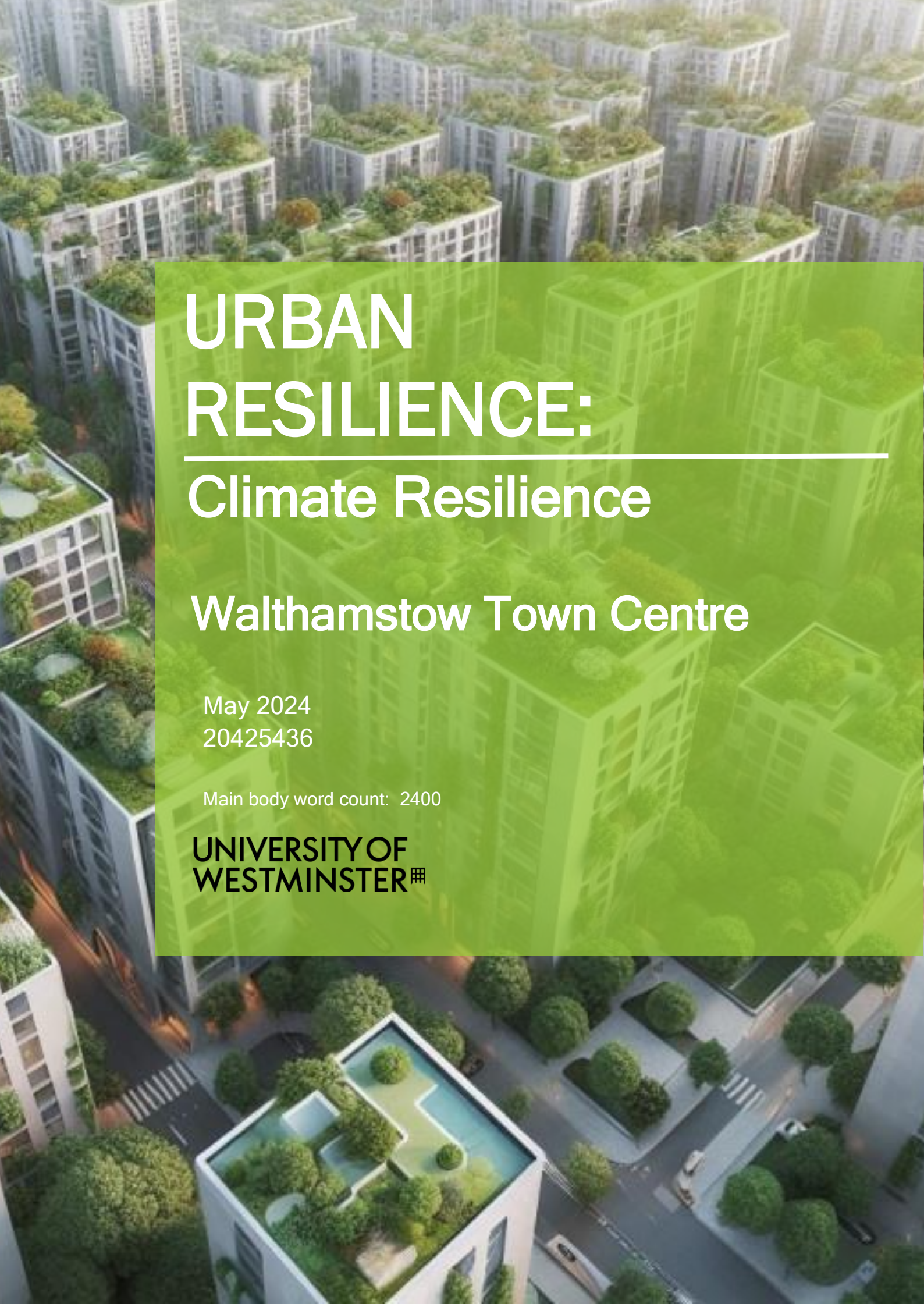

URBAN RESILIENCE:

Climate Resilience

Walthamstow Town Centre

May 2024
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Terms of Reference

This report has been prepared for the London Borough of Waltham Forest to assist with the regeneration of Walthamstow Town Centre. The report focuses on the theme of urban resilience, and in particular climate resilience through the use of green infrastructure. The primary aim of the report is to provide recommendations to the Local Planning Authority (LPA) on incorporating climate resilient design for the regeneration of Walthamstow Town Centre.

