



LONDON
climate change
PARTNERSHIP

Climate Change Adaptation for London's Transport System

Helen Woolston

London Climate Change Partnership,
Transport for London



- This presentation will cover:
 - London Climate Change Partnership
 - Climate Change Adaptation and London's Transport System
 - Recommendations
 - Updates - Key areas of work
 - Mayor's Climate Change Adaptation Strategy
 - Practicalities of assessing climate change impact as well as adaptation response



London Climate Change Partnership

The LCCP is a stakeholder group, coordinated by the Greater London Authority, consisting of over 30 key organisations, with representation from national, regional and local government, the Environment Agency, UK Climate Impacts Programme, emergency services, residential and commercial developers, transport providers, financial institutions, and the health, utility, voluntary sectors.

LCCP Objectives:

- **Raise awareness of climate risks and opportunities across all sectors**
- **Encourage decision makers to mainstream climate issues in formulating plans and policies**
- **Commission research and develop sector specific guidance**
- **Increase the level of adaptation in new and existing development**
- **Provide simple, accessible information on climate impacts and adaptation options**



London's Warming: The Impacts of Climate Change on London

Climate Change and London's Transport Systems



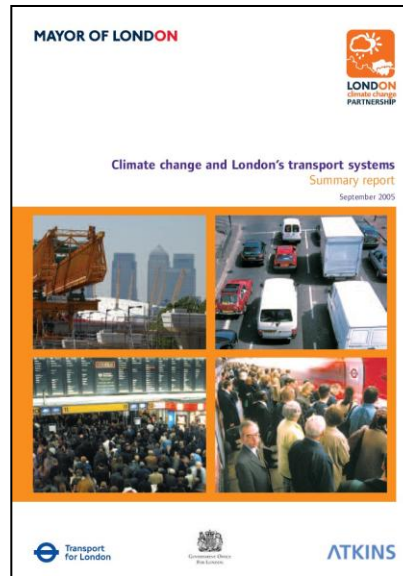
Launched in 2002. First step in understanding climate change impacts on London.

Key messages and future climate prediction (UKCIP02).

Possible consequences for London

Possible adaptation options for London

Summary of climate change impacts for all London's stakeholder sectors



Launched in 2005. Summary & Technical Reports - Four future impacts on London's Transport Systems

Tidal & river flood risk and London Thames Gateway

Infrastructure damage and station closure by local flooding

Infrastructure damage in hot weather

Passenger comfort on the Underground



Impacts of Climate Change on Transport Systems

Wetter winters and more frequent summer thunderstorms

- Groundwater, fluvial, flash flooding incidents

Higher peak temperatures may also cause:

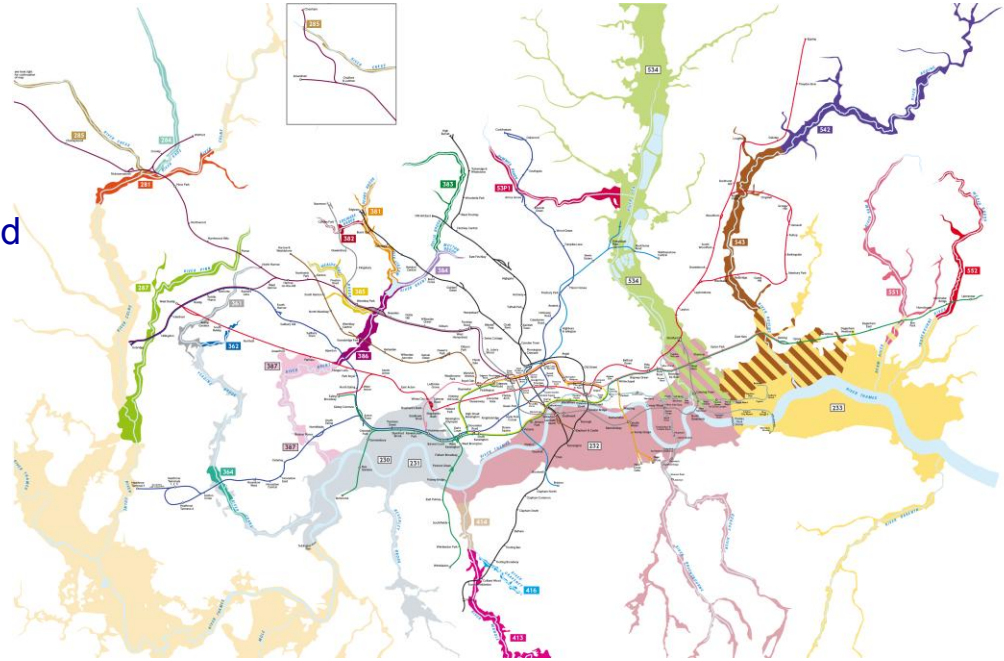
- Greater thermal expansion of bridges and flyovers
- Melting of tarmac
- Buckling of tram tracks

