TfL Adaptation Reporting Power submission 2021

Non-technical summary

MAYOR OF LONDON

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

Contents

Background

Our work to adapt to the impacts of climate change

As part of the Climate Change Act 2008, we are asked to produce reports on what we are doing to adapt to climate change, which is known as the Adaptation Reporting Power (ARP). Following reports we submitted in 2011 and 2015, this year we produced a submission under this third and latest round of reporting, known as ARP3.

This non-technical summary aims to help those who are unfamiliar with the concept of climate change adaptation to recognise its importance and how it links with other policy areas; understand how our governance, strategies and funding incorporate adaptation; understand our main climate risks and the impacts on London's transport services; and be aware of the actions we are taking to reduce our climate risks.

Climate change definitions

Adaptation
The process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities.

Resilience
The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure.

Mitigation
These include the human interventions to reduce emissions or enhance the sinks of greenhouse gases.

We have set out our plans for how we will adapt to climate change

We are already seeing the effects of a changing climage

Investing in climate change adaptation

Any extreme weather event has the potential to cause us significant disruption. This includes affecting safety, reliability, asset management, reputation and cost. There is also the disruption and safety risk to customers. Prolonged or frequent service disruption can also have significant impacts on London as a whole.

We are already seeing the impacts of severe weather events, which are likely to become more common due to climate change. On 12 and 25 July 2021, heavy rain severely disrupted our roads and Underground services, as well as damaging our assets. February 2022 saw three named storms in quick succession, with Storm Eunice causing widespread disruption across our operations, with trees and debris blown onto our networks.

Our short-term response to disruption, including severe weather, is relatively effective. For example, our networks were almost all fully operational within 24 hours of the July floods and Storm Eunice.

Our ARP3 report focuses on climate change adaptation rather than resilience. This is because, as severe weather disruptions become more frequent, the cost of resilience is likely to increase.

We design, construct, operate and maintain infrastructure that often has long lifespans – sometimes up to 120 years. Therefore, the decisions we make now will have consequences decades into the future. To maintain a safe, efficient and comfortable public transport service, and to ensure we are financially sustainable, adaptation measures must be embedded now, which requires certain funding and skills.

As well as improving our – and London's – ability to cope with the impacts of climate change, adaptation measures can deliver multiple additional benefits.