Executive Summary

Urban and climate resilience is gaining popularity in academic literature and national policy due to the increased percentage of people residing in urban areas and the challenges urban areas face with the effects of climate change. Whilst there is a broad range of climate resilience measures that can be implemented in new development and regeneration schemes, this report will have a primary focus on green infrastructure as a tool for achieving climate resilience for Walthamstow Town Centre. This report analyses a range of academic literature and reports to make recommendations on how the regeneration Walthamstow Town Centre can incorporate climate resilient features. The report is focused on small scale measures that can provide a start to climate resilient measures.

List of Abbreviations

BGI: Blue and Green Infrastructure

GLA: Greater London Authority

IPCC: Intergovernmental Panel on Climate Change

LPA: Local Planning Authority

RTPI: Royal Town Planning Institute

SDG: Sustainable Development Goals

TCPA: Town and Country Planning Association

UHIE: Urban Heat Island Effect

UN: United Nations

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Figure 4: A diagram demonstrating the summer cooling process through integration of green infrastructure. Source: Natural England (2023).

1.0 INTRODUCTION

1.1 It is estimated that approximately 54% of the world's population reside in urban areas, with this figure expected to reach 68% by 2050 (Diaz et al., 2024). There has therefore been a major drive across the globe to build sustainable and resilient urban areas that can absorb natural and economic impacts. Urban resilience is based around the capacity that individuals, communities and systems have within a city to survive, adapt and grow when faced with a chronic stress or acute shock (Resilient Cities Network, 2023), with the idea of urban resilience growing in popularity in recent years.

1.2 Global research has demonstrated that the Earth's climate is changing, mainly as a result of human activity, in ways that present an increased risk to cities, with these cities and their residents already experiencing the effects (Rosenzweig et al., 2018). In 2015, the United Nations (UN) published 17 World Sustainable Development Goals (SDGs). SDG 11 'Sustainable cities and communities' has the goal of 'making cities and human settlements inclusive, safe, resilient and sustainable' (United Nations, 2024). Due to the increasing number of climate related incidents around the world, there is a large focus globally to deliver resilient cities and communities.

Key definitions

Climate adaptation:
Adaption is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2007).

Climate resilience:
The ability of cities, as ecological, social and economic system to resist, recover from, and continue to develop despite climate related shocks (RTPI, 2020).

Urban resilience:
Urban resilience refers to the ability of an urban system and its constituent socio-ecological and socio-technical networks across temporal and spatial scales. To maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity (Meerow et al., 2016).

1.3 Climate resilience is a sub field of urban resilience, which focuses on climate change related resilience within urban areas. Climate resilience has recently superseded the drive towards ‘Climate Adaption’, as it reflects the need to perceive cities as interconnected and dynamic systems (RTPI, 2020). The key differentiation between climate adaption and climate resilience is that climate adaptation is focused on an event changing the object, whereas climate resilience is centred around the ability of the object to anticipate and cope with the event (LSE, 2022).

1.4 The site location for this report is Walthamstow Town Centre, located in the London Borough of Waltham Forest. Waltham Forest Council has recently had its Local Plan adopted in February 2024. The Borough is a vibrant borough, with rich culture and diversity. On of the Borough’s main aims emerging from the adopted Local Plan is to deliver 15 minute neighbourhoods, in order for residents to lead healthy, fulfilling and sustainable lives. In the Local Plan, Walthamstow Town Centre has been identified as a site opportunity location.

1.5 Whilst it is acknowledged that the London Plan and the recently adopted Local Plan sets out a range of policies to achieve a sustainable and climate resilient borough (Appendix 1), this report aims to identify areas and make recommendations as to the opportunity areas for Walthamstow Town Centre regeneration, with the focus of achieving a climate resilient Town Centre. Due to the broad spectrum of climate resilient solutions and options for urban development, this report will have a primary focus on green infrastructure. Other factors such as low carbon sustainable materials, orientation of buildings, window placement, renewable energy, redevelopment of existing buildings and retrofitting schemes should also feature in the regeneration of Walthamstow Town Centre to ensure development is sustainable and climate resilient.

