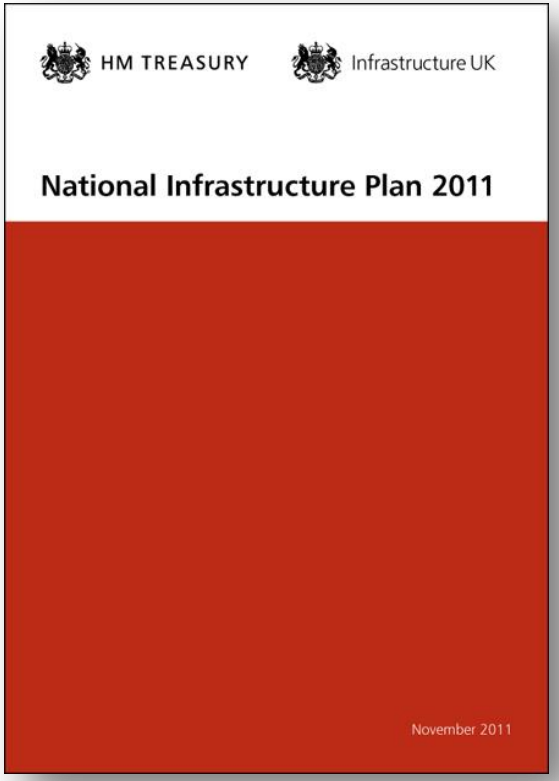
HM TREASURY

National Infrastructure Plan 2011



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Chair of the Engineering Interdependencies Expert Group, IUK

The nature of good infrastructure

- High availability services that must be supplied
  - Energy
  - Transport
  - Water
  - Waste
  - Information
- Shared at a national and regional scale
- Of sufficient quality to support a developed society
- Resilient to shock and well managed
- Adaptable to new contexts
- Attracting continuous investment

