



2094 London Environment Report

From: The Office of the Mayor of London

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As the Mayor of London and the Greater London Authority (GLA), it is our responsibility to address the critical challenges posed by climate change in the face of rising global average temperatures and increasing frequency of climate disasters. This report provides an overview of the current environmental situation in London, the adaptation and resilience strategies implemented, and recommendations for further action to ensure a sustainable, resilient, and prosperous future for our city and its residents.

1. Introduction

London, a city with a rich history spanning over two millennia, has experienced substantial environmental challenges throughout the 21st century as a result of climate change. Global average temperatures have risen by 3.5°C since the pre-industrial era, causing a domino effect of interrelated environmental issues. The increased frequency and severity of climate disasters, such as extreme precipitation, severe droughts, and powerful superwind events, have left an indelible mark on the city's landscape, infrastructure, and communities.

In addition to the increased incidence of extreme weather, London has grappled with the ongoing consequences of rising sea levels, which have caused devastating impacts on low-lying areas. Flooding has become a recurrent issue, necessitating significant investment in flood defences and long-term urban planning strategies. As a result, some communities have been forced to relocate to higher ground to ensure their safety and well-being.

Despite these significant challenges, London has demonstrated remarkable adaptability and resilience. Through strategic planning, investment, and collaboration among public and private stakeholders, the city has implemented innovative solutions and adapted its infrastructure to withstand these unprecedented environmental pressures. Moreover, London has emerged as a global leader in climate change mitigation and adaptation, inspiring other cities around the world to tackle the challenges posed by a rapidly changing climate.

This report offers a comprehensive overview of the current environmental situation in London and presents the adaptation and resilience strategies that have been implemented in response to these challenges. It also provides recommendations for future action, highlighting the ongoing efforts of the Mayor of London, the GLA, and other stakeholders in ensuring a sustainable, resilient, and prosperous future for our city and its residents.

2. Current Situation

2.1. Climate Disasters

Climate disasters have become increasingly common in London due to the impacts of climate change. Extreme weather events, such as heavy precipitation, severe droughts, and powerful superwind storms, are occurring more frequently and with greater intensity. These events have caused significant damage to the city's infrastructure, disrupted public services, and had a substantial impact on public health.

Heavy precipitation events are becoming more common in London, leading to flash flooding, water-logging, and landslides. These events can cause significant damage to buildings, roads, and other infrastructure, as well as disrupting public transport and essential services.

Additionally, severe droughts are becoming more frequent, leading to water shortages, crop failure, and damage to ecosystems. These events can have long-lasting impacts on the city's residents and environment, exacerbating existing social and economic inequalities.

Powerful superwind storms, such as hurricanes and typhoons, are also a growing concern for London. These events can cause severe damage to buildings, infrastructure, and transport networks. The high winds and heavy rainfall associated with these storms can also cause flooding and landslides, further exacerbating the impacts of the event. Additionally, these events can cause significant disruption to the city's economy, leading to lost productivity and economic activity.

To mitigate the impacts of climate disasters, the city has taken a proactive approach to addressing these events. The city has invested in advanced forecasting and warning systems to alert residents and businesses to upcoming weather events. Additionally, the city has implemented measures to protect infrastructure and essential services, such as the construction of advanced flood defences and the retrofitting of public transport systems to handle increased flooding risks.

London has taken a proactive approach to address these challenges, investing in advanced warning systems, protective measures, and resilient infrastructure to reduce the impacts of climate disasters.

2.2 Flooding and Sea Level Rise

Low-lying areas of London, particularly those along the Thames, are experiencing increased flooding due to rising sea levels. This is a result of the melting of polar ice caps and glaciers, as well as the thermal expansion of seawater due to rising global average temperatures. These events have necessitated the implementation of robust flood defences and the relocation of some communities to higher ground.

The flooding of low-lying areas in London is a major concern for the city. It can lead to substantial damage to buildings, infrastructure, and essential services, as well as having a significant impact on public health. In particular, flooding can cause damage to the city's transportation systems, disrupting public transport and emergency services. Additionally, flooding can cause significant economic losses, with businesses and individuals facing significant costs to repair and replace damaged property.

Rising sea levels are also causing long-term damage to the city's infrastructure. The Thames Barrier, a major flood defence system, was built in the 1980s to protect the city from storm surges and rising sea levels. However, the barrier is now becoming increasingly outdated and may not be sufficient to protect the city from the increasing frequency and severity of climate disasters. As a result, the city is investing in advanced flood defences, such as the Thames Barrier 2.0, to protect the city's low-lying areas from flooding.