Increasing subsidence / heave may cause:

- Broken water mains
- Damage to embankments and cuttings

Increasing fluvial / tidal flow may cause:

- Increased scouring of bridge footings



Recommendations for Tidal and River Flood Risk to Thames Gateway Development

- Evaluate integrated impacts on transport eg access problems, options for design adaptation and potential costs. Check Flood risk adaptations against the Strategic Flood Risk Assessment
- Development proposals should:
 - Use the Checklist for Development during the design and development of new transport projects and strategies
 - Seek to minimise risk within the defended floodplain
 - Consider flood proofing in high risk areas,
- Close liaison is needed between the Environment Agency, Defra, ODPM, the Mayor and transport planners with regards to development of the Thames Gateway



Recommendations for Infrastructure Damage and Station Closure Caused by Local Flooding

- Assess the risks of flooding, including understanding of flood sources, pathways and receptors and how this might change in future
- Identify areas (eg stations) which are most likely to flood and prioritise them
- Measures to reduce flood risk should be implemented
- Risk assessment and adaptation planning should involve all relevant agencies
- Full costs should be captured including infrastructure rehabilitation and passenger delays
- Research to assess impact of potential changes in groundwater levels



Recommendations re Infrastructure Damage in Hot Weather

- Cost the potential future impact of delays, repairs and renewals on the railways
- Quantify the effect of better maintenance and improved standards currently being undertaken by Network Rail
- Review Network Rail's duty to maintain the network at 1994 'asset condition'
- Review impacts on long term infrastructure eg bridges
- Explore Indirect impacts to understand future risk of disruption to traffic through street works



Recommendations for Passenger Comfort on the Underground

- A detailed, strategic monitoring programme of temperature and humidity in the Underground, both in stations and inside trains, is recommended
- Further research by TfL is recommended to examine the behaviour of passengers in response to higher temperatures. This research should:
 - assess passenger behaviour in response to hot weather
 - establish costs and benefits of adaptation measures (eg air conditioning)
 - identify potential risks and thresholds where a change in transport mode (eg a switch from the Underground to buses) may be triggered



Update - Key Areas of Work

- Drain London
- London Underground's Tunnel Cooling Programme
- London Underground's Asset management
- Adapting Surface Transport
 - London Buses
 - Network Rail



'Drain London' Project

- Multiple partners to establish network and ownership of London's drains for the first time
- Objectives:
 - to map the layout, ownership and capacity of surface water drains
 - to assess the location, frequency, severity (and cause) of surface water flooding in London
 - to assess the capacity of the surface water drainage to manage future increases in rainfall
 - to identify current and future flood hot spots and their causes
 - to identify and prioritise solutions and determine responsibility to deliver actions



London Underground's Cooling the Tube Project

- Addresses heat from trains now and with investment programme line upgrades
- Sources from trains (braking drive and mechanical losses)
- Mechanical A/c is net outputter of heat
 - adds to the problem in the tunnels/stations
- Ventillation modelling
- Weather Data
- Trials
 - Train optimisation
 - Air movement
 - Hybrid A/c
 - Evaporative Cooling
 - Heat exchange



