



## INFRASTRUCTURE 2014

This report provides government and industry with an independent appraisal of the state of the capital's waste, water, energy and transport infrastructure, and recommendations for priority actions ahead of the next general election.

### UK OVERVIEW

Infrastructure is vital to society – our quality of life depends on it functioning effectively and our reliance becomes painfully evident when infrastructure systems fail.

The UK's ability to compete in the global race and to generate and sustain economic growth with appropriate quality of life depends on infrastructure networks that provide predictable energy generation and distribution, water supply, waste management and the transportation of people and essential goods into and around the UK by rail, road, sea and air.

State of the Nation is ICE's flagship report on the current state of the UK's infrastructure. The 2014 State of the Nation Infrastructure report assesses the performance, capacity and condition of the UK's economic infrastructure networks, and determines the actions required in order to improve and enhance performance, and importantly, to ensure that our infrastructure is resilient when faced with the many challenges ahead – from climate change to population growth.

London is the fastest growing region in the UK. Its population is forecast to reach 10 million in the early 2030s, while employment is expected to grow between now and 2031.<sup>1</sup>

This scale of population growth combined with extra jobs being created, requires a long-term commitment to invest in, and improve London's infrastructure in a sustainable way.

London's politicians must provide clear statements on strategic direction, backed by supportive policy and regulatory frameworks. With lengthy lead times for new and upgraded infrastructure, there is a strong justification for concerted action by government and industry now.



Tottenham Court Road Station Upgrade Programme  
ICE London Civil Engineering Award Winner 2013

1. GLA 2013 Population and Household Projections



## WASTE

### LONDON WASTE AND RESOURCE MANAGEMENT

Since 2010, significant new municipal waste infrastructure has been delivered or contracted and fit for purpose waste treatment, and disposal services are being provided. However, a major challenge remains in securing adequate infrastructure within London for non-municipal solid waste streams.

To date, little progress is being made in the shift from waste disposal to resource management, hindering the social, environmental and economic benefits that can be gained from London's waste infrastructure.

ICE London calls for a shift to a 'circular economy' in which the waste and resources sector continues to evolve from a disposal industry into a sector which collects surplus materials and reuses, repairs and remanufactures them into commercial quality products.

### MUNICIPAL WASTE

The Mayor's *Municipal Waste Management Strategy* (2011) set ambitious targets for London's waste and recycling sector including sending zero waste to landfill by 2025. Currently 25% of London's municipal waste goes to landfill.<sup>2</sup> The strategy also aims to reduce the amount of household waste by 20% per household. Since 2008/2009 there has been an 11% reduction of household waste across London.<sup>3</sup>

Additionally, the strategy aims to increase London's household recycling and composting performance to at least 45% of waste by 2015, 50% by 2020 and 60% by 2031.<sup>4</sup> In terms of the recycling of household waste, London is well below the national average of 43% with 34%, the lowest rate of all of the regions.<sup>5</sup> In common with the rest of England, this past year recycling rates across the capital have levelled off, with 15 boroughs recycling less than they did last year and six staying the same.<sup>6</sup>

The big challenges for London's municipal waste recycling services are the transient population, low levels of owner occupation and language barriers. To improve recycling and reduce waste, individuals need to change. To achieve this, community outreach is crucial. However this type of work is particularly vulnerable to municipal budget cuts.

There is also scope for greater co-operation between boroughs. Currently there are multiple waste collection and management systems across London. Boroughs will get a better price, as well as become more efficient, by working together. The Mayor of London estimates that about £90 million a year could be saved if municipal waste was managed at optimum efficiency levels.<sup>7</sup>

### COMMERCIAL, INDUSTRIAL & CONSTRUCTION WASTE

With 80% of London's total waste coming from business sectors, it is imperative that we capitalise

