



Climate Change Adaptation Plan 2023 Draft

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This report relates to the Corporate Environment Plan 2021 and the Sustainability Report 2021. For more information, visit tfl.gov.uk/sustainability

Foreword

Climate change is both a current and future threat to us all. It has already caused irreversible damage to our planet and way of life, and is one of the biggest challenges of our generation

As London's integrated transport authority, we lead the development and implementation of the Mayor's Transport Strategy, which sets the strategic direction for transport across the capital.

Our challenge is to adapt our systems to reduce the impacts of climate change, and ensure that we are resilient in the face of more extreme and frequent weather events across London.

In recent years we have experienced flooding, storms and heatwaves across the capital, causing safety incidents, widespread disruption and delays to our network, as well as financial challenges.

We now aim to accelerate our adaptation efforts by creating a comprehensive and holistic plan of action, and we are asking all parts of our business to think about ways to contribute to reducing our climate risks. Together and over time, this will enable our network to be better adapted, and more resilient, to climate change.

But we cannot do it alone. Managing our interconnected systems to build a resilient transport network will require engagement and collaboration with numerous agencies and authorities across London, both within and beyond the transport sector.

This plan highlights what we are already doing to adapt to climate change, and is our invitation to the many organisations that we work with to come together to improve our collaboration in the fight against its impacts.


Our vision is for us to keep London moving as reliably, safely and sustainably as possible given the severe risks that climate change poses to our staff, customers and operations. We can only do this by working together across our entire organisation and beyond to embed climate risk management into everything that we do. This adaptation plan is an important part of our ongoing efforts to accelerate action.

Adapting to climate change is not only about managing risk. It also comes with great opportunity to create a more attractive, nature-rich, liveable city, with strong community and new partnerships. Working together will help us to build a more sustainable transport network for all Londoners – both now and in the future.

Lilli Matson
Chief Safety, Health
and Environment Officer



‘We are asking all parts of our business to think about ways to contribute to reducing our climate risks’

A photograph of a flooded city street, likely in London, showing a blue BMW car with license plate WT16 UXR driving through deep water. Other cars and pedestrians are visible in the background. A blue hexagonal overlay on the left contains the text.

Tackling the impacts of climate change on London's transport network

Introduction

The impacts of climate change will intensify for years to come, even with reduced greenhouse gas emissions, so we need to adapt

Our role in addressing the challenges of climate change has never been clearer. We are committed to delivering a safer and more sustainable future for the communities we serve. Climate change is happening now, and we need to take urgent action.

This strategy builds on TfL's Corporate Environment Plan (2021) and aims to inform our stakeholders about how we will adapt to climate change through a coordinated and comprehensive plan.

Our vision is for a well-adapted and climate-resilient transport network that is safe, reliable and sustainable for our customers and colleagues, as well as having no negative impacts on our neighbours and wider stakeholders.

In addition to lost revenue, extreme weather events affect our network, causing increased safety issues and increased costs through our emergency response to get our operation back up and running, as well as repairing damaged assets.

Ongoing projects include working with the Environment Agency on the Thames Estuary 2100 Plan to protect our transport network from tidal flooding, now and in the future. We are also conducting research, such as the London Comprehensive Review of Flood Risk, to understand our risks and take action to protect our network.

£8m

was lost in revenue due to 5 million fewer passengers on the London Underground during the 2022 heatwave

Climate change is already affecting us:

- In July and August 2022, temperatures in the UK reached over 40 degrees Celsius for the first time on record. For TfL, this caused widespread disruption, with some services being cancelled, temporary speed restrictions, asset failures and trackside fires, causing delays and cancellations across the network
- On 12 and 25 July 2021, two severe rainfall events caused significant flooding across London, resulting in the full or partial closure of 30 stations across the whole TfL network. The closures and delays to the London Underground network caused by the 12 July flood event alone resulted in approximately 197,128 lost customer hours, equating to a financial loss of almost £2m
- In February 2022, the UK experienced three named storms (Dudley, Eunice and Franklin) within a one-week period. These storms resulted in widespread disruption for us, with trees and debris blown onto our networks and high winds causing communication issues
- In the UK sea levels have risen 16.5cm since 1990 and will rise by a further 50cm-100cm in the Thames Estuary by 2100. Flood plains in London are currently home to 1.42 million people, as well as £32bn-worth of homes. Our transport network operates throughout London's flood plains and we rely on protection from the Thames Barrier and other tidal and river flooding defences



The impacts of climate change affect public health as well as causing significant financial costs.

More than
20,000

people died across western Europe in the summer 2022 heatwave

More than
200

people died across Europe in the July 2021 floods, which caused \$46bn-worth of damage

3 people

died in August 2020 when heavy rain contributed to an embankment failure and debris on the track near Carmont in Scotland, causing a train to derail

1.42 million

people currently live on London's flood plains

£2m

of income was lost due to flooding on the London Underground in July 2021

The TfL Adaptation Plan identifies the key actions and improvement areas that will:

- Help our transport network to be better adapted and more resilient to climate change
- Support our work to reach net zero
- Improve air quality
- Maintain our safety record
- Support city greening, enhance Londoners' health and wellbeing and provide areas for wildlife



Planning for our future climate

Predicting the exact climate conditions we will experience in the future is a challenging task



We are using Met Office emissions scenarios to inform our adaptation planning. Regardless of the forecast scenario used, Met Office projections are that we will experience hotter, drier summers and warmer, wetter winters, with more frequent and more intense severe weather events.

Due to the national importance of our infrastructure, we are using a medium-high emissions scenario (RCP6.5 90th percentile) that is consistent with a 2-3 degrees Celsius increase in average global temperatures as a base to assess risk.

We will stress-test long lifespan projects and assets using a high emissions scenario (RCP8.5 90th percentile) that is consistent with a 4-5 degree Celsius increase.

What does a changing climate mean for TfL?

We have completed our most comprehensive climate risk assessment to date, which identified the risks to people and assets in 2022, 2050 and 2080.

The results from the climate risk assessment have given us a baseline for our adaptation plan. The results showed that all asset categories are, or will be, at risk from climate change by 2050.

The graphs on page 8 show that, in the absence of adaptation measures, TfL's climate risk will increase over time.