The relocation of some communities to higher ground is also an essential component of the city's adaptation and resilience strategies. This has been a difficult and complex process, requiring careful planning and coordination with local communities. However, it is essential to ensure the safety and well-being of residents in low-lying areas of the city. The relocation process has also provided an opportunity for the city to rethink and redesign its urban infrastructure, incorporating sustainable and resilient design principles.

Rising sea levels and flooding pose significant threats to London's infrastructure, communities, and public health. The city has implemented robust flood defences, invested in advanced warning systems, and relocated some communities to higher ground to mitigate the impacts of these events. However, it is clear that further action is required to ensure the city's long-term resilience in the face of climate change. The Mayor of London and the Greater London Authority remain committed to addressing these challenges and creating a sustainable, resilient, and prosperous future for the city and its residents.

3. Adaptation and Resilience Strategies

3.1. Infrastructure

London has invested heavily in adaptive infrastructure to cope with the changing climate. The city has recognised the importance of infrastructure in ensuring the city's resilience and sustainability in the face of climate change. This includes the construction of advanced flood defences, such as the Thames Barrier 2.0, to protect the city from storm surges and rising sea levels. Additionally, resilient buildings have been designed to withstand extreme weather events and incorporate green technologies to reduce their environmental impact.

The Thames Barrier 2.0 is one of the most significant infrastructure projects undertaken by the city in recent years. The barrier is a movable flood defence system that can be raised and lowered to protect the city from rising sea levels and storm surges. The new barrier is designed to be more resilient and sustainable than the original barrier, incorporating advanced technologies and sustainable design principles. The barrier is also designed to be flexible, allowing it to adapt to changing climate conditions and protect the city from future climate disasters.

Resilient buildings are also a critical component of the city's infrastructure. These buildings are designed to withstand extreme weather events, such as high winds and heavy rainfall. They incorporate advanced technologies and materials to reduce their environmental impact, such as energy-efficient lighting and HVAC systems, green roofs, and solar panels. Additionally, resilient buildings incorporate natural ventilation and lighting, reducing their reliance on artificial energy sources.

The city has also invested in upgrading its transportation infrastructure to ensure minimal disruption during extreme weather events. The city's transportation system has been upgraded to withstand increased flooding risks, with retrofitted public transportation networks such as the Underground. The introduction of autonomous electric vehicles has also helped to reduce emissions and relieve congestion on the city's roads.

To ensure the city's infrastructure remains resilient and sustainable, the city has implemented a range of measures to promote circular economy practices and reduce waste. These measures include the implementation of advanced waste management and recycling systems, reducing the amount of waste sent to landfill and promoting the reuse of materials. Additionally, the city has implemented a range of energy-efficient systems, such as LED street lighting and energy-efficient buildings, to reduce energy consumption and greenhouse gas emissions.

3.2. Transportation

The city's transportation system has faced significant challenges due to the impacts of climate change, particularly in low-lying areas where rising sea levels have led to the permanent submersion of some neighbourhoods. Consequently, several surface railways, including parts of the Overground and National Railway lines, have been permanently closed. Additionally, numerous underground stations in East London have been shuttered due to their low altitude and increased flood risks.

In response to these challenges, Transport for London (TfL) has undertaken a series of strategic initiatives to ensure the reliability, accessibility, and sustainability of London's transportation network:

3.2.1. Elevated Rail Infrastructure

TfL has constructed elevated railway lines and stations to replace the submerged and flood-prone sections of the Overground and National Railway lines. This elevated infrastructure is designed to be resilient to extreme weather events and resistant to future sea level rise.

3.2.2. Flood-Resistant Underground Stations

TfL has retrofitted existing underground stations with advanced flood-resistant technologies, including watertight doors, flood barriers, and improved drainage systems. New underground stations have been designed with these features from the outset, ensuring the long-term viability of London's iconic Tube network.

3.2.3. Autonomous Electric Vehicles

In partnership with the private sector, TfL has accelerated the adoption of autonomous electric vehicles, reducing emissions and alleviating congestion. A comprehensive network of electric charging stations has been established throughout the city, with priority given to areas where public transportation access has been diminished due to climate impacts.

3.2.4. Expanded Waterborne Transportation

Given the challenges faced by land-based transportation, TfL has significantly expanded waterborne transportation options along the Thames and other waterways. This includes the addition of new water taxi routes, electric-powered ferries, and amphibious buses, all contributing to a more resilient and diversified transportation system.

