Appendix A

TOPIC BASED SCHEMES ASSESSMENT: AOS FOR AIRPORTS NPS

A-10 RESOURCES & WASTE

June 2018

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10 RESOURCES AND WASTE

10.1 INTRODUCTION

10.1.1 This topic based assessment considers each airport expansion scheme under the category of Resources and Waste. These are London Heathrow Extended Northern Runway (LHR-ENR), London Heathrow Northwest Runway (LHR-NWR) and London Gatwick Second Runway (LGW-2R) (together the shortlisted schemes).

10.1.2 By law, before designating an Airports National Policy Statement (NPS) an Appraisal of Sustainability (AoS) must be carried out. This AoS is a strategic level assessment. It is based on the contents of the Airports NPS. The AoS considers alternatives to the Government's preferred scheme as set out in the Airports NPS, including the outline masterplans supplied to the Airports Commission for the three shortlisted schemes. This AoS considers the impacts of expansion without the benefits of the mitigation package put forward by scheme promoters, unless stated otherwise. The Government has outlined that it expects a significant mitigation package to be put in place by the promoter of its preferred scheme to ensure that wherever possible significant effects are avoided, reduced or offset.

10.1.3 Further project-level design will be required which will inform an environmental impact assessment carried out by the promoter. This would include an assessment, which is likely to include effects identified in the AoS as well as more detailed mitigation developed as detailed design progresses. This will also be developed through consultation with both affected communities and other stakeholders.

10.1.4 The assessment builds on the previous evaluation undertaken as part of the Airports Commission's (AC) Sustainability Appraisal, but also responds to the AoS Appraisal Framework. The Framework addresses issues identified through a review of plans, policies and programmes, and the current status of national resources and waste in the UK, as described in Section 10.6.

10.1.5 Each airport expansion scheme is considered against the following AoS Appraisal Framework Objectives and Questions as relevant to Resources and Waste:

- **AoS Objective 15:** To minimise consumption of natural, particularly virgin non-renewable, resources.
  - **AoS Question 29:** Will it be possible to minimise the consumption of natural resources?
- **AoS Objective 16:** To minimise the generation of waste in accordance with the principles of the Resource Efficiency Hierarchy.
  - **AoS Question 30:** Will it be possible to minimise waste generated during construction and operation?

10.1.6 The underlying principles of this assessment are based principally upon Regulation 12 of the Waste (England and Wales) Regulations 2011[1] (which is in direct support of the other policies and legislation listed in Section 10.2) and the requirement to operate in accordance with the Waste Hierarchy. The Waste Hierarchy – now increasingly referred to as the 'Resource Efficiency Hierarchy' (thereby encouraging industry to value materials and arisings across a

[1] UK Government, 2016. *Waste (England and Wales) Regulations 2011*. [online] Accessed 15/02/2016.

number of lifetimes, rather than disposing of them as waste before true 'end of life') – is set out in Figure 10.1.

Figure 10.1: The Waste (Resource Efficiency) Hierarchy[2]

10.1.7 Adopting the principles of the Hierarchy, and applying innovation, creativity and careful planning to the management of materials and waste arisings during the lifecycle phases of built environment projects (planning through to end of life transition), will contribute to the long-term industry vision for achieving a circular economy within the UK, Europe and beyond. This vision is built on the premise that exemplar projects will manage resources to achieve their greatest possible value, whilst protecting human health and the environment.

10.2 POLICY AND LEGISLATION

10.2.1 The following policy and legislation relevant to the Resources and Waste assessment are summarised below and their context and applicability is explained as appropriate in the relevant sections of the assessment. Policy that is relevant to this chapter, but has not yet been formalised or implemented through UK statutory documents, has been marked with an asterisk (*).

EU Waste Framework Directive 2008/98/EC[3] and Waste (England and Wales) Regulations 2011[4]

10.2.2 The EU *Waste Framework Directive 2008/98/EC* provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. The *Waste (England and Wales) Regulations 2011* transpose the EU Waste Framework Directive; they require:

- The establishment of waste prevention programmes;
- Waste management plans for England and Wales;
- The Waste Hierarchy to be applied as a priority order; and
- The separate collection of paper, metal, plastic and glass waste.

[2] Defra, 2011. *Guidance on Applying the Waste Hierarchy*, p. 3. [online] Accessed 08/07/2016.
[3] European Commission, *Directive 2008/98/EC on Waste (Waste Framework Directive)*. [online] Accessed 12/08/2016.
[4] UK Government, 2016. *The Waste (England and Wales) Regulations 2011*. [online] Accessed 08/02/2016.

EU Landfill Directive 1999/31/EC[5] and Environmental Permitting Regulations 2016[6]

10.2.3 The EU Landfill Directive sets stringent requirements for the landfilling of wastes. In the UK, the Environmental Permitting (England and Wales) Regulations 2016 sets out conditions for (in particular) granting environmental permits (and exemptions for permits) for the recovery and disposal of waste, with the principal objective of protecting human health and the environment.

