations remain high across all three sites and when additionally considering population vulnerability, air pollution represents a widespread issue (see appendices F and G). Therefore, projections of generally increasing air pollution, ground level ozone and aeroallergens because of climate change suggest that cases of respiratory diseases will likely increase whilst management of the air quality at our sites may also become increasingly difficult. Past indications of respiratory-related deaths are provided in table 2 and will be continually reviewed as part of this plan.

Table 2: CCG data on respiratory diseases

Year	CCG	Total no. registered patients	Death registrations attributed to respiratory disease	Indicator value (Directly standardised (by age and sex) mortality rate from respiratory disease)
2019	SE London CCG	1,891,250	345	29.2
2018	Bromley	320,306	76	26.3
2018	Lambeth	399,816	59	31.6
2018	Southwark	319,491	50	33.5
2018	Lewisham	315,899	62	35.8
2017	Bromley	317,628	52	18.7
2017	Lambeth	388,736	50	27.5
2017	Southwark	312,053	76	53.4
2017	Lewisham	310,238	64	40.1
2016	Bromley	313,129	81	30.1
2016	Lambeth	376,874	50	29.7
2016	Southwark	305,181	56	38.4
2016	Lewisham	302,692	56	36.0

Note: Directly age and sex standardised mortality(DSR) rate from respiratory disease for people aged under 75 in the respective calendar year per 100,000 registered patients, 95% confidence intervals (CI) (Ref: NHS Digital, 2020)

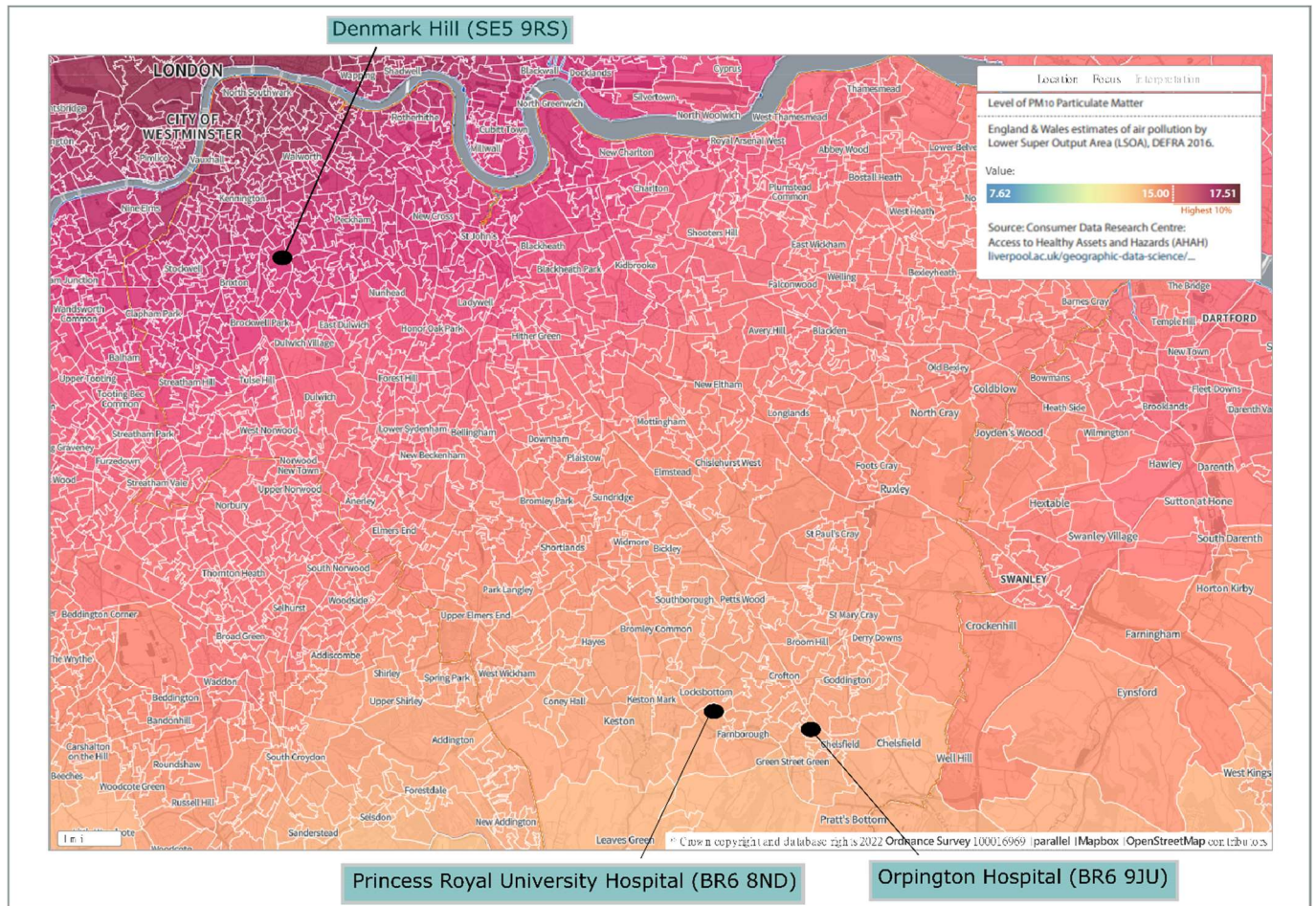


Figure 10: A map outlining relative air quality in terms of PM10 particulate concentration across each of King's three main sites (Ref: Adapted from SHAPE Place Atlas)

Mental health

The relationship of climate change with issues of mental health are largely understudied, potentially as a result of the complex and largely unique nature of the issue (Cianconi et al, 2020). In this regard, the risks are both short and long term, occurring because of both direct and indirect exposure to climate change. Additionally, experiences of mental health issues associated with climate change can vary in magnitude from minimal stress to post-traumatic stress and suicidal thoughts (Cianconi et al, 2020).

Notably, one study in particular which assessed the implications of pluvial flooding in the Bradford area found that mental health problems represented the majority of all calculated health impacts, exceeding the observation of all physical symptoms (Fewtrell and Kay, 2008). Furthermore, climate anxiety refers to the psychological effects of climate change which are unrelated to any particular event but instead are related to the climate crisis in general (Wu et al, 2020). Such stresses may be particularly significant among young people given their generally greater vulnerability to anxiety and stress because of their ongoing development but also because of their increased likelihood of encountering repeated climate stressors across their lives (Wu et al, 2020).