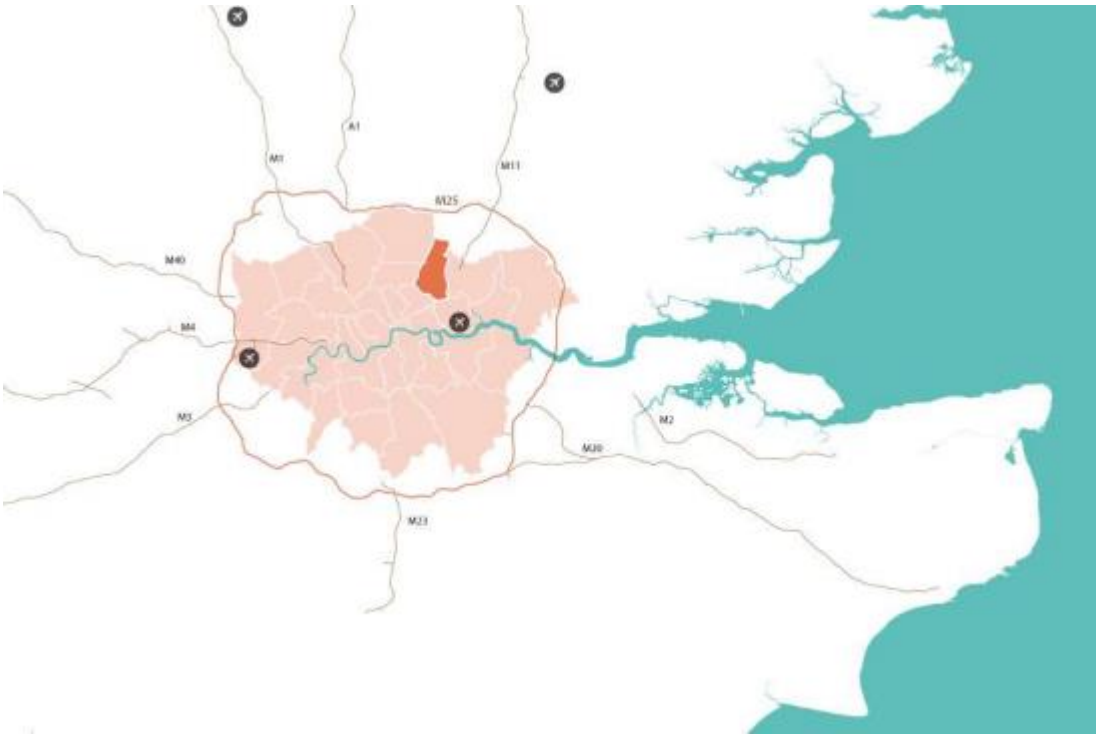

Figure 1: *Map defining location of Waltham Forest Borough within the London context*. Source: Waltham Forest Council (2024).