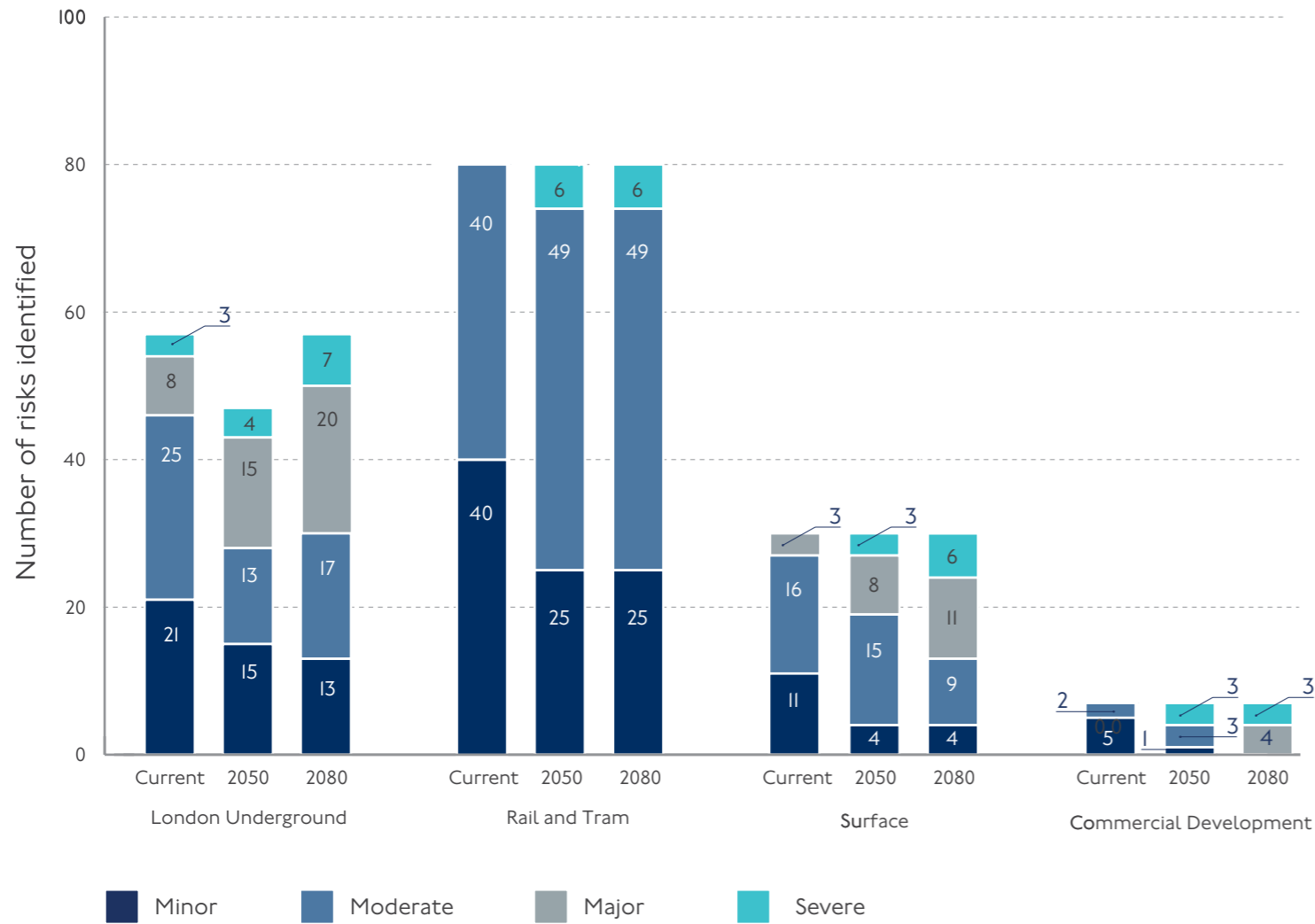
We identified 333 climate risks within the assessment. Precipitation, including both too much and too little rain, is the climate hazard with the greatest number of identified risks. Temperatures, both high and low, are the climate hazards with the next greatest number of identified risks.

Some of our most at-risk assets are:

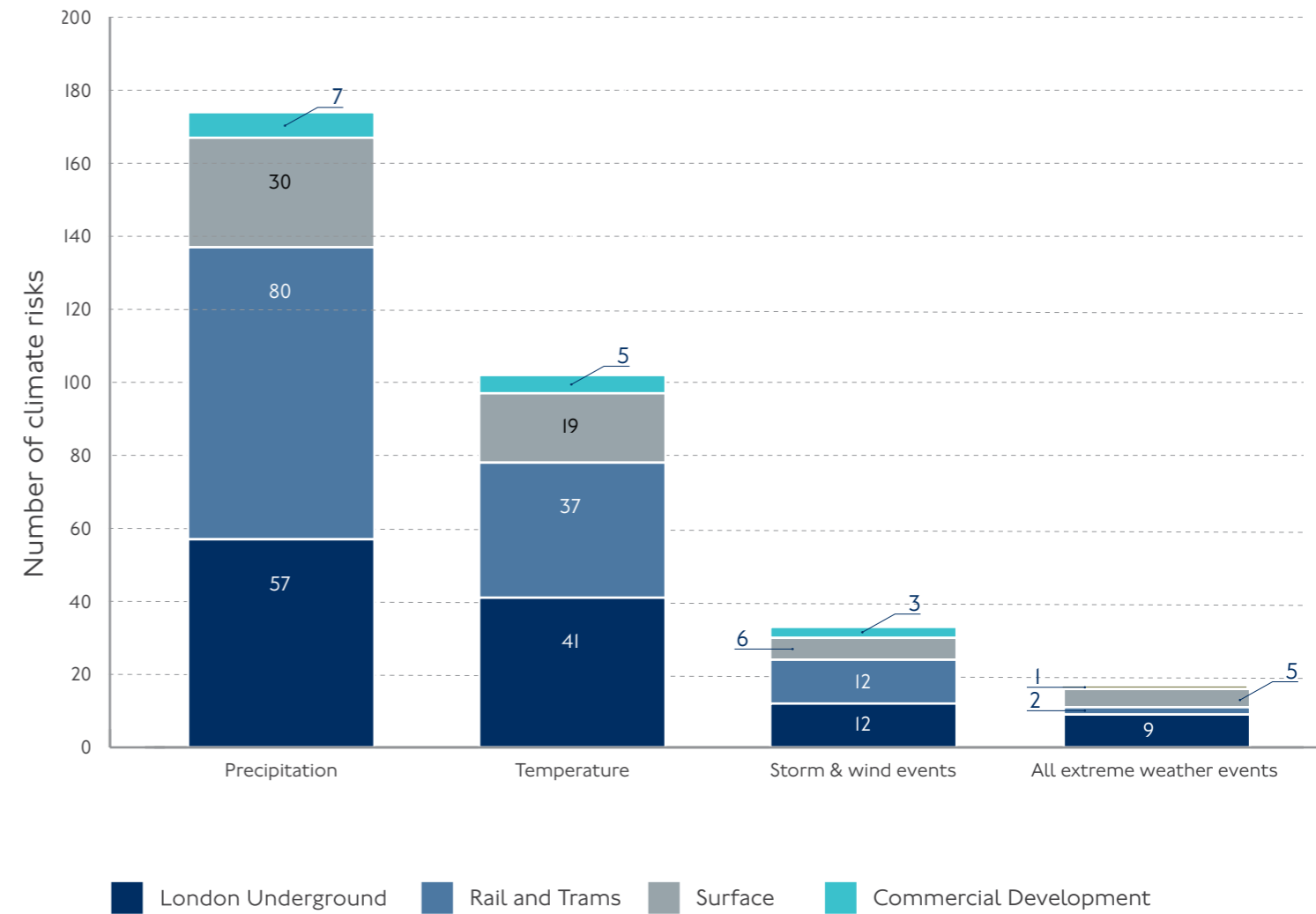
- Bridges and viaducts
- Drainage – track, civil infrastructure, buildings and highways
- Rolling stock
- Signalling systems