London Underground's Asset Management

- London Underground works with its key suppliers to maintain and deliver its assets
 - Tubes Lines has mapped assets against 200 identified risks and opportunities from climate change
 - Identified critical points and their impacts on the business
 - Correlation graphs between climate change parameters, effects on asset management and predicted costs/savings
 - Metronet have a systematic approach to mapping identified failure counts with weather patterns eg sunshine, rainfall, humidity, temperature
 - Financial analysis of results
- LU has recently audited against the 2001 Flood Mitigation Report recommendations
 - Checked on physical protection, training, standards and communications with contractors



Adapting Surface Transport – London Buses

- Buses required from May 2006 to have:
 - air conditioning in the driver's cab
 - automatic heating and ventilation system for the bus (not driver controlled)
 - opening windows on all full size window bays and specifically on the front 2 windows on the upper-deck
 - tinted windows
 - white painted roof
 - full roof and body thermal insulation
 - *forced air extraction systems for upper deck saloons – optional*
 - *full air cooling systems for upper deck saloons - optional*



Adapting Surface Transport – Network Rail

- 2 studies with EA on flood-based risk in the south west eg Dawlish
- Climate Change hazards map for the north west
- “Today’s extreme weather is tomorrow’s norm”
- emerging policy of ‘no regrets’ for renewals; ie: to ensure that new assets are ok throughout their asset life
- would like to factor risks in appropriately in terms of likelihood and capital costs



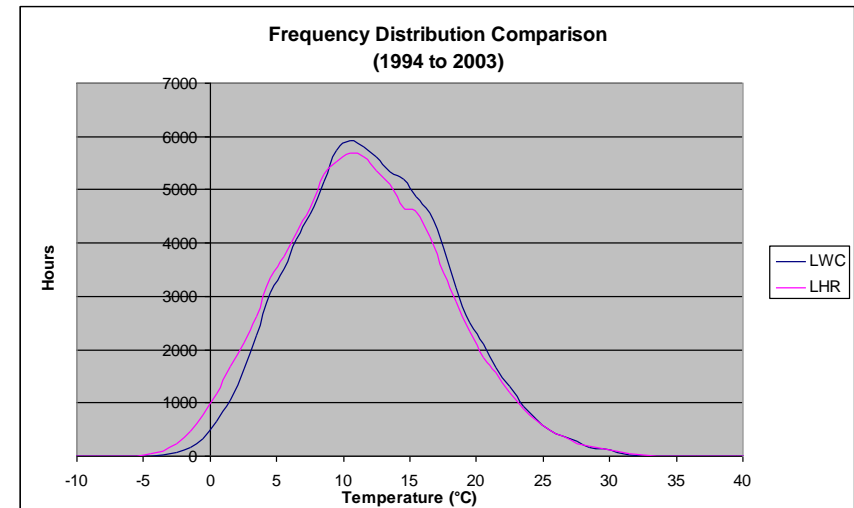
New Mayor's Climate Change Adaptation Strategy

- Statutory to produce under new GLA Act
- Public consultation July 09
- Hierarchy approach
 - Predict
 - Prevent
 - Mitigate



Improved Weather Predictions Data is Needed for London

- TfL uses data taken from UKCP 02 , Hadley RCM3 and London Weather Centre
- Records show London is already exceeding predictions made
 - Between the 1990s and 2006 we have already seen +0.7 c rise
- Better granularity needed
 - Better temporal distribution – will we have one day/week/month heatwaves?
- Better portrayal of London urban heat island



Practicalities of assessing climate change impact and adaptation response

- Has your organisation considered the implications of transport disruptions from weather extremes such as high temperatures and flooding, on it?
- Does your organisation plan for alternative access to transport, or alternatives to the need for transport in cases where its usual modes become unavailable (eg 20 July surface flooding)
- A number of programmes are under way for addressing adaptation of transport networks to the future climate. Which issue do you believe is the highest priority for your organisation's needs?
 - Flood risk management at Underground stations
 - Flood risk management at Bus Stations/Depots
 - Cooling the tube tunnels
 - Cooling the bus network
 - Protection of surface drainage on the Capital's red routes



<http://www.london.gov.uk/climatechangepartnership>

[**Helenwoolston@tfl.gov.uk**](mailto:Helenwoolston@tfl.gov.uk)

