

Appendix D

Resilience Measures

BURO HAPPOLD



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RESILIENCE MEASURES

Building retrofit programme

- # Preparatory Management **Capital Investment** Mainstreaming Initiative Cross-cutting



Roll out a thorough programme of retrofits for residential and non-residential properties throughout the Square Mile and for those assets that the City Corporation are responsible. Retrofits should focus on ensuring assets are resilient to changing weather conditions and environmental patterns.

C40 Cities. (2020). The Multiple Benefits of Deep Energy Retrofits: A Toolkit for Cities.
www.c40knowledgehub.org

Why

Climate change poses multiple resilience risks at property-level. This includes rising temperatures raising the risk of building overheating in warm periods, rising sea levels and rainfall levels in winter heightening local flood risk, and increased frequency and intensity of extreme weather events posing threats to the building fabric and occupant safety. Conversely, management of properties also contributes to these risks: not only does fuel consumption directly cause climate change, consumption of water and contributions to the Urban Heat Island effect from the building design play a role in overheating and water stress.

Retrofits can be used to adapt structurally sound buildings in such a way that their influence on and risk from climatic changes are reduced, as seen in the list of retrofit measures supplied to the City Surveyors. In relation to resilience, risks associated with overheating and flooding are a primary concern. To address overheating, the introduction of shading and ventilation strategies may be considered. Replacing 'hardscaped' roofs with green or brown alternatives may have benefits for internal comfort and co-benefits for surface water management, external comfort and biodiversity. Flood protection measures may include additional water proofing, attenuation or even the reconsideration of finished floor levels or the introduction of temporary flood barriers. As part of resilience led retrofit efforts, interventions to reduce water consumption including in line with reducing availability of potable supplies should also be considered.

What

Resilience measures should be incorporated with the City Corporation's efforts to retrofit the existing building stock as part of their carbon reduction strategy, reducing costs and disruption. The Square Mile and areas beyond have a diverse building stock, so efforts should first start with understanding current levels of risk. Early retrofit actions should be focused on assets at high risk and/or where users are particularly vulnerable to impacts including social housing. Through its asset management strategies the City Corporation will also likely want to take early action on their own building stock, leading by example and showcasing what is expected of others. Funding could take place through the City Funds to support incremental increase in cost of asset management. Match funding from Re:fit and other invest to save finance funds should also be explored, and new government green schemes and opportunities promoted.

To tackle non residential buildings not owned by the City Corporation, action could be catalysed through a 'retrofit pledge' engaging business recognising that many corporates have their headquarters in the Square Mile, with many having already made declarations and commitments in relation to their environmental performance; the City Corporation should work with building owners and managers and wider business networks to show how resilience measures may be implemented within existing management regimes. The diverse nature of the building stock would require different technical strategies and approaches to be adopted; it is recommended the City Corporation share best practice of effective and viable measures for key archetypes and produce design guidance which could draw on its own asset retrofit programmes. City Cash, Neighbourhood Community Infrastructure Levy's, Planning Obligations and third party loans are all potential implementation mechanisms for upgrading public buildings.

Case Study: The Multiple Benefits of Deep Retrofit, C40 Cities

Large-scale urban retrofits require substantial upfront investments. To meet this investment need, city governments have to show exactly how a retrofit project will benefit the city as a whole to get sufficient buy-in from affected stakeholders and citizens. To support Cities in demonstrating this C40 Cities developed a methodology based on the growing body of evidence available to help cities quantify the co-benefits of retrofit. Piloted with New York, Milan, and Copenhagen, the study showed that potential benefits from deep energy retrofit: saving 3.4 MtCO₂e generating 34K - 52K jobs; reducing asthma by 2.9%; reducing energy poverty by 3.8%; and generating a net present value, across the pilot cities, ranging from USD 47.5 million to USD 659.2 million, associated with a payback time of 7 to 29 years. The toolkit provides cities with the evidence to make a compelling case for unlocking and accelerating the large-scale overhaul of urban building stock.

Links to existing City Corporation activities

- ## Relevant parts of the emerging Climate Action Strategy, records of previous retrofit strategies and cases in the Square Mile

Links to other existing policies, plans and guidance

- ☒ London City Resilience Strategy, GLA
(Action B7)
 - ☒ Retrofit Accelerator, GLA
 - ☒ Retrofitting London, London Climate Change Partnership
 - ☒ Re:Fit programme for public buildings
 - ☒ Deep Energy Retrofit Toolkit, C40 Cities



RESILIENCE MEASURES

Introduce retrofit support, funds and prioritisation for vulnerable residents and those in affordable housing

- Preparatory
Management
Capital Investment
Mainstreaming Initiative
Cross cutting**



Support to those in the Square Mile and City Corporation assets who are most vulnerable to shocks and stresses and least able to prepare with dedicated guidance, grants and subsidies for retrofit and resilience measures.

GroundWork. (2020). About urban climate proofing.
urbanclimateproofing.london

Why

The risks associated with climate change pose physical threats to homes through profound increases in peak temperatures and heatwaves, increased frequency and intensity of flooding and extreme weather events, and the potential for rising levels of water and food poverty. These impacts can be mitigated and adapted to a degree through retrofit of buildings, in conjunction with diverse social and political measures as explored in this strategy. However, these impacts will also disproportionately affect different groups – namely those on lower incomes, marginalised groups; those living in poorly maintained or designed housing; those who live in temporary or emergency accommodation; physically vulnerable groups; and the elderly. Ensuring that all homes are safe to live in in the Square Mile, even if not directly managed by the City Corporation, will be key to making sure the whole of the square mile is resilient to projected climatic changes.

What

Through a combination of the building retrofit and inclusion and equity measure set out in this strategy, it is recommended that the roll out of the retrofit programme prioritises early action within vulnerable populations. The financial packages measure will help make funding available to support this. Through this measure, the City Corporation in conjunction with any other Housing Associations active in the square mile should develop additional targeted support for vulnerable groups in the roll-out of its retrofit programme. This may include stakeholder engagement to better understand the acute needs of vulnerable populations, production and distribution of practical, accessible guidance for zero cost measures that may be taken by residents, or indeed the raising of additional funds to accelerate the roll out of retrofit in vulnerable communities. For those not in Corporation-managed properties, guidance for retrofits should be shared with homeowners and private rented sector landlords. Options for funding support should be explored such as special incentives to promote upgrades or a grant scheme.

How

The implementation of this measure may be spread across different areas of work, but oversight would be required to ensure that it is delivered effectively. For City Corporation programmes, the initial review stage should include asset management planning linked to social need to prioritise those who are most vulnerable to the impacts of climate change. The development of targeted guidance should be integrated into educational programming and guidance preparation, while incentives and financial support options for retrofits of private property should follow once easier actions relating to Corporation and Housing Association owned properties are completed.



RESILIENCE MEASURES

Review and expand data collection, monitoring and reporting



Action to encourage property owners to collect and share information related to climate risks, making available monitoring equipment where needed, to support climate action planning and decision making.

The University of Manchester. (No date). The CityVerve Project.
www.digitalfutures.manchester.ac.uk

Why

At property-level, there are many direct climatically influenced risks to resident and worker safety. These may include overheating in escalating periods of high heat, lack of water in increasingly intense droughts, and a rising risk of flooding and surface water build-up with rainfall rising in winters, as have been shown by the analysis of the UK 2018 Climate Projections (detailed in the main report). Understanding where these risks are most acute, and managing interventions designed to mitigate them, can be informed and made more effective through the collection and monitoring of high-quality data across the building stock.

What

There are several areas where data collection, monitoring and analysis can support property-level resilience. One purpose is directly identifying vulnerabilities: smart meters and thermostats and water meters can help to locate properties which are prone to overheating and to identify leaks. Meters, and display of real time data, can also be used to support residents and businesses long-term, in helping them to reduce and manage electricity and water demand, and empower them to make the most of retrofits and other measures designed to increase property-level resilience.

How

This measure would involve distribution of easy-to-install meters and monitors to City Corporation properties on a needs basis. These would be distributed directly by the City Corporation or in partnership with utility providers (where relevant), with clear guidance as to how to use the instruments and how they can support resident and business tenants to make their assets and behaviour more resilient.

Monitoring equipment may be linked to other actions within the strategy, for example building retrofits to help inform targeting of support. Businesses and utility providers should be engaged regarding the roll out of monitoring equipment for non-City Corporation owned assets in the Square Mile to promote take up. In order to enable the use of this data to inform policy and action planning, a robust infrastructure for data collection, sharing and analysis will be required. This will require engagement with businesses, utility providers and others to achieve. It is anticipated that a number of challenges regarding data protection, asset performance liabilities and such will be faced. The City Corporation must work proactively to address these. The funding and roll out of the initiative should be linked to the retrofit programme. A community-based platform engagement and sharing of data can also be effective in encouraging take up. The Capital Bids Process may be leveraged to pay for procurement and distribution of equipment as well as monitoring and data collection infrastructure.

Risks addressed	Lead time	Case Study:	Links to existing City Corporation activities
• Cross-cutting	Ongoing scheme	CityVerve, Manchester	 Adopted and draft local plan
Objectives 19	Possible partnerships <ul style="list-style-type: none"> • Smart London Board • Utility providers • Retrofit contractors • Asset management companies • Business Improvement Districts, City businesses. 	CityVerve aims to bring together the brightest minds and pioneering uses of Internet of Things (IoT) technologies to redefine 'smart' in the context of a living, working city. It aims to build and deliver a smarter, more connected Manchester, creating a city that uses technology to meet the complex needs of its people. Within the programme there are multiple thematic areas, such as 'energy and environment' one focus of which is the use of sensors and cloud services to provide on-demand response equipment, as well as energy and environmental data that will improve occupancy wellbeing and deliver significant cost savings.	Links to other existing policies, plans and guidance
Co-benefits 1 2 3 4 5 Low ----- High			 London City Resilience Strategy, GLA (Action B3)  London Plan, GLA  Smarter London Together, GLA
Cost 1 2 3 4 5 Low ----- High			



R E S I L I E N C E M E A S U R E S

Strengthen resilience requirements for planning

- # Preparatory Management Capital Investment **Mainstreaming Initiative** Cross-cutting



Review existing climate resilience requirements for new build and refurbishment projects in the Square Mile, as well as for the City Corporations own buildings, with a view to increasing the ambition and stringency of resilience requirements which are delivered through new development.

C40 Cities. (2019). Cities 100.
www.c40knowledgehub.org

Why

Numerous new homes and office spaces are set to be developed in the Square Mile in the coming years including 1.15 million m² of office space and 1647 new homes in the period 2011-2026. Whilst it is vital to ensure that proposed developments are future proof so as to ensure long term value of the asset, this scale of development also presents a unique opportunity to deliver interventions that contribute to wider long-term resilience of the Square Mile area. Planning Policy guidance in the form of supplementary planning documents (SPD), planning Conditions and Planning Obligations, are key tools the City Corporation can utilise to implement the City Local Plan and ensure that development proposals align with local priorities, needs and the future Strategic Vision of the Square Mile.

- The City Corporation should review its supplementary planning guidance and approach to Planning Conditions, Planning Obligations for new development in line with the findings from the Climate Risk Assessment and proposed measures within this strategy

 - To strengthen implementation of the City Local Plan, guidance (SPD) relating to Sustainability and Climate, Planning Obligations and Open Space should be updated when they are next reviewed to incorporate additional guidance on climate resilience issues.
 - To support the implementation of CIL and Planning obligations, proposals to deliver the climate strategy including climate adaptation and resilience relevant measures should be identified included in the Council's Infrastructure Delivery Plan when it is next updated.
 - The City should consider preparing additional supplementary guidance for the Key Areas of Change this can help to coordinate action and establish requirements and options for achieving the Climate Strategy at a local level including adaptation and resilience issues and opportunities.

The scope of revised planning requirements should enhance guidance given on material considerations relating to flood, overheating, water stress and natural capital as a minimum and the proposed interventions to address these climate risks. For example sustainability and climate guidance could provide guidance on the performance specification for fixtures and fitting, the sizing of plant rooms for future adaptability, types of species permitted to be planted or measures to mitigate / manage flood risk at property or scheme level.

Risks addressed

- Flooding
 - Overheating
 - Water stress

- Water stress

Co-benefits

1 2 3

Low

Cost

1 2 3

low

Lead time

Ongoing

Objectives

1, 2, 6

Possible partners

- GLA
 - London Climate Change Partnership
 - Practitioners. Academia
 - UK Committee on Climate Change

Case Study: Buildings Mandate, New York

The Buildings Mandate is a first-of-its-kind legislation, requiring large buildings ($>2,300\text{ m}^2$) to cut their carbon emissions in half by 2030, and by more than 80% before 2050. Given that these buildings make up only 2% of the city's real estate, but generate half of the energy demand, addressing their efficiency is vital if New York City is to meet its carbon neutrality goals. Rather than a one-size-fits-all approach, the policy gives building owners the flexibility to pursue the best solutions for cutting carbon, meaning reductions can be achieved at the highest pace and lowest cost. Such legislation, demonstrates the influence that policy interventions can have and the potential such strategic changes may drive through the Square Mile.

Early opportunities to strengthen guidance should be identified, such as the current period of consultation around the Planning Obligations SPD. Planning guidance should be regularly reviewed and updated when the Local Plan is next reviewed against the UK National Adaptation Programme time periods to ensure requirements are accurate against changing projections and risks. Where amendments are to be proposed, studies to demonstrate the effectiveness, economic viability and technical feasibility of revisions will need to be demonstrated. This creates an opportunity for the further development of the adaptive pathways approach to specific climate risks. The future needs (i.e. skills and knowledge) of the City Corporation in relation to climate resilience in line with revisions made should be considered, as per the knowledge, skills and capacity measure. Additionally, the needs of development management Officers who would be responsible for reviewing development proposals against the revised guidance should be considered including internal guidance and training.

Links to existing City Corporation activities

- ☒ Existing and emerging Planning Obligations SPD
 - ☒ Sustainability and Climate SPD
 - ☒ Open Space Strategy and SPD
 - ☒ Existing and emerging Local Plan

Links to other existing policies, plans and guidance

- ## London City Resilience Strategy, GLA (Action B6 and B7)



RESILIENCE MEASURES

Cool streets programme

Preparatory Management Capital Investment Streaming Initiative Cross-cutting



Build on existing public realm initiatives develop a programme of actions focused on minimising the build-up of the urban heat island effect and to support people to cope with high temperatures and heatwaves.