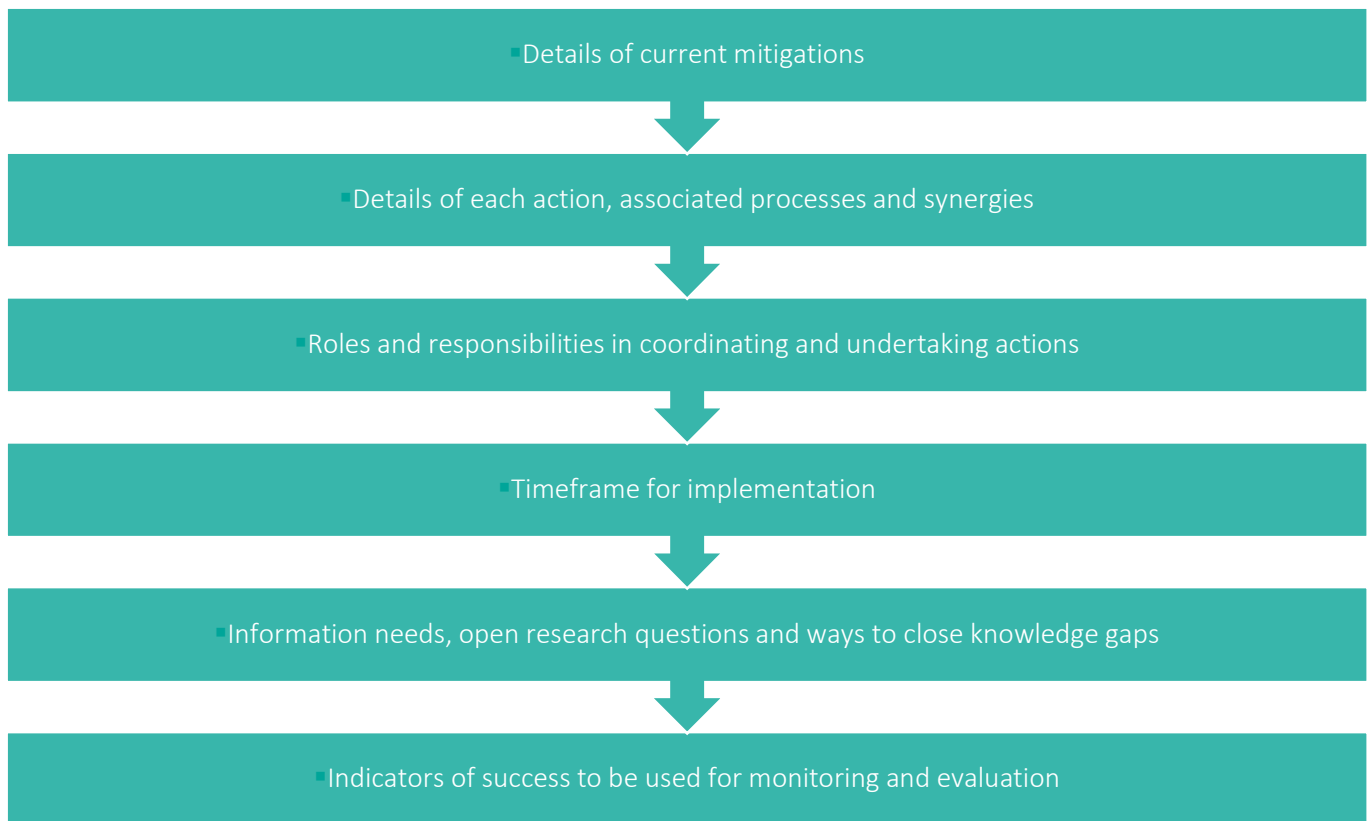
Therefore, within the context of King's, whilst it is difficult to predict the exact nature of climate change-induced mental health challenges over time, the context of a climate which is projected to experience more frequent and more extreme weather events suggests that further mental health challenges may be observed amongst both our staff and wider community.

Implementation plan

The following implementation plan reviews current climate adaptation measures and aims to address gaps in existing efforts through initiatives and programmes to build resilience. We have identified the following 5 outcomes that are embedded throughout the purpose of the actions set out and highlight the role we need to play in protecting the local community and population health:

- Our communities are inclusive, empowered, resilient and safe in response to the changing climate
- The people of South East London who are most vulnerable to climate change are able to adapt and climate justice is embedded in climate change adaptation policy
- Our inclusive and sustainable healthcare services are flexible, adaptable and responsive to the changing climate
- Our supporting systems, suppliers and services are resilient to climate change
- Our natural environment is valued, enjoyed, protected and enhanced and has increased resilience to climate change

Our implementation plan will be structured by our four key themes; built infrastructure, clinical services, operational service and workforce and community. For each of the actions, we have taken consideration for the above key risks and desired outcomes by identifying the following elements for successful implementation:



Built infrastructure

Our aim is to prepare for the direct impacts of climate change on the infrastructure at our three primary sites: Denmark Hill, Princess Royal University Hospital and Orpington Hospital. To do so, we aim to recognise where climate risks are present and expected to increase and work to build resilience to them by preparing mitigation measures and response strategies by ensuring that sustainability is embedded within the development of further capital projects and our estate management.

Current mitigations

- Ongoing estates improvement programmes to reduce our energy demand and carbon footprint whilst improving the building fabric to better control indoor temperatures
- Risk assessment processes in place for overheating events and reported through ERIC
- Capital projects include sustainable design considerations and greenspace provision

Action plan

Action	Lead	Partners (if applicable)	Delivered by (date)
Align PFI providers with updated policy on climate adaptation	Head of Business and PFI Performance	PFI providers	Ongoing
Estates strategy and site master plan to demonstrate climate change adaptation measures	Directors of CEF		2024/25
HTM compliant contingencies for water/power shortages	Head of Compliance		Ongoing
Improve building fabric via insulation to prevent overheating	Capital Projects Manager		Ongoing
Utilise more energy and water efficient technologies and practices to ensure contingency supply	Energy and Environment Manager		Ongoing
Ensure all business continuity plans are reviewed and updated considering the latest climate change risk data	Emergency Planning Leads		2023/24
Enhance green infrastructure onsite to provide cooling and shading, as well as seating areas	Capital Projects Manager		2024/25
Conduct a flood risk assessment across estates and all supporting infrastructure	Directors of CEF		2024/25
Conduct a fire risk assessment across the estate	Directors of CEF		2023/24
Explore sustainable urban drainage systems and other innovative technologies into infrastructure development	Capital Projects Manager	Local councils	2024/25
Consider future weather patterns in the development of capital projects and major refurbishments e.g. insulation, natural ventilation, solar shading on south facing windows, building management systems, etc.	Capital Projects Manager		Ongoing

Clinical services

Our aim is that by identifying key risk areas where climate change is expected to impact the clinical services we provide, we will be able to establish adaptive measures that mitigate the mental and physical effects that climate change may have on our staff and broader community, thus ensuring that public health is prioritised and improved.

Current mitigations

- Within our Heatwave Escalation Plan, we recognise the need to identify high risk groups, risk-increasing conditions and medications which may increase the severity of heatstroke
- Equality, Diversity and Inclusion strategy in development to encompass climate change risks, health inequalities and plans to tackle high risk groups

Action plan

Action	Lead	Partners (if applicable)	Delivered by (date)
Conduct thermal monitoring of clinical areas	CEF		2024/25
Identify vulnerable populations and health inequalities to enable tailored communications and support	Associate Director of Sustainability / Head of EDI	Local councils	2024/25
Align local protocols with national cold and extreme heat plans	Emergency Planning Managers		Ongoing
Collaborate with local stakeholders to improve air quality e.g., promote the use of active and public transport, engage with local awareness programmes	Associate Director of Sustainability	Transport for London, SEL ICS, local Councils	Ongoing
Raise awareness of the links between climate change, air quality and health	Associate Director of Sustainability	Communications team	Ongoing
Ensure that all relevant services e.g., neurology, oncology, orthopaedics, etc. plan for increased demand from climate-related incidents	Emergency Planning Managers		2024/25
Ensure vulnerable patients and communities are supported and prioritised following extreme events	Head of EDI		When required
Embed the effects of climate change into our Risk Register, in relation to clinical needs, interventions and the quality of estate and supporting infrastructure	Emergency Planning Managers		2023/24
In cases of extreme temperatures, increase clinical observations in high-risk patients	Chief Nurse / Deputy Chief Nurse		Ongoing

Operational Services

Our aim is that by working both internally and with our external suppliers, we can ensure that our operational services are resilient to the effects of climate change. In doing so, we recognise the importance of building business continuity through constructive discussions on logistics, digital infrastructure and with our supply chains so that our ability to provide healthcare isn't compromised by extreme weather.