GRADE

**B-**

#### WASTE

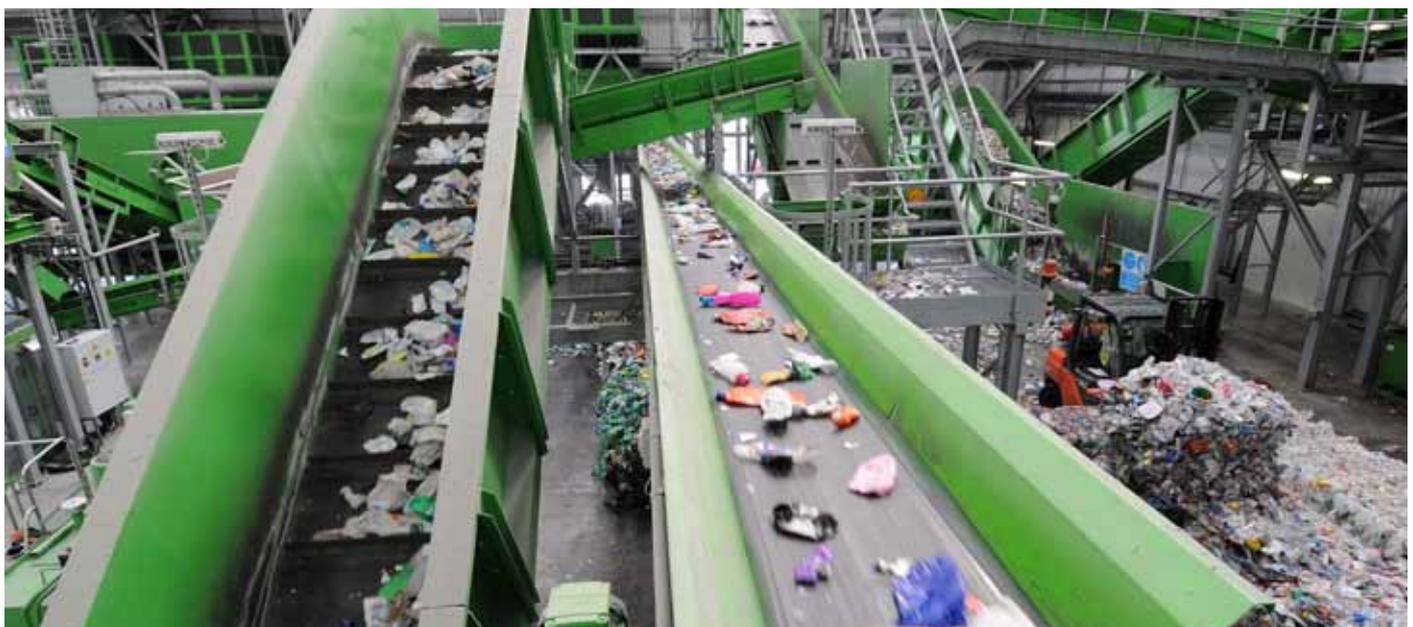
#### RECOMMENDATIONS

The Mayor should develop a circular economy roadmap for London setting out the GLA's approach to unlocking value from waste.

Improved integration of collection, treatment and reprocessing infrastructure is needed to realise economies of scale and reduce overheads.

The Mayor should work with the Environment Agency, Defra and BIS to collect and publish annual non-municipal waste data.

on the potential resources that are available, reusing and recycling as much as possible, and retaining their value in the economy.<sup>8</sup> The Mayor's *Business Waste Strategy* set useful targets for this sector's waste; however, unlike the municipal waste sector, there is very limited data available for the commercial, industrial and construction sectors. Some parts of this sector, such as construction, are performing very well, but this success needs to be confirmed with quality data.



Closed Loop Recycling, Dagenham

2. London Assembly Environment Committee Meeting Transcript: Waste and Recycling in London, 27 November 2013.  
3. Defra, ENV18 - Local authority collected waste: annual results tables, May 2014 4. Appendix 3, The Mayor's municipal waste management strategy, November 2011. 5. London Councils: Waste management in London - Key challenges 6. GLA Household Waste Recycling Rates - Borough, November 2013 7. London's wasted resource: The Mayor's municipal waste management strategy, November 2011.  
8. Making business sense of waste: The Mayor's business waste strategy for London, November 2011.