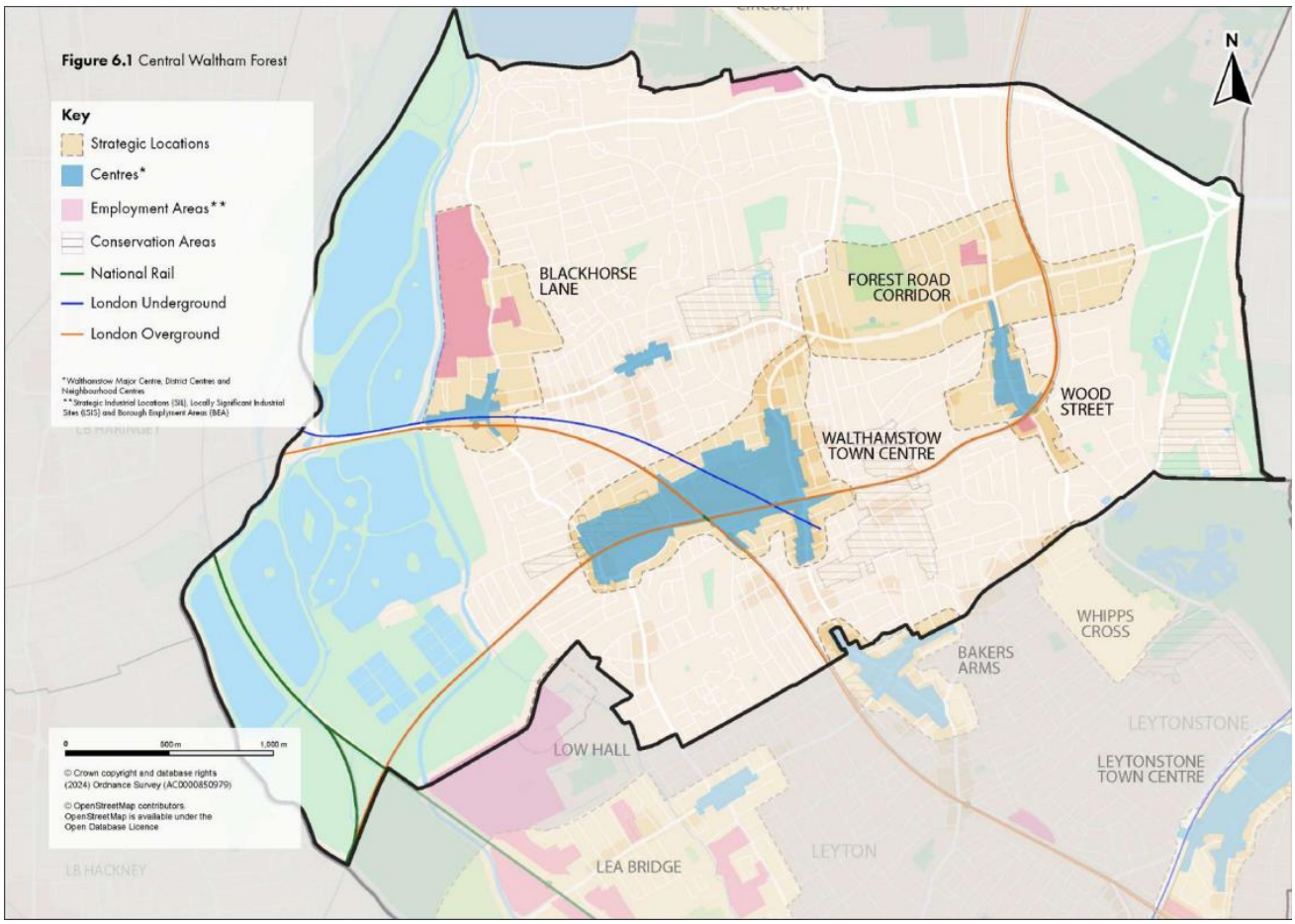

Figure 2: *Map defining Walthamstow Town Centre.* Source: Waltham Forest Council (2024).

2.0 METHODOLOGY

2.1 This report has been produced using a range of secondary sources. The information that has been gathered includes a range of academic literature and reports from professional and research bodies. This report provides evidence of the research around the theme of climate and urban resilience, specifically focusing on green infrastructure.

2.2 A site visit was undertaken to Walthamstow Town Centre in March 2024 to identify opportunity areas within the site area, and to observe areas which could benefit from regeneration.

3.0 RESULTS AND DISCUSSION

3.1 In 2023, the IPCC stated in Report AR6 – Climate Change Synthesis Report that 'urban systems are critical to achieving emissions reduction and advancing climate resilient development' (IPCC, 2023). The IPCC recommends that adaptation and mitigation measures for climate change should be considered in the planning and design of settlements and infrastructure (IPCC, 2023). The report further states that combined with grey infrastructure, green and blue infrastructure can support carbon uptake and storage, as well as reducing energy use and risk from extreme climate events such as heatwaves, flooding, heavy precipitation and droughts. Alongside environmental measures, it can help to generate co-benefits in terms of health and wellbeing (IPCC, 2023). From a planning perspective, the Town and Country Planning Association (TCPA) outlines that 'new buildings should be designed for energy efficiency, with care taken over orientation, shading, albedo, insulation and green roofs and walls to reduce the effect of high temperatures' (TCPA, 2021).