Current mitigations

- Pharmacy storage currently well controlled with a continuous monitoring system in place for overheating and risk management
- Digital infrastructure management procedures in place to monitor and prevent overheating
- Social value introduced into procurement tenders and contracts
- Electrification of fleet programme in development alongside ongoing expansion of cycle storage facilities across our sites
- Promote active and public modes of travel to reduce local traffic congestion and carbon emissions
- Catering services expanding the vegan and vegetarian options across the menus and utilising seasonal, local produce where possible

Action plan

Action	Lead	Partners (if applicable)	Delivered by (date)
Engage with suppliers to promote sustainable and climate change resistant practices	KFM	Suppliers, NHSE/I	2023/24
Expand trees and vegetation on site to provide shade and enhance natural cooling effect, including the use drought tolerant species	CEF		2024/25
Adopt recommendations from the NICE Guidance on Air Pollution: Outdoor air quality and health	Associate Director of Sustainability		2024/25
Develop a sustainable procurement policy which reflects climate change adaptation and ensures suppliers have emergency preparedness and response plans in place	KFM	CEF, SEL ICS	2024/25
Ensure compliance with Health Building Note 14-02: Medicines storage in clinical areas	Pharmacy		Ongoing
Temperature excursions for medicines storage above 25°C or below 0°C should be avoided. Where an excursion is likely to occur (for example, heatwave), temperatures should be monitored ideally daily	Pharmacy		Ongoing
Ensure robust, secure ICT systems which can cope with extreme heat/cold and with emergency backup power	Digital team	CEF	Ongoing
Explore cooling methods in data centres e.g. liquid hardware cooling, outside air-cooling technology, data centre consolidation and data centre infrastructure management (DCIM)	Digital team	CEF	2024/25

Action	Lead	Partners (if applicable)	Delivered by (date)
Implement HTM compliant contingencies for power shortages and supply chain failures to mitigate the impact on service delivery	Directors of CEF	Head of Compliance	Ongoing

Workforce and community

Our aim is to engage with our workforce communities to ensure that they are climate literate and are able to recognise the risks that climate change poses to them whilst also ensuring that their perspectives and concerns are incorporated into our plans. By promoting this collaboration, we hope to make a positive difference to the lives of our communities by encouraging them to take actions which will reduce the impact that climate change represents to them.

Current mitigations

- Signed up to the Clear Air Hospitals Framework and set out a plan for 2023/24
- Sustainability training and awareness
- Bank staff available for staff absence
- Engaging with existing stakeholders such as Bromley, Lambeth and Lewisham Councils, South East London ICS sustainability network and the Trust's Sustainability Steering Group

Action plan

Action	Lead	Partners (if applicable)	Delivered by (date)
Provide staff training on climate change adaptation measures to be implemented in cases of extreme weather	Learning, Leadership & Organisational Development		2024/25
Conduct risk assessments on the impact of our climate change adaptation decisions on the local community	Associate Director of Sustainability	Local councils	Annually
Deliver actions set under the Clean Air Hospital Framework to achieve a score of good, reducing the impact of air pollution	Associate Director of Sustainability	SEL ICS partners	2023/24
Continue to engage with local councils and community groups via Borough Resilience Forums to discuss emergency risks and preparedness activities	Emergency Planning Manager	Associate Director of Sustainability	Ongoing
Carry out knowledge shares with other organisations, particularly local NHS Trusts	Associate Director of Sustainability	SEL ICS partners	Ongoing
Hold/participate in exercise(s) to rehearse our response to extreme weather with partners organisations	Emergency Planning Manager		2024/25

Communication and awareness

Raising awareness and understanding is a key component of this Climate Change Adaptation Plan both via internal communication networks and with external partners, residents, businesses and suppliers/contractors. A robust communications strategy will raise awareness regarding climate adaptation and create a support base for the importance of the measures outlined within this plan. This also showcases the commitment of the Trust and enhances our reputation as an anchor institution within the community; enhancing the local population's adaptability: a well-informed citizen can prepare for things like heat waves or water nuisance. Moreover, this plan can motivate people to act, to take responsibility and help build a climate-ready King's.

The communications strategy aims to follow the following principles related to climate adaptation:

- **Positive messaging:** communicating the severity of the issue but steering clear from doomsday rhetoric. Focus must be placed on solutions, on the fact that we can prepare for climate change. Climate adaptation must be translated into the consequences and gains regarding health, safety, and wellbeing.
- **Specific and purposeful messaging:** the core message for climate adaptation is for the Trust to mitigate, protect and adapt to the challenges presented by climate change and remain a safe, green and healthy space for patients and wider community; serving our purpose as an anchor institution within southeast London.
- **Relatable to people's own experiences:** explain climate adaptation by adapting communications to specific risks likely to affect the audience, such as heavy rainfall flooding, or heat waves. These communications will be prepared by the Trust in case of incidents in order to communicate current events at such times, e.g. via the Trust's social media and internal communications.
- **Ensure understanding of ability to prevent risks presented by climate change whilst emphasising the need to prepare.**

The key activities we will undertake to educate, engage and empower staff, partners and wider community.

- Further integrate climate adaptation into Green Plan messaging and communications, linking to the sustainable healthcare for all and Greener NHS branding.
- Introduce regular communication on adaptation within existing communication such as:
 - Kingsweb – regular monthly news items/cascades
 - Printed campaign materials including posters
 - Staff and patient stories, especially through video
 - Social media, including Twitter (to share staff stories/pledges)
 - Green Champions network and monthly newsletter
 - Kwiki pages – resources and information available for all staff
- Facilitate behavioural change through awareness and training programmes e.g., Centre for Sustainable Healthcare, corporate induction and build into existing staff training programmes
- Communication for patients is vital to raise the profile of climate change and improve climate literacy across the region. Working alongside our partner healthcare providers we seek to raise awareness of the links between climate change and health.
- Communication for suppliers and contractors: this target group must also be involved, informed, and made aware in order to turn King's into a climate-ready Trust. This could be done by creating policy and embedding climate adaptation into contracts where appropriate, or hosting workshops/lectures on the importance of their own climate action plans.

Networks and partnerships

South East London Integrated Care System

King's strongly believes that the local level can and must play a significant role in climate adaptation. Regional collaboration with our NHS partners has a key role to address this topic. One crucial element is of course our role as an anchor institution and the interaction between the health service and local businesses and communities. Our Healthier South East London Integrated Care System therefore has a role to play in setting out our collective ambitions to climate resilience and establishing a joint policy to prevent and protect our services and local residence alike. King's will share the learnings gained from this plan to encourage further regional alignment for climate adaptation along with local councils, suppliers and key partners.

NHSE/I and Greener NHS

Coordination and alignment with NHS England and Improvement as well as the Greener NHS is key to ensure we are compliant with central policy and undertaking the steps required to build climate adaptation. The Trust will continually review the wider health implications of climate change and utilise current and future Health and Social Care Sector Climate Change Adaptation Reports to cover these topics and align adaptation and mitigation where risks are increasingly likely.

The NHS National Emergency Preparedness, Resilience and Response (EPRR) team will include climate adaptation planning in the 2022/23 revision of the EPRR core standards. King's will ensure we update our EPRR policy accordingly.

Local Authorities

Local Councils to King's three main sites are coordinating various themes of work focussed on climate change, some of which is noted under 'background and drivers'. Following discussions with the sustainability and climate change adaptation leads at Southwark, Lambeth and Bromley, we have identified key areas of collaboration below:

- **Regional sustainability networks** – King's Associate Director of Sustainability and board-level lead for sustainability will participate in and contribute to the Council-led networks and feedback to the Climate Adaptation Working Group to align priorities, drive action and share learnings from across various organisations.
- **Transport and access** – provide feedback and share opportunities to local councils and TfL to shape future transport planning strategy and networks in order to strengthen access for deliveries, patients and emergency response across the local area and for our sites, with a focus on areas prone to surface flooding.
- **Local engagement** – communicating the risks presented by climate change and informing the local community and businesses on how to mitigate against and adapt to those risks, linking to the wider communications surrounding carbon reduction and sustainable development.
- **Greenspaces and SUDS** – enhance the quality and provision of greenspace across south east London to reduce the risk of flooding, improve local air quality and provide areas of shading and respite for patients, residents and visitors.
- **Joint funding** – identify shared objectives and review opportunities to jointly-fund initiatives focussed on climate change adaptation and wider Green Plan ambitions.

- **Planning policy** – work closely with Council planning teams to increasingly embed climate change considerations within policy requirements and ensure our capital projects meet or exceed their ambitions for new builds and developments.

Academic institutions

University College London, King's College London and other institutions of higher education are key partners in the framework of knowledge build-up regarding climate change, the possible consequences for public health and care services, and possible measures.