3.2.5. Active Transportation Infrastructure

TfL has invested heavily in the development of pedestrian and cycling infrastructure to promote active transportation and reduce reliance on motorised vehicles. This includes the creation of extensive cycling networks, pedestrian bridges, and traffic-calming measures, making London a more walkable and bike-friendly city.

3.2.6. Integrated Mobility-as-a-Service (MaaS) Platform

To facilitate seamless multimodal transportation, TfL has developed an integrated Mobility-

as-a-Service (MaaS) platform that combines real-time information from various transport modes, including public transit, ride-sharing, bike-sharing, and waterborne transportation. This platform enables users to plan and pay for their journeys across different transport options, increasing the efficiency and flexibility of London's transportation system.

These efforts by TfL have been instrumental in ensuring that London's transportation network remains reliable, accessible, and sustainable, even as the city grapples with the challenges posed by climate change and rising sea levels.

3.3. Green Spaces and Urban Ecology

London has prioritised the creation of green spaces and the preservation of urban biodiversity as a key part of its climate change adaptation and resilience strategies. The city recognises that green spaces can help mitigate the urban heat island effect, absorb excess rainfall, and provide habitat for wildlife, all while enhancing the quality of life for its residents.

To achieve this, London has implemented a range of initiatives to create green spaces and preserve urban biodiversity. One of the most notable initiatives has been the establishment of numerous urban forests, which are large areas of land designated for the growth of trees and other vegetation. These forests help to absorb carbon dioxide from the atmosphere, mitigate the effects of climate change, and provide important habitat for a variety of wildlife.

In addition to urban forests, London has also implemented green roofs and vertical gardens, which are designed to provide additional green space in urban areas where space is limited. Green roofs are covered in vegetation, while vertical gardens are designed to grow plants on the sides of buildings, providing additional insulation, reducing energy use, and helping to regulate temperature.

London has also created numerous community gardens and allotments, which provide residents with the opportunity to grow their own food and participate in community gardening projects. These gardens help to foster a sense of community and encourage the production of local food, reducing the need for transportation and promoting sustainable agriculture practices.

Furthermore, London has introduced policies and programs to protect and preserve its urban biodiversity. The city has created wildlife corridors to connect green spaces and allow wildlife to move freely between them. Additionally, the city has created protected areas for wildlife, such as nature reserves and parks, to provide important habitats for endangered species.

To support the development of green spaces and urban ecology, the city has also invested in green infrastructure. This includes the installation of rain gardens, which are designed to capture and absorb rainwater, reducing the risk of flooding and providing additional habitat

for wildlife. London has also introduced green walls and green roofs on public buildings to promote biodiversity and mitigate the urban heat island effect.

Finally, London has implemented education and outreach programs to promote the importance of green spaces and urban ecology to residents. This includes providing educational resources on sustainable gardening practices, wildlife conservation, and the benefits of green spaces for human health and well-being.

3.4. Energy and Resource Management

To address the challenges of climate change and improve its sustainability, London has transitioned to a predominantly renewable energy system, reducing greenhouse gas emissions and improving air quality. The city has also implemented advanced waste management and recycling systems to minimise resource consumption and promote circular economy practices.

In terms of energy management, London has implemented a range of policies and initiatives to promote renewable energy generation and reduce greenhouse gas emissions. The city has invested in renewable energy technologies, including wind, solar, and hydropower, and has established policies to encourage the use of low-carbon energy sources, such as biomass and geothermal energy. Additionally, the city has introduced smart grid technologies to improve the efficiency of energy distribution and storage.

London has also implemented a range of energy efficiency measures to reduce energy consumption and improve energy performance in buildings. This includes the implementation of energy performance standards for buildings and the introduction of financial incentives for building owners to invest in energy efficiency upgrades. The city has also introduced policies to encourage the use of energy-efficient appliances and lighting in homes and businesses.

To manage resources, London has implemented advanced waste management and recycling systems. The city has introduced a "zero waste" policy, which aims to reduce the amount of waste generated in the city and maximise resource recovery through recycling and composting. London has invested in recycling infrastructure, including waste separation facilities, composting facilities, and recycling centres, to improve the efficiency of waste management and increase recycling rates.

London has also introduced circular economy practices to reduce the consumption of natural resources and promote the reuse and recycling of materials. This includes initiatives to promote the sharing economy, such as bike-sharing schemes and car-sharing schemes, and the implementation of product stewardship programs to ensure the responsible disposal of products and materials at the end of their life cycle.

