Annex B: Assessment of key and secondary drivers

Following an assessment of previous scenario development work in each of the sectors for which Capacity and Demand Assessment Models (CDAMs) are being developed, and advice from the ITRC sectoral research teams, a number of cross-sectoral and sector-specific drivers were identified. Each of these 'long lists' was assessed to determine which drivers should be inputs to the Fast Track Analysis, which would be deferred to be considered during the second stage of modelling work (WS1), and which should be developed in a more qualitative and narrative manner to assess the infrastructure futures which emerge from the FTA. A brief summary of each sector's key drivers is given below.

Energy	
Five key drivers were identified:	
Population growth	**Increased population is likely to result in increased energy usage in consuming sectors.**
Economic growth	**Higher GDP per capita is likely to result in higher energy usage, particularly in production.**
Energy costs	**Increased energy costs are likely to result in a reduction in energy usage in all sectors.**
Centralised vs decentralised supply systems	**A more decentralised energy supply system (particularly for electricity) could have significant impacts on the scale of infrastructure, potentially (but not necessarily) reducing national scale transmission, but also increasing connection and demand response at a local level, adding complexity to system control. There are associated governance issues relating to more emphasis on localised planning to secure greater use of localised resources.**

Energy (continued)	
Carbon emissions reduction targets	a) Energy demand – one contribution to reach targets can come from increased efficiency of energy use, which could result in a reduced demand and capacity.
	b) Low carbon energy supply – the other contribution from the change to a low carbon energy supply might result in a higher capacity and demand for electricity, but vice versa for other fuels.
NOTE: While changing population, GDP and energy costs are likely to be significant and have long term uncertainties, it is likely that the interventions required to meet carbon mitigation targets will be the most important driver of change and uncertainty for the energy infrastructure.	

Transport	
Three key drivers were identified:	
Population growth	Increased population is likely to result in an increased number and use of private vehicles and increased travel across all modes resulting in a higher demand for transport infrastructure.
Economic growth	Higher GDP per capita is likely to result in an increased number and use of private vehicles and increased travel across all modes resulting in a higher demand for transport infrastructure.
Energy costs	Increased fossil fuel costs are likely to result in a reduction in private car usage, with associated displacement of travel to other modes, particularly rail. There may also be a switch to more energy efficient fuels and vehicles as a result of increasing fossil fuel costs.
NOTE: The main driver for transport growth since 1960 has been income growth, but other drivers have been related to prices, journey time, comfort and reliability (and these in turn have been related to technology). However, there is evidence that the link between GDP and transport growth (especially for freight) may be decoupling. In the next 50 years, environmental drivers (reflected in prices) and technological drivers (reflected in quality of service) may become more important, and the income driver less so as the demand for travel may be approaching saturation (for the existing network, although this may trigger investment and expansion such as HS2).	

Water supply	
Five key drivers were identified:	
Population growth	Increased population results in increased demand for clean water supply.
Household size	Continuation of the historic trend of falling household size (including a greater number of single person households) will increase the number of households and is likely to increase water consumption.
Energy costs	Increased costs in energy result in increased costs for treatment and supply of clean water, which, if passed on to the end user, is likely to reduce demand.
Mean temperature changes	An increase in the average temperature as expected due to climate change is likely to reduce water resources due to increased evaporation.
Changes in precipitation levels	Effects of climate change are expected to include wetter winters, but drier summers, with significant variability across GB. This is likely to result in a substantially reduced resource, particularly in the South East during the summer and early autumn.

Wastewater: Demand for wastewater infrastructure is strongly linked to water demand	
Four key drivers were identified:	
Population growth	Increased population results in increased generation of wastewater.
Energy costs	Increased energy costs result in increased costs of treatment, which may result in a decline in water quality due to less investment.
EU directives / National strategies and standards	More stringent standards could result in increased costs of treatment, and increased demands on current infrastructure and/or investment needs.

Wastewater (continued)	
Improved waste processing technologies	a) More efficient wastewater treatments – a more efficient treatment system might reduce overall costs, and reduce demands on the wastewater infrastructure.
	b) Capturing nutrients/resources – greater capture of energy or other resources within the treatment system could reduce overall costs.
NOTE: While demand for wastewater infrastructure necessarily increases with population, the costs of treatment are reduced if population density increases.	

Solid waste	
Four key drivers were identified:	
Population growth	Increased population is likely to result in an increase in waste generation.
Economic growth	Increased GDP per capita is likely to result in an increase in per capita waste generation; relative poverty tends to reduce consumption.
EU directives / National strategies and standards	Policy-driven strategies to reduce waste generation, encourage more resource recovery, and greater control over the storage, transfer and processing of waste are likely to result in a reduction for demand for final disposal waste infrastructures (e.g. landfill), but may result in an increase in demand for waste processing (e.g. AD (anaerobic digestion); composting plant, materials recovery facilities (MRF) etc.).
Improved waste processing techniques	Alternative methods of waste disposal and processing (such as anaerobic digestion, mixed waste processing, combined mechanical and biological treatments, gasification and pyrolysis) are likely to result in greater use of waste as a resource, but may discourage the recent trend of reducing waste generation. There is the potential for a paradigm shift where waste management becomes resource recovery.
NOTE: There is some evidence that waste generation has become decoupled from GDP per capita growth since 2002/03, but the time series is too short to come to definite conclusions (see Annex I).	