Local stakeholders

Climate adaptation also requires cooperation with other parties. Because adaptation takes place in the urban space, residents, businesses, project developers, Transport for London, knowledge institutions and other interest groups can also participate and positively contribute to climate proofing the NHS, in addition to south east London itself. By external local stakeholders we mean everyone who has a role to play in the London Plan.

Governance and reporting

In line with King's Green Plan: Sustainable Healthcare for All, the Trust is committed to monitoring and periodically evaluating our climate adaptation policy. A number of relevant indicators are listed below, part of which are being annually monitored and reported for the sustainability report of the Trust's annual reporting. Implementation of the Climate Change Adaptation Plan will be led by the Working Group on Climate Adaptation.

National indicators on climate change and vulnerability

The following metrics will enable us to track progress towards the achievement of the desired outcomes and monitor how well the Plan is being implemented.

- National Aeronautics and Space Administration (NASA) has developed a series of interactive maps and graphs to describe the global climate and how it has changed over time. They focus on 5 key climate indicators:
 - carbon dioxide concentration
 - global surface temperature
 - Arctic sea ice
 - land ice
 - sea level
- Climate Change Committee provide independent advice on setting and meeting carbon budgets and preparing for climate change. Within current and future reports, the CCC provides insight into carbon reduction progress and conduct independent analysis into climate change science, economics and policy.
- The Met Office UK Climate Projections (UKCP) can be used as a climate projection toolkit, which looks at how the UK climate may change in the future.

Local indicators for the climate adaptation plan

The following resources will support the ongoing review and identification of climate-related risks and impacts:

- GLA Climate Risk Map: a series of London-wide climate risk maps have been produced to analyse climate exposure and vulnerability across Greater London. These maps were produced to help the GLA and other

London-based organisations deliver equitable responses to the impacts of climate change and target resources to support communities at highest risk. These will assist the review and identification of areas to target action. Climate vulnerability relates to people's exposure to climate impacts like flooding or heatwaves, but also to personal and social factors that affect their ability to cope with and respond to extreme events. High climate risk coincides with areas of income and health inequalities. A series of citywide maps overlays key metrics to identify areas within London that are most exposed to climate impacts with high concentrations of vulnerable populations.

- Alongside our ICS partners, air quality monitors are to be installed across our sites to build a London network to monitor air pollution. Additionally, we will utilise the air pollution forecast provided by the Met Office to build a greater understanding of current and future levels that may impact population health and risks to service provision
- The Environmental Public Health Surveillance System (EPHSS) is a particularly useful tool, used to collect and analyse data on a range of environmental risks, exposures, and health outcomes; ranging from acute environmental events, lead exposure in children, and meteorological variables.
- The Strategic Health Asset Planning and Evaluation (SHAPE) tool supports strategic planning for all healthcare services. Local organisations and health services use the tool to map local risks, to assess the best locations for services, and evaluate any impact of service configuration on population health. The SHAPE tool also informs the development of flood, emergency response, and community plans. SHAPE Atlas provides mapping for a range of risk indicators across the UK split by NHS regions. This includes flood risk, particulate matter (PM) levels, air pollution vulnerability, open greenspace and other population indices.

Reporting and implementation

We will ensure alignment with national guidance that is to be released e.g. any new KPIs, current reporting requirements from ERIC. Currently, the NHS monitors the number of overheating events that trigger a risk assessment via the Estates Record Information Collection (ERIC) returns but it is expected that reporting requirements linked to climate change will expand.

As stated in the NHS' Third Health and Care Adaptation Report (2021), the CQC will identify sites that trigger risk assessments from overheating and include this in its national reporting. The CQC could identify these events through the Greener NHS data collection and include their consideration in future assessments. Where appropriate, the CQC's inspection outputs could recommend review of our CCAP.

To support this adaptation plan, we will utilise the Climate Adaptation Risk Assessment template. The Climate Adaptation Risk Assessment identifies the significant risks facing our four key areas (built infrastructure, clinical services, operational services, workforce and community) and sets out the adaptation and mitigation actions required. King's has adapted the template to help identify the specific risks and mitigation measures which apply specifically to our infrastructure, services and people.

The implementation of the Climate Adaptation Action Plan will be monitored annually against set KPIs.

Governance

Our sustainability lead will manage mitigation and adaptation activities. They will be accountable for adaptation planning and overseeing prioritisation and implementation of adaptation actions. The outcomes of the action plan will be reported to the Sustainability Steering Group (SSG).

A Climate Adaptation Working Group will be established to oversee this delivery area. The membership of this working group will largely overlap with members of the SSG but is likely to include:

- Associate Director of Sustainability
- Built infrastructure
 - Director of Capital, Estates and Facilities
 - Emergency Planning Managers
 - Travel and Logistics Manager
 - PFI managers
- Clinical services
 - Respiratory Consultant
 - Director of Infection Prevention and Control (IPC)
- Operational services
 - Director of ICT
 - Associate Chief Pharmacist
 - KFM (procurement) sustainability lead
- Workforce and community
 - Associate Director Workforce Operations
 - Health and Wellbeing Manager
 - Council leads for climate change adaptation

The working group will review progress against actions quarterly and report on progress to the SSG on an annual basis.

Updating and review

This plan will be reviewed following guidance changes from UK Health Security Agency, NHS England and NHS Improvement or the Department of Health and Social Care. This is likely to be in respect of the Climate Change Risk Assessment and National Adaptation Programme. It should be noted that this plan has been produced whilst still awaiting the full Annual Climate Change Risk and Opportunities Assessment (CCROA). Following release of the CCROA this plan may need updating and amending.

Glossary

BEIS – The Department for Business, Energy, and Industrial Strategy. A UK government department responsible for promoting action on climate change in the UK and internationally.

Carbon sink – A process, activity or mechanism that removes carbon from the atmosphere and stores it e.g., forests, oceans, and peatland.

Carbon source – A process, activity or mechanism that releases carbon dioxide into the atmosphere e.g., burning coal.

CCAP – Climate Change Adaptation Plan

CCC - Climate Change Committee. Established as an independent, statutory body under the Climate Change Act 2008, the CCC report on progress made in reporting greenhouse gas emissions and advise the UK government on emissions targets.

CCRA - Climate Change Risk Assessment. Required under the Climate Change Act 2008, UK-wide Climate Change Risk Assessments are published every five years and assess the risks from current and predicted impacts of climate change.

CCRA3 – The UK's Third Climate Change Risk Assessment, the technical report of which was published in 2021.

CCROA – Climate Change Risk and Opportunities Assessment.

CDC – Centre for Disease Control and Prevention.

CEF – Capital Estates and Facilities team at King's.

Climate change – Long-term shifts in temperature and weather patterns that can occur naturally and as a consequence of human activities such as the burning of fossil fuels to release greenhouse gases.

Climate Change Act – A piece of UK legislation published in November 2008 which set a target of reducing UK greenhouse gas emissions by 80 per cent by 2050 whilst also prompting the establishment of the Climate Change Committee and requiring the conduction of a UK wide Climate Change Risk Assessment every five years. Since updated in 2019 to set the UK target at net zero by 2050.

Climate change adaptation – The process of reducing vulnerabilities to the immediate and predicted impacts of climate change whilst increasing the capacity of communities to be resilient.

Climate change mitigation – Efforts that reduce the magnitude of climate change by preventing the emission of greenhouse gases or by enhancing carbon sinks which reduce the concentration of these gases in the atmosphere.

CQC – Care Quality Commission. The independent regulator of all health and social care services in England.

Defra – The Department for Environment, Food and Rural Affairs. The UK Government Department leading on domestic climate change adaptation.

Delivering a Net Zero National Health Service Report – A report published by the NHS in October 2020 which outlines the NHS' targets on climate change; notably including net zero from emissions directly controlled by 2040 and for the emissions the NHS can influence by 2045.

EDI – Equality, Diversity and Inclusion

EPHSS – Environmental Public Health Surveillance System. A Public Health England surveillance project which approaches the systematic collection of data on environmental hazards, exposures and health outcomes.