Bankside Substation Modernisation  
ICE London Civil Engineering Awards Winner 2013

## ENERGY

### ENERGY IN LONDON

As with the rest of the UK, London must overcome the 'trilemma' of security of supply, low carbon targets and affordability. While much of the policy framework and powers are controlled nationally, rather than at city level, there are important steps that London can take to improve its own situation, and to help the rest of the UK.

London needs sufficient, affordable, secure, resilient and decarbonised power supply systems with strategically planned long-term capability and capacity. These systems include the sourcing of energy, the generation of electricity, the distribution networks and demand management, both domestic and commercial.

### DEMAND MANAGEMENT

The Mayor aims to cut London's CO<sub>2</sub> emissions by 60% from 1990 levels by 2025 and 80% by 2050.<sup>9</sup> To meet these targets, the Mayor launched a number of initiatives in 2011 to reduce carbon emissions including:

- RE:NEW – retrofitting homes in London with energy efficiency measures
- RE:FIT – retrofitting public sector buildings in London
- RE:CONNECT – creating ten low carbon zones in London aiming to reduce CO<sub>2</sub> emissions by 20% by 2020.

The efficiency of London's homes and buildings needs to be improved. Domestic properties account for 36% of London's carbon emissions. The Mayor's RE:NEW initiative aims to retrofit 1.2 million homes with energy efficiency measures by 2015. To date it has retrofitted 100,000 homes and a further 400,000 homes have been retrofitted throughout London through the wider market during the same time period.<sup>10</sup>

Ground-based transport accounts for some 22% of London's CO<sub>2</sub> emissions.<sup>11</sup> ICE London supports the Mayor's efforts to encourage the uptake of more sustainable transport modes, such as public transport, cycling and walking and reducing the carbon emissions of the London bus and taxi fleets.

### SOURCING OF ENERGY & GENERATION OF ELECTRICITY

London is a major energy consumer through its domestic and commercial demand for electricity, heat and fuel for transport. While London will continue to import most of its energy for the

foreseeable future, more can be done to increase its own generation capacity, enhancing energy efficiency and contributing to the overall UK energy challenge.

The Mayor of London has set a target for 25% of London's energy supply to be decentralized by 2025, much of which will be delivered through heat networks. It remains to be seen if London will meet this target, as it is currently not on track to meet the interim target of 1,892 gigawatts from decentralised energy.<sup>12</sup>

London will be the first public authority in the country to receive a brand new type of 'junior' electricity licence, and aims to be buying and selling power by early 2015. This move will permit the Mayor to offer the capital's small electricity producers up to 30% more for their excess energy than existing suppliers do, which will then be sold on to Transport for London, the Metropolitan Police Service and others at cost price.

ICE London calls on the Mayor to continue to develop strategies to facilitate the long-term development and decarbonisation of London's energy supply, including facilitating the transition from local heat networks using gas-fired combined heat and power to larger scale district heating schemes capable of integrating alternative and multiple low carbon fuel and heat sources.

## GRADE



### ENERGY

#### RECOMMENDATIONS

London's energy mix must be secure, sustainable and affordable.

Continue to develop strategies for the long-term development and decarbonisation of London's energy supply and use.

Develop a strong package of measures to encourage the commercial sector to reduce CO<sub>2</sub> emissions.