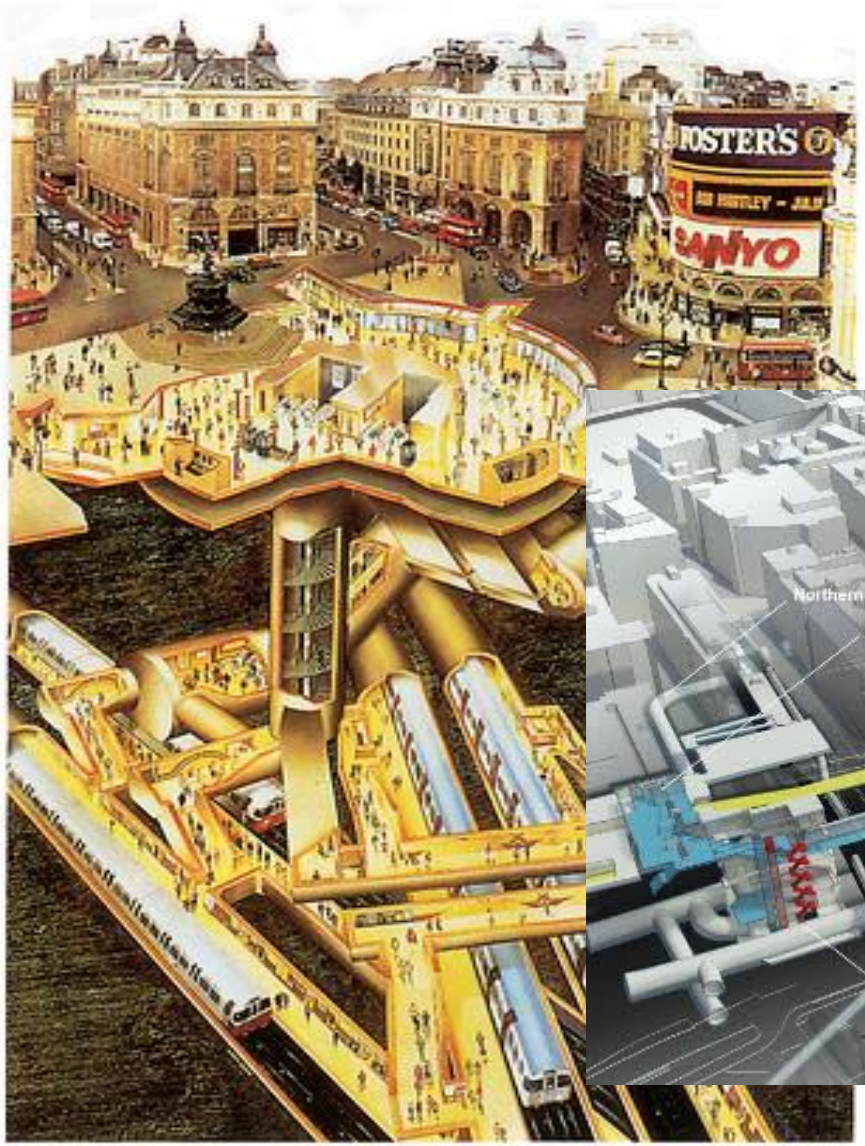
A brief history of UK infrastructure

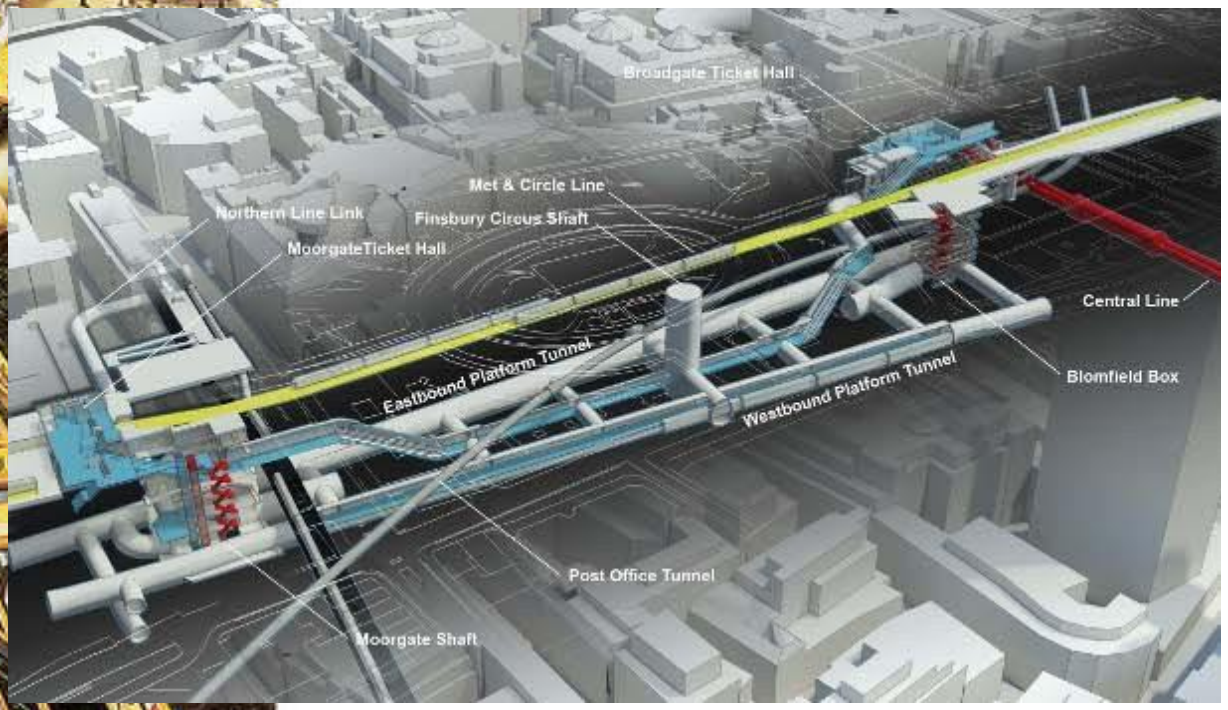
1. 19th century: World leader in developing water and waste systems, urban and long distance road and rail connections. Still benefiting from much of this early investment
2. 1950's – 70's: Significant expansion of national infrastructure under state control including motorways, nuclear power, North Sea oil and gas
3. 1980's – 90's: Early leader in privatisations including telecommunications, water, energy and rail, signifying a shift to market-driven decisions on infrastructure
4. 1990's – 00's: Pioneer of new forms of private sector engagement (PPPs and PFIs)
5. But much is ageing and we have set ourselves challenging targets, particularly in relation to energy generation