We are already completing work with asset strategy and engineering teams to identify actions that will reduce the risk from climate hazards for these assets.

The change in severity of climate risks over time across different areas of the business in the absence of adaptation measures



The number of climate risks identified for different areas of the business



There are five risks to people scored as major or above today. The majority (four out of five) are linked to extreme high temperatures. This increases to 11 risks in the 2050s and 13 in the 2080s.

Understanding the risks to our assets and people has provided the baseline for our adaptation plan.

Our role

At TfL, we lead the development and implementation of the Mayor's Transport Strategy

The Mayor's Transport Strategy sets the strategic direction for transport across London and is closely linked with other mayoral strategies, such as the London Environment Strategy and London Plan.

Our transport network is integral to London and is woven throughout the city. It also connects with other transport networks, such as borough roads and Network Rail infrastructure.

We take a leading role, but we cannot tackle climate change in isolation. We are collaborating with major stakeholders across London to develop adaptation measures.

This includes urgent actions that need to be taken now, as well as longer-term planning. We see adaptation as a vital activity that we need to do to protect London as a whole.

Adaptation can also have additional benefits. For example, creating and enhancing green infrastructure to reduce flood risk and provide shade and shelter increases the attractiveness of neighbourhoods, can improve air quality, supports biodiversity and contributes to the mental health of Londoners.

Our aim is for 80 per cent of trips to be via walking, cycling or public transport by 2041. Over time, the number of Londoners using our network will increase as the population grows and as more people walk, cycle or use public transport.

To help meet this demand and our air quality and carbon reduction goals, it is vital that our transport networks are a safe and reliable alternative to private cars by being resilient and adapted to climate change.

Mayor's Transport Strategy

MTS Policy 9: The Mayor, through TfL and the boroughs, and working with stakeholders, will seek to ensure that London's transport is resilient to the impacts of severe weather and climate change, so that services can respond effectively to extreme weather events, while continuing to operate safely, reliably and with a good level of passenger comfort

80%

of trips should be via walking, cycling or public transport by 2041



What is climate change adaptation?

Adapting to climate change will make our network and services more reliable, attractive and safe

Adaptation is ‘the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities’¹

Through our adaptation journey, we will make our network more resilient to future climate conditions. For example, we will embed climate change modelling into design specifications for assets, meaning they will be capable of operating with climate challenges and stressors.

Adaptation and resilience are both important to managing climate change.

Adaptation decision-making is complex and our role in tackling climate change will be iterative. We will monitor and adapt our approach as:

- The field of adaptation knowledge matures
- We expand our evidence base
- We make progress with the work that needs to be done

Our approach is to embed adaptation across TfL: updating existing processes and standards to include climate risk and adaptation, as well as upskilling our colleagues on their responsibilities.

We are also prioritising data collection to improve our understanding of climate risks and their implications for our business and for Londoners.

Adaptation is vital, but we also currently rely on resilience to keep our services running after extreme weather events. Using our adverse weather plans and emergency procedures, we have been successful in restoring our network’s capability quickly after extreme weather events.

We will continue to focus on building our resilience through our emergency response teams, while working on longer-term adaptation measures. However, as severe weather becomes more frequent over time due to climate change, the cost and time spent on resilience will increase.



TfL approaches to resilience and adaptation

Item	Approach	Benefits	Examples for TfL
Resilience	Using weather forecasts, industry best practice and previous experience to prepare for extreme weather events, dealing with climate impacts as they are happening	<ul style="list-style-type: none"> • Inform operational teams of extreme weather, allowing time to enact adverse weather plans • Rapid recovery after extreme weather events • Improve customer and staff safety 	<ul style="list-style-type: none"> • Reliable and timely weather forecasting and warning systems • Emergency response teams to address weather-related impacts • Timely communication to the public and staff • Sufficient supplies, materials and resources to respond to the effects of extreme events • Pumps to remove floodwater
Adaptation	Preparing, planning and investing for future climate impacts using long-term weather projections and scenarios	<ul style="list-style-type: none"> • Better design and planning for assets, as climate risks are included in standards and processes, resulting in: <ul style="list-style-type: none"> ◊ A safer and more reliable network during and after extreme weather events ◊ Fewer catastrophic costs caused by extreme weather 	<ul style="list-style-type: none"> • Climate projections data that the rail sector can effectively use to manage risk • Reviewing standards and specifications to incorporate appropriate requirements • Embedding adaptation measures, such as green infrastructure and flood barriers, into renewal and enhancement projects and programmes • Asset and business strategies incorporating adaptation requirements

* ¹ IPCC (2021) Sixth Assessment Report Annex VII: Glossary



Providing a service for all

Keeping our staff and customers safe while providing sustainable, reliable and attractive services is our priority

All Londoners should have access to safe, reliable and sustainable public transport. We understand that different groups prefer certain modes over others, and so it is important we provide a good service on all our transport modes.