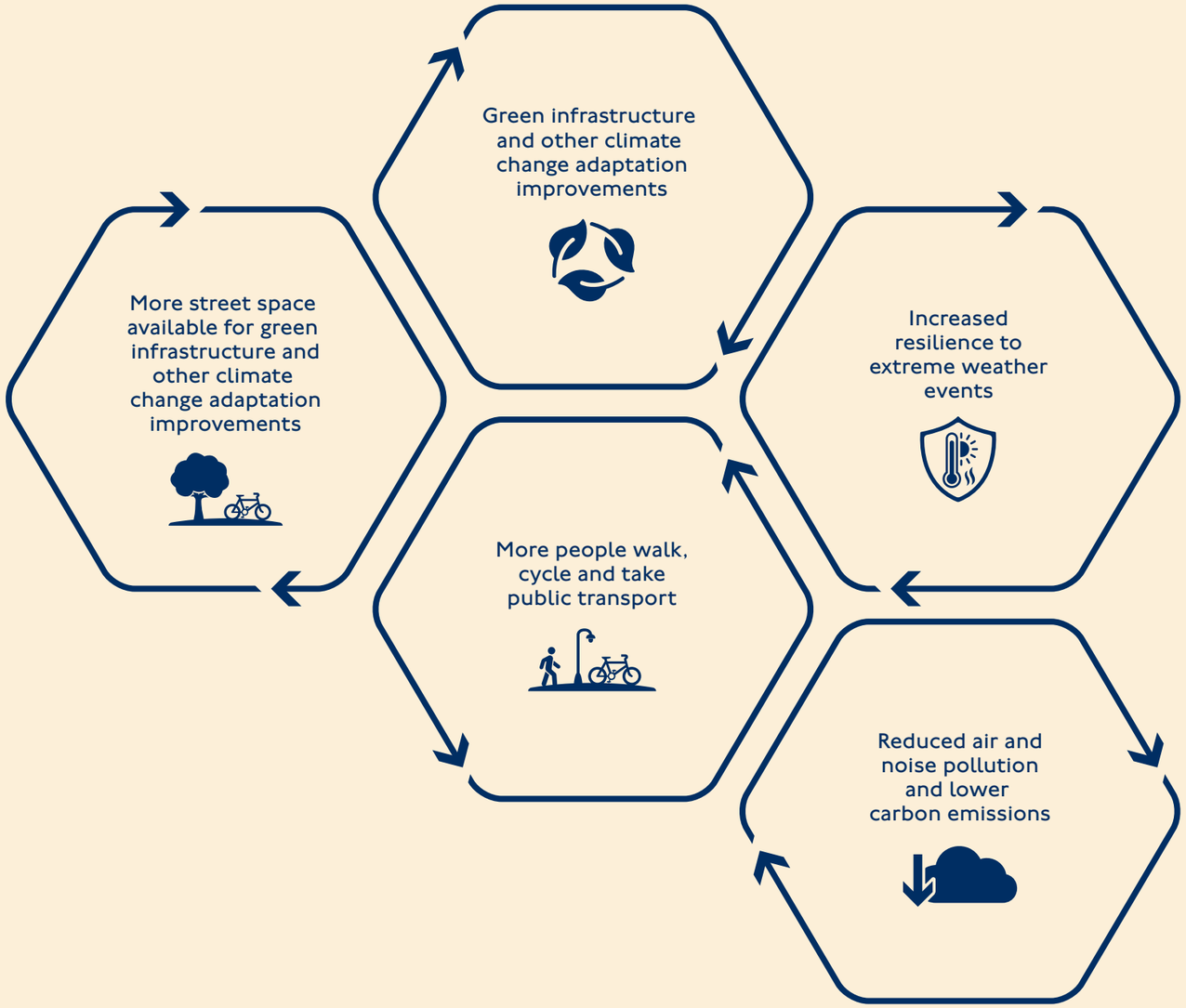
By investing in climate change adaptation, we can:

Improve
safety, reliability and comfort of our services

Reduce
asset degradation, or even increase asset life

Increase
cost effectiveness and timeliness of investment

Connecting climate change adaptation with other environmental policy priorities



However, some adaptation measures could have negative impacts on other areas of our policy. For example, green infrastructure can affect safety if it is poorly managed, such as tree branches falling onto roads and train tracks.

In addition, adapting to one climate risk could make other climate risks worse. For example, installing air conditioning on trains might help reduce temperatures, but it could also increase platform temperatures and, in some cases, increase carbon emissions. We need to take a system-wide view of adaptation measures to avoid or reduce these negative impacts.

If incorporated early enough in the design process, many adaptation measures can be cost-effectively incorporated as part of existing projects. Other adaptation measures are part of our 'business as usual' operations, such as inspecting and maintaining, upgrading, replacing or renewing our assets.

As a large, internationally recognised asset owner and public sector organisation, we have an important role to play in leading by example, influencing our supply chain and other key stakeholders, and helping to reduce climate risks and environmental inequalities across London.

Our climate governance, strategy and funding

The mechanisms, documents and funding issues that impact our climate change adaptation work

As the integrated transport authority for London, we manage and operate a wide range of London's transport networks and are responsible for developing the Mayor's Transport Strategy, which applies to all London transport.

However, not all of London's transport networks are under our control. For example, 95 per cent of London's roads are maintained by the boroughs, while the London Overground and most Elizabeth line services are run on Network Rail track.

We are also a developer and landlord, owning around 23km^2 of land and properties.