UK infrastructure in numbers

- 245,000 miles of roads; 600 trips per person per year; 5.2 billion passenger trips per year on buses.
- Railways are busier than in the last 60 years; 24,000 trains per weekday
- 15,500 miles of high voltage overhead cables (The Grid), 500,000 miles of regional electricity distribution network.
- 18.6 million residential broadband connections
- London sewerage system that has not changed much since 19th century.
- Railway bridges are the same as 150 years ago

Piccadilly circus





Crossrail
Liverpool Street Station - design

Characteristics of UK Infrastructure that are causing concern

- Major unregulated growth in interdependency
- Some population growth and radical change in the nature of living and working in the last fifty years
- Most infrastructure provision has been privatised and internationalised
- No central governance of infrastructure as a system
- Little investment in resilience to climate change
- As yet little understanding of the impact of the need for adaptation

The UK Government programme

- Published a report by Council of Science and Technology – an infrastructure fit for 21st century – June 2009
- Recommendations accepted by government in December 2009, forming Infrastructure UK (IUK) in The Treasury as governance body and lead dept.
- IUK survived the election in May 2010, and the PM published the National Infrastructure Plan (NIP1) in December 2010.
- Engineering, Interdependency and Resilience an explicit activity which I continue to lead.
- Further findings were published in Summer 2011 and NIP2011 was published in late Autumn 2011
- Economic value of interdependency and resilience also studied
- Recommendations for research across all aspects being taken up by all relevant RCs, Industry and Professional bodies

Outline agenda in NIP 2011

1. A vision for the UK's infrastructure
   a) Extensive performance and cost analysis
   b) Long-term ambitions for each sector

2. Funding and financing infrastructure investment
   a) New approach to private investment
   b) New investment worth £2.7bn

3. Focusing on delivery
   a) Prioritising major projects through a new Cabinet Committee
   b) Bringing down costs in planning and through the Infrastructure Cost Review

1a. The vision – performance and cost analysis

Sector	Evolution of performance since 2005	Evolution of cost since 2005
Major roads	↑	↑
Rail	↑	→
Airports	↓	↑
Ports	↑	↑
Electricity	↑	↑
Gas	↑	↑
Communications	↑	↓
Water and sewerage	↑	↑
Waste	↑	↑
Flood risk management	↑	↓

	Capacity access and availability	Asset or capacity utilisation	Service quality and reliability	Asset condition
Major roads	→	→	↑	↑
Rail	↑	↓	↑	↑
Airports	↓	--	↓	--
Ports	→	↓	↑	--
Electricity	↑	↑	↑	↓
Gas	↑	↑	↓	→
Communications	↑	--	↑	--
Water and sewerage	↑	↑	↑	↑
Waste	↑	↑	↑	--
Flood risk management	↑	--	--	↑

Source: HM Treasury analysis.