Safety and reliability

Safety is our key priority. Climate change makes it more challenging to operate our infrastructure and services safely. We will not compromise on safety, which means during extreme weather events we may not be able to run maximum service levels, or we may even have to close some services, roads and stations.

As well as extreme weather events, climate change means that we will experience increased levels of asset degradation over time. These will require additional investment to avoid or reduce safety and reliability issues.

During severe weather events we aim to operate services when it is safe to do. If service levels need to change, informing customers as far in advance as possible is vital to ensuring safety for our customers and staff.

A joined-up approach

Disruption on our network can have knock-on effects for other transport providers within and beyond London, and vice versa.

Our operations do not exist in isolation. For example, many of our services operate on others' networks, including London Overground services on Network Rail infrastructure, and buses on borough roads. In addition, other operators run services on our assets.

Damage to these networks can have impacts on our services, such as overcrowding on buses and congestion on the road network. We are also reliant on infrastructure beyond the transport sector, such as water supply, power and communications.

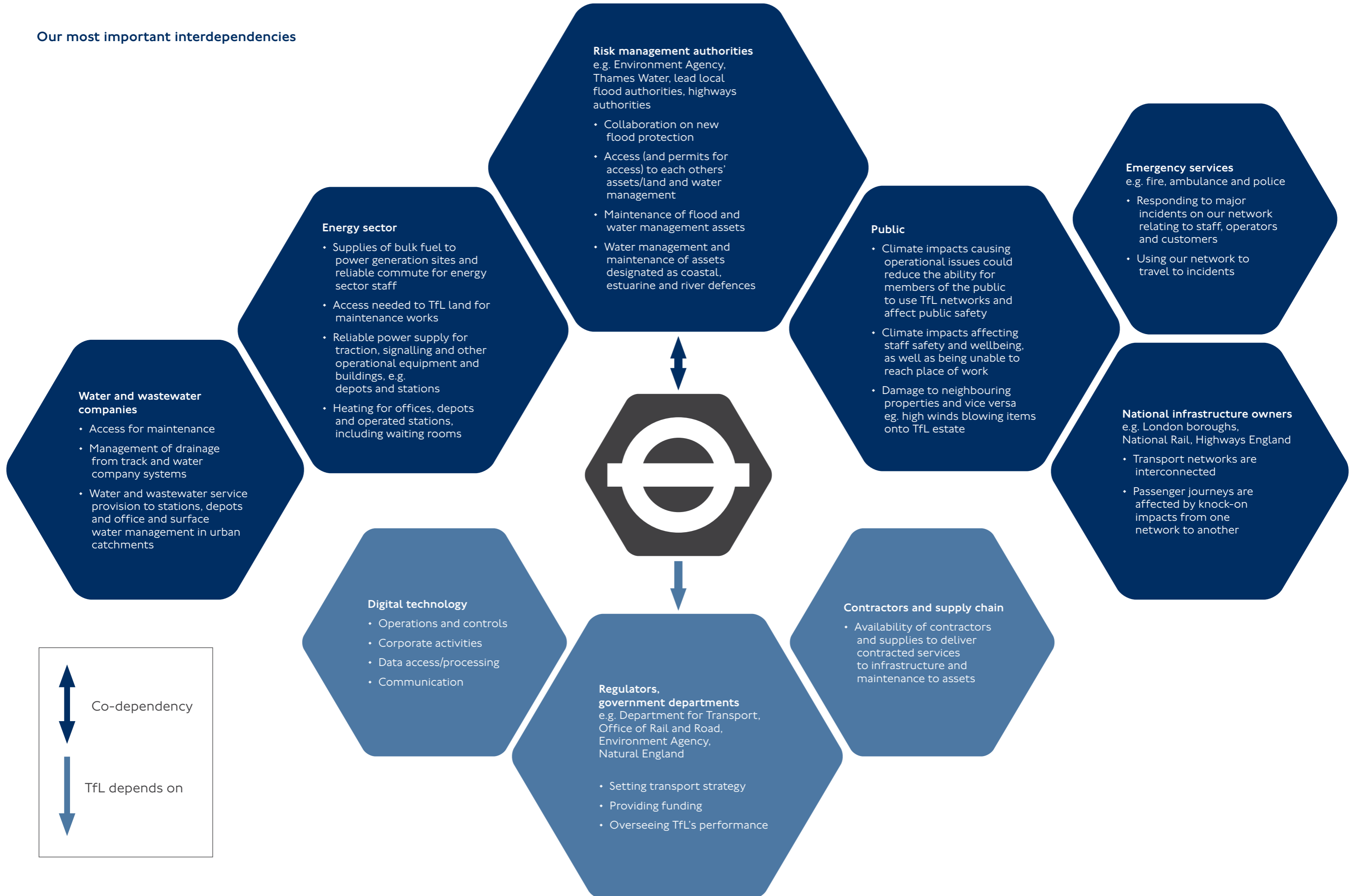
We recognise that we cannot operate a resilient transport network by ourselves. Managing our interconnected systems in the face of climate change will require engagement, support and collaboration with a wide range of organisations.


We are already making good progress on this collaboration effort through, for example, the national Infrastructure Operators Adaptation Forum, the pan-London Surface Water Flooding Strategic Group and the London-focused Transport Adaptation Steering Group.

Managing our interconnected systems requires collaboration with other organisations

Adverse weather can cause disruption across the network

Our most important interdependencies





Adapting to changing
climate conditions
and providing safe,
reliable services
across London

Our action plan

Our environmental sustainability is inextricably linked to our financial and social sustainability

Our vision is for a well-adapted and climate-resilient transport network that is safe and reliable for our customers and colleagues, as well as having no negative impacts on our neighbours and wider stakeholders.

A key step to achieving this is to better understand the key risks from climate change on our assets, business, people and operations.

Addressing the actions within the adaptation plan will be an iterative process, as we gather more data and expertise, and we will continually review our approach to ensure that we are making the best decisions.



Our action plan is focused on six interlinked thematic areas:

- Leadership and governance
- Organisation and people
- Risk management
- Information management
- Capital and operational delivery
- Collaboration, communication and reporting

The plan has three interlinked aims:

- To deliver an efficient and reliable transport network that provides an attractive alternative to car use, while playing our part in adapting London to climate impacts
- To protect our staff, contractors, and customers
- To reduce the financial impact of climate change and make the most of any financial opportunities arising from climate change and/or climate change adaptation

What we are already doing

We are committed to adapting our network to climate change.