In addition to these initiatives, London has also implemented policies to improve air quality, such as the introduction of low-emission zones, which restrict the most polluting vehicles from entering certain areas of the city. The city has also introduced programs to promote active transportation, such as cycling and walking, to reduce reliance on private vehicles and improve air quality.

Finally, London has implemented education and outreach programs to promote sustainable energy and resource management practices to residents and businesses. This includes providing educational resources on energy efficiency, waste reduction, and circular economy practices.

London has implemented a range of policies and initiatives to improve its energy and resource management practices, reduce greenhouse gas emissions, and promote circular economy practices. The city's transition to renewable energy, introduction of energy efficiency measures, advanced waste management and recycling systems, circular economy practices, and promotion of active transportation and education and outreach programs highlight its commitment to building a sustainable and resilient future for its residents. These efforts have significantly enhanced London's resilience to the challenges posed by climate change and demonstrate its leadership in addressing environmental issues.

4. Monitoring and Evaluation

To ensure the effectiveness of our adaptation and resilience strategies, the GLA will:

4.1. Establish a Climate Resilience Monitoring and Evaluation Framework

The GLA has established a comprehensive Climate Resilience Monitoring and Evaluation Framework to track the progress of its climate change adaptation and resilience strategies. This framework includes a range of components that enable the GLA to evaluate the effectiveness of its initiatives and refine its strategies as needed.

The first component of the framework is a set of key performance indicators (KPIs), which provide a standardised and consistent way to track progress across different initiatives. The KPIs cover a range of topics, including greenhouse gas emissions, energy consumption, air and water quality, waste management, and climate resilience. By tracking progress against these KPIs, the GLA can identify areas where additional action is needed and evaluate the effectiveness of different initiatives.

To support the collection and analysis of data, the GLA has established a range of data management systems and tools. These systems enable the GLA to collect and manage data from a range of sources, including sensors, surveys, and other data-gathering methods. The GLA also uses advanced data analytics and visualisation tools to analyse and present data in a clear and accessible way, making it easier to identify trends and areas for improvement.

To ensure the accuracy and reliability of data, the GLA has also established a range of quality control measures. These measures include regular checks and audits of data sources, as well as training programs for staff and stakeholders to ensure that data is collected and managed in a consistent and reliable way.

In addition to these components, the Climate Resilience Monitoring and Evaluation Framework also includes a system for reporting and communicating progress to stakeholders. The GLA regularly produces reports and updates on the progress of its initiatives, which are made publicly available to ensure transparency and accountability. The GLA also engages with stakeholders, including community groups, businesses, and academic institutions, to gather feedback and incorporate input into its monitoring and evaluation efforts.

Finally, the Climate Resilience Monitoring and Evaluation Framework is designed to be adaptive and flexible, allowing the GLA to refine its strategies as needed. The GLA regularly reviews and updates the framework to ensure that it remains effective and relevant in the face of evolving environmental challenges and emerging trends.

4.2. Conduct Regular Environmental Assessments

The GLA conducts regular environmental assessments to understand the evolving environmental challenges faced by the city and to inform the development of future plans and policies. These assessments cover a range of environmental factors, including air quality, water quality, biodiversity, and climate resilience.

Air quality assessments are a key component of the GLA's environmental assessment program. The city regularly measures air pollution levels using a range of monitoring methods, including stationary monitoring stations, mobile monitoring units, and low-cost sensors. This data is used to identify areas where air quality is poor and to evaluate the effectiveness of air pollution reduction initiatives.

Water quality assessments are also a critical part of the GLA's environmental assessment program. The city monitors water quality in the River Thames, as well as in smaller rivers and streams throughout the city. This data is used to identify areas where water quality is poor and to guide efforts to reduce pollution and improve water quality.

Biodiversity assessments are another important component of the GLA's environmental assessment program. The city conducts surveys to identify and monitor plant and animal

species within its boundaries, as well as to assess the quality of their habitats. This data is used to inform efforts to protect and enhance biodiversity within the city.

Climate resilience assessments are also conducted on a regular basis to understand the evolving risks and challenges posed by climate change. These assessments evaluate the city's vulnerability to extreme weather events, rising sea levels, and other climate-related risks. This data is used to inform the development of climate adaptation and resilience strategies and to guide efforts to build a more climate-resilient city.

To support these assessments, the GLA has established a range of partnerships and collaborations with academic institutions, non-governmental organisations, and other stakeholders. These partnerships help to leverage expertise and resources to improve the city's environmental resilience and facilitate the exchange of best practices and knowledge-sharing.