1b. The vision – long-term ambitions for each sector

Transport

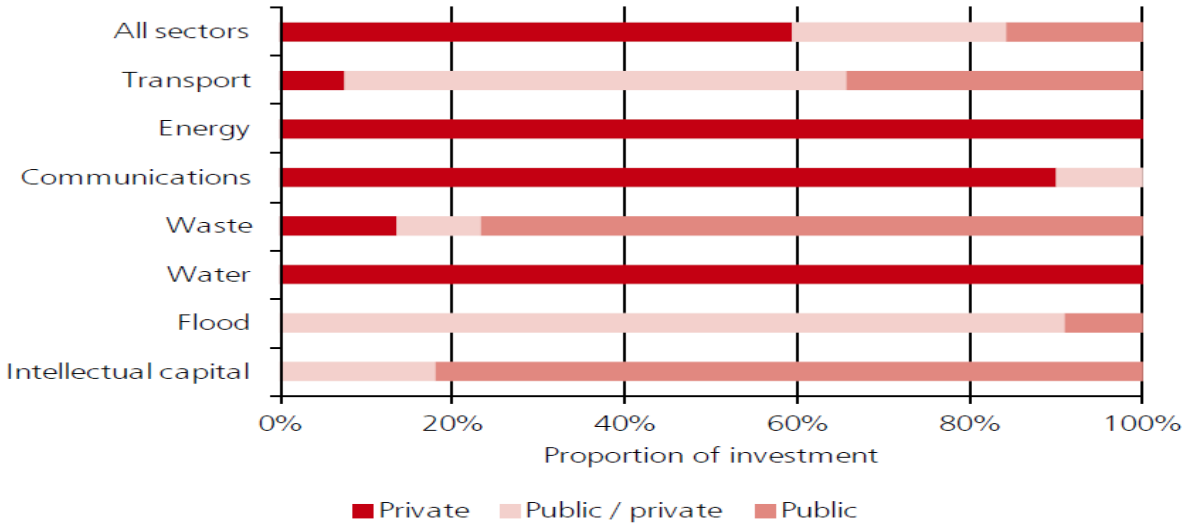
Energy

Communications

Environmental networks

2a. Funding and financing – a new approach to private investment

Most UK infrastructure investment is already funded by the private sector



The Government is taking a new strategic approach to mobilise further private finance

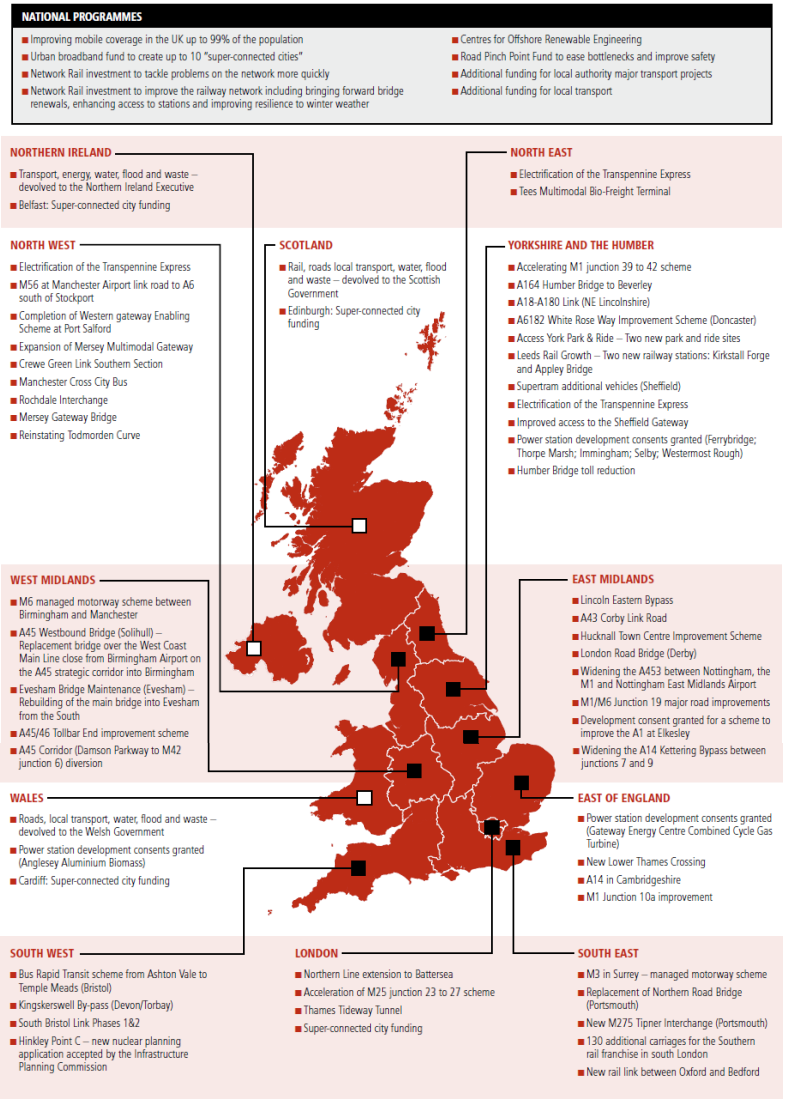
- new investors
- new sources of revenue
- more flexibility for local authorities
- using guarantees