ICE London welcomes the recent launch of a heat network at South East London Combined Heat and Power (SELCHP), as well as the Bunhill development in Clerkenwell and Islington, which has 850 homes plugged into the heat network there. The second phase of the Bunhill scheme is designed to capture low-grade heat from a London Underground ventilation shaft and UK Power Networks substation. This is a practical example of the potential for London to heat itself using waste and low-grade heat, demonstrated in the Greater London Authority's *Secondary Heat – London's Zero Carbon Energy Resource*.<sup>13</sup>



Sky Wind Turbine, Isleworth  
ICE London Civil Engineering Award 2013 Highly Commended

9. Delivering London's energy future: The Mayor's climate change mitigation and energy strategy, October 2011.

10. London Assembly Environment Committee Meeting Transcript: Mayoral Carbon Reduction Targets, 26 March 2014

11. An Electric Vehicle Delivery Plan for London, May 2009. 12. London Assembly Environment Committee Meeting Transcript: Mayoral Carbon Reduction Targets, 26 March 2014. 13. Greater London Authority, Secondary heat: London's zero carbon energy resource, July 2013



Barclays Cycle Hire  
ICE London Civil Engineering Award Winner 2011

King's Cross Station main train shed roof  
ICE London Civil Engineering Award 2013 Highly Commended



## TRANSPORT

### STRATEGIC VISION

The Mayor of London recognises the crucial role that transport plays in London, not least in supporting two of City Hall's top priorities – jobs and housing – and he has provided a clear vision for London's transport network. This continues with his forward-looking work covering the period to 2050. This will require, among other things, measures to increase the capacity and connectivity of the rail network, and improve its resilience; transform the roads to ensure they meet London's movement needs and help create world class places. This will include a city with fewer barriers to cycling and provide London and the South East with the aviation capacity they need in a way that it is acceptable in terms of peoples' quality of life.

The Mayor's remit does not cover all transport modes and as a result, transport policy and strategy suffers from fragmented leadership. For example, further devolution of appropriate parts of the suburban rail network to Transport for London has the potential to deliver the same dramatic improvements seen on London Overground rolled out across London's rail network.

### INCREASE RAIL NETWORK CAPACITY, CONNECTIVITY & IMPROVE RESILIENCE

London's transport network will have to accommodate rising passenger numbers through schemes such as Crossrail 2. Current issues with network resilience (e.g rail signalling on

routes into London termini) must continue to be addressed or their impact will grow. Rail access to London airports should also continue to be improved, recognising the specific needs of aviation passengers.

### CREATE WORLD CLASS ROADS

The forward focus for the strategic road network should be to ensure that roads play a full role in creating world class places in London while improving network efficiency, resilience, and reducing vehicle-related carbon emissions. This may include additional capacity at key pinch-points or the upgrade of existing assets to better suit future needs. These improvements will support more reliable bus performance and will provide for significant growth in goods vehicle operations and cycling. There is a growing need to create a more resilient network for the roads to grow as the city does and to maintain efficient operations during adverse weather conditions and periods when major links in the strategic network need to be repaired or replaced.<sup>14</sup>

To prepare for this additional demand, planning must continue in order to ensure that London's future transport infrastructure will be able to deliver a consistent and reliable service.

### REMOVE BARRIERS TO CYCLING

The Mayor and Transport for London are aiming to deliver a 400 per cent increase in cycling between 2011 and 2026 compared with 2001 levels.<sup>15</sup> Their level of commitment is clear with £913 million pledged for spending on cycling schemes over the next decade.

While cycling is on the rise in the capital, the key barrier to encouraging greater levels of cycling is cyclist safety, both actual and perceived. On cycle super-highways in London, road space for cyclists on selected routes is much more visible, but even these routes do not have continuous and consistent provision. The remainder of London has a network of cycleways but the quantity and quality of provision are highly variable.

The announcement of a £300 million programme to transform "thirty-three of London's biggest and nastiest road junctions" is welcomed by ICE London, which views this as a positive step towards removing barriers to cycling as a mode of choice.<sup>16</sup> The delivery of these improvements, however, will not be straightforward as there are good reasons why many of these junctions were not treated at the time that the cycle super-highways were first constructed.

The Construction Logistics and Cyclist Safety (CLOCS) initiative is welcome as conflict between large vehicles and cyclists represents the most critical problem in this area. There are several ways this should be addressed:

- Better equipped vehicles
- Training for cyclists, HGV bus, coach and construction vehicle drivers
- Cycle infrastructure that minimises conflict (particularly for left-turning vehicles).