Key definitions

Green infrastructure:
The strategically planned interconnected set of natural and constructed ecological systems, green spaces and other landscape features that can provide functions and services including air and water purification, temperature management, floodwater management and coastal defence often with co-benefits for human and ecological well-being. Green infrastructure includes planted and remnant native vegetation, soils, wetlands, parks and green open spaces, as well as building and street-level design interventions that incorporate vegetation (IPCC, 2023).

Blue infrastructure:
Blue infrastructure includes bodies of water, watercourses, ponds, lakes and storm drainage, that provide ecological and hydrological functions including evaporation, transpiration, drainage, infiltration and temporary storage of runoff and discharge (IPCC,2023).

Grey infrastructure:
Engineered physical components and networks of pipes, wires, tracks and roads that underpin energy, transport, communications (including digital), built form, water and sanitation and solid waste management systems (IPCC,2023).

3.2 One method that is supported in the literature and research is addressing climate change issues through the installation of green infrastructure, to make urban areas resilient to the impacts of climate change. The implementation of green infrastructure in development has multiple environmental benefits, as well as social benefits. High-quality green infrastructure in development helps to combat overheating, flooding and soil erosion as well as improving mental and physical wellbeing for residents (TCPA, 2021). Examples of green infrastructure can include, but not exhaustive to, street trees, green roofs, green walls, sustainable urban drainage systems, parks, gardens allotments, wildlife areas and woodlands (Natural England, 2023). Figure 3 below demonstrates how blue and green infrastructure (BGI) integrates with urban systems to create sustainable and climate resilient spaces.