LA Mayor. (2019). Mayor Garcetti Kicks Off 'Cool Streets LA'.
www.lamayor.org

Why

UKCP18 forecasts that by 2080, under the high emissions scenario, summer average temperatures in the City of London may increase by nearly 5°C, and winter by about 3°C. In line with rising air temperatures, the frequency and duration of heatwaves are also set to increase in coming decades. By 2080 we may see four times the number of days of heatwave to today, some lasting up to three weeks. Implications for human health and wellbeing, business productivity and the functioning of infrastructure are well documented

The purpose of this programme would be two-fold: minimise temperature increases in the public realm and provide a network of cool spots across for users. In order to limit temperature increases, a combination of measures such as shading, urban greening (e.g. street planting, green roofs), and careful material selection should be considered as well as analysis of the contributions from the transport network and heat rejection associated with plant, such as air conditioning units. To achieve this and prior to implementation, a series of preliminary studies would be required to model current and future external comfort within the Square Mile, with further analysis of the most effective interventions and the extent of intervention required to structure the programme. The studies would prioritise areas in which action should be taken first, for example areas of greatest risk and populations at greatest vulnerability. Given the uncertainty of climate change, this should be done utilising an adaptive pathways approach.

In providing a network of cool spots, the City Corporation should work with stakeholders to map existing publicly accessible indoor and outdoor cool spots and make this data available. This would provide the basis for understanding gaps in current provision and inform future strategies to expand the network. Cool spots may be shaded open spaces or facilities designed to receive people (e.g. cultural institutions) but must be accessible to all possible users.

What

The preparatory studies would be funded through the proposed City Climate Readiness programme which would be resourced from City Cash and other complimentary sources, like PhD and MSc Projects in partnership with London Universities, identified in the implementation plan. Initially, interventions identified would be delivered in conjunction with new development which comes forward and through integration of action within public realm and streetscape programmes and other capital works programmes. The “Business for Climate” Partnership would help to identify and enable access to a network of private indoor and outdoor cool spots which can be publicly accessible during heatwaves.

How



RESILIENCE MEASURES

Heat resilient public realm and highway surfaces

Preparatory Management Capital Investment **Mainstreaming Initiatives** Cross-cutting



Build on existing actions to develop a comprehensive programme of action focused on minimising disruption to road networks due to rising heat and changing use patterns.

Your Say Adelaide. (2020). Cool Road Adelaide.
www.cityofadelaide.com.au

Why

UKCIP18 forecasts that by 2080, under the high emissions scenario, summer maximum temperatures may reach 40°C. The temperature of road surfaces can be substantially higher than air temperatures, reaching up to 60°C in hot weather in the UK, despite recommended design conditions typically not exceeding 45°C. Increasing hot weather in the Square Mile may substantially speed up the rate of deterioration of the area's roads, intensifying replacement and maintenance schedules, and peak temperatures will pose a risk of short-term disruption through road softening and melt.

What

The purpose of this programme would be to identify and accommodate necessary changes to Square Mile street management and asset management in light of rising temperatures into the City Corporation asset maintenance and replacement regimes. This would involve: identifying roads which would be particularly vulnerable to acute heat-induced disruption or for which closures would most substantially affect circulation through the Square Mile and replacing them; identifying 'easy win' roads to cheaply replace or use in the design of alternative circulation routes in hot periods; and updating planned road replacement and resurfacing strategies to mainstream the use of heat-resilient designs and asphalts, as specified by Highways England. These programs can be aligned with the City of London Transport Strategy and the proposed cool streets programme through the development of circulation routes, material selection and incorporation of shading interventions and green infrastructure. Through this initiative the City Corporations existing partnerships with the likes of the London Climate Change Partnership Transport Adaptation Sector Group (TASG) and Transport for London (TfL) should be used to accelerate actions already underway.

How

The specification of climate resilient materials should be integrated into asset management and maintenance programmes and budgets to enhance the network over time. The approach should align with asset management, maintenance and replacement regimes so as not to inflate the embodied energy emissions associated with resurfacing. This should align with Highways England and TfL best practice, and ongoing transport strategy work, to assess the current status, usage rate and heat-vulnerability of Square Mile roads. A programme of solutions and works can then be designed, for dynamic and flexible implementation over the following decades. This measure can likely be delivered through integration with existing projects and capital works budgets.

Risks addressed	Lead time	Case Study:	Links to existing City Corporation activities
• Overheating	20 years	Cool Road Surfaces, Adelaide	 Infrastructure Delivery Plan  Transport Strategy  Open Space Strategy  City Public Realm SPD
Objectives	Possible partnerships		
2	<ul style="list-style-type: none"> • Highways England • Business Improvement Districts • TfL • TASG • Highway maintenance contractors 	The City of Adelaide have begun experimenting with 'Cool Seal' roads and other surfacing options that aim to reduce the temperatures and absorptivity of roads in the city. This is currently under trial, with future implementation of such roads to be prioritised using heat maps of the city and where dark bitumen roads are currently used. Results from these studies will help to build understanding of this technology's effectiveness and improve the quality of products available for use in the UK.	
Co-benefits			Links to other existing policies, plans and guidance
1 2 3 4 5			 Streetscape Guidance, TfL  Healthy Streets Toolkit, TfL and GLA
Cost			
1 2 3 4 5			



RESILIENCE MEASURES

Sacrificial land and/or natural flood risk management areas.

Preparatory
Management
Capital Investment
Mainstreaming Initiative
Cross-cutting



Extend the function of the public realm areas and open spaces situated within (current and future) fluvial and surface water floodplains as sacrificial land or natural flood risk management areas.

Rebuild by Design. (2020). The Big U.
rebuildbydesign.org

Why

Sea level is projected to rise by up to a metre by the end of the century. At present, London is protected from fluvial flooding, namely storm surges on top of rising sea water levels, through a system of flood defences along the Thames: the immediate river walls and embankments and the Thames Barrier. The management of these flood defences is set out in the TE2100 plan, which is an adaptive approach to managing flood risk on the Thames in line with sea level projections and infrastructural requirements. If the TE2100 plan changes radically in future decades, it may be that the current flood defence network becomes insufficient for the protection of the Square Mile, and different approaches will need to be considered.

What

An alternative to raising river walls and mitigating flood risk would be to make the Square Mile physically resilient to flood events and moving away from attempting to prevent them happening. One such strategy would be to designate public areas as sacrificial, as exists at Customs House. In doing so the City Corporation would essentially accept a certain level of flood risk in some areas and introduce physical and management interventions to support effective management of flood water, safe continued operating conditions outside of sacrificial areas and alternative arrangements for access to critical infrastructure at these times. Such strategies would require coordination with the development of contingency plans for all entities operating within the sacrificial areas, as well as programmes focused on retrofitting existing infrastructure and assets as well as revising design and zoning requirements for proposed developments to ensure that these are appropriately adapted or designed to consider this need.

How

Funded by the proposed Climate Readiness Fund, the Corporation should develop a flood risk management plan and business case to explore options for addressing the fluvial, surface water and ground water flooding risks which do not relate to the Thames using the Environment Agency Flood Risk and Coastal Management Risk Management approach. This will evaluate the cost and benefit of possible interventions. This work should be undertaken with neighbouring Boroughs recognising the cross-boundary issues relating to risks and potential solutions.

Changes to the TE2100 plan and flood risk to the Square Mile should be tracked carefully through the Strategic Flood Risk Assessment for the Square Mile and its implementation. Engagement with the Environment Agency, who manage flood risk along the Thames, should be undertaken to anticipate whether a change in approach to flood defence from the Thames' waters might be appropriate. At present, a major change to the TE2100 plan is not anticipated until around 2070, when a new Thames Barrier may be constructed. A decision as to whether or not a new barrier is to be constructed is expected around 2050. This may require a strategy and additional mechanism to support funding.

Risks addressed

- Flooding
- Overheating
- Natural Capital

Lead time

20 years +

Objectives

1

Co-benefits



Cost



Case Study: The Big U, New York

"In collaboration with New York City, The BIG U proposal was developed to protect Lower Manhattan from floodwater, storms, and other impacts of a changing climate. The BIG U calls for a protective system around the low-lying topography of Manhattan...10 continuous miles of protection tailored to respond to individual neighbourhood typology as well as community-desired amenities... Like the hull of a ship, each can provide a flood-protection zone, providing separate opportunities for integrated social and community planning processes for each. Each compartment comprises a physically separate flood-protection zone, isolated from flooding in the other zones, but each equally a field for integrated social and community planning. The compartments work in concert to protect and enhance the city, but each compartment's proposal is designed to stand on its own." Lessons learnt from this scheme will be valuable in informing a possible measure of this kind in the Square Mile

Links to existing City Corporation activities

- ☒ Riverside Walk Enhancement Strategy
- ☒ Open Space Strategy
- ☒ Strategic Flood Risk Assessment

Links to other existing policies, plans and guidance

- ☒ Thames Estuary 2100 Plan, Environment Agency



RESILIENCE MEASURES

Flood defence assets maintenance and management regimes

Preparatory
Management
Capital Investment

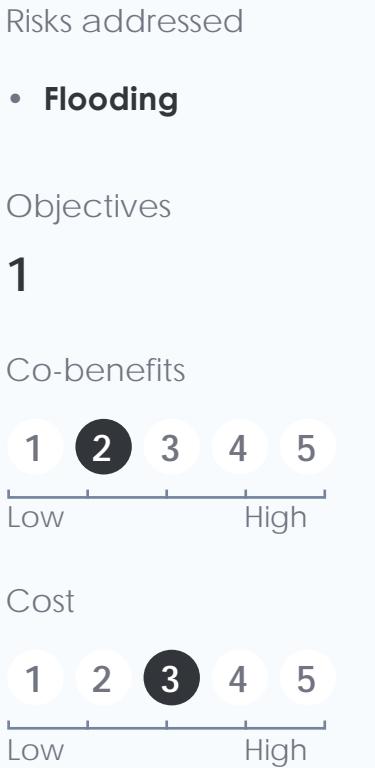
Mainstreaming Initiative

Cross-cutting



The City Corporation will continue to maintain assets for which it is the riparian owner and will support other owners in the Square Mile to complete required works and maintenance on their defences in a timely manner.

Environment Agency. (2012). Thames Estuary 2100. Managing flood risk through London and Thames estuary.
www.gov.uk



Why

It is essential that the river walls and embankments bordering the Thames and the Square Mile are maintained and refurbished regularly in order to protect spaces from fluvial flooding through asset breaching or failure. As this infrastructure ages and sea levels rise, increasing the loading on these assets, the condition of the flood walls becomes increasingly important.

What

At present, fluvial flooding is prevented in London through a network of flood defences: the river walls and embankments and the Thames Barrier. It is the responsibility of the riparian owner of these defences to maintain and replace these defences to an appropriate standard, as defined by the Environment Agency. The City Corporation should play a supporting role to the Environment Agency to manage, monitor and repair flood defences along its border under the required timescales and to the appropriate standard. This might include coordinating with developers to replace and repair flood walls, carrying out periodic reviews of flood wall management requirements and programmes like the ongoing Riverside Walk Enhancement Strategy programme, and developing financial mechanisms to fund necessary works and repairs. As part of the planning of future management and maintenance regimes, it is suggested that the City Corporation should first consider the opportunities for 'nature led' interventions. Though such interventions may not always be possible, such solutions should be considered and pursued where feasible based on the wider co-benefits that may be afforded.

How

Reviews of planning and flood defence requirements should be carried out periodically as part of the existing Strategic Flood Risk Assessment process with the Environment Agency followed by appraisal of appropriate flood risk mitigation options following the EA's Riverside Strategy Approach methodology. The current plan envisages raising of local flood defences on the City's riverside by up to 1 metre. The City Corporation should align such work with flood modelling and studies required for developments and future asset maintenance programmes. It is understood that City Funds are used to pay for the maintenance of assets owned by the City Corporation as the riparian owner. Opportunities for additional funding using the Mayoral Community Infrastructure Levy's and planning obligations to deliver flood risk management solutions should be explored within affected areas.

Links to existing City Corporation activities

- [Riverside Walk Enhancement Strategy](#)
- [Strategic Flood Risk Assessment](#)

Links to other existing policies, plans and guidance

- [Thames Estuary 2100 Plan, Environment Agency](#)
- [Drain London, London Climate Change Partnership](#)



RESILIENCE MEASURES

Protect key assets, critical infrastructure and sensitive equipment in flood zones

- # Preparatory Management Capital Investment Mainstreaming Initiatives Cross-cutting



Identify critical and sensitive assets such as infrastructure, services and heritage features within the floodplain, assess risks, plan and implement mitigation measures as necessary.

Utile. (2019). City of Kalamunda. (2019). **Boston coastal flood resilience design guidelines and zoning overlay district.** www.utiledesign.com

As described in the City of London Strategic Flood Risk Assessment (2017), the Square Mile is located on the north bank of The River Thames and contains two historic watercourses: the River Fleet and the River Walbrook, culverted within the sewer network. The City is also underlain by two natural aquifers: River Terrace deposits and Upper Chalk. This positioning, and its highly urban structure, means that there is a risk of fluvial, tidal, surface water, sewer discharge and ground water flooding. The risk of flooding will increase with climate change, with varied rainfall patterns and rising sea levels projected. Engineered solutions are in place to manage the risk of flooding from a number of sources. The Thames Barrier for example protects the City from pluvial and fluvial flood risk, while groundwater levels are managed and maintained at a low level by the General Aquifer Research Development and Investigation Team (GARDIT). Without action, the Square Mile will see an increased risk in the frequency and intensity of flood events. This means increasing extents of flooding, and increased water depths.

It is proposed that the City Corporation with key stakeholders' review flood risk areas to identify critical receptors in terms of infrastructure, services or features of heritage and archaeological value, to inform an assessment of vulnerability. This should be supplemented by engagement with existing business and residents' forums regarding the location of essential building equipment in those buildings identified as at risk. Based on the outcomes of this, it is suggested that the City Corporation with key stakeholders develop a programme of works, focused on protecting and where necessary relocating key assets identified to be at risk to be funded by the asset owners. This should be supported by the production of guidance building owner and occupiers to be prepared to support implementation of other aspects of the strategy.

What

How

City Corporation may wish to take early action over assets that they own and control. Actions to adapt City Corporation owned assets may be done as part of the proposed maintenance and refurbishment cycles or from City Cash. The level of preparation taken by others may fundamentally be a business decision for their owners as the improvements would be self-funded. The City Corporation should clearly communicate the level of forecast risk, provide guidance on how to adapt buildings and, if felt necessary, consider changes to planning policy requirements for future proposed developments.