EPRR – Emergency Preparedness, Resilience and Response. A programme of work within the health community to outline planned responses to emergencies which may affect health or patient care, including extreme weather conditions.

ERIC – Estates Record Information Collection. A mandatory, yearly data collection for all NHS Trust's on their estates.

Flooding – An event in which land that is typically dry, is inundated by water. Can be triggered through multiple different mechanisms: **Coastal** – inundation by seawater, for example as a result of a storm surge. **Fluvial** – where the volume of water in a river or stream exceeds its normal channel. **Surface** – where the capacity of drainage systems are exceeded and so rain water fills the streets.

GLA – The Greater London Authority, also known as City Hall, operate as the democratically elected governance body for Greater London.

Green Plan – A document that NHS Trust's are required to produce in line with the 2021/22 NHS Standard Contract. It outlines an individual Trust's approach to reducing their emissions in line with national trajectories.

Greenhouse gases – Atmospheric gases, such as carbon dioxide that regulate the Earth's atmospheric conditions by absorbing infrared radiation.

IPCC – Intergovernmental Panel on Climate Change. An intergovernmental body of the United Nations that is responsible for assessing knowledge on anthropogenic climate change.

KFM – King's Facilities Management

NAP – National Adaptation Programme. A document produced by Defra every five years because of the Climate Change Act 2008. It communicates the extent, nature and immediacy of different climate risks and the actions that the UK government intends to do to address them.

Net Zero – Refers to a state in which an overall balance is achieved between the greenhouse gas emissions entering the atmosphere and those which are removed, for example through carbon capture and storage.

NHS – National Health Service

NHS Long Term Plan – This document was published in January 2019 and outlines the long term ambitions of the NHS with regard to operating sustainably through a number of measures including increasing digitalisation of NHS services.

NHS Third Health Care and Adaptation Report – This document was published in December 2021 and summarises the current and future effects of climate change on the health and social care sector and outlines steps to adapt and so manage these risks.

ONS – Office for National Statistics

Paris Agreement – A legally binding international treaty on climate change, adopted by 196 countries in 2015. It outlines an agreed upon goal to limit warming to well below 2, preferably to 1.5 degrees Celsius compared to pre-industrial levels.

PFI – Private finance initiative

SDGs – Sustainable Development Goals. A series of 17 goals for 2030 developed by the United Nations and adopted in 2015 which call for global action to achieve progress against a number of key areas e.g., on poverty, education, inequality and climate action.

SEL ICS – The South East London Integrated Care System. A partnership between the numerous organisations that meet health and care needs across the South East of London which aims to coordinate services to improve population health and reduce inequality.

SHAPE – Strategic Health Asset Planning and Evaluation. A web enabled, evidence-based Geographic Information System tool which can be used to inform and support the strategic planning of services and assets.

SSG – Sustainability Steering Group. The committee responsible for overseeing the delivery of the Green Plan.

TfL – Transport for London. The integrated transport authority responsible for managing London's strategy on public transport in addition to its roads.

The Trust – King's College Hospital NHS Foundation Trust.

UKCP – The UK Climate Projections. A climate analysis tool supported by BEIS and Defra that provides assessments of how the UK climate may change in the future.

UKCP18 – The latest generation of national climate change projections for the United Kingdom, originally published in 2018 and consequently updated in 2019 and 2021.

UV – Ultraviolet. A form of non-ionizing radiation emitted by the sun and artificial sources, such as tanning beds.

UVI – Ultraviolet index which measures the intensity of UV exposure at any one time and location.

WHO – The World Health Organization. A specialised United Nations Agency who are responsible for international public health.

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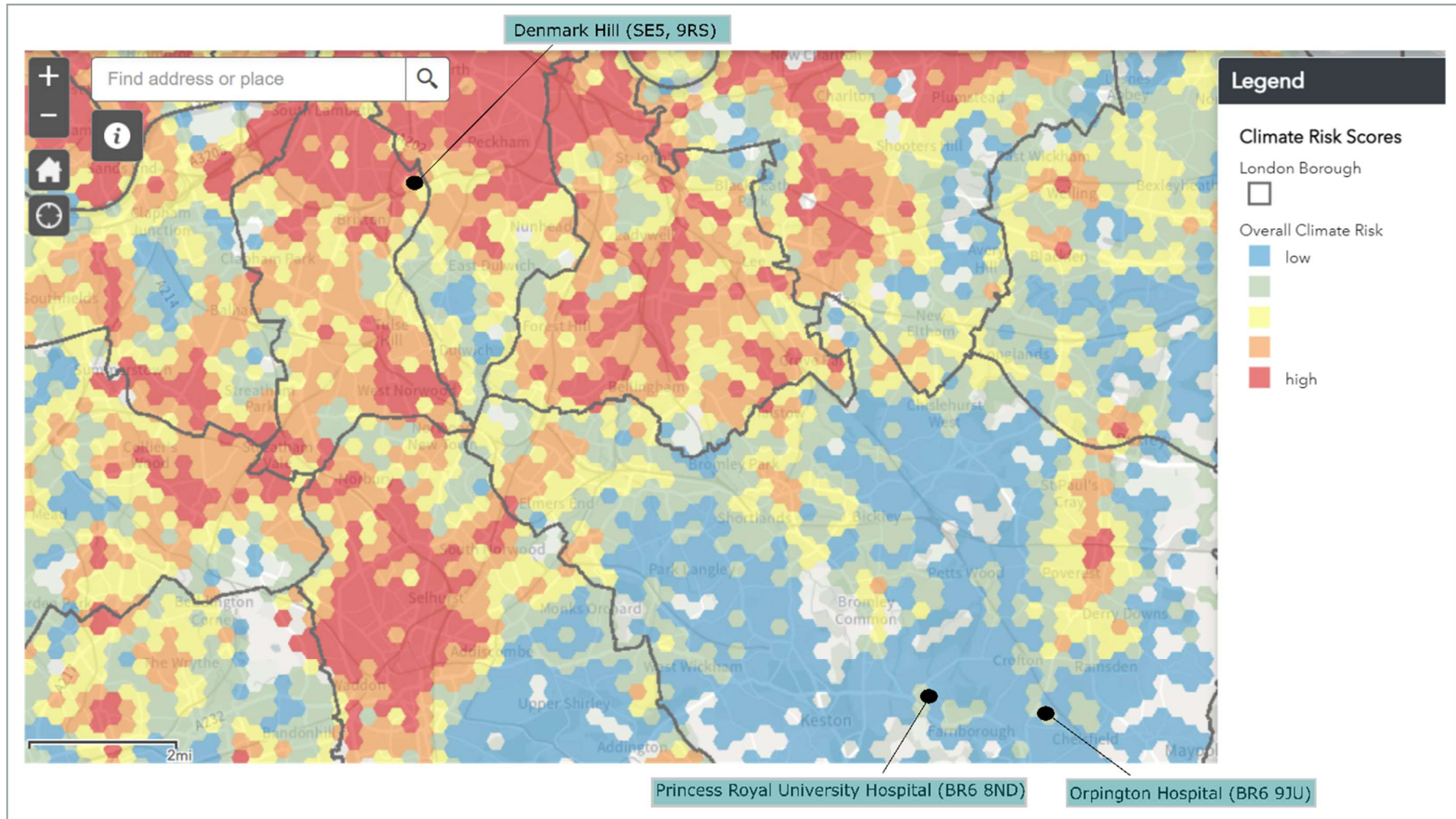
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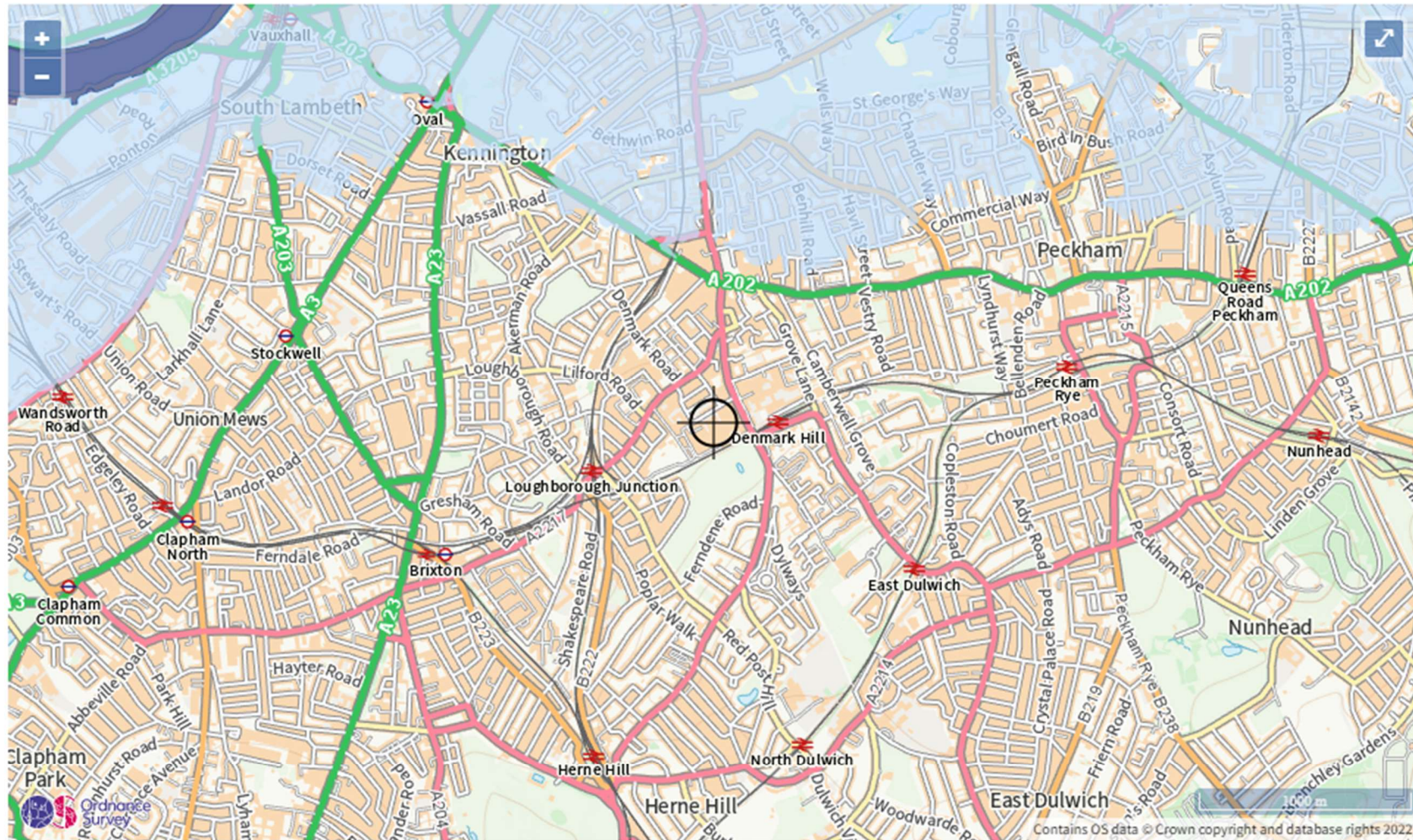
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Appendices