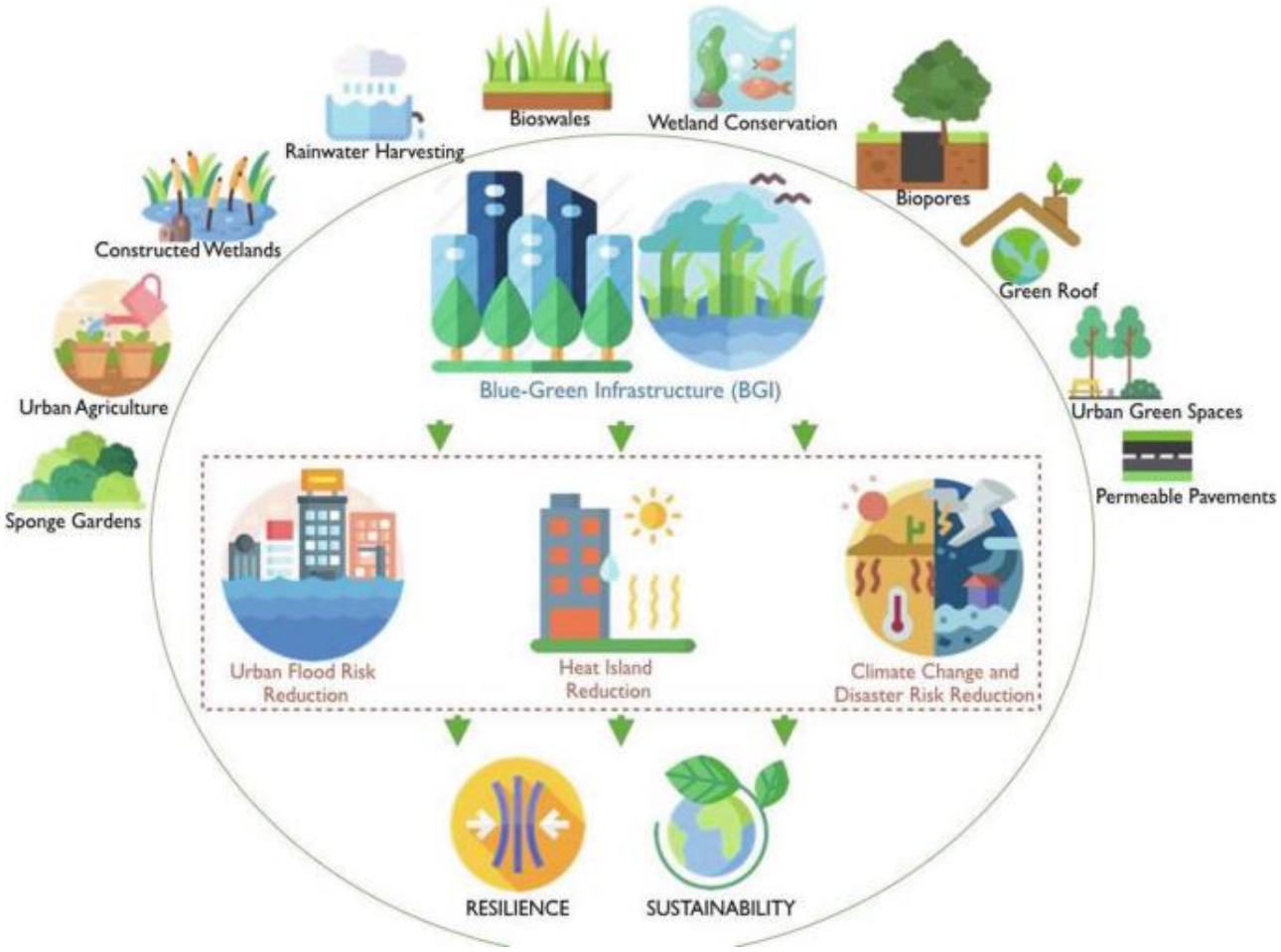

Figure 3: *Infographic demonstrating examples of blue and green infrastructure; their effects and outcomes.* Source: Dhyani et al. (2022).

3.3 Urban overheating is one of the most documented consequences of climate change, with the magnitude of urban overheating having an average value of 5-6 °C (Santamouris & Osmond, 2020). Town Centres often contain dark and dense materials which have a low albedo, and as a result re-radiate this heat energy during the night causing the Urban Heat Island Effect (UHIE) (Natural England, 2023). Green infrastructure can assist in the reduction of air temperature in urban areas, particularly in the summer months, by modifying the local microclimates (Natural England, 2023). The provision of vegetation within the urban setting can help to reduce temperatures by having higher albedos, providing shade to buildings and the process of evapotranspiration causing cooling (Natural England, 2023). Figure 4 demonstrates how green infrastructure in the form of trees and green roofs can have an impact on reducing air temperatures in urban areas, and therefore the provision of these can contribute to creating a climate resilient urban area.