Case Study: **Boston Coastal Flood Resilience Design Guidelines and zoning, Boston Planning and Development Agency**

Boston's first Coastal Resilience Design Guidelines work to ensure buildings are built or adapted to withstand the flooding risks posed by sea level rise and storm surge. With the need for retrofits in mind, the Guidelines include case studies with short and long-term adaptation strategies tailored to work for each of the most common building types in the floodplain. The zoning requirements are based on those buildings located within areas with a 1% chance of coastal flooding in 2070. Measures within the Design Guidelines include relocating sensitive infrastructure from lower to higher levels and elevating lowest interior floors to designed flood elevations.

Links to existing City Corporation activities

- ☒ Riverside Walk Enhancement Strategy
 - ☒ Strategic Flood Risk Assessment 2017
 - ☒ City Open Space SPD

Links to other existing policies, plans and guidance

- ☒ Drain London Plan, London Climate Change Partnership
 - ☒ Thames Estuary 2100 Plan, Environment Agency



RESILIENCE MEASURES

Sustainable rain and surface water management policies and implementation

Preparatory Management Capital Investment Mainstreaming Initiative



To enhance and expand management of rain, surface water and grey water across the Square Mile and City Corporation properties through SUDs, rainwater harvesting and greywater recycling, and water storage.

40 Cities. (2015). **Cities100: Copenhagen – Creating a climate resilient neighbourhood.**
www.c40.org

Why

Water shortages are one of the most pressing issues facing London and the Thames Catchment, with a 6% water capacity deficit in 2020 alone. Londoners currently have an average footprint of 164 l/day, with goals to reduce water consumption to around 105 l/day. In addition, surface water flooding and rainfall runoff are an additional water management issue in the Square Mile: 107 properties are currently at risk of surface water flooding (1% Annual Exceedance Probability). Alongside demand reduction measures, there is a role to be played for harvesting and water recycling measures to help manage local water cycles, flood mitigation and usage patterns.

The City Corporation should develop a connected system of water recycling, urban drainage and rainwater management measures in the Square Mile and for its wider assets. This may include continuing to expand Sustainable Urban Drainage infrastructure in the Square Mile through public realm initiatives and on City Corporation properties, with a focus on green infrastructure and targeting areas at risk of flooding, developed in accordance with CIRIA guidance (this may include rainwater harvesting, greening/bioretention, detention ponds, rooftop greening, permeable surfaces, infiltration systems, drains, detention basins, ponds and underground storage). For new development SUDs interventions should be designed in tandem with the introduction of rainwater recycling and harvesting systems, greywater recycling and requirements for 'water neutral' developments. The key opportunity areas represent an opportunity for coordinated action linking existing and planned development. The results of the Square Mile space utilisation review proposed through this study should be used to develop policy to store dewatering effluent and flood water for irrigation and non-potable uses.

What

The development of a strategy funded by the proposed Climate Readiness Fund would focus on opportunities for the design and implementation of sustainable water management measures for all City Corporation buildings, and the introduction of policy, incentives and guidance to support private owners to do the same at the same time as planned maintenance, repair and improvement works. As part of the work, existing barriers for developers should be identified, understood and options for overcoming these developed. Revisions to existing management, maintenance and capital programmes could be made to achieve the objectives of the measure. A number of other measures proposed within the strategy will support this measure, such as strengthened planning requirements and improved public communications. If space is available for water storage from industrial or dewatering processes these should be constructed as a priority.

How

Risks addressed			
<ul style="list-style-type: none"> • Flooding • Water Stress • Natural Capital 			
Objectives			
1, 5, 7			
Co-benefits			
1 2 3 4 5			
Low			High
Cost			
1 2 3 4 5			
Low			High
Lead time	10 years		
Case Study:	Østerbro Climate Quarter, Copenhagen		
	"Faced with increasing rates of flooding, the Danish capital created the world's first climate-resilient district Østerbro Climate Quarter by implementing green infrastructure. This concept is cheaper to implement and maintain than expanding sewers, and it reduces the financial impact of extreme weather events. Should a storm-related flood hit the area, the integrated system of green streets and pocket parks will serve as retention areas and water basins. Local hills will function as the sides of a bowl, funnelling water to designated retention areas. Public squares will even be able to collect water from surrounding buildings' roofs and distribute the water locally, thanks to a new pipe system. When completed, 30% of rainwater is expected to be managed this way, instead of ending up in the sewer system. In total, 50,000 m ² of cityscape will become climate-resilient, natural urban infrastructure." Lessons learnt from this scheme, particularly in the aftermath to future storm events, will be valuable for developing expertise across northern Europe."		
Links to existing City Corporation activities			
	Existing and emerging Local Plan (note, SUDs and Urban Greening Factor requirements)		
	Open Space Strategy. City Public Realm SPD		
Links to other existing policies, plans and guidance			
	London City Resilience Strategy, GLA (Action A3 and B1)		
	London Plan, GLA		
	London Sustainable Drainage Action Plan, GLA		



RESILIENCE MEASURES

Increase the quality and provision of green space and coverage in the Square Mile and wider City Corporation spaces

- Preparatory
- Management
- Capital Investment
- Mainstreaming Initiative**
- Cross-cutting



Increase and enhance green infrastructure and coverage across the City Corporation area of influence through programmes of planting and restoration, stakeholder engagement and cross-council collaboration.

C40 Cities. (2016). Cool Cities: Good practice guide.
www.c40.org

Why

The UK has seen substantial changes to insect and species populations in the last years according to the UK Committee on Climate Change, with long-term decline in species richness of woodland ground flora and similar indicators of biodiversity decline found repeatedly. The City Corporation manages over 4,500 hectares, including designated Sites of Special Scientific Interest and the habitats of valuable urban species like Peregrine Falcons, bats and butterflies. These spaces also play a multi-functional role as green infrastructure – including in mitigating the Urban Heat Island effect and as sites of Sustainable Urban Drainage – and in supporting the health and wellbeing of visitors. As temperatures rise, these spaces will experience rising heat stress, volatile environmental factors and levels of pests and diseases, while high temperatures may also limit visitor access.

What

This measure is intended to safeguard and expand natural green spaces in the Square Mile and beyond, thus increasing their resilience to changing climatic factors and improving their ability to help alleviate intersecting risks covered in this study – such as flooding and overheating as well as supporting biodiversity. A comprehensive programme to enhance the quantity, quality and value of green spaces is suggested, which would include expanding greenery within the Square Mile public realm through application of the urban green factor, planting and habitat restoration programmes, encouraging local landowners to increase the quality and provision of planting on their properties and by establishing partnerships with surrounding boroughs and the GLA in order to contribute to green corridors and contiguous green spaces across London. This action should be carried out with overlapping measures such as the cool streets programme which focusses on planting for shading and cooling within the Square Mile and build on other streams of work that may already be underway in the City, for example through the City Corporation's Public Health directorate.

How

Fundamental to this action is the need to understand the level of greening required to combat risks of overheating, flooding and threats to natural capital as well as addressing local greenspace needs. When established, increasing green cover in and around the Square Mile can be realised through a range of mechanisms. For example, direct action in areas of City Corporation ownership and in conjunction with new development, through CIL and Planning Obligations (e.g. Urban Greening Factor requirements). This action should be supported by the outcomes of other proposed actions within this strategy and through engagement with landowners and surrounding local authorities. Green and blue infrastructure mapping and the ongoing biodiversity planning and research undertaken by the City Corporation and partners form a robust starting point for action.

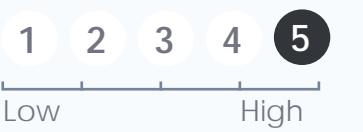
Risks addressed

- Flooding
- Overheating
- Natural Capital

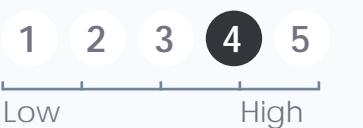
Objectives

- 1, 3, 4, 8, 9**

Co-benefits



Cost



Lead time

20 years +

Possible partnerships

- GLA
- Business Improvement Districts
- London boroughs
- Community forums

Case Study:

Tokyo - Nature Conservation Ordinance

Launched in 2001, this policy requires the greening of building roofs and walls in addition to ground-level greenings for all new construction and existing buildings undergoing renovations. Thanks to the Ordinance, more than 5,700 new or existing buildings have added about 1.8 million m² of green roofs. Research has shown interventions could reduce surface temperatures of buildings by 25°C and ceiling temperatures by 1-3°C. Success factors included strong regulatory authority and media outreach and advertised the Conservation Ordinance and compliance requirements widely. This partnership-driven approach to build the scheme could be effective in the Square Mile.

Links to existing City Corporation activities

- ☒ [London Biodiversity Action Plan](#)
- ☒ [Open Space Strategy](#)
- ☒ [Adopted and draft local plan](#)
(note, Urban Greening Factor requirements)
- ☒ [City Public Realm SPD](#)

Links to other existing policies, plans and guidance

- ☒ [London National Park City, GLA](#)
- ☒ [London City Resilience Strategy, GLA](#)
(Action A2)
- ☒ [Grey to Green Depaving Guide, GLA](#)



RESILIENCE MEASURES

Introduce climate-resistant and adaptive landscaping



If climatic conditions change substantially in future decades, landscaping in the Square Mile and natural spaces run by the City Corporation should be incrementally redesigned and developed to remain healthy and flourishing.

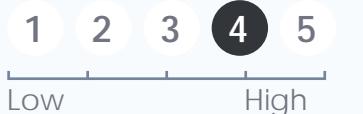
Forestry Commission. (2020). Trees for a changing climate.
www.forestreresearch.gov.uk

Preparatory
Management
Capital Investment
Mainstreaming Initiative
Cross-cutting

Risks addressed

- Water Stress
- Natural Capital

Co-benefits



Cost



Lead time

20 years +

Objectives

5, 7

Possible partnerships

- GLA
- Forestry Commission
- iTree
- Natural England
- London Climate Change Partnership

Why

The CCC UK notes that changing seasonal temperatures and rainfall levels will drastically alter growing seasons in the UK. Not only will many species become unsuited to hotter conditions and changing rainfall patterns, permanent variations to the seasons may require landscaping to alter substantially. As an example, the UK Committee on Climate Change describe that summer average temperatures above 22°C combined with winter averages over 7°C would represent a shift to a Mediterranean growing climate. These conditions would be seen in the Square Mile as soon as 2071 under high emissions UK Climate Projections 2018. As such, it is essential that landscape management plans for the Square Mile and City Corporation natural spaces are updated to incorporate these measures to allow a transition to a warmer climate

What

Landscape and habitat management plans for Corporation managed spaces should be reviewed to ensure that planting and vegetation within green spaces in the Square Mile and those run by the City Corporation are able to adapt to changing climatic conditions over time. This may include choosing the types and locations of trees carefully, considering how subsidence and root penetration would be affected by climate change. Drought-resistant landscaping schemes and 'low water gardens' in open spaces that may tolerate periodic reductions in irrigation should be introduced, designed and installed. SUDS schemes, rainwater harvesting and grey water recycling into schemes, as well as other green infrastructure elements, are also potentially valuable measures; synergies with other measures set out within this strategy should be identified. All plans should be reviewed by ecologists to ensure that existing species and habitats will not be negatively affected.

This is an adaptive measure in the pathways study. The Biodiversity Action Plan, existing Public Open Space Strategy SPD, City Public Realm SPD, Tree Strategy SPD, and Urban Green Factor study provide guidance on urban greening with some recognition of the need for climate resilient planting and landscape management. In addition, landscape and habitat management plans exist to manage and maintenance individual spaces. When these plans are reviewed it will be important to consider long term changes and to update plans over time. The Mediterranean landscape condition noted by the UK Committee on Climate Change is used as an indicative threshold, but ongoing monitoring, research and reviews should be used to investigate the state of natural capital and projected conditions throughout the next decade and action planned accordingly.

In the first five years an initial period of study is recommended to explore the impact of possible future conditions and possible open space and habitat responses. This should be followed by a series of pilot projects to explore implementation through new public realm schemes and updates to landscape and habitat management plans. These can assist in refining strategies and informing more detailed guidance and species planting guidelines. Findings from existing studies, such as those done a Burnham Beeches and Stoke Common, should be drawn upon, and used to inform future iterations of the Biodiversity Action Plan.

How

Links to existing City Corporation activities

- ☒ Biodiversity Action Plan
- ☒ Open Space Strategy
- ☒ City Public Realm SPD

Links to other existing policies, plans and guidance

- ☒ London Drought Response Framework, London resilience Partnership
- ☒ Sustainable Drainage Action Plan, GLA
- ☒ Trees for a Changing Climate, Forestry Commission



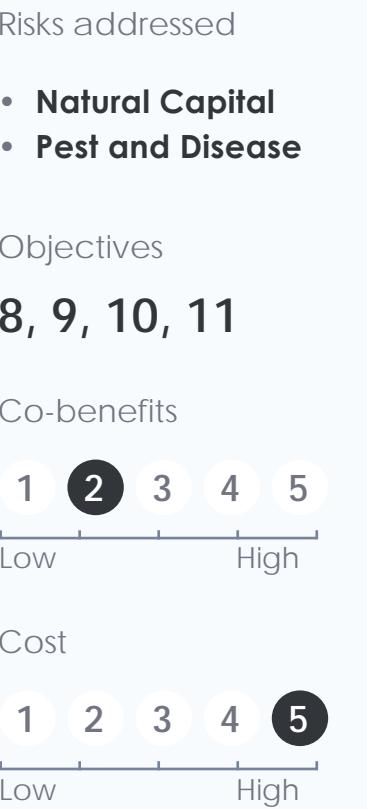
RESILIENCE MEASURES

Enhanced monitoring, surveying
and tracking of ecosystem health

- # Preparatory Management Capital Investment Mainstreaming Initiative Cross-cutting



Biodiversity reporting and surveys should be strengthened and expanded in order to support national monitoring and research programmes and to improve management of green spaces in the Square Mile and City Corporation parks.



Why

Species decline in the South East of England is anticipated to be severe under 4°C warming, a net loss of biodiversity richness is forecast. This trend is also seen in ongoing surveys: one study indicated that two fifths of species had seen a significant decline in recent decades in the UK. The City Corporation manages over 4,500 hectares of natural spaces, including large areas of dedicated Sites of Special Scientific Interest, while the Square Mile itself is home to numerous key urban species. Surveys and monitoring are a crucial mechanism for understanding the state of biodiversity, identifying possible risks (e.g. outbreaks of pests or diseases) and to enable their effective management.