Source: HM Treasury analysis.

2b. Funding and financing – new investment

£2.7 billion of new investment:

- £1 billion on roads
- £1.4 billion on rail
- £170 million on local transport
- £100m on broadband



Note: around £1 billion of the investment in railways is funded by Network Rail.

3a. Focusing on delivery – prioritising major projects

- 40 priority projects and programmes
- New Cabinet Committee to focus on delivery
- Address poor coordination and planning and regulatory hold ups, and focus commercial expertise

Transport	
Roads	
Highways Agency programme in construction – pre-2010 Spending Review	New Lower Thames crossing
Highways Agency managed motorways programme – Spending Review projects	Mersey Gateway Bridge
Highways Agency trunk road improvements programme – 2010 Spending Review projects	Local transport projects – funded at or before 2010 Spending Review
Highways Agency – Autumn Statement package	Local authority major transport schemes – development pool projects
Alternative approaches to resolving issues along the A14 corridor	
Public transport	
Crossrail	Reading upgrade programme
Thameslink	High Speed Two (subject to consultation)
Rail infrastructure and rolling stock enhancement	Northern rail connectivity (Liverpool-Newcastle including Northern Hub)
East Coast Main Line	Intercity Express Programme
Great Western Electrification	London Underground investment programme
Kings Cross Station improvements	Northern Line Extension to Battersea
Airports	
Gatwick capital investment programme	Heathrow capital investment programme
Ports	
Ports – container terminal projects	Ports – renewable energy projects
Local infrastructure funding programmes	
Growing Places Fund	Regional Growth Fund
Energy	
Electricity generation – new nuclear investment	Electricity generation – wind energy investment
Carbon Capture and Storage investment	Electricity and gas transmission and distribution investment
Electricity generation – gas investment (CCGT)	Smart meters
Electricity generation – biomass investment	
Communications	
4G mobile auction and rollout	Fixed broadband investment – private and public
Rural mobile coverage	Urban broadband fund
Water and sewerage and flood risk management	
Thames Tideway Tunnel	Flood and coastal erosion risk management programme (including Thames Estuary 2100)