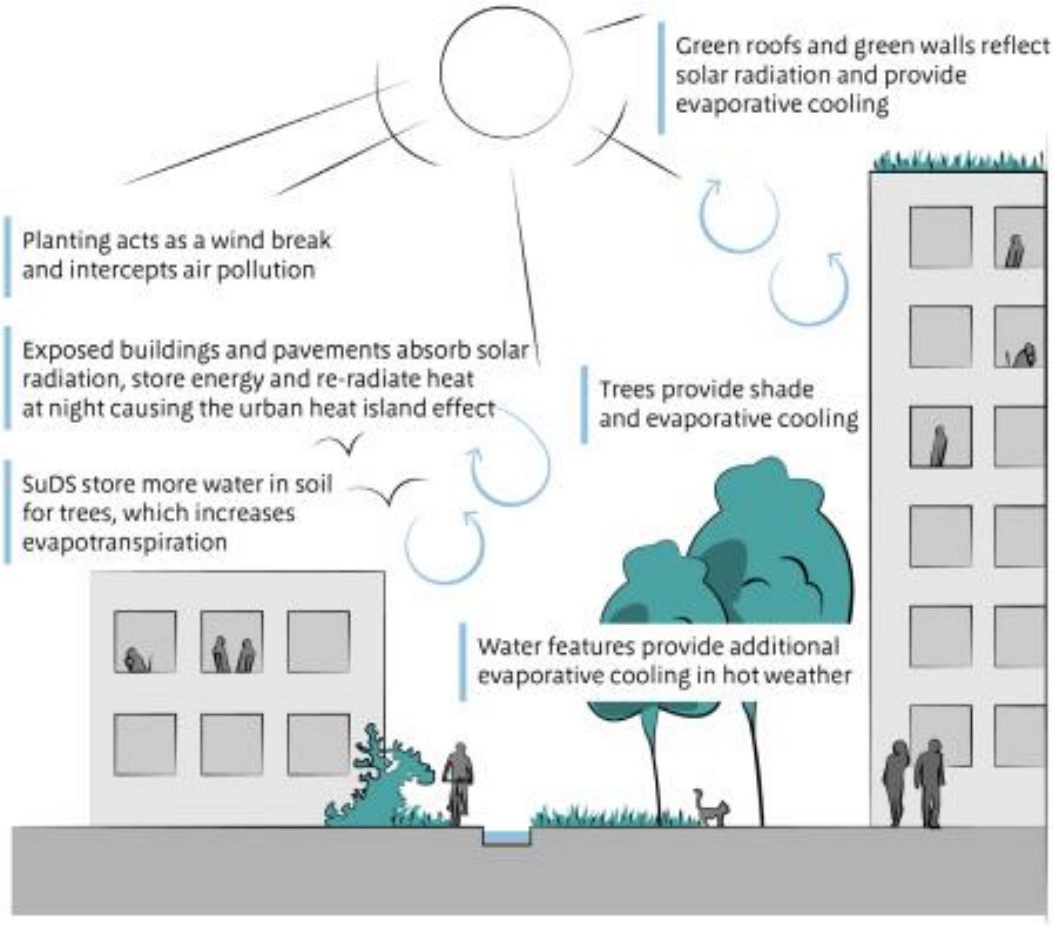

Figure 4*: A diagram demonstrating the summer cooling process through integration of green infrastructure.*
Source: Natural England (2023).

3.4 London experiences some of the highest levels of air pollution of all European cities, which has a significant impact on the health of London residents (Fairbrass et al., 2018). It is estimated that in 2010, up to 9416 people in London died as a result of poor air quality, mainly due to nitrogen dioxide (NO_2) and fine particulate ($PM_{2.5}$) pollution (Walton et al., 2015). The depletion in air quality coupled with the increasing air temperatures caused by climate change can exacerbate resultant impacts on the local residents. There are three types of green infrastructure that are considered to be most beneficial in improving air quality; trees, green roofs and open green spaces (Sinnet et al., 2016). By providing green infrastructure within urban areas, air quality can be improved as the vegetation can directly remove the pollutants from the air by deposition and absorption and dilute and disperse the pollution particles (Fairbrass et al., 2018). In turn, referring back to the previous issues on air temperature, this can help to reduce the UHIE.

3.5 Flooding and urban surface water is one of the most common natural hazards in urban areas, which has been increasing in recent years and can lead to physical water disturbance as well as socio-economic losses and building damage (Li et al., 2020). A study by Gill et al. (2007) in Greater Manchester demonstrated that by adding green roofs to all town centre and retail buildings, surface runoff is reduced by between 17.0-19.9% in an 18mm rainfall event (Fairbrass et al., 2018). Whilst there are factors which need to be accounted for such as roof slope, vegetation type and cover and depth of the substrate, there is a range of evidence which highlights the significance of green roofs in aiding the climate resilience of a town centre.

3.6 Whilst this report has discussed a few examples of environmental impacts on how the provision of green infrastructure can contribute to the creation of a climate resilient urban area, it should also be noted that green infrastructure has also been proven to provide enormous benefits to biodiversity and social wellbeing. The installation of green infrastructure and vegetation can create habitats for species, which benefits the urban ecosystem and increases species diversity and abundance (Fairbrass et al., 2018). There are also reports that demonstrate how having access to green infrastructure can provide benefits to human physical and mental health and wellbeing, however it should be noted that there is a lack of evidence on small scale schemes such as green roofs and green walls (Fairbrass et al., 2018).

4.0 RECOMMENDATIONS

4.1 This section of the report provides two recommendations that Waltham Forest Council should consider when regenerating Waltham Town Centre. The recommendations follow the results of the research into green infrastructure as a tool to achieving climate resilience in urban areas. This section also outlines some of the opportunity areas that were observed on site.

4.2 On a site visit to Walthamstow Town Centre, it was observed that there was a lack of green infrastructure in the main High Street area. It was noted on a site visit that to the east of the High Street, the newly regenerated and developed buildings do feature green terraces on the upper floors of the residential blocks, and there is a presence of trees and planters along the High Street. As such, these recommendations would be applicable to the area west of the new development.