### ADDRESS AVIATION RUNWAY CAPACITY IN THE SOUTH EAST

London airports account for two-thirds of the UK's air passenger demand and Heathrow for two-thirds of those. With Heathrow operating at almost full capacity, London's international connectivity is becoming ever more constrained by limits to runway expansion at its busiest airports.<sup>17</sup> This not only contributes to delays but will eventually restrict the growth of links to emerging economies worldwide. Sufficient international short haul and long haul aviation capacity is vital to the health of London's economy as a business hub, cultural centre and tourist destination.

ICE London believes there are long-term benefits from strategic runway capacity expansion in the South East and calls on City Hall to continue to take an active role in shaping the UK's national sustainable aviation strategy, in collaboration with the Greater South East region, ensuring that any solution supports sustainable economic growth in the capital whilst minimizing the impacts of aviation on the environment. ICE London urges central Government to continue to take account of London's population growth and distribution and to support the outcome of the Airports Commission process. Critically, Government should act decisively to deliver new aviation capacity in the South East following the Commission's report in 2015.



GRADE



## TRANSPORT

### RECOMMENDATIONS

Outline a clear transport investment programme to ensure that London's future transport infrastructure maintains London as a globally competitive city.

Further devolution of appropriate parts of the suburban rail network to Transport for London.

Remove barriers to cycling through reducing the principal threats to cyclists, particularly: better equipped vehicles (especially HGVs); training for cyclists, HGV bus, coach and construction vehicle drivers; and delivery of cycle infrastructure that minimises conflict.

Address aviation capacity in the South East to maintain London's status as a business hub, cultural centre and tourist destination.

14. Roads Task Force, 'The vision and direction for London's streets and roads', July 2013.

15. Transport for London, 'Analysis of cycling potential', December 2010.

16. Mayor of London, 'Sixties relics' to be ripped out as cycle transformation begins, 26 February 2014.

17. Aviation policy framework, March 2013.



Thames Water Ring Main Extension  
ICE London Civil Engineering Award Winner 2010



Thames Gateway Water Treatment Works  
ICE London Civil Engineering Award Winner 2011  
Highly Commended

## WATER

### LONDON WATER & WASTEWATER

London's water and wastewater infrastructure faces several key challenges including deterioration of condition due to age, decades of underinvestment, and the twin challenges of climate change and population growth.

### CHALLENGES

London has the oldest water main distribution network in all of the UK and consequently suffers from high levels of leakage, with a water loss rate of 646ML/d, ranking at the bottom of the industry league table.<sup>18, 19</sup> However, there are significant challenges to replacing and maintaining London's assets including cost and disruption to transport systems. While Thames Water is currently replacing the Victorian mains, these works are being undertaken at a rate that means it will take many decades to replace them all.

London and much of the South East have been classified as 'seriously' water stressed by the Environment Agency. Water stress poses a significant challenge and is likely to become worse in the future due to population growth and climate change. Meeting demand will require continued investment and innovation by water companies, demand management to reduce water consumption and changes in the way the water resources are managed and regulated.



Lee Tunnel overflow shaft excavation  
ICE London Civil Engineering Award Winner 2012



Pudding Mill Pump Station © Lyall, Bills and Young Architects

### STRATEGIC LEADERSHIP

The lack of strategic leadership in the water sector has an impact on the long-term investment in the sector. It has also led to delayed decisions over important supply issues in the sector.

Moreover, the potential for water scarcity in London means that some challenging water supply decisions over controversial options must be made. This includes recycling wastewater, providing more reservoir storage, desalination and reducing leakage. Leadership coordination and collaboration will be required to show the benefits of these options and the necessity to prevent the water scarcity issue having a detrimental impact on the residents and businesses in London now and into the future.