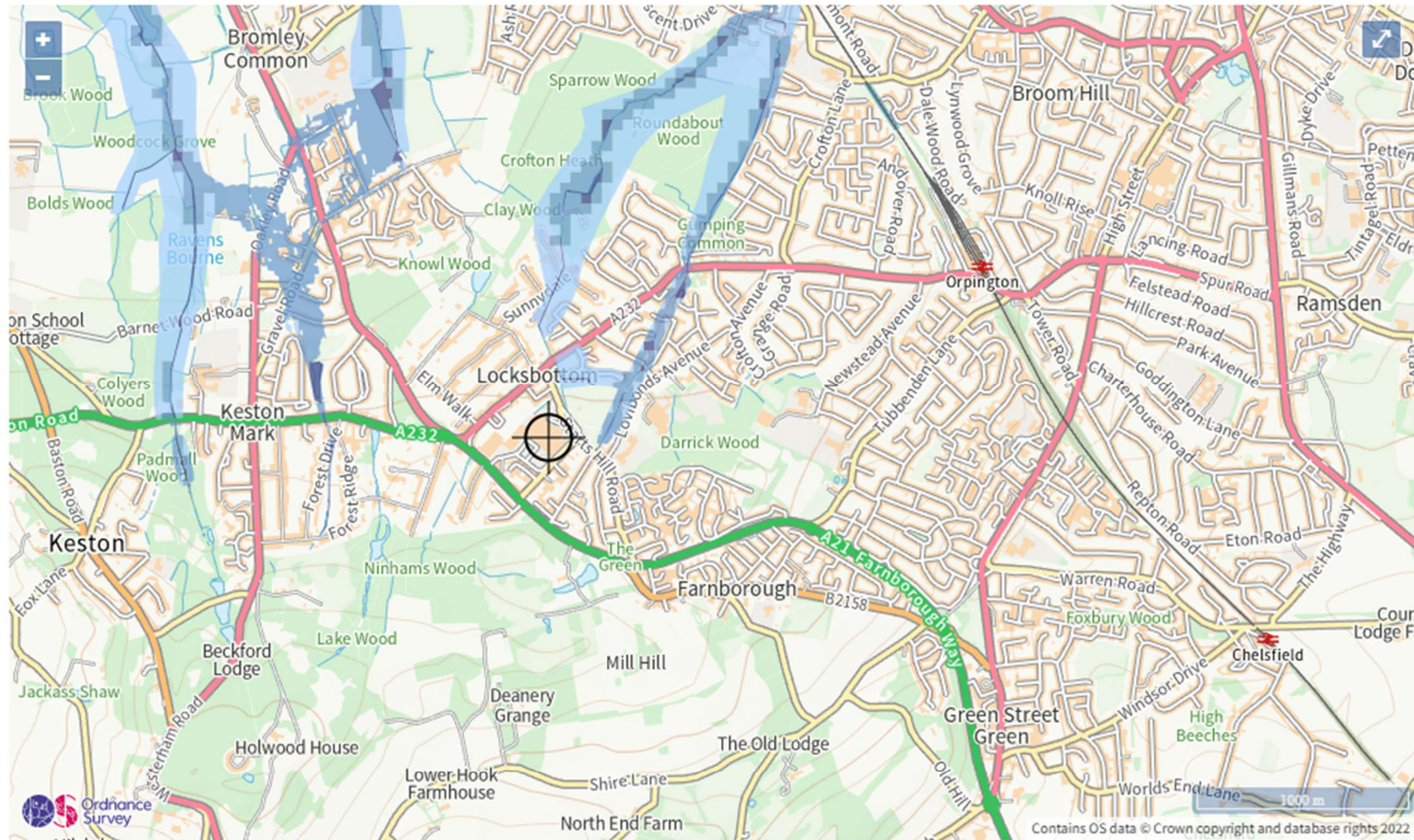
Appendix A: A map outlining overall climate risk around each of the Trust's three sites (Ref: Bloomberg Associates, 2021)