The TfL Board has oversight and advisory responsibilities regarding climate risk and adaptation. This work is supported through our Audit and Assurance Committee and the Safety, Sustainability and Human Resources Panel. Across the organisation, the responsibility for climate risk and adaptation rests with our Executive Committee.

Effective adaptation of London's transport networks cannot be designed and implemented in isolation, so we collaborate with other teams, sectors and organisations to ensure that gaps are avoided, duplication is minimised, and lessons are learned quickly to avoid unnecessary costs.

Our work on climate change adaptation is informed and shaped by a series of strategic documents. These include the Mayor's Transport Strategy, the London Environment Strategy, the London Plan, and our Sustainable Development Framework and Corporate Environment Plan.

Funding

Implementing our policies and meeting the targets depends on our ability to fund appropriate actions and initiatives. Before the pandemic, 72 per cent of our operating income was generated from customer fare revenue.

Since the pandemic, we have received a series of short-term Government funding settlements that have helped keep services running. However funding constraints have limited our ability to plan long-term and invest in major projects, including climate change adaptation initiatives.

A lack of adequate funding support will undercut our ability to prepare London's transport system for a changing climate and increasingly weaken the system's resilience to shocks and stresses.

We manage and operate a range of services and infrastructure

Our climate risk assessment

Managing risks

Enterprise Risk Management is concerned with managing risks, both threats and opportunities, that may impact our objectives. It uses a three-step hierarchy, which comprises organisation-wide enterprise risks (Level 0), business area risks (Level I) and operational risks (Level 2). Climate risk is included within our Health and Environment Level 0 enterprise risk.

Risk assessment methodology

Due to the age and design of many of our data collection systems, it is not currently possible to directly attribute faults or delays, or their full costs, to specific weather events. This functionality may not be possible for several years for many systems, as they are not easily retrofitted and can be costly to replace. Owing to this lack of comprehensive baseline data, our climate risk assessment relies heavily on professional knowledge and judgement.

We used climate projections to create assessments for today, the 2050s and the 2080s. These were based on the likely weather conditions, provided by the Met Office, under a global carbon emissions scenario that is broadly equivalent to 2°C of warming. If emissions increase beyond this scenario, it is likely that the number of major or severe risks would increase.

Our climate risk assessment has considered risks to assets and services as well as risks to people, including our staff, contractors, customers and tenants. This is our most comprehensive and detailed climate risk assessment to date and involved collaboration across a number of teams across the organisation.

Risk scores according to impact and likelihood

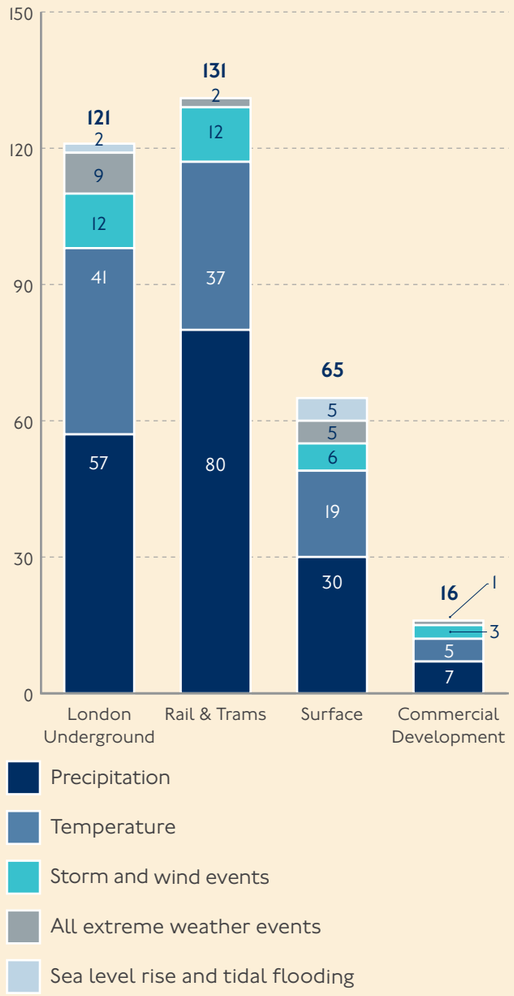
		Impact				
		Low	**Medium**	**High**	**Very High**	**Critical**
Likelihood	Highly unlikely	Minor	Minor	Minor	Moderate	Moderate
	Unlikely	Minor	Moderate	Moderate	Moderate	Major
	Possible	Minor	Moderate	Moderate	Major	Major
	Likely	Moderate	Moderate	Major	Major	Severe
	Almost certain	Moderate	Major	Major	Severe	Severe