Recommendations:

Recommendation 1:
Installation of planters and trees along the High Street.

Recommendation 2:
Green roofs to be installed on existing commercial and residential buildings.

4.3 Walthamstow Town Centre has a popular and established market, which has been claimed to be the longest in Europe at one kilometre long (Waltham Forest Council, 2024). It is acknowledged that any recommendations and regeneration schemes in the Town Centre should be complementary and respectful of the cultural and economic aspects of the Town Centre. Planters and trees should be located at strategic locations to be respectful of the market and to be appropriate in size and scale to the surrounding area. Trees would also need to be planted in areas respectful of the first and second floor residential accommodation. As discussed, this area is lacking in green infrastructure, so it is recommended, along with additional street furniture, to improve climate resilience in the Town Centre. The trees could provide shaded areas in the High Street, which could improve public realm when coupled with the provision of benches and street lights. From an environmental stance, the trees and planters could help to reduce CO2 levels, help to regulate air quality and temperature, and increase biodiversity in the area. Due to the lack of ground space, and the need to provide a solution minimising any disruption to the local market, green roofs could be provided on the flat roof elements of commercial buildings and on flat roof shop frontages.

5.0 CONCLUSION

5.1 In conclusion, the information provided in this report should be regarded as a broad overview of potential approaches to integrate green infrastructure into the regeneration of Walthamstow Town Centre. The recommendations would help to improve the Town Centres climate resilience as part of small scale initiatives.

5.2 The research gathered has demonstrated the importance and significance of the role that green infrastructure plays within urban areas in climate resilient Town Centres. This report has suggested two recommendations to the LPA pursuant to the regeneration of Walthamstow Town Centre, to aid in mitigating the effects of climate change on the local population and economy of Walthamstow Town Centre. Whilst the list is not exhaustive, and there are many other measures which can be implemented to achieve a climate resilient Town Centre, the recommendations above provide a starting point of small scale initiatives for the centre. These recommendations are considered to reduce environmental impacts by reducing surface runoff from precipitation events, absorbing co2 in the atmosphere and increasing biodiversity within the Town Centre. Simultaneously, increasing green infrastructure within the Town Centre has the potential to have societal impacts by increasing public realm and improving mental health of residents and visitors. It should be noted that these recommendations should be read alongside the policies within Waltham Forest Local Plan (2024) and the London Plan (2021) for policies relating to Town Centre regeneration and Climate Chage (Appendix 1).

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APPENDICES

Appendix 1 – List of Policies

List of adopted Policies relevant to the regeneration of Town Centres, Climate Change and Green Infrastructure:

Plan and Policy:	Policy Title:
The London Plan (2021)	
Policy GG2	Making the best use of land
Policy GG3	Creating a healthy city
Policy GG5	Growing a good economy
Policy GG6	Increasing efficiency and resilience
Policy SD1	Opportunity areas
Policy SD4	The Central Activities Zone
Policy SD6	Town centres and high streets
Policy SD10	Strategic and local regeneration
Policy D1	London's form, character and capacity for growth
Policy D3	Optimising site capacity through the design-led approach
Policy D8	Public realm
Policy D9	Tall buildings
Policy D11	Safety, security and resilience to emergency
Policy G1	Green infrastructure
Policy G4	Open space
Policy G5	Urban greening
Policy G6	Biodiversity and access to nature
Policy G7	Trees and woodlands
Policy SI 1	Improving air quality
Policy SI 2	Minimising greenhouse gas emissions
Policy SI 4	Managing heat risk
Policy SI 5	Water infrastructure
Policy SI 13	Sustainable drainage
Waltham Forest Local Plan (2024)	
Policy 1	Presumption in favour of sustainable development
Policy 53	Delivering High Quality Design
Policy 57	Amenity
Policy 77	Green infrastructure and the Natural Environment
Policy 78	Parks, open spaces and recreation
Policy 79	Biodiversity and Geodiveristy
Policy 80	Trees
Policy 85	A zero carbon borough
Policy 87	Sustainable design and construction
Policy 88	Air pollution
Policy 91	Managing flood risk
Policy 92	Overheating