Extent of flooding from rivers or the sea

- High
- Medium
- Low
- Very low
- ⊕ Location you selected

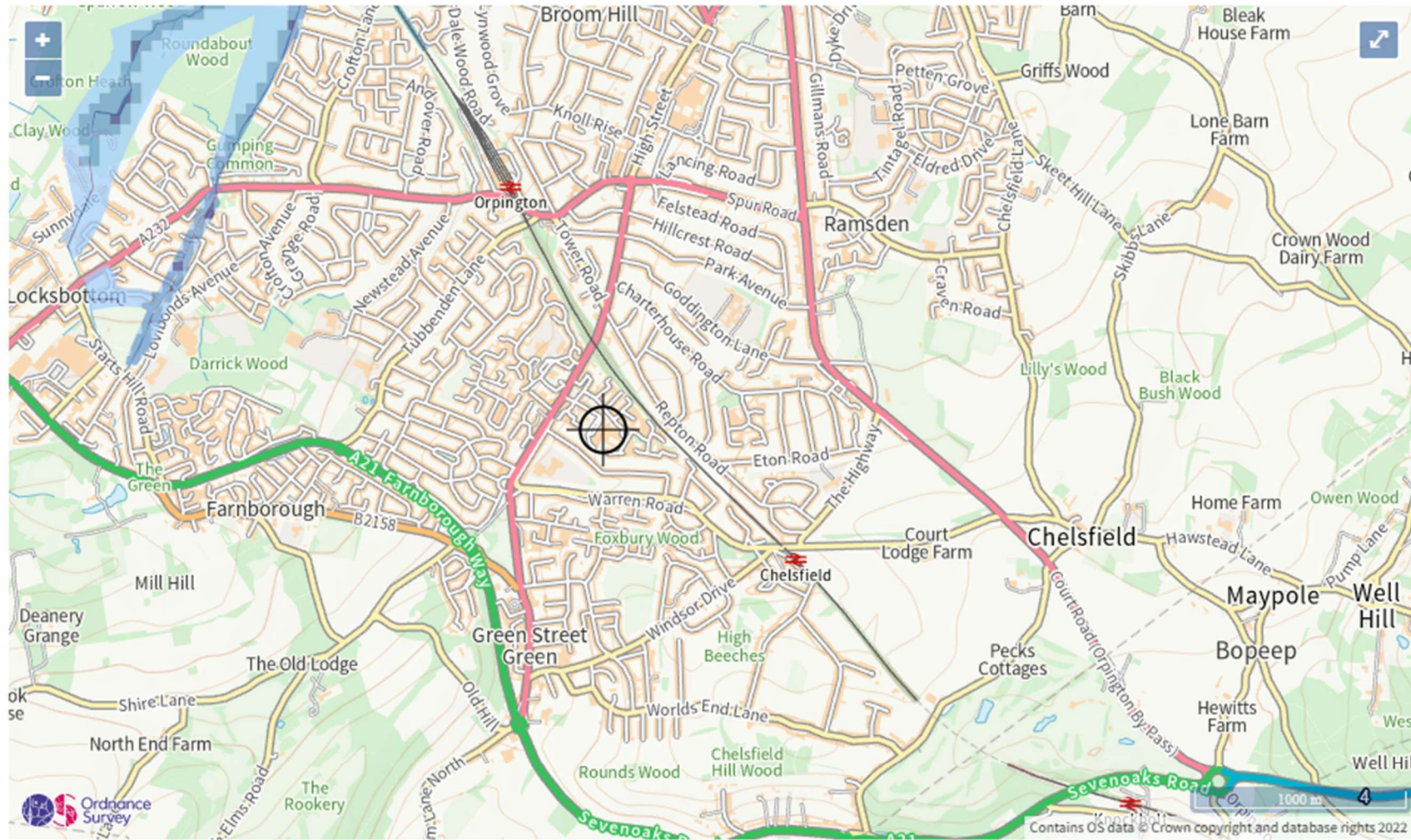
Appendix B: A map to show the extent of potential flooding from rivers or the sea around Denmark Hill. (Ref: The Environment Agency, 2019)



Extent of flooding from rivers or the sea

- High
- Medium
- Low
- Very Low
- ⊕ Location you selected

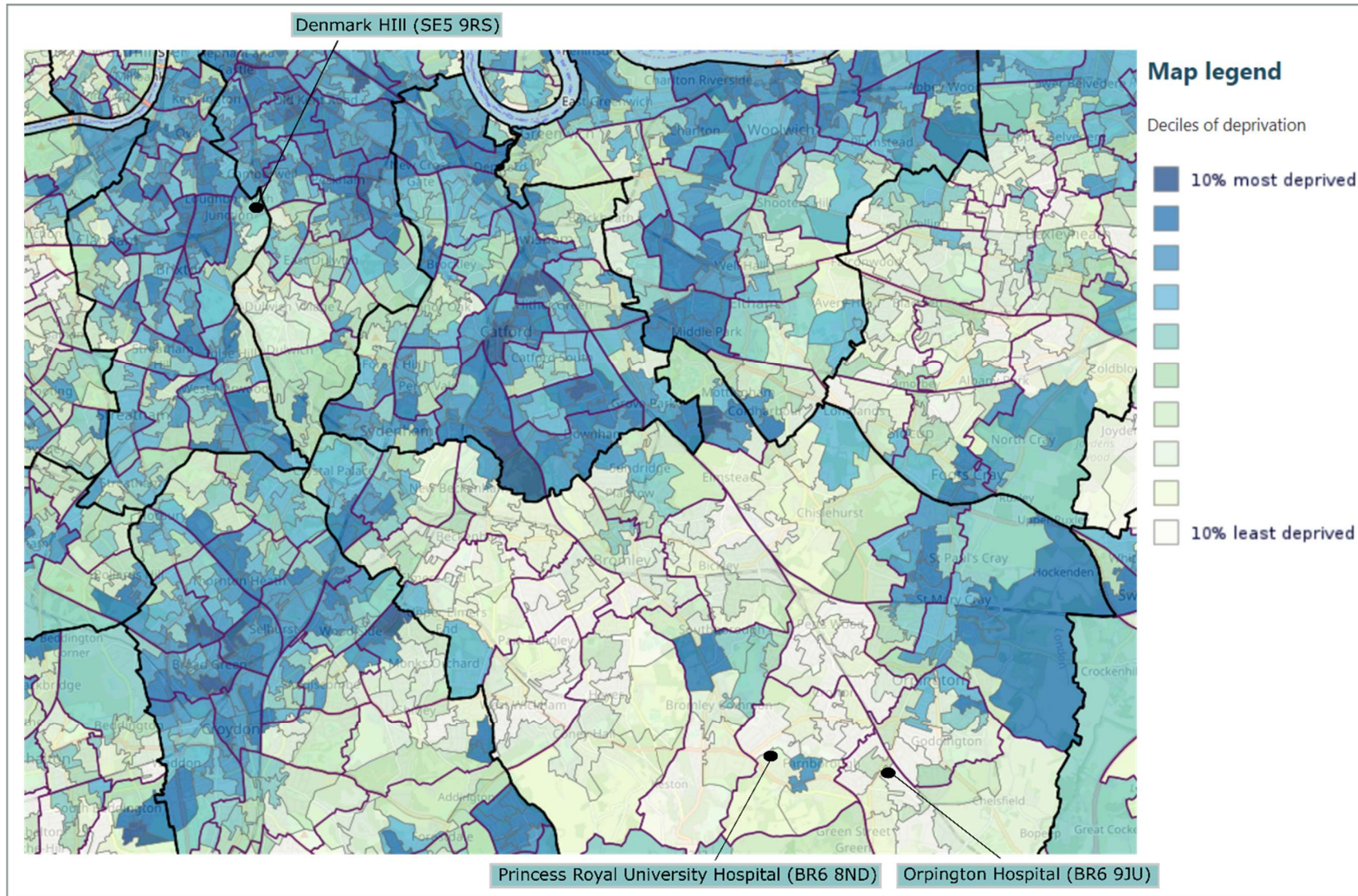
Appendix C: A map to show the extent of potential flooding from rivers or the sea around the Princess Royal University Hospital (Ref: The Environment Agency, 2019)