We have assessed the level of risk for a number of events

Our climate risks

All of our assets, operations and services carry some degree of weather- and future climate-related risk, which could affect our financial sustainability, as well as the health and safety of staff, contractors and customers. Precipitation, including too much and too little precipitation, is the category with the greatest number of risks.

Number of climate risks



Precipitation
Our climate risk assessment identified 174 precipitation risks. Of these, 14 risks currently score major or above, which, if unmitigated, increases to 39 risks in 2050 and 57 risks in 2080.

Precipitation risks and scores of major and above

Climate hazard	Risk	Score			CCRA3 infrastructure sector risk
		Today	2050s	2080s	
Low rainfall over a long period but not necessarily leading to water use restrictions	Ground movement causing damage to water supply infrastructure and to drainage, causing water leakage, affecting fire systems	Major	Major	Major	11, 14, 17
High rainfall over a season or longer, leading to events like groundwater flooding	Failure of clay cuttings	Major	Major	Major	12, 15
	Increased vegetation growth and shedding of leaves on track side, affecting wheel-track adhesion and potentially leading to operational failure	Major	Major	Major	12
	Slips, trips and falls within trains due to water ingress	Major	Major	Major	N/A
	Water ingress in tunnels due to rising groundwater or soil saturation	Severe	Severe	Severe	12
	Older buildings are more vulnerable and likely to fail or be severely damaged	Major	Severe	Severe	12

Key precipitation risks and scores (continued)

Climate hazard	Risk	Score			CCRA3 infrastructure sector risk
		Today	2050s	2080s	
Extreme high rainfall in a single event leading to surface water flooding	Flooding damages buildings that could lead to asset failure, and in turn could lead to a safety and operational issue that may affect other assets and modes	Severe	Severe	Severe	I2
	Track circuit failure as a result of track system drainage being overwhelmed, flash floods, water pipes leaking leading to safety and operations issues	Major	Major	Major	I2, I4
	Changes in ground condition causing building structural instability could lead to asset failure	Major	Major	Major	I2, I5, I7
	Flooding on network such as subways, underpasses, carriageways and service buildings could become unsafe, increase wear and tear of structures, and increase maintenance costs	Major	Severe	Severe	I2
Fluvial flooding	Water damage to track infrastructure, localised inundation, debris washed obstruct critical components, such as switches, increase wear on rail head due to sediment. Increased maintenance cost of clean up	Major	Major	Major	I2
Flooding - all	High volumes of water overwhelm the drainage system leading to flooding, impacting network reliability and safety	Severe	Severe	Severe	I2
	Third-party drainage assets not performing due to flooding could cause problems to our assets	Major	Severe	Severe	I1, I2
	Pumping stations overwhelmed by rain or groundwater and/or associated debris/silt, which results in increased wear and risk of failure	Major	Severe	Severe	I2

Sea level rise and tidal flooding

There are no sea level rise and tidal flooding risks that currently score major or above. However, this increases to three risks in 2080. London is relatively well protected from sea level rise and tidal flooding by the Thames Barrier and other flood defences.

Temperature

There are I02 temperature risks, which include high and low temperatures, as well as rapid changes in temperature. Of these, eight risks currently score major or above. This increases to 25 risks in 2050 and 38 risks in 2080.