In order to inform activities to protect and enhance these spaces (as proposed via other measures in this strategy), it is proposed that the City Corporation reviews and further develops its approach to monitoring, surveying and tracking ecosystem health. This should include three elements: 1) expanding the scope of biodiversity reporting to increase frequency, coverage and detail as necessary, 2) introducing regular independent surveys and studies of City Corporation natural spaces, and 3) establish a clear definition of ecosystem health to inform ongoing monitoring activities and action planning. A more robust system of monitoring against a key definition of ecosystem health would enable more effective natural capital management and allow responsive sharing of information with others. These strategies should be integrated with existing programmes – such as the reporting of disease and pests outbreaks to the UK Plant Health Risk Register.

What

This work would require an initial review of current approaches in line with best practice (as set out by Defra, the Environmental Agency, others) and of available and required funding. It is anticipated that much of this initiative may be funded through existing programmes focused on the management of open spaces, though some additional funding is likely needed. Roles and responsibilities within the Open Spaces team would need to be established, as well as procedures for managing information. Partnerships would be required for external surveys and potentially to establish an appropriate definition of ecosystem health, though the latter may be done by the City Corporation Open Spaces team. A programme of activities should then be designed and appropriate staff training rolled out under the City Corporation knowledge, skills and capacity programme.

How

Links to existing City Corporation activities

-  Biodiversity Action Plan
 -  Open Space Strategy
 -  City Open Space SPD

Case Study: Natural England Designated Sites

Natural England uses a comprehensive system of designated sites to track the quality and range of natural spaces across the UK. These are categorised into nature conservation areas, nature reserves, protected areas and more. Not only does this allow different regulations and policies to be designed according to the designation, it helps to develop sustainable community and ecotourism initiatives and for reporting and statistics. This approach to zoning is one that the City Corporation could utilise and could even absorb targets around different zones into its own surveys and planning.

Links to other existing policies, plans and guidance

- London Environment Strategy, GLA



RESILIENCE MEASURES

Strengthen water quality monitoring networks

Preparatory Management Capital Investment Mainstreaming Initiative



Expand coverage and increase frequency of water quality monitoring in City Corporation ponds and reservoirs to support the health of aquatic ecosystems and to improve responsiveness to algal blooms and high levels of toxicity.

UN Environment. (2018). A framework for freshwater ecosystem management. Volume 3: Case studies. wedocs.unep.org

Why

Air temperatures are projected to rise rapidly across Greater London and beyond under climate change, with summer peak daily temperatures exceeding 36°C as early as 2045, and heatwaves increasing in intensity and duration annually. High temperatures will also raise the temperatures of the numerous ponds and reservoirs owned by the City Corporation. At water temperatures of above 25°C, the risk of toxic algal bloom proliferation increases rapidly. This may have the further consequence of lowering water levels through evaporation and increasing concentrations of oxygen or pollutants, which can cause fish kills. Being reactive to these changing conditions through monitoring allows quick responses to acute conditions and better management of aquatic spaces. These risks also will heighten the risks of bacterial and pathogen survival in drinking water systems.

What

The City Corporation should increase the coverage of existing its water monitoring systems, as well as the frequency with which health of water bodies are monitored. To achieve this the introduction of additional sensors to provide real time monitoring may be explored. Similarly, more frequent surveys, especially in hot periods, and methods which allow crowd sourcing of site condition information may be explored. Such approaches would allow the City Corporation to better track the health of aquatic habitats impacts and more effectively manage the shocks and stresses that emerge with changes in climate. Such management measures may include the use of 'bio-bombs' or barley straw in water courses when required to absorb nutrients and prevent algal blooms. This measure should be aligned with the work of other measures proposed within this study, namely enhanced monitoring, surveying and tracking of ecosystem health.

How

A review of current water management practices should be undertaken by the Parks team and other relevant departments. A new system of monitoring as well as suite of possible management responses should be designed, potentially in partnership with others, which focus on risks from rising temperatures and changing rainfall patterns. Pilot studies are recommended to in order to test and refine new proposals prior to their full adoption and roll out. Once rolled out, appropriate training would be required for City Corporation staff. It is recommended that ecological status (as set out within the Water Framework Directive) is incorporated within water quality metrics in the new systems of monitoring and reporting. It is anticipated that a proportion of this initiative may be realised through the redirection of existing funding dedicated to the management of Open Spaces.

Risks addressed

- Natural Capital
 - Pest and Disease

Lead time

3 years

Objectives

10, 11, 16

Possible partnerships

- Environment Agency
 - Defra
 - Natural England
 - London Climate Change Partnership
 - London Wildlife Trust

Cost

Case Study

Eutrophication Management in Lake Balaton, Hungary

Many ecosystems suffer lasting impacts from various human activities, such as pollution. Reducing the causes of such impacts and successfully restoring ecosystems typically involves implementing long-term management plans with interim targets and the engagement of all stakeholders. This case study illustrates the restoration of water quality in Lake Balaton, Hungary. Though the primary driver of deteriorating water quality was pollution from human activity in this case study, the framework adopted provides a useful framework that may basis for managing impacts associated with a changing climate. The importance of monitoring programmes that are directed at managing natural resources and implementing resource management based on monitoring is stressed within this. The use of "citizen science" is cited as a useful tool to support monitoring efforts but should not replace ecological surveys and assessments.

Links to existing City Corporation activities

- ## Biodiversity Action Plan

Open Space Strategy

City Open Space SPD

Links to other existing policies
plans and guidance

-  London Environment Strategy, GLA



RESILIENCE MEASURES

Action to tackle food poverty

Preparatory
Management
Capital Investment
Mainstreaming Initiative
Cross-cutting



Develop programmes and partnerships to reduce food inequality in the Square Mile and communities connected to City Corporation assets to compliment national welfare programmes, aiming to build resilience and reduce food insecurity and poverty.

Sustain. (2018). Good Food in Greenwich Food Poverty Action Plan.
www.sustainweb.org

Why

Food poverty is as high as 28% across London, with stark divisions across racial and geographic lines, and with poverty rates 10% higher in inner London than in many parts of the North of England. These patterns and levels of insecurity are set to be strongly influenced by projected volatility in food supplies and prices as global events and agricultural patterns shift in line with disrupted climatic systems. Impacts of such events may range from changes to general availability and affordability of specific products to more acute food shortages and volatile pricing. The City Corporation's role through the wholesale markets may be substantial here, as will being prepared to support communities affected by such trends, namely local residents and workers in the Square Mile and in City Corporation assets across Greater London, will be an essential component of climate resilience planning for the City Corporation.

What

The purpose of this measure is to build a coordinated strategy to cope with potential food insecurity patterns in coming years. Identifying key vulnerabilities in the food system and at-risk communities alongside a review of options to support them would enable the development of a robust resilience plan. Measures may include food banks, financial support packages, strategies to smooth deliveries and ensure distribution in times of shortage and working to connect patterns of food insecurity with regional agriculture initiatives that may be supported by other measures set out within this strategy. It may also be appropriate to expand access to nutritious, low-cost food choices through guidance and regulations for street and wholesale markets, and to connect food banks with circular food management planning under related measures.

How

Initially, within this action it is proposed that a clear understanding of current and future challenges faced by those experiencing food poverty is established through engaging those in need via public health, adult social care, early help programmes and charitable sector. Links may exist with the food redistribution and growing measures also planned. This may be achieved through multiple methods, such as desktop research and stakeholder engagement, but will be fundamental in defining the action areas and required outcomes. This measure should be an ongoing process of research, review and planning linked to existing strategies. Forecasts of food shortages and challenges should be monitored as part of emergency planning and preparedness to inform this work, with potential responses to shocks and stresses budgeted for as soon as possible. Partnerships would be key and actions may be funded in partnership with others.

Risks addressed	Lead time										
• Food	Ongoing										
Objectives	Possible partnerships										
12	<ul style="list-style-type: none"> • London Food Board • UK Committee on Climate Change • Retailers • Defra's Food Chain Emergency Liaison Group 										
Co-benefits											
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1	2	3	4	5							
Low				High							
Cost											
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1	2	3	4	5							
Low				High							

Case Study: **Food Poverty Action Plan, Royal Borough of Greenwich**

In the light of increasing national and London-level evidence of rising levels of food poverty, the Good Food in Greenwich Food Poverty Subgroup took the decision to evaluate the local situation in 2015, to have a firm basis from which to develop further strategic action to address this problem. The published action plan contains a range of measures, such as maximising opportunities for low income households to improve their financial situation and manage conflicting demands on income, ensuring access to advice and support services, supporting community meals provision to vulnerable groups and annual monitoring of food poverty levels in the borough. The importance of the local environment in supporting good health and wellbeing is cited in the Joint Health and Wellbeing Strategy, this would be supported by a food poverty strategy.

Links to existing City Corporation activities

- ☒ **Joint Health and Wellbeing Strategy**
- ☒ **Joint Strategic Needs Assessment**

Links to other existing policies, plans and guidance

- ☒ **London City Resilience Strategy, GLA**
(Action A4)
- ☒ **Beyond the Food Bank, Sustain**
- ☒ **Good Food for London, Sustain**



RESILIENCE MEASURES

Support mutual aid and community aid groups

Preparatory
Management

Capital Investment

Mainstreaming Initiative

Cross-cutting



Support the work of existing community and mutual aid groups working within the Square Mile and the neighbourhoods surrounding the City Corporations wider asset portfolio.

LA Mayor. (2018). Resilient Los Angeles.
www.lamayor.org

Risks addressed
• Cross-cutting

Objectives

19

Co-benefits



Cost



Lead time
Ongoing

Possible partnerships

- GLA
- Mutual aid networks
- Resident Associations
- Public Health England
- Business Improvement Districts

Case Study:
Stewards of Los Angeles, USA

As part of a major series of measures around education and resilience, Los Angeles' resilience strategy includes the measure 'Develop the next generation of stewards of Los Angeles to be leaders in climate and disaster resilience'. This program involves close collaboration with the LA Unified School District to build young peoples' awareness of resilience issues as well as skills in science, technology 'and other fields critical to addressing these challenges.' The Square Mile is home to several schools, and the City Corporation manages other academic assets across London which could present opportunities to work on a similar young leaders programme

What

The City Corporation should engage key mutual aid and community-based organisations in an open dialogue about their work, challenges faced and opportunities address these. This should be supplemented through engagement with the resident network, to understand their needs. It should be ensured that those engaged are representative of the City Corporation's diverse user base, ensuring those most vulnerable to the effects of climate change are represented. Based on a robust understanding of needs, the City Corporation would then design a programme of support for mutual aid and community groups. In order to fund this, a range of options should be considered and may, for example, seek to draw on the Corporate Social Responsibility strategies of businesses operating within the Square Mile. An appropriate governance and project management system would be required to ensure funds (where given) are appropriately spent and that lessons are learnt to enable continuous performance improvement.

How



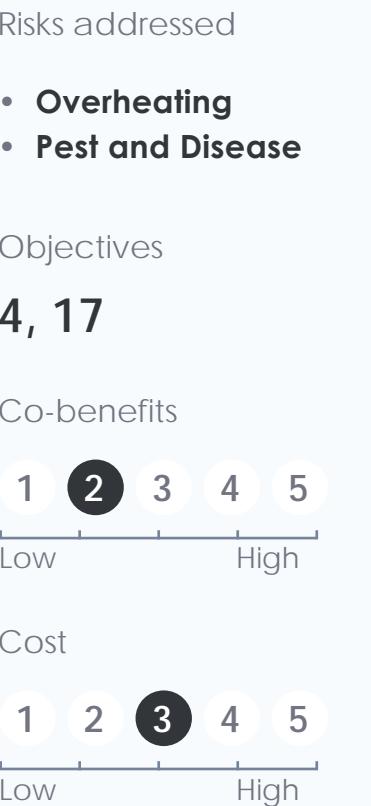
R E S I L I E N C E M E A S U R E S

Climate-ready, fortified public health programmes

- Preparatory**
Management
Capital Investment
Mainstreaming Initiative
Cross-cutting



Establish a healthcare programme to manage City Corporation activities related to building resilience to health-related climate impacts.



Why

Climatic changes are projected to cause major healthcare shocks and stresses. Rising temperatures will increase heat-related ill health, particularly during increasingly intense and frequent periods of heatwave. Milder and wetter winters will facilitate increased disease vector populations and the introduction of emerging infections, while shifting agricultural patterns due to growing season changes and geopolitical events threaten risks to nutrition and diets. Extreme weather events and floods may pose further risks to health during immediate emergency events.

What

The City Corporation should develop a coordinated strategy to outline its responsibilities and influence in managing healthcare efforts connected to these risks. This may have three distinct areas:

- Fortification of public health programming – planning to protect healthcare critical infrastructure and leverage partnerships with public health organisations to improve the resilience of community health and wellness services. This may extend to updating public health-related guidance, education programmes and hazard planning in line with UK Committee on Climate Change guidance on vector borne diseases and climate-related risks and integrating Public Health England guidance on heatwaves and extreme weather into City Corporation public communication channels. As part of this measure planning to meet increased demands placed on services as a result of shock or stress events should be developed.
 - Develop and fund first aid education for City Corporation residents and workers – deliver first aid education to residents in City Corporation areas, to support community-level resilience and preparedness during shock events and emergencies.
 - Planning for social care during extreme weather and resilience shocks – planning to deal with impacts on health and social care delivery from extreme weather, with contingency strategies in place to enable operations to run smoothly despite loss of infrastructure or in crisis events.

This measure should be developed in collaboration with Public Health England and other healthcare professionals. It should start with a review of the City Corporation's existing Health and Wellbeing Strategy and supporting plans to identify where the impacts of climate change require further consideration. In response, a programme of activity under each of the three areas outlined above should be developed. The intention should not be to reproduce information already available but to collate the most relevant information, use this to inform strategies and disseminate as appropriate, and to define additional actions as necessary. Due consideration of the diversity of the users is imperative. Regular review, testing and updates to the plan would then be essential in following years, through updates to the Joint Health and Wellbeing Strategy and with reference to changing healthcare advice.