3b. Focusing on delivery – bring down costs

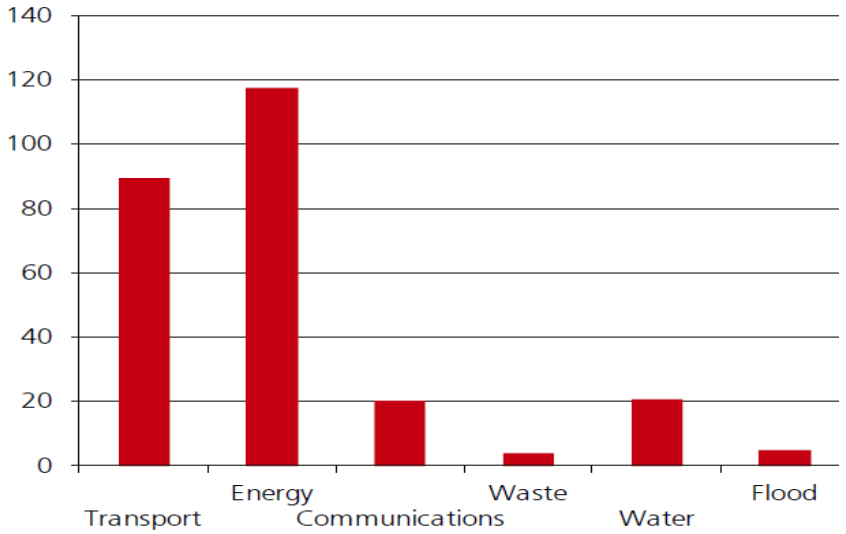
Reforming the planning system

- reform statutory consultees
- speed up the consenting system
- rebalance the consenting process
- build more flexibility into planning
- review the Habitats & Wild Birds Directives

Implementing the Cost Review

- exploit interdependencies
- simplify technical standards
- publish the future pipeline

Infrastructure investment pipeline value by sector (£bns)



Opportunities for economic growth

Kings Cross site development	Channel Tunnel Interconnector	More efficient street-works	West East Link Main Pipeline	Low emission vehicles (LEVs) and smart grid	Highways Agency network (A14)
Facilitated new value creation of 30 – 70% of investment cost	Sharing existing infrastructure suggests capital investment costs potentially in excess of 25%	Could lower congestion 5-20% & save 20-50% business management and planning cost	Planning and design accounts for infrastructure interdependencies & reliance on telemetry	Smart grid charging could save ~18% of annual charging (£50/vehicle per year)	Land owned could deliver rental or wayleave income

Channels through which interdependency can contribute to economic growth

- Unlocking new investment and growth
- Delivering new capacity at lower cost
- Maintaining infrastructure at lower cost
- Sharing infrastructure systems
- Delivering a future vision
- Extracting value from land assets

Opportunities for themes to deliver value to the economy:

- Major transport decisions e.g. proposed High Speed 2 rail line, regional planning of housing developments
- Delivering potentially 3-4 million ultra-low emission vehicles in the UK by 2030
- 2,185 miles of motorway (and corridors) managed by HA
- Implementation of measures to reduce street-works disruption
- Planned investments within 5 years assume some £20 billion communications; around £20 bn water; around £15 billion electricity and gas distribution and transmission

Potential opportunities to facilitate economic growth?

What would unlocking 3 major site developments, even half the size of Kings Cross offer?

Potentially in excess of £1-1.5 billion

What could targeted, well-designed street-works offer in lower congestion and wider benefits?

Around £150-450 million present value over 5 years

What could widespread use of LEVs across UK imply for running costs?

Saving in excess of about £400 million per year by 2030

How could public land deliver economic value?