Key temperature risks and scores

Climate hazard	Risk	Score			CCRA3 infrastructure sector risk
		Today	2050s	2080s	
Short-term extreme high temperature, such as over a few days	Failure of air conditioning in Control Centres could lead to uncomfortable working conditions and may affect people taking operational decisions	Major	Major	Major	II2
	Train staff and passengers at risk of overheating, which could disrupt services	Major	Severe	Severe	II2
	Depot staff will not be able to work under extreme heat, train maintenance could be delayed, affecting reliability of operations	Major	Severe	Severe	II2
	Rails expanding at the points, resulting in signal failures	Major	Major	Moderate	II2
	Staff exposed to high temperatures and UV levels resulting in fatigue, dehydration, and sunburn	Major	Severe	Severe	N/A
	Temperatures on the buses become oppressive, leading to an adverse effect on bus customer experience	Major	Major	Severe	N/A
Large temperature range during the day in the short term, such as a few days	Rail distortion and movement at points and crossing as a result of temperature fluctuations	Major	Major	Major	II2
Higher average temperature in the long term	Linear heat detection systems, part of fire systems, falsely activating could lead to service disruption	Major	Major	Major	II2

All extreme weather events

Our climate risk assessment identified 17 risks that could be caused by any category of climate hazard. None were scored as major or above today, but this increases to four risks in the 2050s and six in the 2080s.

Storms and high winds

We identified 33 storm and wind risks. Of these, one risk currently scores major or above, increasing to four risks in 2050 and six in 2080.

Risks to our assets

There are four asset categories that have the greatest greatest number of major or severe risks today, in the 2050s and the 2080s. These are bridges and viaducts, drainage, rolling stock, signalling systems, and risks to people.

Key storm and wind event risks and scores

Climate hazard	Risk	Score			CCRA3 infrastructure sector risk
		Today	2050s	2080s	
High wind speeds	Green infrastructure structural damage, increased risk of tree failure, impacting on network safety and availability, leading to disruption	Major	Major	Severe	12

Key risks to people and scores

Climate hazard	Risk	Score		
		Today	2050s	2080s
High rainfall over a season or longer	Slips, trips and falling within trains due to wet surfaces	Major	Major	Major
Extreme high temperature in the short term, such as a few days	On-train staff and passengers at risk of overheating. Service disruptions.	Major	Severe	Severe
	Depot staff will not be able to work under extreme heat, train maintenance could be delayed, affecting reliability of operations.	Major	Severe	Severe
	Staff exposed to high temperatures and UV levels resulting in fatigue, dehydration and sunburn	Major	Severe	Severe
	Temperatures on the buses become oppressive, leading to an adverse effect on bus customer experience	Major	Major	Severe

Climate change opportunities

As well as the risks, climate change can present some opportunities, such as savings on fuel costs for heating, reduced cold weather disruption to services and operations, less damage to assets and reduced health and safety issues.

Our interdependencies

Some of the key internal interdependencies Include the following:

- Areas of multiple land ownership, where we rely on each other to maintain green spaces and embankments, which can impact and damage other assets such as tracks or overhead wires
- If our buildings and head offices were unavailable through an event such as flooding, it could have significant impacts on our ability to deliver our services
- Where we have shared-use tracks or rail assets, if these were unable to cope under extreme weather then we would be unable to deliver certain services and it could damage our trains
- Our surface transport options, such as our roads and buses, will be needed when other networks are unable to operate due to weather impacts

We also have a number of external interdependencies, particularly power supply, telecommunications, water supply and wastewater services, as well as other transport networks, such as Network Rail and borough roads. If these are vulnerable to climate change, then our operations will also be affected.

Disruptions to our services can also affect other transport networks within and beyond London. Our operations are also critical for other sectors, such as ambulances and travel for school.