How

Links to existing City Corporation activities

Joint Health and Wellbeing Strategy

Links to other existing policies, plans and guidance

London City Resilience Strategy, GLA (Action A1)

Heatwave Plan for England, Public Health England



RESILIENCE MEASURES

Strengthen community and business networks to build adaptive capacity

Preparatory
Management

Capital Investment

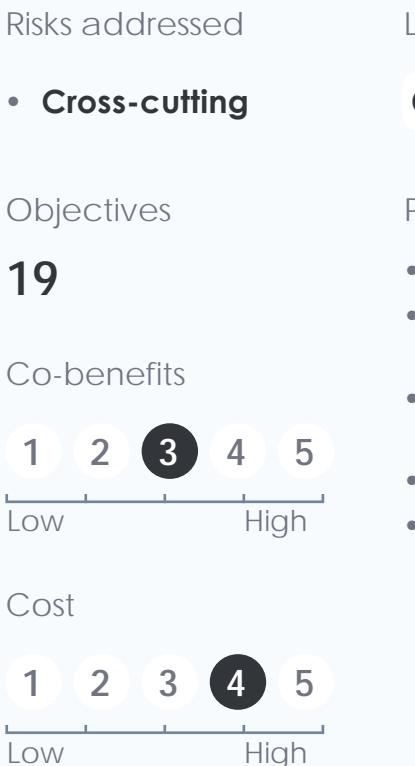
Mainstreaming Initiative

Cross-cutting



Development of streams of work dedicated to supporting community initiatives, grassroots projects and small business and resident networks with a focus on resilience goals.
These will be essential areas to build adaptive capacity, cultivate engagement with resilience measures, and to appropriately design and implement effective strategies.

LA Mayor. (2018). Resilient Los Angeles.
www.lamayor.org



Why

The primary function of measures within the strategy is to safeguard the health, wellbeing and productivity of all users, residents and businesses in the Square Mile and wider portfolio of City Corporation assets. As such, their engagement, feedback and insight will be essential in order to design effective, targeted strategies, and especially to ensure the accessibility and inclusivity of all measures. Communities and small businesses are agile, indeed many are taking action right now, the City Corporation should support this.

What

This programme should involve three key areas. Firstly, the identification and implementation of measures to improve social cohesion and community networks. Through increasing cohesion and strengthening networks it is hoped that the adaptive capacity of communities will be built. Secondly, programmes to support grassroots resilience projects are proposed. Through these, communities will be able to access financial and technical resources to aid the design and implementation of projects identified as necessary and valuable. Finally, the programme should build on the success of existing business and resident networks to ensure that such forums can be used to share knowledge and experiences aimed at improving resilience. Through this, organisations would be able to share experiences to support one other as well as to develop collective preparatory and response strategies.

It is intended that this programme integrates within existing networks and activities of the City Corporation. Partnerships with others, like the London Resilience Partnership, may also be useful. A number of existing financial resources may be drawn upon to deliver the programme such as philanthropic funds and in-kind contributions from business Corporate Social Responsibility obligations and volunteering programmes and partnerships with the BIDs. The City corporation through the proposed Climate readiness programme would help to structure the programme and act as an exchange to match partners to projects and initiatives. Clear communication would be required to ensure that residents and businesses understand what resources are available to them through the programme and ensure that all can access these with ease.

How

Links to existing City Corporation activities

Statement of Community Involvement

Links to other existing policies, plans and guidance

London City Resilience Strategy, GLA (Action B8)



RESILIENCE MEASURES

Emergency support and contingency planning for food networks and businesses

Preparatory

Management

Capital Investment

Mainstreaming Initiative

Cross-cutting



Develop business support packages for local food and drink organisations during periods of food shortage or food price volatility.



Objectives

13, 14, 15

Co-benefits



Cost



Why

Agricultural trade and food infrastructure systems are likely to be more volatile with changes in future climate. A combination of acute shocks ranging from increasingly frequent and intense extreme weather events to geopolitical conflicts are likely to be causes of such volatility for example. The result may be changes to food supplies, food shortages and volatile pricing which may hit the City Corporation's wholesale food markets, diverse system of local food vendors, restaurants, bars and businesses in the Square Mile significantly.

The City Corporation should work with wholesale market traders, local businesses and suppliers to raise awareness and enable them to develop appropriate contingency and preparatory planning for periods of food shortage and in response to food price volatility. Contingency and preparatory planning should seek to develop guides which can be used by traders and businesses to develop their supply chain resilience plans and identify the level of business disruption insurance required for their needs. Opportunities for businesses to share ideas through existing forums and the Business Improvement Districts should also be identified. It is anticipated that a number of the larger retailers will have existing plans in place.

As part of its contingency planning, the City Corporation may seek to consider possible business support packages from its reserves which could provide temporary loans or other support which may be accessed in response to price volatilities.

What

These packages should be designed with the collaboration of local businesses and infrastructure networks to ensure that packages are targeted and effective. Existing business networks may provide a useful forum to begin debates, with a separate working group formed from this. Outcomes from additional studies undertaken the City Corporation should be shared and disseminated to inform the development of support packages.

How



RESILIENCE MEASURES

Develop financial package and programme to manage resilience actions



Development of a robust framework that sets out the financial mechanisms that will be used to deliver the ambitions of the Climate Action Strategy, and those supporting measures.

European Investment Bank. (2016). Italy: EIB lends Municipality of Bologna EUR 50 million for public works.
www.eib.org

Why

Delivering the strategy comes with significant costs to the City Corporation over the short, medium and longer term.

Acting now however is vital to avoiding higher future costs that may be incurred through not keep pacing with the level of change.

through this measure it is recommended that the City Corporation develop a robust and diverse set of packages and programmes to enable the financing of the measures adopted as part of this study and broader Climate Action Strategy as a City Climate Fund. This should include a portfolio of mechanisms that blend internal funds with external sources of finance. In addition to making use of existing internal and external funds, the unique role of the Square Mile as a financial centre represents an opportunity to develop and showcase new financial and insurance-based solutions to climate change. Within the fund various programmes would link with the actions identified within this strategy such as the proposed Climate Readiness Fund.

What

A funding and financing strategy to deliver the Climate Strategy would be developed. It is understood that a number of the measures within the plan can be delivered through budgets already committed by the City Corporation with amendments to the programmes that these funds, and thus at no or low net additional cost. Mechanisms such as those below are used to fund projects that are well aligned to a number of the measures in the adaptive pathways: City Cash, City Funds, Community Infrastructure Levy's and the Capital Bid process. A number of external finance opportunities exist, for example through national and GLA funding programmes, better alignment of resilience objectives with the Business Improvement District priorities or loans from entities such as the Public Works Loan Board or European Investment Bank. Land based finance is also a possible option where the improvements to be made would lead to an uplift in property values which could be delivered through a tax increment finance mechanism. Other opportunities may include working with TCFD (Taskforce on Climate-related Financial Disclosures) early movers, establishing voluntary funds supported by businesses that be drawn down from, or aligning business CSR (Corporate Social Responsibility) or ESG (Environmental, Social and Governance) activities.

How



RESILIENCE MEASURES

Embed principles of inclusion and equity throughout all climate action strategies

- # Preparatory Management Capital Investment **Mainstreaming Initiative** Cross-cutting



Ensure that climate resilience and action strategies are delivered equitably, inclusively and in the interest communities with different needs and vulnerabilities through a review of existing policies and plans and the introduction of oversight measures and assessments for future policy.

C40 Cities. (2019). Cities 100.
www.c40knowledgehub.org

Why

It is well documented that the impacts of climate change are not evenly distributed and tend to be felt harder by vulnerable groups who have fewer resources to draw upon. Furthermore, climate mitigation and adaptation actions are not always equitable and the benefits and costs of action could also be uneven. The Square Mile's population of residents, workers, learners and visitors is diverse, as are their needs. This is also true of the City Corporation's wider asset portfolio. Action to adapt and build resilience to the impacts of climate change must be inclusive and equitable, in line with the Public Sector Equality Duty.

The aim of this measure is to ensure that inclusion and equity is embedded within each measure of the strategy. It is intended that through this, actions undertaken through the proposed measures can be focused on meeting the needs of the most vulnerable first. The City Corporation should review all climate resilience policies and actions in their implementation to ensure that these principles are embedded through appropriate appraisal and equality impact assessment tools which consider socioeconomic, distributional and equalities impact and the opportunities presented by initiatives for engagement with marginalised groups and to reduce inequalities and promote social inclusion. This might include reviewing the accessibility of measures to marginalised groups, ensuring that infrastructure and spaces are accessible and adaptable for different uses. A consistent oversight mechanism should be developed to ensure that subsequent implementation of plans, new policy and strategy is similarly reviewed in terms of its accessibility, engagement with vulnerable and marginalised stakeholders, and to support the prioritisation of outcomes that consider the scale and range of co-benefits in terms of the social return on investment. Oversight mechanisms may include a dedicated internal reviewer(s) and a stakeholder engagement forum which is consulted on during the development of new resilience initiatives.

What

Setting up this measure would require a review of internal project development, gateway and procurement processes. Transparency throughout this process will be essential to support feedback and engagement with those who this measure intends to support. The City Corporation should ensure that oversight and monitoring for mitigation strategies are aligned, and all new measures integrated fully with existing oversight procedures, so they are valued and effective.

How

Links to existing City Corporation activities

- ## **☒ Equal Opportunities Statement ☒ Existing and emerging Local Plan**

Links to other existing policies, plans
and guidance

- ☒ Equality, Diversity and Inclusion Evidence Base for London, GLA
 - ☒ Inclusive London, GLA
 - ☒ Inclusive Climate Action programme studies, C40 Cities



RESILIENCE MEASURES

Mainstream climate resilience into City Corporation governance and decision-making

Preparatory

Management

Capital Investment

Mainstreaming Initiative

Cross-cutting



Review, refine and develop all governance and decision-making processes to embed climate resilience as a key component, improving the capacity of the City Corporation to prepare for and manage shocks and stresses.

Grayson, David. (2011). Embedding corporate responsibility and sustainability: Marks & Spencer. Journal of Management Development. 30. 1017-1026. 10.1108/0262171111182510. www.researchgate.net

Why

The extent to which the climate will change by the end of the century is a complex science with much uncertainty. Similarly so, the nature of the risks and the associated impacts of these are complex and diverse. What is clear, is that even with the most ambitious carbon reduction scenarios, the climate will continue to change. An effective response to climate resilience and adaptation will necessitate coordinated action to be taken on across all City Corporation departments, functions and assets.

A governance framework to manage Climate risk associated with the City Corporation functions and activities should be defined so that there is clear responsibility and accountability for managing this risk throughout the city corporation.

Action should start with a detailed and thorough review of how climate resilience is currently embedded in all key aspects of the City Corporation operations. This may be in capital programme delivery and policy-making as well as the strategic vision and development plans of the organisation. Moreover, each of the key risks identified when this study should be considered. Based on the outcomes of this review, key strengths and weaknesses should be identified to inform subsequent actions and the introduction of measures that ensure effective and coordinated responses to climate resilience. Progress against key climate resilience objectives should be reported regularly to Members and where appropriate included in external reporting.

What

As with any strategy clear ownership, roles and responsibilities within the Adaptive Pathways Strategy would be vital to its success – within the main body of the report, a recommended structure has been proposed. Moreover, some of the actions would require close cross boundary and interagency working. The City Corporation would need to work with others to shape the strategic agenda within London and beyond. This must include engagement with those local authorities where City Corporation assets lie outside of the Square Mile and may be combined with other areas of the Climate Action Strategy including climate mitigation and biodiversity improvements.

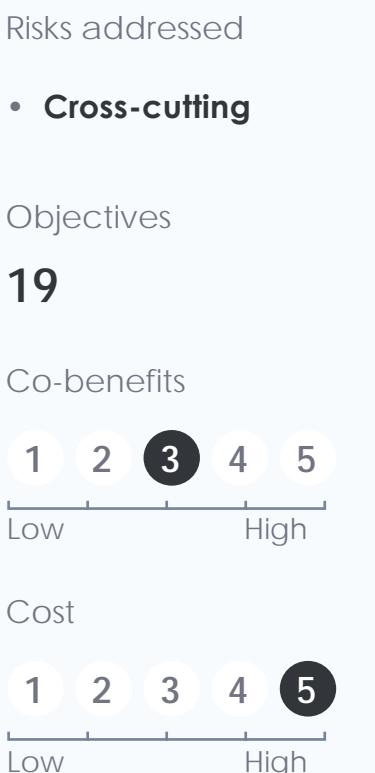
How

Links to existing City Corporation activities

 Climate Action Strategy

Links to other existing policies, plans and guidance

London City Resilience Strategy, GLA (Action B8 and C2)





RESILIENCE MEASURES

Public communications and awareness raising campaigns

Preparatory
Management
Capital Investment
Mainstreaming Initiative

Cross-cutting



A dedicated communications programme to coordinate City Corporation resilience activities, raise resident and business awareness of shocks and stresses and to disseminate guidance and educational materials.

Risks addressed

• **Cross-cutting**

Objectives

19

Co-benefits

1 2 3 4 5

Low

High

Cost

1 2 3 4 5

Low

High

Why

Making sure that residents and business owners in the Square Mile and City Corporation assets are aware of planned activities is essential and should enable dialogue to ensure that plans and strategies are designed in collaboration with those directly affected by them. Communication is also critical to enabling residents and businesses to take preparatory action, with the development of educational and public-facing guidance materials a powerful way to support dialogue with those directly affected by resilience impacts and measures, encouraging their involvement with the design and critical analysis of such actions.

What

The City Corporation should mainstream climate resilience educational materials and guidance into its existing public communications strategies, with new platforms built as required. Resilience preparedness guidance and toolkits for residents and businesses, encouraging actions and planning that improves resilience, both in the short, medium and long term and for disaster recovery should be prepared. These may include workforce training, mitigation and planning resources, and strategies for dealing with rising temperatures in buildings and common activities such as food preparation. To do this, partnership with bodies such as the Public Health England and Transport for London would be required to coordinate messaging, as would engagement with businesses, cultural institutions and academic centres to embed resilience into programming and campaigns. This would spread awareness of resilience issues and nurture political leaders, knowledge entrepreneurs, and social movements and help to grow and enhance City Corporation goals. Finally, events and actions taken by others should be shared and championed (e.g. Thames Water drought and water use awareness communications).

How

The communications programme would be funded by the proposed Climate Readiness Programme. Existing platforms should be reviewed to identify appropriate channels for the various types of information (e.g. public health, educational, otherwise) to be communicated. This should be supported by a study to understand the diverse needs of users as well as to inform how information may be best communicated and targeted. All information should be available to users via a variety of platforms and free to access. Relevant information to be communicated should be identified early and updated frequently so that programming of communications can be planned. It is proposed that this measure supports the initiatives set out within the wider Climate Action Strategy. The intention should not be to duplicate information services or work done by others, but to ensure the highest number of individuals within the City Corporation target audiences are reached.