We have:

- Completed our most comprehensive and detailed climate risk assessment to date, identifying the key risks to people and assets
- Established a wide-ranging research programme to understand climate risks, which we use to inform our adaptation activity
- Increased funding for sustainable drainage systems (SuDS) in four major schemes on our network
- Set requirements to consider climate change in new transport policies and projects, including all papers to our Programme and Investment Committee
- Collaborated with a wide range of internal and external stakeholders to share knowledge and push for change
- Trained over 450 colleagues (as of January 2023) on carbon literacy, which includes an introduction to climate change adaptation

Leadership and governance

Effective climate risk management requires TfL to have a clear direction, strong leadership and good control mechanisms in place. To do this, we will fully integrate climate risk and adaptation into our governance, build adaptation into day-to-day activity and create a culture where all teams understand and take ownership of their contribution to protecting TfL from climate risks.

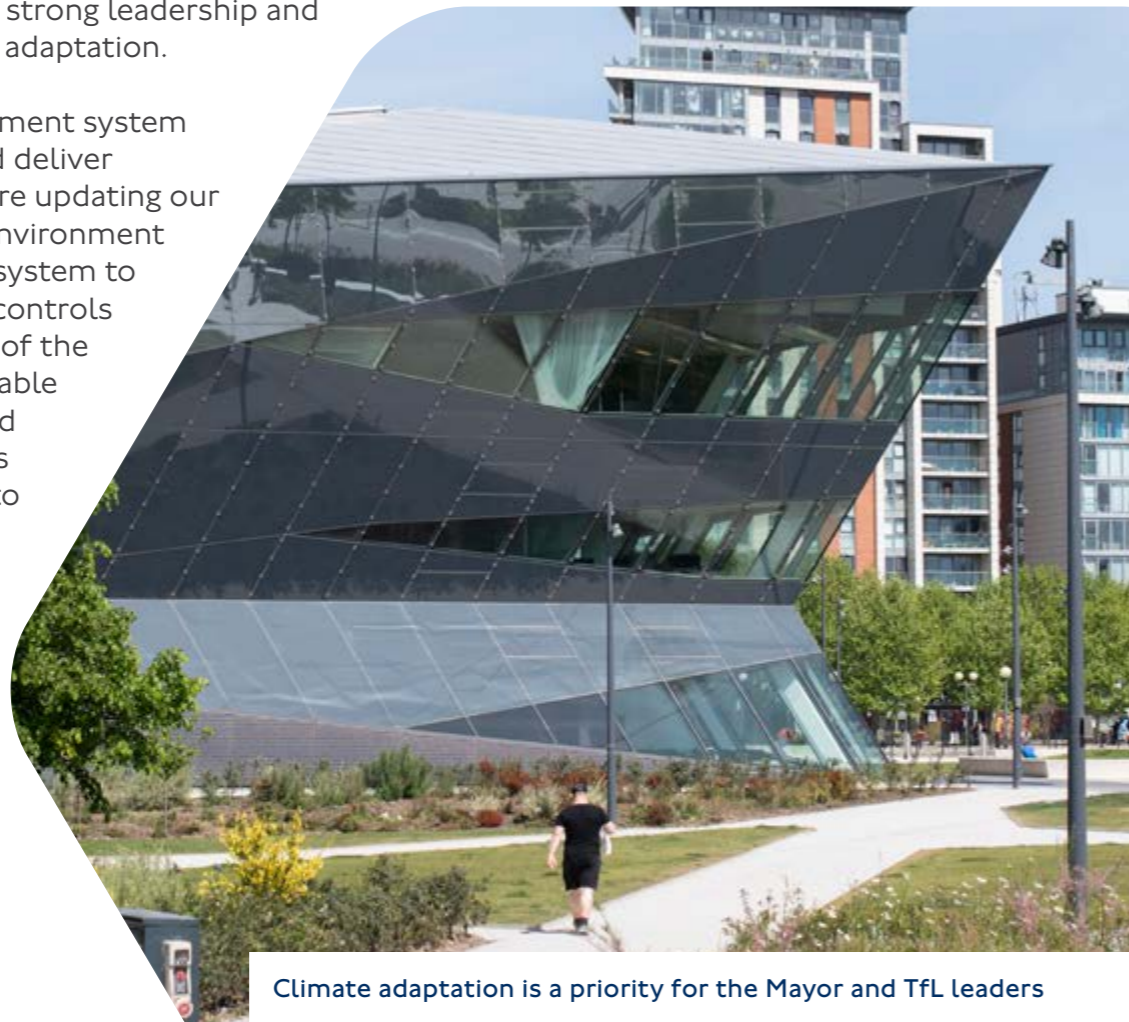
Working collaboratively across teams is crucial to ensure that we avoid duplication and fill any gaps. We currently manage climate risk and adaptation through our Executive Committee Sustainability Group. This group provides strong leadership and a clear direction for adaptation.

We use our management system to mitigate risks and deliver opportunities. We are updating our safety, health and environment (SHE) management system to include adaptation controls in all relevant parts of the system. This will enable teams to understand their responsibilities and commitments to managing climate risk.

Asset management is a core component in adaptation. Through our strategic asset management, we will continue to focus on improving

our understanding of current and future climate risks to our people, network, assets and components.

Adaptation work will require investment. We will build long-term investment plans that consider adaptation as important as (and closely linked with) safety and reliability. We will continue to seek third-party funding opportunities for adaptation and will set up specific budgets that will fund adaptation measures. We are also working with our insurers to strengthen our understanding of, and protection against, climate change.



Climate adaptation is a priority for the Mayor and TfL leaders

Short term (by the end of 2023)

Through the Executive Committee Sustainability Group, review adaptation roles and responsibilities for all business areas, gaining ownership from senior leaders

Clearly define how adaptation should be integrated into business planning and tracked

Work with insurers to better understand our climate risks

Update the SHE management system to include climate risk and adaptation more comprehensively

Create a budget specifically for adaptation measures, e.g. SuDS installation

Medium term (by the end of 2026)

Integrate adaptation into business planning and create a programme to continually review processes

Update all TfL-wide management systems to better include climate risk and adaptation and link to the SHE management system

Work with insurers to improve our access to insurance products that will best protect us from the financial impacts of climate change

Build a framework to capture all external funding opportunities for adaptation measures, and have success completing adaptation schemes using funding

Long term (by the end of 2030)

Develop quantitative data that will enable decision-making for investment in adaptation

Outcomes

As a result of these actions, we will:

Have clear leadership and oversight on climate change adaptation and investment decision-making

Have consistent and joined-up processes for managing climate risks across TfL

Understand our risks and liabilities from climate change and have the most suitable insurance products, to protect our business

Organisation and people

We need our colleagues to have the right skills and knowledge for adaptation. Alongside this, colleagues need to understand the importance and criticality of urgent action.