Substantial wayleave or easement revenues

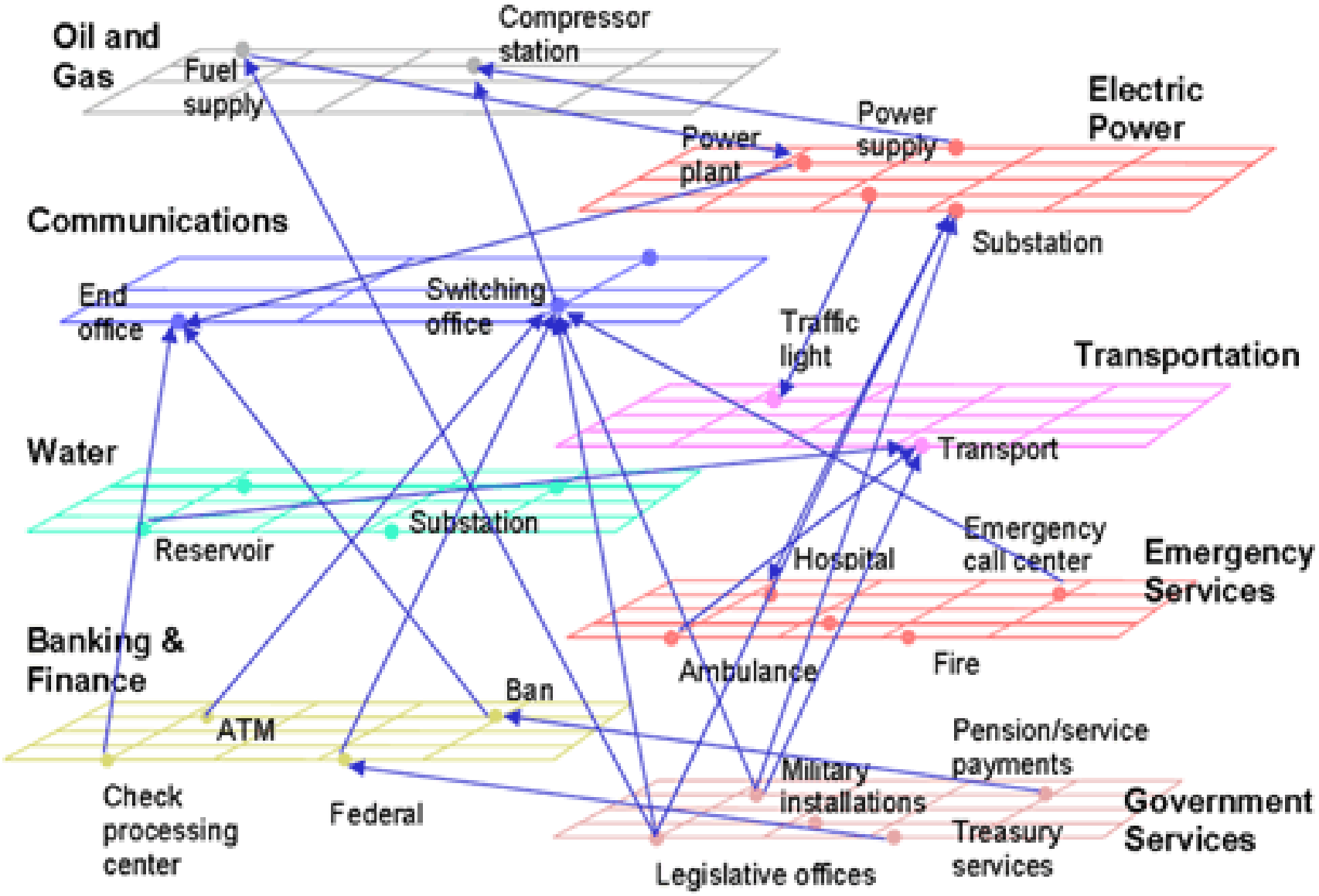
What scale of potential would 16-26% cost reduction on existing plans for fibre access and rural broadband investment be?

Some £600 million to £1 billion

Resilience Research

- What aspects of service and systems performance need to be resilient
- How should resilience be valued
  - Monetised
  - Socialised
  - Politicised
- How does it get maintained and tested
- Where is the data

A simplified view of interdependence



Interdependency Research

- How do we treat ICT and Energy (particularly electricity) as a critical system
- Water, Waste and Transport are nearly as critical – how do we cope with the added complexity of including them
- How do we identify the relationship between them when they are largely unregulated and a matter of bilateral contracts
- How do we improve the system of system analysis and operational management disciplines
- Where is the data

Next Steps

- Use some projects as pilots to test out more complex analysis methodologies
  - Interdependencies
  - Resilience evaluation
  - Whole life cycle costing
  - Procurement methods
- Move towards creating a methodology for infrastructure data collection, curation and exploitation
- Improve the quality of procurement from both a client and supply chain perspective
- Examine opportunities for better regulatory coherence
- See where innovation may offer cost and benefit opportunities – technological, system, design and procurement
- Develop and maintain an engineering roadmap for all components of infrastructure
- Invest in skills development across a wide range of disciplines and trades
- Invest in research to further understand the possible nature of sustainable infrastructure in a developed society over the next century

Thank you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