Links to existing City Corporation activities

- [City Risk Register](#)
- [Contingency Planning Team](#)

Links to other existing policies, plans and guidance

- [London City Resilience Strategy, GLA \(Action A5\)](#)
- [Heatwave Plan for England, Public Health England](#)



RESILIENCE MEASURES

Strengthen City Corporation
knowledge, skills and capacity

- # Preparatory Management Capital Investment **Mainstreaming Initiative** Cross-cutting



Review existing knowledge, skills and capacity of the City Corporation in relation to climate resilience and the wider Climate Action Strategy, identifying future needs in order to support the successful implementation of the strategy.

Innovate UK. (2020). Knowledge Transfer partnerships:
what they are and how to apply.
www.ukri.org

Why

The climate resilience measures proposed within this strategy, as well as the additional actions within the broader Climate Action Strategy, will cut across City Corporation departments. There will be multiple measures to deliver in parallel, whilst some measures will be well understood, further understanding of others may be required. The successful delivery of the strategy will require the City Corporation to ensure that there are adequate resources available, as well as appropriate skills and knowledge within the City Corporation, to manage the coordination and implementation of resilience measures.

What

The City Corporation should undertake an internal review of the climate resilience measures to understand both the resource and knowledge requirements of the strategy. Based on this, the City Corporation should define a programme of skills sharing, learning and development, and where necessary hiring, to address any key gaps that are identified. As part of this measure, it is recommended that further skills and development needs across the City Corporation are considered. For example, it is proposed that guidance manuals and check lists are produced for Planning Officers to help them identify what should be provided by developers when submitting development applications, this may be supported by training. This measure aligns with the recommendations of others within this study (e.g. mainstream climate resilience into City Corporation governance and decision-making) and should be done in parallel.

How

It is proposed that this measure is considered as part of the wider recommendations around governance. The City Corporation has a number of highly skilled individuals across departments. Whilst the Climate Action Strategy may be led by one department, it will cut across many. It is recommended that skills and development needs across the City Corporation are considered and responsibilities are distributed across departments. This in turn will help to build capacity of the City Corporation whilst reducing the dependency on any one department which may lead to challenges. The internal review should look at the short-term measures within the Climate Action Strategy, map needs to available expertise and roles. As part of this the City Corporation may also need to identify key actions – such as the production of guidance documents or commissioning of evidence base studies – and coordinating ongoing work in the Environmental Resilience Team that also sit within this measure.

Risks addressed	Lead time	Case Study:	Knowledge Transfer Partnerships
• Cross-cutting	2.5 years		
Objectives 19	Possible partnerships <ul style="list-style-type: none"> • GLA • London Climate Change Partnership • Public Practice. • Innovate UK. • Academic partnerships. 	The Knowledge Transfer Partnership programmes pair organisations and academics to develop practical research and action programmes. One case in 2005 involved Queen's University Belfast supporting RPS Ireland Ltd, a consulting engineering firm, to develop ecological expertise and environmental risk assessment tools to implement the Water Framework Directive. This is a valuable example of how cross-sector partnerships can build cutting-edge knowledge and research implemented practically to achieve environmental objectives. The City Corporation could establish similar mechanisms or support similar work in the interests of building expertise	
Co-benefits 1 2 3 4 5 Low High			
Cost 1 2 3 4 5 Low High			



R E S I L I E N C E M E A S U R E S

Expand use and availability of non-sensitive data

Preparatory Management Capital Investment **Mainstreaming Initiative** Cross-cutting



Make available non-sensitive data for external stakeholders and other local authorities which may be of use in the planning of resilience strategies. This publicly available data set will contribute to improving joined up development and resilience planning amongst stakeholders, facilitating data-driven decision-making across London.

Cabinet Office. (2020). National Underground Asset Register Project Update.
www.gov.uk

Why

The risks posed by climatic change, and the intersecting measures required to tackle such risks, require collaborative, multi-agency, cross-disciplinary engagement. It is essential that organisations, research institutes and individuals are able to work together and take informed, connected decisions that align with goals to radically reduce carbon emissions and build resilience. Publicly available datasets related to climate, physical space and its utilisation and socioeconomic characteristics is hugely useful to facilitate such joined-up thinking.

What

The City Corporation should work to continue and to expand its repository of published data on the Square Mile and its assets in the interest of supporting planning, research and climate mitigation and adaptation efforts. This might include continuing to release mappings of building typologies and usage to make flood mapping freely available and releasing analysed climate data for the Square Mile in excel format. The City Corporation should also work to review and release as yet unpublished data around planning, building types and historic records where sensitivity and legal limitations allows. The intention is not to duplicate datasets published by others, but to provide complementary data not otherwise available.

How

The City Corporation currently releases a large amount of data on the gov.uk data repository and its own platforms. A review should be carried out to consider which other data and records may be in the public interest with regard climate action, and to consider whether the current structure of data formatting and circulation is the most accessible. This may include reviewing options for a new online platform or considering existing databases and tools like the Geospatial Commission Underground Asset Register and other initiatives. Stakeholder engagement should be carried out to discuss where utility, infrastructure and corporate data would be of use to make more widely available, and to identify where new data collection would be useful to support projects and planning. In line with the Climate Action Strategy, the City Corporation may consider adding identifiers to relevant data series.

The initiative could be funded by the proposed Climate Readiness Fund or existing departmental resources.



RESILIENCE MEASURES

Emergency Planning

Preparatory

Management

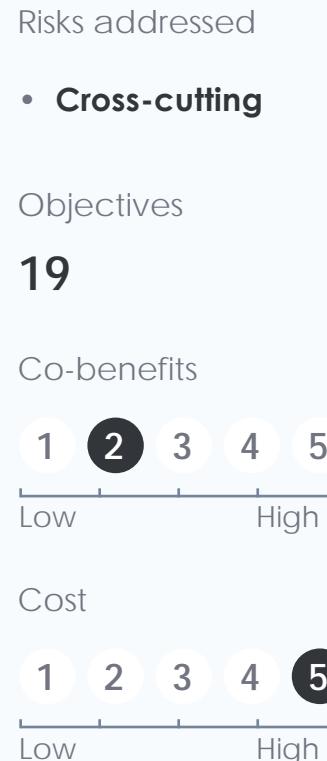
Capital Investment

Mainstreaming Initiative

Cross-cutting



Update and maintain a comprehensive series of emergency plans to support Square Mile resilience to extreme weather events and other shocks.



Why

With changing climatic conditions, the risk of extreme events and shocks are projected to rise in future years. This includes such diverse risks as food shortages due to extreme weather or geopolitical events impacting agricultural systems, flooding, heatwaves, droughts and pest and disease outbreaks. During such events it is essential that the City Corporation is able to respond quickly and effectively.

To build emergency plans such that they are resilient to climatically driven risks, the City Corporation should undertake two actions:

- Undertake a review of system resilience under previous shock events – reviews of shock events with independent oversight such that lessons can be learnt and incorporated into future emergency planning. These should draw on interviews and engagement with local communities, workers and businesses to gain insight from those directly affected by the situation. Existing reviews of previous events should be reanalysed to consider the role of climate resilience and future projections.
 - Review and strengthen existing emergency planning procedures – existing emergency planning strategies and procedures for all risks should be reworked, including the development of short, medium and long-term post-disaster housing plans, partnerships to provide critical services to vulnerable communities in times of crisis, water and food distribution points and transport strategies, delivery and public transport access routes in periods of stress and shock, flood scenario planning, loss of infrastructure planning, funding allocation for disease outbreaks, temporary accommodation after floods and more.

What

Emergency planning reviews and procedures should be carried out internally, with a robust external oversight strategy. It would be essential to centre the experiences of residents, local businesses, infrastructure providers, emergency responders and Square Mile users in these reviews.

This would capture insights from those directly affected by shocks and those with expertise in how to deal with them appropriately. Where possible, analysis should be referred to potential future shock scenarios – such as higher temperatures, longer heatwaves, larger flood plains – to make plans flexible to a range of possible events.

How

-  **City Risk Register**
 -  **Contingency Planning Team**
 -  **Joint health and Wellbeing Strategy**

Links to other existing policies, plans and guidance

- ☒ London City Resilience Strategy, GLA
(Action A2 and B8)
 - ☒ London Severe Weather and Natural Hazards Response Framework, London Resilience Partnership



RESILIENCE MEASURES

Continue to fund flood modelling, which include SUDs and other mitigation strategies, to complement EA flood models

Preparatory

Management

Capital Investment

Mainstreaming Initiative

Cross-cutting



Continue to develop studies and models to inform flood risk and the Strategic Flood Risk Assessment (SFRA) for the Square Mile.

BlueGreenCities. (2020). Delivering and Evaluating Multiple Flood Risk Benefits in Blue-Green Cities. WP5. Newcastle – the demonstration city.
www.bluegreencities.ac.uk

Risks addressed

- Flooding

Objectives

1

Co-benefits



Cost



Lead time

Ongoing

Possible partnerships

- Environment Agency
- London Climate Change Partnership
- GLA
- London Councils

Case Study:

Blue-Green Cities Demonstration, Newcastle-upon-Tyne

Following major flood events and struggling local drainage systems, Newcastle was selected for the Blue-Green Cities SUDs demonstration study in 2013. They modelled blue-green infrastructure such as roofs, permeable areas, swales and water butts extensively. The research demonstrated that such initiatives quantitatively reduced flood risks, with high local interest and satisfaction (90%), with benefits to sequestration, habitats, air pollution and noise. The use of computer modelling was central to this study, and enabled the project to cheaply and quickly plan a new strategy and highlight zones of flood risk.

Links to existing City Corporation activities

Riverside Walk Enhancement Strategy
Strategic Flood Risk Assessment 2017

City Open Space SPD

Links to other existing policies, plans and guidance

Drain London Plan, London Climate Change Partnership
 Thames Estuary 2100 Plan, Environment Agency

Why

Periodic flood risk assessments are carried out for the Square Mile as part of the Strategic Flood Risk Assessment process. This looks at risk of flooding to properties and infrastructure in the Square Mile from surface water flooding (including rainfall, sewer flooding etc), river wall breaches and groundwater flooding. It provides detailed information to developers and residents and can be used to collate the results of studies projecting future flood risk.

What

The City Corporation should continue to fund additional modelling, assessment and flood risk management options work to support the SFRA and City Plan implementation with a particular focus on groundwater risk and vulnerability and changing flood risk under climate change to support planning and flood resilience strategies. Assessment and models should explore options for new water infrastructure such as strategic SUDs, roof top greening, catchment greening and afforestation, upstream river retention and storage, combined sewer widening and relief tunnels, and more as relevant. This would fill essential gaps in understanding and support the City Corporation with decision-making in relation to the infrastructure and management options to be considered for funding and implementation.

How

This work would require close collaboration with the Environment Agency to highlight key gaps in understanding and to coordinate studies commissioned with their own research. The results should be updated in line with Local Plan review and SFRA periods (every 5 years), and changes to understanding clearly communicated to the public and incorporated in City Corporation plans. This action could be integrated within the existing modelling and as such might be delivered with little additional cost.



RESILIENCE MEASURES

Review above and below ground space utilisation in the Square Mile



Commission a study to understand the utilisation of space and infrastructure above and below ground throughout the Square Mile to identify potential opportunities as to how underutilised space may be better used to improve climate resilience.

Growing Underground. (2020). Growing Underground.
growing-underground.com

Why

Many actions to increase the resilience of the Square Mile and City Corporation assets require changes to physical spaces or revisions to how public realm areas are used. Examples include increased urban greening, incorporation of water storage and recycling infrastructure or the creation of cool pedestrian and cycle routes. The effective planning and delivery of such interventions may be supported by a detailed understanding of space utilisation across the city.

What

The City Corporation should carry out a detailed space utilisation review and analysis of the Square Mile in the interests of identifying possible areas of underutilisation that may be better used when planning and later delivering resilience interventions. The interventions should be defined by the outcomes and needs of other measures within the strategy. The outcomes of the study should be shared broadly to ensure that all actors in the Square Mile can consider the opportunities available to them, though clear priorities for particular spaces – with a focus on building resilience – should be established.

How

The success of this measure would depend on stakeholder engagement. The study would require an extensive mapping of information, some of which would be accessible to the City Corporation (e.g. those made publicly available via the GLA and ONS), some of which would not. The support of landowners and utility providers would be key. Where the initiative is pursued, it is suggested that key landowners are identified and engaged with early in order to share data needs and availability.

Risks addressed	Lead time	Case Study:	Links to existing City Corporation activities
• Cross-cutting	3 years	Growing Underground, London	 Existing City Corporation GIS database
Objectives 19	Possible partnerships <ul style="list-style-type: none"> • GLA • ONS • Utility providers • Business Improvement Districts • Ordinance Survey 	"At Growing Underground, we sustainably grow mouth-wateringly fresh micro greens and salad leaves 33 metres below the busy streets of Clapham. Using the latest hydroponic systems and LED technology, our crops are grown year-round in the perfect, pesticide-free environment that these forgotten tunnels provide. Thanks to a controlled environment, each tiny leaf tastes as amazing as the last. Our greens are unaffected by the weather and seasonal changes, and thanks to our prime location, we reduce the need to import crops and drastically reduce the food miles for retailers and consumers." This technology is proven in London, and as such could be a consideration for underground growing in the Square Mile.	Links to other existing policies, plans and guidance
Co-benefits 19			 Meanwhile in London, Centre for London
Cost	1 2 3 4 5 Low High		
Cost	1 2 3 4 5 Low High		



RESILIENCE MEASURES

Ports and markets operational resilience planning

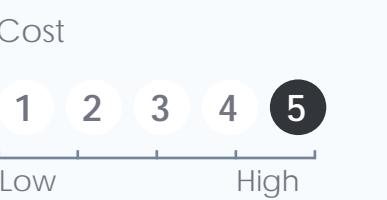


A dedicated resilience strategy for ports and markets. This should be developed to ensure that operations maximise resilience to national and international climate risks and to propose new regulations and guidance where relevant.