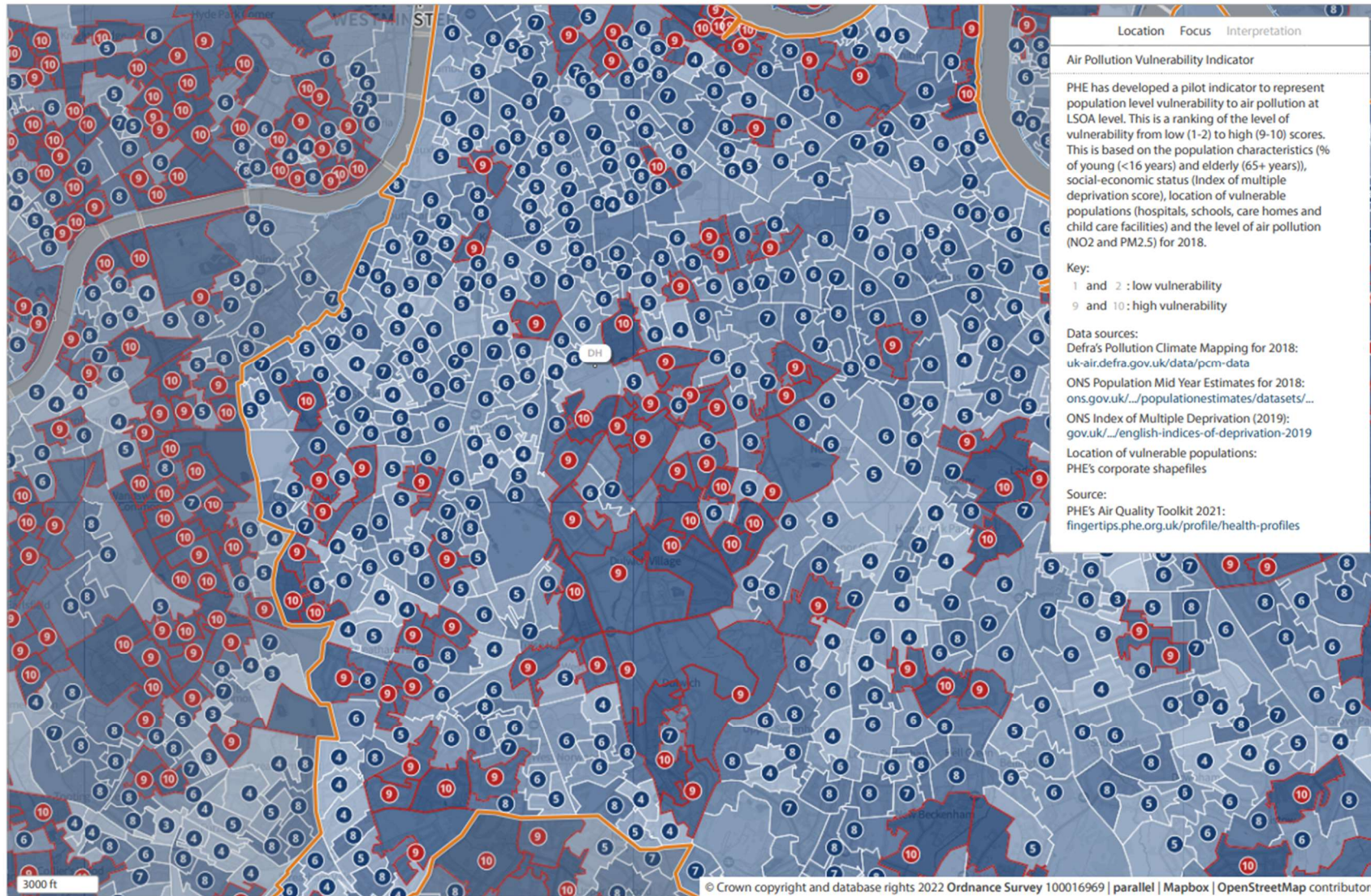
Extent of flooding from rivers or the sea

- High
- Medium
- Low
- Very low
- ⊕ Location you selected

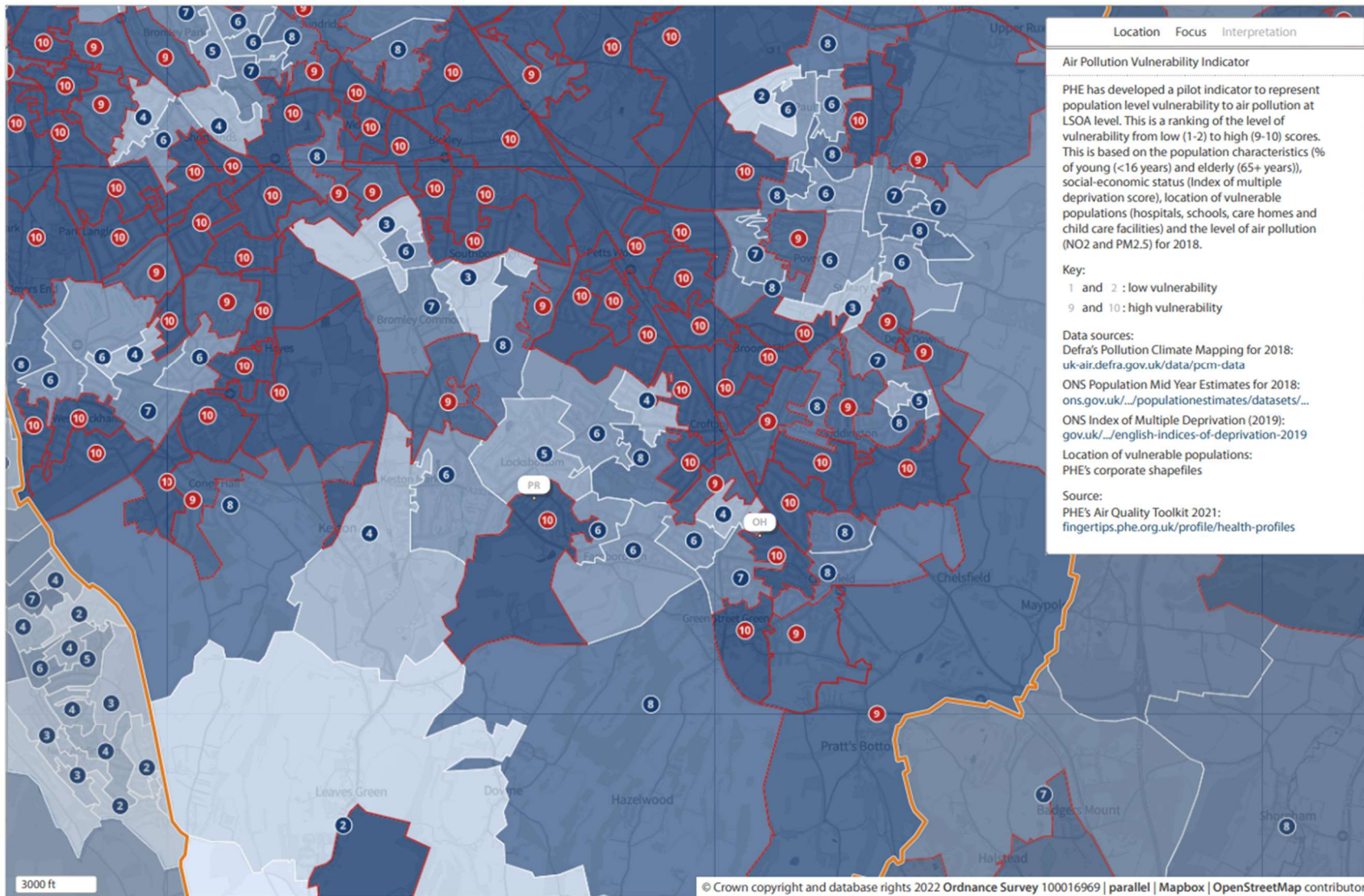
Appendix D: A map to show the extent of potential flooding from rivers or the sea around Orpington Hospital (Ref: The Environment Agency, 2019)



Appendix E: A map outlining relative levels of deprivation around each of the Trust's three sites (Ref: Adapted from Gov.UK, Ministry of Housing, Communities & Local Government, 2019)



Appendix F: A map to show air pollution vulnerability around Denmark Hill (DH) (Ref: Shape Place Atlas)



Appendix G: A map to show air pollution vulnerability around the Princess Royal University Hospital (PR) and Orpington Hospital (OH) (Ref: Shape Place Atlas)