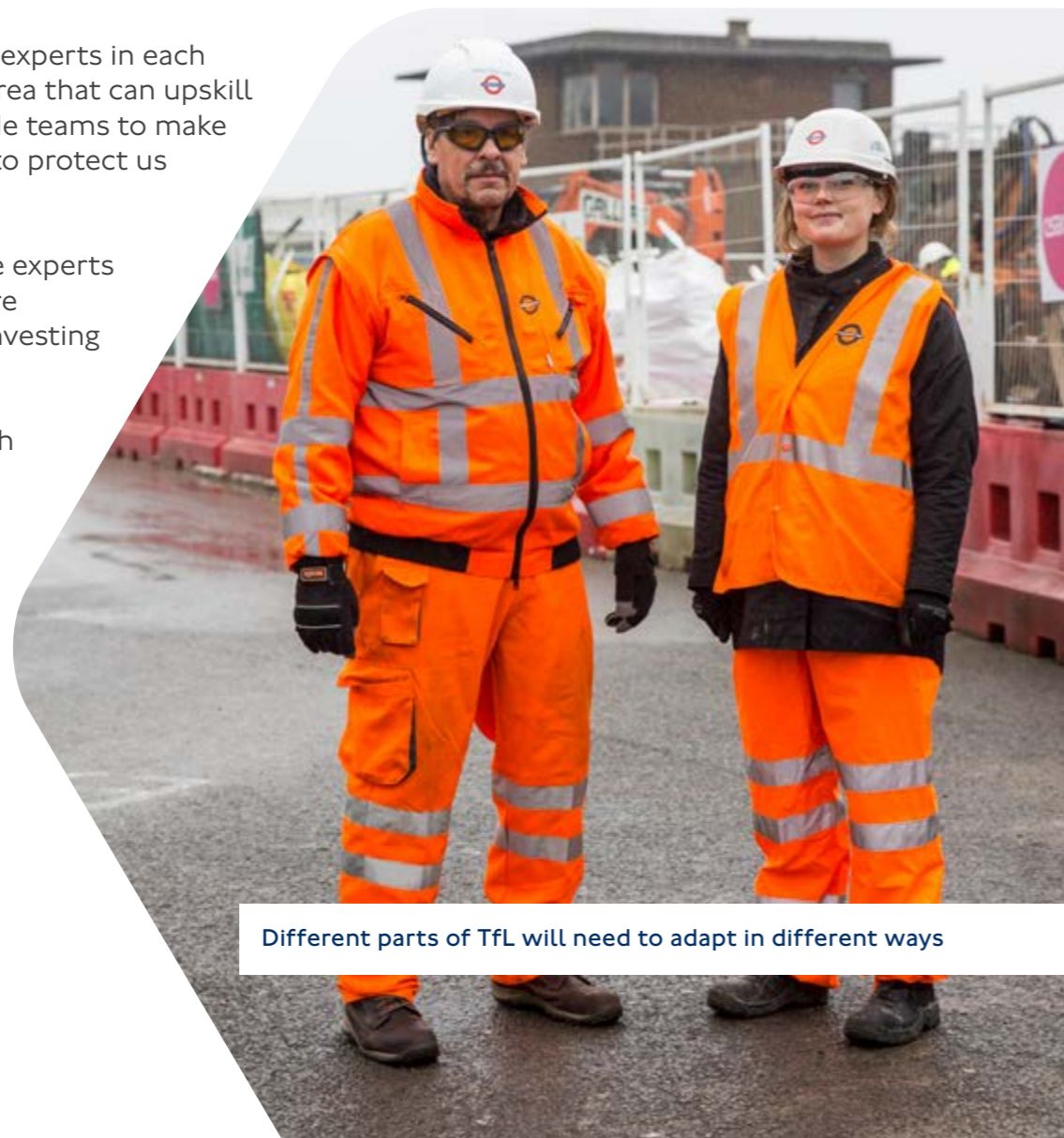
By understanding the knowledge and skill requirements for each business area, we will provide comprehensive and specific adaptation training for colleagues in departments that require it. We will also provide training materials so that all colleagues have a baseline knowledge of climate risks and adaptation.

Our plan is to have experts in each relevant business area that can upskill colleagues and guide teams to make the best decisions to protect us from climate risk.

We also want those experts to be able to explore opportunities for investing in adaptation, such as installing green infrastructure which will improve the attractiveness of our city, as well as having benefits for residents and biodiversity.

We will look at the staff and financial resources needed to do this.

There is a limited number of transport sector professionals with adaptation knowledge. We will work with our key stakeholders within the transport sector and beyond to address this issue, with a view to ensuring future professionals have specific adaptation training. For example, the skills shortage has been identified as a key area of work as part of the rail industry's whole-industry strategic plan.



Different parts of TfL will need to adapt in different ways

Short term (by the end of 2023)

Implement an internal communications and education programme to inform colleagues of how climate change is affecting us and our approach to reducing risks

Develop a pan-TfL adaptation forum to encourage knowledge-sharing and the development of solutions across departments

Review and formalise the pan-TfL adaptation working group, which works to embed climate-change adaptation into TfL's processes and decision-making

Identify business areas that require resource for focused adaptation work

Medium term (by the end of 2026)

Develop and deliver targeted, comprehensive and specific adaptation training for teams that require it

Develop and make available online and/or in person training to educate colleagues on baseline understanding of climate change and adaptation

Engage with the development of the rail sector's adaptation maturity matrix and assess its potential for use in TfL

Fill roles in departments that require resource for focused adaptation work

Outcomes

As a result of these actions, we will:

Ensure our people have the skills and knowledge to deliver adaptation throughout TfL

Ensure we have the right resources in the right places to integrate adaptation into our work

Have an established communications channel, whereby any colleague interested in climate updates can access information

Risk management

All risks in TfL, including climate risks, are managed using the enterprise risk management (ERM) framework. This provides a consistent approach and holistic view of risks across the organisation. Adaptation is assessed at an enterprise, strategic and tactical level. We have updated the ERM to include specific actions needed to control climate risk.