In conclusion, the GLA's regular environmental assessments provide critical data and insights that inform the development of policies and initiatives to protect and enhance the city's environment. By monitoring air and water quality, biodiversity, and climate resilience, the GLA is able to identify areas where action is needed and guide efforts to build a more resilient and sustainable future for London. The GLA's partnerships and collaborations with stakeholders highlight its commitment to collaboration and knowledge-sharing and ensure that the city remains at the forefront of environmental resilience and adaptation.

4.3. Foster Collaboration with Global Partners

The GLA recognises that climate change is a global challenge that requires global solutions. To this end, the GLA fosters collaboration with a range of global partners, including other cities, regions, and countries facing similar challenges. These partnerships help to leverage expertise, resources, and best practices to build a more resilient and sustainable world.

One key partner for the GLA is the C40 Cities Climate Leadership Group, a network of over 90 cities committed to taking bold action on climate change. Through this partnership, the GLA is able to share knowledge and best practices with other leading cities, as well as collaborate on joint initiatives and advocacy efforts.

The GLA also collaborates with other cities and regions facing similar environmental challenges. For example, the GLA has a partnership with New York City to share expertise and collaborate on initiatives to reduce greenhouse gas emissions and build climate resilience. Similarly, the GLA collaborates with other European cities through networks such as Eurocities and the European Union's Covenant of Mayors.

The GLA also collaborates with national and international organisations to promote greater global action on climate change. For example, the GLA is a signatory to the Paris Agreement,

a global agreement to limit global warming to below 2 degrees Celsius. The GLA also engages with international organisations such as the United Nations and the World Bank to advocate for greater action on climate change and promote innovative solutions.

To facilitate these partnerships and collaborations, the GLA regularly hosts and participates in global conferences and events. For example, the GLA hosted the Cities Climate Action Summit in 2019, which brought together representatives from over 50 cities to discuss best practices and strategies for reducing greenhouse gas emissions and building climate resilience.

5. Recommendations for Further Action

To ensure continued resilience in the face of climate change and to maintain London's position as a global leader in sustainable urban development, we propose the following recommendations for further action:

5.1. Strengthen Community Engagement and Preparedness

Empower local communities to develop and implement localised resilience strategies by providing education, resources, and support. This includes the development of community-based emergency preparedness plans, the establishment of local support networks, and the promotion of volunteer-driven initiatives to enhance neighborhood-level resilience.

5.2. Enhance Climate Change Education

Promote climate change education and awareness across all age groups and sectors, with a focus on fostering a deep understanding of the challenges, opportunities, and solutions associated with climate change. Encourage schools, universities, and community organisations to incorporate climate change education into their curricula and outreach programs, and engage businesses in adopting sustainable practices.

5.3. Support Research and Innovation

Invest in research and development to drive innovation in sustainable technologies, urban planning practices, and climate-resilient infrastructure. Establish research partnerships with academic institutions, businesses, and international organisations to develop and share cutting-edge solutions, positioning London as a global hub for climate resilience research and innovation.

5.4. Encourage Green Business Development and Job Creation

Provide incentives and support for the development of green businesses and industries, creating jobs and economic growth opportunities in the sustainable sector. Develop workforce training and upskilling programs to equip Londoners with the skills and knowledge required to thrive in a low-carbon, climate-resilient economy.

5.5. Strengthen Climate Change Legislation and Policy

Review and update existing legislation and policies to ensure they adequately address the evolving challenges posed by climate change. Consider the development of new policies and regulations that encourage the adoption of climate-resilient practices across various sectors, including transportation, housing, energy, and waste management.

5.6. Improve Cross-Sector Collaboration

Foster collaboration and communication among various sectors, including government agencies, businesses, non-profit organisations, and local communities, to facilitate the development and implementation of comprehensive and integrated climate resilience strategies.

5.7. Enhance Regional and International Cooperation

Strengthen regional and international cooperation to share knowledge, best practices, and resources in addressing climate change challenges. Engage in collaborative projects and initiatives with other cities, regions, and countries facing similar issues to build a more resilient and sustainable world.

By implementing these recommendations, London will continue to bolster its climate change resilience and contribute to global efforts to mitigate the impacts of climate change, ensuring a sustainable, thriving, and inclusive future for our city and its residents.

The challenges posed by climate change are immense, but so too are the opportunities for innovation, collaboration, and transformation. By taking these next steps, the Mayor of London and the Greater London Authority will remain committed to ensuring a sustainable, resilient, and prosperous future for our city and its residents. Together, we will rise to the challenge and create a thriving, inclusive London that can withstand the tests of time and climate.