One of our key interdependencies is our reliance on Government funding following the pandemic. Without reliable, long-term and sustainable funding, we will need significant prioritisation of adaptation actions, which will likely affect our long-term financial sustainability.

Our services are critical for a number of sectors across London

We have worked to improve surface water flooding

Our adaptation actions

We have identified several actions since our 2015 report and are working to develop these

Progress against ARP2 actions

ARP2 action	Risk addressed	Current status
Addressing the risks identified in the London Underground Comprehensive Flood Risk Review	Natural and man-made flood risk	Phase 2 has funding for completion Phase 3 – expanding to additional London Underground assets and priority surface assets – has recently obtained funding
We are trialling material for different porous asphalts under London's road use conditions	Pluvial flood risk	Complete
London Underground commissioned a design guide containing the latest understanding of clay cuttings and embankments	Flood and heat (freeze thaw) risks	Complete. G0054B: Earth Structures – Guide for Slope Stability Analysis was published in December 2014 and updated in June 2018 and May 2019
Continuing to deliver the highways asset management plan	Flood risks	Ongoing
Continuing to deliver the Rail and Underground asset management plan	All climate risks	Ongoing
Continuing to specify new projects and services regarding climate projections	All climate risks	Ongoing

As well as progress on the actions identified in our ARP2 report, we have also made progress on additional adaptation actions. These include setting up an organisation-wide adaptation research programme, developing a natural capital account to understand the different benefits of green infrastructure, and updating our Environmental Evaluation process, which is a key stage in our project management process (Pathway), to include climate change adaptation.

We have installed air-cooling, reflective white roofs, and tinted windows to buses.

We also worked with the GLA to develop and deliver bespoke sustainable drainage system training modules for highway officers, and we have installed a raingarden capturing 500m^2 of surface water run-off at Elspeth Road in Wandsworth.

We are developing a London Underground Flood Risk Management GIS platform that brings together our spatial data, along with relevant data from third parties.

We have also incorporated climate risk and adaptation into the design of the Elizabeth line and the Northern Line Extension, as well at the Silvertown Tunnel and Old Street roundabout.

Priority climate change adaptation actions

Data and evidence

A key strand of our ongoing adaptation activity is the development of a comprehensive baseline understanding of weather impacts.

We do this by identifying opportunities to attribute the impacts of weather events in our performance reporting systems, and also by researching programme and exploring further research opportunities.

Processes and tools

The climate risk assessment conducted for this report will be incorporated into our risk management database, enabling more comprehensive and detailed assessments. We are also considering whether to create a new Level 0 enterprise risk for climate change, which would cover mitigation, adaptation, and resilience, as part of wider discussions on the Enterprise Risk Management framework.

We will develop an Adaptation Pathways Framework, which aims to avoid the need for expensive 'white elephant' measures, should risks increase slower or at lower levels than predicted.

We have developed our first natural capital account, which is the first step in embedding the natural capital approach into our decision-making processes and activities.

We will explore the potential for transport sector-wide and TfL-specific standards to better consider climate risk, adaptation and resilience.

We work with many suppliers and contractors on a wide range of projects. We already have certain clauses around climate risk and adaptation within our contracts.

However, we will identify and implement opportunities to expand and improve these requirements.

Collaboration and engagement

Our key collaboration and engagement actions include voluntarily reporting under the Taskforce for Climate-Related Financial Disclosure. We did this a year before we were required to do so under the Government roadmap towards mandatory climate-related disclosures.

We are developing a carbon literacy course for all staff, which will explain the climate emergency and the importance of adapting to it. We will continue to collaborate in key transport-sector and cross-sectoral groups to better understand and take action on external interdependencies. We will also set up workshops with experts within the organisation, to better understand and take action on internal interdependencies.

We have developed a better understanding of weather impacts

Conclusions

We have achieved a lot since our first ARP submission, but there is still more work to do

We have taken important steps towards understanding the impact of climate change on our networks since the 2015 ARP2 submission. These include working with academics to determine baselines and thresholds, and sharing knowledge across the sector, for example through the Transport Adaptation Steering Group.