Risk modelling is another tool we can use. This involves quantifying the probability of a risk event occurring, and its potential severity. It provides much more detailed information about specific risks at specific locations and areas.

Two challenges for us are:

- Identifying and gathering the right data, such as asset exposure, vulnerability, and condition
- Using the models to make meaningful decisions by incorporating them into existing processes

As well as using data from our information systems, we will explore how we can use third-party weather forecast data from MetDesk and information from our internal weather stations.

The weather stations strategically placed on our network for resilience purposes give us specific insight into the performance of our assets under different weather stressors. We will look at how this and MetDesk data could be combined with our asset data for risk modelling purposes.



A climate-resilient network is safe and reliable for everyone

Short term (by the end of 2023)

Develop the ERM to fully include climate risk and adaptation measures

Outline our approach for risk modelling, identifying actions that are required and data gaps that need to be filled

Medium term (by the end of 2026)

Include climate change in the risk profiles for our assets

Identify and develop risk models that will be most informative in helping reduce climate risks

Agree a process with external stakeholders on how we will share data and work together to create pan-London risk models

Investigate how we can use weather stations and other third-party data to inform research and risk models

Long term (by the end of 2030)

Obtain and continually improve the data we require for risk modelling, for example through amending existing asset condition reporting and performance reporting systems.

Outcomes

As a result of these impacts, we will:

Have an integrated approach to managing our climate risks across TfL

Ensure we understand our current and future risks in detail through in-depth quantified risk modelling

Improve performance against risks

Information management

Developing a comprehensive and accurate evidence base is fundamental for making decisions on climate change adaptation. We currently gather information through our research programme and our internal systems to better understand the impacts of extreme weather on our people, assets and services.

We plan to improve the information collected in our systems, to enable us to use reliable and relevant quantitative data to inform our decision-making.

We launched our strategic adaptation research programme in 2018 and we are currently working with universities and organisations to improve our knowledge of climate risks and opportunities on our network. Over time, as our baseline understanding improves, the research programme will evolve so the insight we gain can increasingly be used to drive specific action.

We will combine our evidence base with Met Office climate projections to understand how these impacts are likely to increase in magnitude and frequency with climate change. We will use this information to identify and target cost-effective adaptation measures.

Gathering rapid, accurate, reliable, comprehensive and centralised data through our information systems will help us with business planning and making investment decisions.

Across TfL we currently use multiple systems to store information. In order to make the most informed decisions for adaptation, it is vital that we link systems across our organisation, so that we can access information in a centralised way.

We have two key distinct information systems that we need for adaptation purposes:

- Performance reporting system information is required to gather data on weather-related closures and delays. We can use information such as staff time, repair costs and service disruptions to better understand the financial costs of extreme weather events
- Asset management system information is required to inform adaptation investment decisions. For example, by linking asset condition data to weather data, we can better understand degradation rates and vulnerabilities that need addressing

We will improve our data to enable us to improve performance monitoring. Data will be used to set appropriate adaptation-related measures and objectives to monitor performance for relevant departments. Our long-term aim is to monitor climate change adaptation through the TfL scorecard.



Adaptation pathways

Adaptation pathways are a way of developing a long-term climate adaptation plan for a place, often looking towards the end of the century (2100) or beyond. They set out a range of actions that can be taken to better anticipate and respond to climate change.

These actions are linked to specific thresholds or 'tipping points', where a change to our understanding of the impacts of climate change, the local environment or other socio-economic conditions triggers particular actions.

This means that while a range of different climate change scenarios are considered and planned for, actions are only taken when they are needed, making this approach cost-effective and resource-efficient.

Adaptation pathway plans need to be regularly monitored and evaluated so that they can remain agile to managing future risks over time.

The first step for us is to develop an adaptation pathways methodology which will result in pathways that are specific enough for implementation to be practicable, while also being broad enough for use across TfL. The development of this methodology will take into account the availability of TfL's current and likely future data to set thresholds.



Green infrastructure makes areas healthier and more attractive

Short term (by the end of 2023)

Understand gaps in our evidence base and use the strategic adaptation research programme to identify and prioritise the most effective areas for further research

Develop a process to ensure that we embed the use of research findings to make the most cost-effective business decisions

Medium term (by the end of 2026)

Review information gathered in TfL's performance reporting systems to determine if it is sufficient for adaptation decision-making. Determine the potential for amending systems cost-effectively to support adaptation if required

Review the opportunity to link information systems for improved understanding, such as performance reporting systems with operational weather forecasting tools

Launch a pilot project to explore the feasibility of identifying weather (and consequently climate change) as a contributing factor in asset degradation

Integrate weather information data into asset-condition reporting where possible

Set operational targets to monitor adaptation progress

Develop a methodology for effective adaptation pathways

Improve data to allow us to make evidence-based investment decisions on climate risk

Long term (by the end of 2030)

Develop a quantitative data-driven approach to include an adaptation-related metric in the TfL Scorecard

Develop and implement adaptation pathways

Outcomes

As a result of these actions, we will:

Have a sound evidence base to make planning and investment decisions

Understand climate risks across the network and be able to use information to improve performance

Capital and operational delivery

Adaptation must be considered early in, and throughout, the project development process. This is because many of our assets have long lifespans that will need to be resilient to future weather.

We are focusing on this by:

- Using our climate risk assessment to provide detail on the type and location of projects that need to prioritise considerations of climate risk and adaptation
- Setting out which climate projection scenarios are appropriate to inform the design of the project
- Updating our standards to make sustainable drainage systems (SuDS) the default in projects

We are transitioning our procurement processes to a new system and have worked to include environmental considerations into the whole procurement lifecycle. As part of this we will provide the appropriate Met Office climate scenarios to help our suppliers design assets fit for future climate challenges.

We will also work with our suppliers to understand their risks in relation to climate change, to help protect our supply of critical assets.

Green infrastructure (GI) includes parks, green spaces, gardens, woodlands, rivers and wetlands, as well as urban greening features such as rain gardens, street trees and green roofs.

GI is a crucial climate-change adaptation measure. For example, trees help provide shade and cooling during hot weather and vegetation reduces the amount and speed of surface water run-off before it reaches our over-burdened drainage systems. As part of our projects, we are actively seeking new locations on our network for planting trees and installing other forms of green infrastructure.