Singapore Food Agency. (2020).
Meeting Singapore's food supply.
www.sfa.gov.sg

Risks addressed	Lead time
<ul style="list-style-type: none"> Food Pest and Disease 	Ongoing

Objectives	Possible partnerships
13, 14, 15, 16, 17, 18 Co-benefits	<ul style="list-style-type: none"> Defra Public Health England Market users and suppliers International port health authorities



Why

The UK Committee on Climate Change describes that international trade will likely be vulnerable to major shocks and stresses in future years, including stresses from shifts in crop production patterns, a rise in pest transmission and disease outbreaks, and acute shocks from food shortages and geopolitical events. The markets and ports in the Square Mile and City Corporation portfolio are key hubs for food infrastructure and trade in the South East, with their influence stretching across the UK and internationally. This, combined with their physical handling of goods moving across the world, makes them critical infrastructure points for the distribution of food in the UK and the management of pests and diseases.

What

The City Corporation should build dedicated resilience plans and emergency strategies linked to the operation of ports and markets under its control. These should consider identification and prioritisation of key vulnerabilities and risks in the context of climate change and develop clear strategies for adaptive and resilient operation of ports and markets. Initiatives might include strengthened health and safety measures in light of rising temperatures, horizon scanning exercises, a systematic risk register, tightened disease and pest outbreak response plans and altered food storage strategies.

How

This measure would be undertaken with operational managers of the facilities to review forecast risks and identify key vulnerabilities within the existing system. This might be undertaken in partnership with agricultural, logistics and trade experts and include a review existing emergency and resilience plans for ports and markets. The outputs of other measures should also be drawn upon as useful. Resilience plans should be developed in collaboration with market tenants and users, and key port authority stakeholders. Risks will evolve with time and as such a robust monitoring and review cycle should be designed to ensure that the plans remain relevant and accurate. It is anticipated that some initial investment would be required, from the proposed Climate Readiness Fund in order to review and the develop the plans, after which regular annual operational budgets may be organised in such a way that they support the roll out of the plans.

Case Study:	Meeting Singapore's Food Supply	Links to existing City Corporation activities
	<p>The Singapore Food Agency has developed a three-part plan to ensure a continuous supply of safe food in the country. This focusses on diversification of food sources to reduce reliance on any single country, a food fund for local companies to study potential food zones and farming overseas and public education campaigns to use liquid effs, egg powder and frozen meat. This is accompanied by encouraging citizens to choose local produce and broad business cluster meetings and dialogues with retailers and importers to build active participation at all stages in the food chain. These initiatives would all be valuable additions to the City Corporation resilience planning efforts in Ports and Markets.</p>	<p>Local Business Plans (as relevant)</p>

Links to other existing policies, plans and guidance
<p>London City Resilience Strategy, GLA (Action B8)</p>



RESILIENCE MEASURES

Establish research partnerships to inform future action planning and management of natural capital

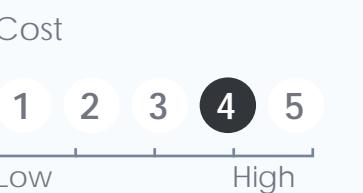
- Preparatory**
- Management
- Capital Investment
- Mainstreaming Initiative
- Cross-cutting



A programme of research and planning to fill knowledge gaps and to strengthen actions to build and enhance green infrastructure and natural capital management.

Greater Manchester Combined Authority. (2020).
The IGNITION Project.
www.greatermanchester-ca.gov.uk

Risks addressed	Lead time
<ul style="list-style-type: none"> • Natural Capital • Pest and Disease 	2 years
Objectives	Possible partnerships
7, 8, 9, 10, 11, 18	<ul style="list-style-type: none"> • GLA • Supplier network • Research institutions • Defra • Natural England • Forestry Commission



Why

Risks to natural capital are high in the UK and central London: rising temperatures, increasing periods of drought, greater susceptibility of flora to existing pests and diseases, while new pest and diseases are expected to emerge. All leave natural capital assets highly vulnerable. In addition, natural capital is essential for building resilience to a multitude climate risks. Climate change as such presents a substantial risk to the vital goods and services provided to people by the natural environment. The Committee on Climate Change highlight a number of critical knowledge gaps in which further research is required to better understand the relationship between climatic changes and natural capital. Particularly around terrestrial species and habitats, pollination, freshwater ecosystems, pest, pathogens and diseases, agriculture, carbon sequestration, landscapes and sense of place.

What

Through partnerships and engagement, the City Corporation should identify opportunities to strengthen relationships with those undertaking research into areas most pertinent to the City (as identified in the Climate Risk Assessment). Through developing stronger relationships with key industry bodies and academic institutions, the City Corporation should be able to use research outputs to inform future decisions and action planning. It is suggested that the City Corporation should consider collaborating with existing partners (e.g. nurseries, food suppliers) as well as academic institutions to undertake a series of studies particularly focused on the needs of the City Corporation. These should be focused on natural capital, may be co-defined with the Open Spaces and other relevant team in the City Corporation, and may use particular sites as test beds / study areas for action based research. It would be recommended that all research outcomes are shared in an open source and engaging manner to raise awareness of the role and value of natural capital. Research should be shaped in such a way that it is able to be easily transferable and integrated within the future management of natural capital assets.

How

The delivery of this measure would depend on partnerships. It is intended that key City Corporation departments and external partners are identified and brought together to scope the key priorities. Based on this, key high potential relationships should be identified based on the City Corporations priorities. The City Corporation should then engage partners to understand how support may be best provided. Based on any gaps identified between City Corporation priorities and needs and research underway, the City Corporation should explore opportunities to set up its own research programmes. These may facilitated through PhD or EngD sponsorships, commissioning of research or in partnership with others.

Links to existing City Corporation activities

- [Biodiversity Action Plan](#)
- [Open Space Strategy](#)
- [Open Space SPD](#)

Links to other existing policies, plans and guidance

- [2017 UK Climate Risk Assessment Evidence Report, UK Committee on Climate Change](#)



RESILIENCE MEASURES

Open a City Corporation Ecological Research and Education programme

Preparatory
Management
Capital Investment
Mainstreaming Initiative
Cross-cutting



Natural capital has a key role to play in addressing the impacts of a changing climate but is also at threat of such changes. Through this measure the City Corporation will establish a dedicated ecological centre or service to action research goals and assist the implementation of their recommendations.

City of Kalamunda. (2019). 21 years of free plants for residents.
www.kalamunda.wa.gov.au

Why

The City Corporation have numerous plans to enhance their natural spaces and biodiversity in the Square Mile and beyond. In order to do this effectively, other measures within this strategy focus on developing closer relationships with research institutes to address knowledge gaps in the link between climate change and natural capital. In order to ensure that the findings of this research can be effectively adopted and acted upon it will be necessary for the City Corporation to influence their own production processes as well as the supply chain.

- Through this measure it is proposed that the City Corporation build stronger supply chain relationships, establish a research centre and raise public awareness of the value of natural capital.

 - 1 It is suggested that working groups are established with key suppliers (e.g. agricultural, forestry) in which research findings can be shared and used to influence their activities. For example, on use and management of recreational land, cultivation of urban crops, how soils are managed or the types of species being propagated. Enhanced green procurement requirements could be established which respond to climate risks.
 - 2 An Ecological research centre should be established through which the City Corporation would support the action based research proposed in other measures, whilst also creating the unique opportunity to propagate its own species based on the findings from research. The Ecological research centre may also act as a community seed library, supporting community led growing initiatives. If pursued, the ecological research centre may be a partnership with existing institutions (e.g. academic, cultural, otherwise). The Ecological research centre should be publicly accessible to enable research to be shared with the public, raising awareness of the value of natural capital.

What

Early action should be taken to establish a supply chain working group to establish the opportunity for green procurement in connection with projects to enhance natural capital and align with the research findings measure. A feasibility study to explore concept options for establishing the Ecological Research and Education Programme and options for the centre would undertaken funded by the proposed Climate Readiness Fund. Prior to embarking on the development of an ecological research centre, the value of the initiative should weighed up against need, as determined by the success of research partnerships and practical implementation of findings. Staff time would be required to facilitate the working group, as well as the time of individuals from key cross cutting departments and external partners.

Potential academic and philanthropic partnerships could also be developed to support the development of a ecological research centre and its programmes. Synergies also exist linking to community programmes (e.g. through propagation of species fit for future climates and distribution of seeds).



RESILIENCE MEASURES

Pest and disease horizon scanning, surveillance and research programme

Preparatory Management Capital Investment **Mainstreaming Initiative**



A programme of research and horizon-scanning exercises to assess key risks from existing and emerging pests and diseases in order to appropriately plan for mitigating actions and to identify and protect vulnerable species.

European and Mediterranean Plant Protection Organisation. (2020). What is EPPO?
www.eppo.int

Why

Changing seasonal conditions and global patterns influence the spread of new and emerging diseases, with rising average temperatures forecast to increase the emergence, transmission rate and spread of human and plant diseases previously not recorded in the UK. In addition, research has shown that pests and invasive non-native species will increase in number and range in a warmer, wetter atmosphere. This means that new challenges around disease outbreaks and control are anticipated in London and the UK, with potential to cause significant disruption to natural capital and human populations. Despite this, challenges and vulnerabilities around climate-influenced pests and diseases are relatively poorly understood, with greater focus in the academic sphere than governance. As a local authority, asset owner and Port Health Authority, the City Corporation must remain alert to such challenges, and have responsive and up-to-date plans to deal with them.

To inform strategy, mitigation and control of such risks, the City Corporation should undertake a rolling programme of research, horizon scanning and planning to remain abreast of new research and future challenges. Collaborations with academic groups to commission and deliver studies in relation the City Corporation natural spaces and key species, working with Public Health England and Defra to coordinate local planning would be essential. As would be the dissemination of information to City Corporation staff, delivery of appropriate training and engagement in other industry networks related to health challenges. Finally, working with regional and national bodies to share information and work collaboratively with international partners, such as the European and Mediterranean Plant Protection Organisation, would be beneficial and support the development of early warning systems. Thorough coordination of these diverse activities would be required to ensure that this work is effective, organised and well-integrated.

What

This measure would rely on an initial review of key tracking, forecasting and oversight mechanisms active in this realm, and an analysis of existing City Corporation skills as per other measures. This should then inform a strategy to coordinate internal activities in relation to research priorities and tracking of governance recommendations in this area and which mainstreams results into other City Corporation plans and activities – including the Biodiversity Action Plans, open spaces management plans, emergency planning and healthcare planning. These exercises should be updated and reviewed with regularity in order to keep activities in line with key pest and disease understanding and management.

How

Risks addressed	Lead time	Case Study:	Links to existing City Corporation activities
• Pest and Disease	Ongoing	European and Mediterranean Plant Protection Organisation (EPPO)	Biodiversity Strategy Port Health management procedures Joint Health and Wellbeing Strategy
Objectives	Possible partnerships	The EPPO is an international organization responsible for cooperation and harmonization in plant protection within the European and Mediterranean region. They coordinate research, develop international strategy, provide information and set regional standards for phytosanitary measures. Engagement with bodies such as these would be a valuable exercise for the City of London to draw on a synthesised body of research with targeted information and guidance for policy makers, and to utilise bulletins to respond quickly to forecast outbreaks or changes	Links to other existing policies, plans and guidance
15, 16, 17, 18	<ul style="list-style-type: none">DefraPublic Health EnglandKings CollegeUniversity College LondonSt Bartholomew's HospitalLondon Resilience ForumWellcome TrustForestry Commission		Health and Climate Change, The Lancet Managing England's Woodlands in a climate emergency, Forestry Commission
Co-benefits			
Cost			



RESILIENCE MEASURES

Model food supply networks through the Square Mile to inform future planning

- Preparatory**
- Management
- Capital Investment
- Mainstreaming Initiative
- Cross-cutting



Research and modelling to better understand the Square Mile food supply system and use that understanding to reduce the potential impacts of its disruption to businesses and consumers.

City of New York. (2016). Five borough food flow. 2016 New York City Food Distribution and Resiliency Study Results. www1.nyc.gov

Why

Security of food supplies and risks of volatility in pricing are key threats to the resilience of the City of London. This challenge is twofold: future geopolitical shocks and crises – such as major displacement events through wars and disasters, extreme weather events, volatility in international trading agreements and pest and disease outbreaks – cause major disruption to consumers and local supply chains through food shortages and price volatility. In addition, projected long-term shifts in growing conditions and agricultural patterns could alter nutritional patterns and pricing, intensifying food insecurity and food poverty amongst Square Mile and City Corporation residents and users. These relationships are complex, and their influence depend strongly on the nature of the food supply chain and consumption patterns through the Square Mile, not to mention the broader region. At present, the GLA notes that this infrastructure is not well understood.

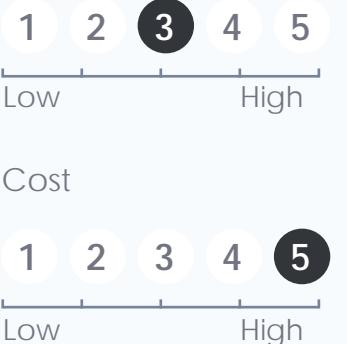
What

This exercise would involve detailed research into food consumption and trading patterns in and around the Square Mile in order to map and model the layout of this essential system. It would identify key trends in food distribution, purchasing and supply chains to highlight particular vulnerabilities and opportunities for improvement in the system. The results could be essential in developing measures that aim to increase resilience of the Square Mile food supply which could also link with last mile food logistics optimisation and opportunities for consolidation which may also link to Corporation of London operated markets. Such action will be valuable additions to GLA work with similar aims, and as such partnerships may be sought. In producing this study, outcomes should be considered in the context of levels of food security, vulnerable populations and the operation of the regional food infrastructure network.

How

It is proposed that the City Corporation commission an academic institution or consultant to research, model and assess the food supply network feeding the city. This may be jointly commissioned with one of the key partners identified, such as the London Resilience Forum, London Food Board or Public Health England. Through the study, engagement with resident and business networks should be sought to explore this risks and issues test possible solutions to challenges and vulnerabilities highlighted. It is acknowledged that the London Resilience Partnership has an ongoing programme of a similar nature and thus should be engaged and the scoping of the study coordinated with. This could be funded by the proposed Climate Preparedness Fund.