### WASTEWATER

Currently, too much sewage flows into the Thames and the capacity of sewage flows collection system infrastructure is inadequate. Hence only a small amount of rainfall can cause huge volumes of untreated sewage to enter the Thames. The Thames Tideway Tunnel will address this capacity issue; however the benefits of this are still several years off with construction set to start in 2015.

Furthermore, population growth in and around London will require more wastewater infrastructure. These treatment plants are

sometimes unpleasant to live near due to odour, and communities may become unwilling to tolerate the negative aspects of wastewater treatment.

There are potentially further opportunities that can be gained in the wastewater sector. It is recommended that the policy outlined in the London Plan is implemented to ensure that sustainable drainage systems are installed for new developments to reduce the volume of additional rainwater entering the sewerage system. In addition, more can be done to optimise the generation of electricity from sewage sludge.

GRADE

C

### WATER

#### RECOMMENDATIONS

Leadership coordination and collaboration by all key stakeholders is required to prevent water scarcity during a drought from having a detrimental impact on the residents and businesses in London now and into the future.

Continue to reduce leakage from London's water mains to a sustainable economic level.

18. Financial Times, UK water companies struggle to plug leakage rates, 3 November 2013.  
19. Ofwat, Companies' performance 2012-2013.



Deptford Creek Frontages Floor Risk Management Project  
© Environment Agency



Thames Barrier  
ICE London Civil Engineering Awards Winner 2011

## FLOOD RISK MANAGEMENT

### LONDON FLOOD RISK MANAGEMENT

The Thames is London's most important asset, but it poses a threat to many Londoners. The Thames tidal floodplains are home to 1.25 million residents, 16 hospitals, 51 rail stations, 35 underground stations and approximately £200 billion worth of assets.<sup>20</sup> In London there is more of a risk from surface water flooding, followed by flooding from tributaries as they have lower standards of protection than the Tidal Thames. This section of the report will examine flood risk in terms of drainage and tidal.

### STRATEGIC LEADERSHIP

In England responsibility for flood risk management is spread across multiple organisations. The Environment Agency (EA) provides a national strategic lead for flood risk management. At a local level, Lead Local Flood Authorities (LLFA), established by the *Flood and Water Management Act* (2010), are responsible for managing local flood risk management strategies from surface water, groundwater and ordinary watercourses. Additionally, water and sewerage companies are responsible for managing the risks from surface water and combined sewer systems.

In London, boroughs serve as the LLFAs. They are currently developing local flood risk management strategies, carrying out investigations into flood events and producing asset registers, which are to be completed by 2015.

The relationship between the LLFAs and the EA is not without challenges. While the EA provides some strategic lead, the LLFAs vary in their abilities to implement and manage flood risk management.

The role of water and sewerage companies in managing flooding could be greater. Flood alleviation schemes by sewer undertakers are only designed for a 1 in 30 standard of protection, far lower than those for schemes to reduce river and sea flood risk. Regulators, the Greater London Authority and the LLFAs should look at ways of incentivising water company involvement in flood risk management, especially in the creation and maintenance of sustainable urban drainage system (SUDs) schemes.

The approach to managing the flood risk posed by the Tidal Thames is excellent. The EA's Thames Estuary 2100 plan (TE2100) sets out a clear objective for managing flood risk management in the capital. ICE London fully supports this initiative and would welcome a debate over the preferred implementation options for TE2100.

### CAPACITY & CONDITION

London's urban drainage infrastructure is poor and ageing assets contribute to surface water flooding. There are significant challenges to replacing and maintaining assets, particularly the disruption caused to transport systems and local communities, however, it must be addressed.

## GRADE

# C

### FLOOD RISK MANAGEMENT

#### RECOMMENDATIONS

Continue to proactively plan for the future management of tidal flood risk in London.

Encourage the use of flood resilient design materials and construction methods for all new and existing development.

Create realistic expectations about flood risk by improving community engagement and increasing the use of adaptive natural drainage systems.