The Mayor's Transport Strategy includes a target to deliver 50,000 square metres of catchment draining into highways SuDS features every year. TfL owns and manages London's strategic road network, which represents approximately five per cent of London's roads by length. We have now committed to delivering 5,000 square metres as part of this target.

Given the scale of the climate crisis and the need to install SuDS across the whole city, SuDS should be considered as a default design feature for any project that involves excavation or structural changes to a roof.

Through our project management system (Pathway), TfL designers will be required to fully justify any instances where SuDS have not been included.

We have robust resilience processes in place to provide a consistent and structured approach to the management of extreme weather events. This involves using forecasting tools, risk assessment and adverse weather plans.

5,000 square metres of catchment draining into highways SuDS to be added every year

Sustainable drainage systems are essential to climate adaptation



Coordinated by our control centre, we work collaboratively with a range of stakeholders across TfL, to manage risks, update operational procedures, inform customers of changes during periods of weather disruption, and repair damage quickly after extreme weather has passed, to provide the best service possible to customers.

We use our resilience processes to provide a consistent and structured approach to the management of extreme weather impacts. This involves using twice-daily weather reports and forecasts up to five days in advance of weather incidents that could affect our transport network.

Our resilience is organised through our Network Management Control Centre, which communicates with operational departments to complete risk assessments and weather plans, as well as highlighting risks and identifying mitigations.



We aim to repair damage quickly after extreme weather events

Short term (by the end of 2023)

- Develop high-level principles for trackside green infrastructure management in collaboration with the Rail Safety and Standards Board (RSSB) and other rail sector stakeholders
- Deliver 5,000 square metres of SuDS each year
- Ensure SuDS are a default component of project design
- Ensure all TfL capital investment projects seeking financial authority demonstrate consideration of climate change and adaptation measures
- Input flood mapping into options selection

Outcomes

As a result of these actions, we will:

- Have a more resilient infrastructure, with adaptation measures installed as part of project design
- Increased installation of SuDS, reducing the risk of flooding across London
- Increase safety for our customers and our people

Medium term (by end of 2026)

Ensure adaptation is fully embedded across our project management processes, including:

- Ensuring climate risk and climate projection scenarios are included across procurement processes
- Ensuring climate projection scenarios and adaptation are included in contract clauses and works information

Review options for the development of a non-highways SuDS target

Actively engage in the pan-London initiative to complete the monitoring phase of the London strategic SuDS pilot study to demonstrate the benefits of highways-based SuDS

Actively engage in the pan-London initiative to expand the London strategic SuDS pilot study's hydraulic modelling to show optimal locations for SuDS across the city

Collaboration, communication and reporting

Climate hazards do not respect organisational boundaries and our networks do not operate in isolation from each other, third parties' infrastructure, or the public. Consequently we need to actively engage with a wide range of stakeholders. Collaboration is an ongoing process, as new knowledge and initiatives are being continually developed.

We communicate with customers in advance of extreme weather, where sufficient notice of the event exists. During the weather event, live channels, such as TfL Go, are used to keep customers informed about specific impacts on journeys. As forecasts and technology improve, we will explore whether we can provide more detailed information further in advance of, and during, weather events.

From 2023, it will be a mandatory requirement for TfL to report on Taskforce for Financial-related Climate Disclosures (TCFD). This will showcase our financial risks and opportunities in relation to physical

climate hazards. We provided a high-level voluntary overview of TCFD in our 2021/22 annual report. We will also continue to provide submissions under Defra's Adaptation Reporting Power, collaborating with transport sector stakeholders to ensure a consistent approach to reporting.



Short term (by the end of 2023)

- Improve our customer communications before, during and after severe weather events
- Expand TfL's collaboration work with external stakeholders, including contributing to the third National Adaptation Programme
- Collaborate with key stakeholders regarding surface-water flood risk, through the pan-London Surface Water Strategic Forum and the development of a pan-London vision and strategy for surface-water flood risk management
- Collaborate across industry, with the Government, regulators and other stakeholder and infrastructure operators to develop joint plans and understand and manage interdependencies
- Develop a framework to provide detailed climate-related reporting following the TCFD framework
- Develop processes to gather data and information as part of mandatory climate change reporting
- Develop a page on the TfL website on TfL's climate risks and the work that we are doing on climate change adaptation

Medium term (by the end of 2026)

Work with the Transport Research and Innovation Board and key transport sector stakeholders to develop a transport sector adaptation design playbook

Outcomes

As a result of these actions, we will:

- Strengthen partnerships with stakeholders and implement joint actions to manage climate impacts
- Communicate our progress on adapting to climate change to our customers and stakeholders

Delivering the plan

The transition to a climate-adapted London has implications for every aspect of society

We are committed to building a well-adapted transport network that is resilient to climate change. The way forward requires a coordinated effort across TfL, as well as working with external stakeholders.

We also require both public funding and private finance to improve our understanding of climate change and to invest in adaptation measures.

Transparency on our adaptation journey is vital to us. You can access TfL's adaptation

reporting power submission and TCFD disclosure through our website. We will also launch a page on our website where you can access our latest information on climate change and adaptation.

We have a clear direction for our adaptation work. Through TfL's Executive Committee Sustainability Group, the actions within our Adaptation Plan will be monitored and we will regularly report progress to the TfL Safety, Sustainability and Human Resources Panel and the TfL Board.

TfL is a regular and contributing member of several key knowledge-sharing groups:

- The Pan-London Surface Water Flooding Strategic Group and associated Officers Group, as well as the Severe Weather and Natural Hazards Working Group
- The Rail Safety and Standards Board, Sustainable Rail Strategy Executive Committee and Leadership Group and Climate Change Adaptation Working Group
- The Transport Infrastructure Efficiency Strategy
- The Infrastructure Operators Adaptation Forum
- The London Climate Change Partnership Steering Group, which also provides the secretariat for the Transport Adaptation Steering Group
- The UITP Sustainable Development Committee
- The Community of Metros and International Suburban Rail Benchmarking Group, facilitated by Imperial College London's Transport Strategy Centre
- The London Technical Advisers Group and its sub-groups for Drainage Engineers, Highway Engineers, London Bridge Engineers and Lighting Engineers
- The Construction Industry Research and Information Association



Adapting to climate change creates a greener environment enjoyed by all

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.

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February 2023

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