Risks addressed	Lead time	Case Study:	Links to existing City Corporation activities
• Food	3 years	Five Borough Food Flow, New York	
Objectives	Possible partnerships	"The Five Borough Food Flow is a study of the last-mile food distribution system that feeds New York City and its millions of visitors every year. This complex network of food hubs, distribution centres, trucking routes, and point-of-sale outlets ranks among the largest food distribution systems in the nation. With demand on the rise and billions of pounds of food flowing through the city every year, this study helps us understand how New York City's food distribution system is changing and informs our work to make it sounder, stronger, and more resilient." This approach could be highly effective in the Square Mile, which is similarly densely structured to New York, with a comparable diversity of food sellers and distributors.	Joint Health and Wellbeing Strategy
13, 14, 15	• London Resilience Forum • London Food Board • Defra • Public Health England • Global Food Security		Links to other existing policies, plans and guidance
Co-benefits			London City resilience Strategy, GLA (Action A4)
Cost			





RESILIENCE MEASURES

Explore and facilitate opportunities to promote regional food production

Preparatory

Management

Capital Investment

Mainstreaming Initiative

Cross-cutting



Research the potential for introducing food production in City Corporation managed land, or for improving the efficiency of production from key suppliers.

Mayor of London (2020). Food growing in London.
www.london.gov.uk

Why

Resilience of food supplies may be greatly threatened under climate change through a combination of shocks – extreme weather events, geopolitical changes and local agricultural issues – and stresses – such as shifts in growing patterns and changing agricultural conditions. The resilience of food infrastructure to these risks can be strengthened by diversification of food sources and expanding local growing schemes.

What

The City Corporation should undertake a thorough review as to the potential to grow food within City Corporation-managed land, and to consider how it may best support regional agriculture as a purchaser of goods and services relating to food. Three key actions should be pursued:

- Exploring and establishing food growing spaces in City Corporation land outside of the Square Mile. This may include actively plan for or introduce allotments, underground growing infrastructure or rooftop gardens to proposed and existing assets or even smallholdings or farmland which it may own. Where feasible, the City Corporation should developing guidance and create funding opportunities enable this to happen.
 - Critically review opportunities to promote regional food production including through its own procurement of goods and services relating to food. This may be achieved, for example, through procurement criteria and engaging with key regional suppliers and assessing opportunities for increasing efficiency of production (without environmental harm).
 - A study to identify the growing potential of underutilised sites within the Square Mile in tandem with the proposed space utilisation analysis. Through this, potential public and private sites for growing across the Square Mile may be identified; these could then be planted by the City Corporation, partner organisations or residents.

How

Dialogue with business networks in the city should be used to establish needs and priorities to ensure that packages are targeted and effective. A separate working group formed from this. Outcomes from additional studies undertaken the City Corporation should be shared and disseminated to inform the development of appropriate measures.



RESILIENCE MEASURES

Diversify energy sources and partner with regional organisations and utility providers to increase back-up power for critical services.

- Preparatory
- Management
- Capital Investment**
- Mainstreaming Initiative

- Cross-cutting



Diversify and increase resilience of energy sources, back-up supplies and distribution networks to improve resilience of supply during shock events (extreme weather, water shortages, flooding of critical infrastructure etc).

Wellington City Council. (2017). Wellington Resilience Strategy.
resilientcitiesnetwork.org

Why

UK Power Networks (UKPN) highlights that energy supplies are vulnerable to a range of climatically influenced events, including substations affected by flooding, overhead lines affected by summer drought and consequent ground movement and transformer and switchgear rating reducing due to temperature rise. Some risks are not anticipated to begin in earnest until future decades, while others are of 'almost certain likelihood' today. Within the Square Mile itself, the Square Mile Strategic Flood Risk Assessment has shown that there are electrical substations and other services at risk of flooding (1% Annual Exceedance Probability), and the UK Climate Change Projections 2018 predict peak daily temperatures of over 40°C under high emissions scenarios that could affect the operation of power stations and infrastructure by 2080. Taken together, there is an imminent risk to power supplies in the Square Mile and City Corporation properties.

What

Diversification of energy supplies would strengthen resilience of infrastructure and services in the Square Mile greatly, especially given the localised nature of risks to energy sources making diversification an effective strategy. The City Corporation should work with UK Power Networks in alignment with its clean energy – to ensure no negative impact on local air quality – and mitigation strategies to prepare a strategy to strengthen the resilience of power sources and networks serving the square mile. Options could include further reinforcement and meshing of electricity distribution networks, local microgeneration of energy and backup power, expanding district heating networks further, exploring the potential of district cooling networks, and encouraging the installation of energy storage, smart grids and metering.

How

Funding would depend on the type of improvements required. Diversifying energy sources used in the Square Mile would depend on collaboration with UK Power Networks as Distribution Network Operator, and stakeholder engagement to encourage adoption of back-up measures. The opportunity for decentralised energy networks would require coordination with the GLA. Liaison should take place with UKPN in order review the scale of the resiliency issue and to establish a strategy approach.

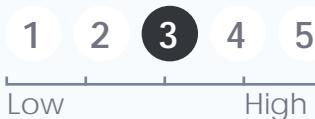
Risks addressed

- Flooding
- Overheating
- Water Stress

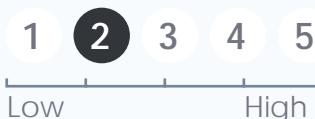
Objectives

- 1, 2, 5, 6

Co-benefits



Cost



Lead time

20 years +

Possible partnerships

- National Grid
- UK Power Networks
- Citigen
- Local utility providers
- GLA
- BEIS
- London Councils
- London Power

Case Study:

Wellington Flexible Energy Supply, New Zealand

With high seismic risk in the area and a centralised energy system, New Zealand's capital, Wellington, has developed a Flexible Energy Supply to tackle outages. This consists of investments in adding redundancy to the central grid and setting up 'virtual power plants'. The virtual power plant systems consist of a set of rooftop solar panels, and storage batteries (starting at 8kW, with the ability to upgrade up to 16kW). These systems function year-round for the homeowners, allowing them to power even non-emergency needs with a sustainable and low-cost source of energy, reducing peak demands on the grid. Expanding renewables in the Square Mile could bring similar benefits.

Links to existing City Corporation activities

- ☒ Climate Action Strategy
- ☒ Existing and emerging local plan

Links to other existing policies, plans and guidance

- ☒ Energy for Londoners, GLA
- ☒ London Plan, GLA
- ☒ Underground Asset Register, Geospatial Commission



RESILIENCE MEASURES

Develop City Corporation and Square Mile water footprint management strategy

Preparatory

Management

Capital Investment Main

Cross-cutting



Develop a City Corporation and Square Mile water footprint management strategy, collaborating with Thames Water and utility companies to support demand management and measures and the enhancement and resiliency of water supply and treatment networks servicing the Square Mile and City Corporation assets.

City of Cape Town. (2020). Water map.
www.capetown.gov.za

Why

Without action, current water supplies may only meet 76% of demand by 2100 under Thames Water models. This makes water stress one of the key risks for the Square Mile and City Corporation assets. At present Thames Water reporting covers the large South Eastern region to which it distributes water with only some metrics on small zones – largely the inner London area compared to upstream customers. This means that there is relatively little understanding of how Square Mile residents use water and where critical infrastructure for these supplies lie, or where the City Corporation could support Thames Water in improving the water footprint in its realm of influence.

What

The City Corporation should collaborate with Thames Water (and other partners as necessary) to investigate the water footprint of the Square Mile and the City Corporations assets. In doing so the City Corporation should establish credible water use reduction pathways, opportunities and constraints to delivering these. In establishing the water footprint and developing water use reduction pathways, key risks to potable water supplies networks and treatment facilities should be identified. In producing the strategy, lessons learnt should be shared with other boroughs to help them take action to reduce water use.

How

This work would require collaboration with Thames Water to define parameters and collate available data. Further research would then likely be required in partnership with other utility providers and institutes, such as the Environment Agency and Defra, with extensive stakeholder engagement to better define the current water footprint of the Square Mile. This work should then be analysed and synthesised, with a set of recommendations and plan prepared to leverage City of London influence to reduce risk of water stress in the Square Mile and its assets.

Case Stud

The Water Map, Cape Town

"The Water Map was a behavioural-change tool introduced, in January 2018, at the height of the Cape Town drought crisis in order to encourage water saving. The main purpose of the map was to publicly acknowledge or "reward" households that saved water, thereby normalizing and incentivising water conservation behaviour." The map was based on detailed monitoring and municipal billing data to show:

- Water use per household (free-standing houses only; not cluster housing, flats or other land uses).
 - Collection points for treated effluent (recycled wastewater) for industry and construction.
 - Water distribution zones used to supply water and manage water pressure.

The City Corporation may consider whether this approach is possible for their assets.

Links to existing City Corporation activities

Existing and emerging Local Plan

 City Open Space SPD

Links to other existing policies, plans and guidance

 London City Resilience Strategy, GLA

(Action A3)

 London Drought Response Framework,
London Resilience Forum



RESILIENCE MEASURES

Work with partners to accelerate actions to address water leak management



An initiative to drive leak management measures, supporting Thames Water to identify and mitigate leaks in infrastructure across the Square Mile and City Corporation assets.

Bruebach, K., Sobey, M. and Agbor-Tabi, L. (2018). Building a water resilient city: Cape Town through the drought.
www.preventionweb.net

Why

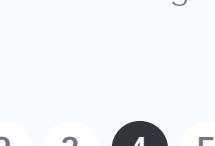
Until measures taken this year, over 20% of Thames Water supplies were lost through leakage, generally as a result of aging infrastructure and pipe failures, with additional concerns that droughts and flooding will rise incidents of leakage. With water supplies facing potential serious shortages in future years, targeting these leaks is a key area of focus for Thames Water, with recent expenditure on leakage measures exceeding £200m, and targets set for a 50% reduction in leaks by 2045.

What

The City Corporation should work with Thames Water to identify how it can support them to accelerate actions and investment focused on delivering leak reductions. As the asset owner, Thames Water will be responsible for investment and upgrading infrastructure however the City Corporation may help through sharing information, condition surveys, access arrangements, adoption of new operational practices and link upgrades to improvements the city corporation is funding. This action would support other initiatives set out within this strategy focused on reducing water consumption and raising awareness.

How

This programme would depend on close collaboration with Thames Water and potentially connecting local authorities. A period of developing partnerships and engaging relevant stakeholders should be followed by the identification of priority actions that the City Corporation can take to support the existing programme of activities defined by Thames Water.

Risks addressed	Lead time
• Water stress	15 years
Objectives	Possible partnerships
6	<ul style="list-style-type: none"> • Thames Water • Ofwat • GLA • London Councils • London Climate Change Partnership • London Resilience Forum • UK Committee on Climate Change
Co-benefits	
	
Cost	
	



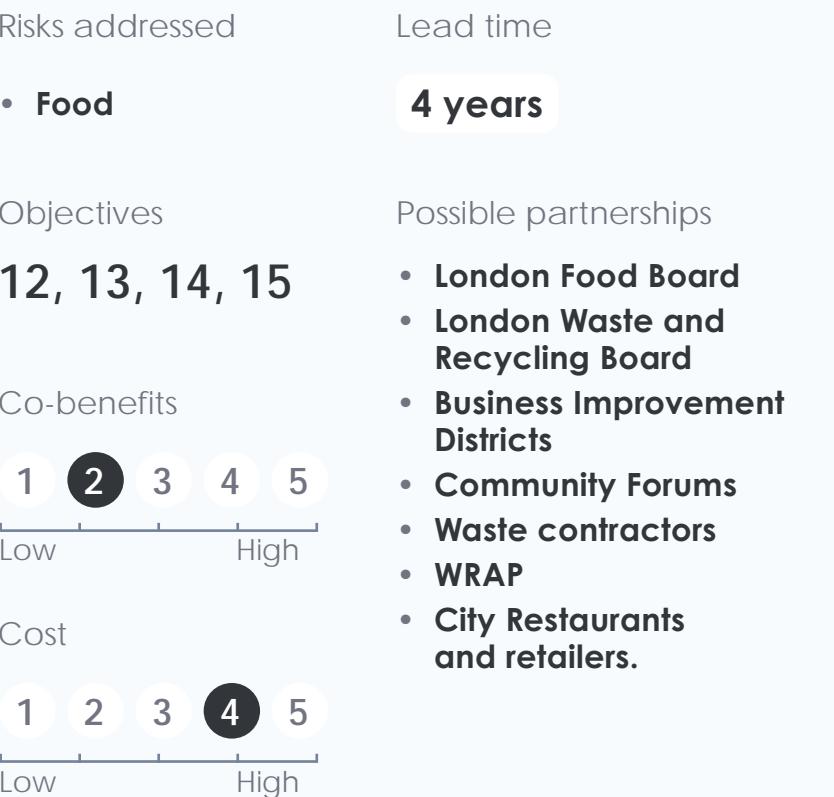
RESILIENCE MEASURES

Food ‘waste’ collection and redistribution system

Preparatory Management Capital Investment Mainstreaming Initiative Cross-cutting



Utilise the Square Mile business network to establish a food waste collection and redistribution service, in partnership with local residents.



Why

To improve the resilience of the Square Mile food system. Food waste in London accounts from 20% of domestic waste, with reducing landfill capacities and soil degradation compounding the need to better handle organic refuse. Higher temperatures will also require a greater collection frequency to deal with odours and organic fraction. Against this, under changing geo-political and agricultural patterns globally and nationally, food supply in London may see periods of volatility and shortage, with major changes to diets and products possible.

There are currently a significant number of food and beverage outlets within the Square Mile and, indeed, wholesale markets. The intention of this measure is to work with such businesses to streamline food supplies and avoid 'waste' food and beverage products being disposed of. Partnerships would be established to identify areas 'waste' (outputs) and ingredients (inputs) could possibly be shared, and the food waste scheme currently used in the Square Mile expanded to collect organic matter for composting which in turn could support open space landscaping or community led initiatives such as those proposed elsewhere in this study. As part of the initiative, there also may be an opportunity to support action to reduce food poverty through connections with food banks and mutual aid groups. Though this would be done in parallel with efforts to address more systemic issues of food poverty.

What

When the City of London updates its Waste Strategy in 2020 options for addressing food waste should be explored. It is proposed that the City Corporation establish a working group consisting of key food retailers and distributors with the common objective of trialling and later implementing the measure. Within this group, charities or mutual aid groups already undertaking such activities should also be engaged. This could lead to the development of pilot projects with food and beverage businesses should be run. If successful, the programme should be refined based on lessons learnt and expanded to cover a greater number of food retailers within the Square Mile. The business network should be used to grow awareness around the measure as well as clearly communicate how businesses may participate within this.

How

Links to existing City Corporation activities

 Waste Strategy

Links to other existing policies, plans and guidance

 London City Resilience Strategy, GLA

(Action A4)

 Beyond the Food Bank, Sustain

 Circular London, London Waste and Recycling Board