The Thames Barrier and the associated tidal defences currently provide a high level of protection from tidal surges; however, in recent years the barrier has been increasingly used to manage riverine flooding upstream of the tidal limit at Teddington Weir, which was not its original design purpose. A combination of a tidal surge and riverine flooding may leave certain parts of London further upstream vulnerable to flooding.

Closures of the Thames Barrier have also increased since it was built in 1982. During the 2000s the barrier closed 75 times, while it has closed 65 times (as of March 2014) since 2010.<sup>21</sup> As a result of the record rainfall during the 2013/2014 winter storms the barrier closed 28 times between 6 December and 12 February.

### RESILIENCE

Resilience is impacted by the previously discussed challenges of managing urban flooding. As the storms of winter 2014 have shown, surface water flooding has a significant impact on the resilience of transport infrastructure. Roads and portions of the rail network suffer from partial closure in order to deal with surface water flooding issues.

Developers play a key role in increasing resilience. ICE London believes that developers should do more to share the investment in urban drainage. While they are currently asked to contribute, they often find ways to avoid this. Moreover, the implementation of effective sustainable urban drainage systems (SUDs) may require more input from developers.

20. TE2100 Plan, November 2012. 21. Detailed Guidance: The Thames Barrier, <https://www.gov.uk/the-thames-barrier>



## THE STATE OF THE NATION: INFRASTRUCTURE 2014

### ABOUT ICE

The Institution of Civil Engineers (ICE) is a global membership organisation that promotes and advances civil engineering around the world. ICE is a leading source of professional expertise in transport, water supply and treatment, flood management and energy. Established in 1818, it has over 80,000 members throughout the world, including over 60,000 in the UK. ICE's vision is to place civil engineers at the heart of society, delivering sustainable development through knowledge, skills and professional expertise.

### ABOUT THIS REPORT

State of the Nation reports have been compiled each year since 2000 by panels of experts drawn from the various fields of expertise across ICE's membership. Their aim is stimulate debate and to highlight the actions that we believe are needed to improve the state of the nation's infrastructure and associated services.

This regional report has been compiled by analysing and assessing the state of infrastructure in London through a series of workshops that produced evidence based on the views and experience of the participants.

The reports are issued to a wide range of stakeholders, including politicians, civil servants, local authorities, trade, regulatory and consumer bodies, as well as the media. ICE has published several State of the Nation reports each focused on a specific issue which will affect the delivery of effective infrastructure for the UK. Since 2008 ICE has published reports on defending critical infrastructure, low carbon infrastructure, transport capacity and skills. These are available at [ice.org.uk/stateofthenation](http://ice.org.uk/stateofthenation)

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The findings of this report are based on the collective input of all the workshop participants and ICE London member survey. The results do not reflect individual opinion or the views of their companies.



View the full report online at [ice.org.uk/stateofthenation](http://ice.org.uk/stateofthenation)

KEY TO LONDON GRADES

**A**

**FIT FOR THE FUTURE**

Infrastructure is well-maintained and in good condition. There is excess capacity to cope with major incidents. There is clear strategic leadership with good plans to develop the sector to meet the needs of the next five years.

**B**

**ADEQUATE FOR NOW**

Infrastructure is in acceptable condition with a reasonable maintenance regime. It can meet current demand and deal with minor incidents across the network. However investment will be needed to meet needs over the next five years.

**C**

**REQUIRES ATTENTION**

Infrastructure is infrequently maintained and requires attention. There is no excess capacity resulting in deficiencies at peak periods and if there are even minor incidents. Significant investment is required to improve it to meet needs in the next five years.

**D**

**AT RISK**

Infrastructure condition is below standard and poorly maintained. There is frequently a lack of capacity to meet demand and it is not resilient. In the absence of significant investment there may be an impact on the national economy.

**E**

**UNFIT FOR PURPOSE**

Infrastructure is in unacceptable condition with little maintenance. There is insufficient capacity and resilience is of serious concern. The state of the infrastructure is impacting on the national economy.



View the full report online at [ice.org.uk/stateofthenation](http://ice.org.uk/stateofthenation)

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