Our climate risk assessment revealed significant current and future risks from weather- and climate-related impacts. These can be broadly categorised into financial impacts, such as costs of increased maintenance, repairs, renewals and loss of revenue, and also impacts on the health, safety and wellbeing of our staff, customers and contractors. These impacts will increase over time, potentially affecting our financial sustainability.

We have made and, despite the challenging funding environment, are continuing to make, important improvements to increase our adaptation to climate change, such as our work to reduce overheating on buses. We also recognise that climate change is a key strategic risk and our senior leaders are involved with our continued work on adaptation.

However, there is considerable work to be done before we can be considered to have fully managed our climate risks. Long-term, sustainable funding availability as a result of the impacts of the pandemic is a serious issue, which is affecting our ability to adapt London's transport networks to climate change.

We will continue to develop our approach to climate change

About us

Part of the Greater London Authority family led by Mayor of London Sadiq Khan, we are the integrated transport authority responsible for delivering the Mayor's aims for transport. We have a key role in shaping what life is like in London, helping to realise the Mayor's vision for a 'City for All Londoners' and helping to create a safer, fairer, greener, healthier and more prosperous city. The Mayor's Transport Strategy sets a target for 80 per cent of all journeys to be made by walking, cycling or using public transport by 2041. To make this a reality, we prioritise sustainability, health and the quality of people's experience in everything we do.

We run most of London's public transport services, including the London Underground, London Buses, the DLR, London Overground, Elizabeth line, London Trams, London River Services, London Dial-a-Ride, Victoria Coach Station, Santander Cycles and the IFS Cloud Cable Car. The experience, reliability and accessibility of these services is fundamental to Londoners' quality of life.

We manage the city's red route strategic roads and, through collaboration with the London boroughs, we are helping to shape the character of all London's streets. These are the places where Londoners travel, work, shop and socialise. Making them places for people to walk, cycle and spend time will reduce car dependency, improve air quality, revitalise town centres, boost businesses and connect communities. As part of this, our expanded Ultra Low Emission Zone and fleets of increasingly environmentally friendly and zero-emission buses are helping to tackle London's toxic air.

During the pandemic, we took a huge range of measures to ensure people were safe while travelling. This included extensive cleaning regimes across the public transport network and working with London's boroughs to introduce the Streetspace for London programme, which provided wider pavements and cycle lanes for people to walk and cycle safely and maintain social distancing. London's recovery is vital to the UK's recovery as life returns to normal. We want to ensure London avoids a car-led recovery and we continue to reassure people the capital and our transport network is safe and ready for them.

We have constructed many of London's most significant infrastructure projects in recent years, using transport to unlock much needed economic growth. This includes major projects like the extension of the Northern line to Battersea Power Station and Nine Elms in south London, as well as our work at Barking Riverside and the Bank station upgrade.

Working with the Government, we opened the Elizabeth line in time for Queen Elizabeth II's Jubilee. This transformational new railway adds 10 per cent to central London's rail capacity and supports the delivery of high-density, mixed-use developments, which are planned around active and sustainable travel to ensure London's growth is good growth. We also use our own land to provide thousands of new affordable homes and our own supply chain creates tens of thousands of jobs and apprenticeships across the country.

We are committed to being an employer that is fully representative of the community we serve, where everyone can realise their potential. Our aim is to be a fully inclusive employer, valuing and celebrating the diversity of our workforce to improve services for all Londoners.

We are constantly working to improve the city for everyone. This means using information, data and technology to make services intuitive and easy to use and doing all we can to make streets and transport services accessible to all. We reinvest every penny of our income to continually improve transport networks for the people who use them every day. None of this would be possible without the support of boroughs, communities and other partners who we work with to improve our services. By working together, we can create a better city as London's recovery from the pandemic continues.

July 2023

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PUB23_035