Waste Management Plan for England (December 2013)[7]

10.2.4 The *Waste Management Plan for England* contributes towards the requirements in Article 28 of the revised Waste Framework Directive. These requirements include:

- An analysis of the current waste management situation … and identifies measures to be taken to improve environmentally sound preparing for re-use, recycling, recovery and disposal of waste
- Information on the type, quantity and source of waste generated within England, the waste likely to be shipped from or to this territory, and an evaluation of future waste streams;
- Existing waste collection schemes and major disposal and recovery installations;
- An assessment of the need for new collection schemes, the closure of existing waste installations, and additional waste installation infrastructure;
- The capacity of future disposal or major recovery installations; and
- General waste management policies, technologies and methods.

The Strategy for Hazardous Waste Management in England (December 2010)[8], the National Policy Statement for Hazardous Waste (2013)[9] and the Hazardous Waste (England and Wales) Regulations (2005)[10]

10.2.5 The *Strategy for Hazardous Waste Management in England (2010*) underpins the Waste Framework Directive 2008/98/EC in relation to the requirements to manage hazardous waste in accordance with the principles of the Waste Hierarchy, including the treatment of hazardous waste and the provision of associated infrastructure.

10.2.6 The Strategy is advanced by the *National Policy Statement for Hazardous Waste (2013)*, which provides a framework for planning decisions on nationally significant hazardous waste infrastructure.

10.2.7 In the UK, these documents are effected through *the Hazardous Waste (England and Wales) Regulations (2005)*. The regulations have been designed to ensure that the management of hazardous waste is achieved without endangering human health and without using processes or methods which could harm the environment.

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[5] European Union, 1999. *Council Directive on the Landfill of Waste* (1999). [online] Accessed 12/08/2016.
[6] UK Government, 2016. *Environmental Permitting (England and Wales) Regulations, 2016* . [online] Accessed 02/10/2017.
[7] Defra, 2013. *Waste Management Plan for England*. [online] Accessed 08/02/2016.
[8] Defra, 2010, *Strategy for Hazardous Waste Management in England*. [online] Accessed 09/09/2016.
[9] Defra, 2013. *Hazardous Waste National Policy Statement*. [online] Accessed 09/09/2016
[10] UK Government, 2005. *The Hazardous Waste (England and Wales) Regulations.* [online] Accessed 09/09/2016.

* Closing the loop – An EU Action Plan for the Circular Economy[11]

10.2.8 The Closing the Loop Package comprises an EU *Action Plan for the Circular Economy*. It sets out a programme of action with measures covering the whole material lifecycle: from production and consumption, to waste management, to the market for secondary raw materials. The annex to the Action Plan sets out the timeline for completing actions.

10.2.9 In the UK, organisations such as the Waste & Resources Action Programme (WRAP), Zero Waste Scotland (ZWS) and the Circular Economy Task Force champion policy and business solutions that improve opportunities to make more of resources and simultaneously benefit the economy[12].

10.2.10 Through their work, a circular economy is increasingly recognised as having the potential to create new opportunities for growth, reduce waste, advance resource productivity, create a more competitive economy, and reduce environmental impacts both in the UK and abroad. Defra has stated that UK businesses could benefit by around £6 billion to £7 billion per year through low cost or no cost improvements achieved through the more efficient use of resources.

25 Year Plan for the environment

10.2.11 The Government launched its 25 Year Plan for the environment in January 2018. The plan contains ten goals, six about enhancing the environment to secure the benefits it provides, from clean air to clean water, and four about managing the pressures we put on the environment, such as climate change and waste. It includes a suite of ambitious policies to achieve these goals, emphasising an integrated approach to decision making based on natural capital.

10.3 BACKGROUND TO THE ASSESSMENT

10.3.1 This assessment has been undertaken using data and information from the following reports:

- Airports Commission, 2015. *Final Report*[13];
- Jacobs, 2014. *10. Place: Assessment*[14]; and
- Jacobs, 2014. *10. Place: Baseline*[15].

10.3.2 Specifically, the '*Place: Assessment* (Chapter 5)[16] considers impacts associated with waste, and highlights some approaches that could be adopted to manage and minimise disposal to landfill.

10.3.3 No further work has been undertaken to advance or expand upon resources or waste information provided by the scheme promoters.

[11] *Closing the loop - An EU action plan for the Circular Economy* COM/2015/0614 final [online]
[12] WRAP, 2016. *Circular Economy* [online1] [online2] Accessed: 08/07/2016.
[13] Airports Commission, 2015. *Final Report*. [online] Accessed 21/12/2015.
[14] Jacobs, 2014. *10. Place: Assessment.* [online] Accessed 21/12/2015.
[15] Jacobs, 2014. *10. Place: Baseline.* [online] Accessed 21/12/2015.
[16] Jacobs, 2014. *10. Place Assessment,* pp. 103-144. [online] Accessed 21/12/2015.

10.4 INTERACTION WITH OTHER TOPICS

10.4.1 Resources and waste have broad interactions with other topic-based assessments in this report. Where resources and waste interact with topics and associated impacts are understood to be direct and potentially significant, they have been listed in the below table. A description of the interaction is provided.

Table 10.1: Interaction of the Resources and Waste topic with other topics

AoS Topic	Interaction
Community	The transportation of resources to, and waste from, construction and operational sites has the potential to adversely impact neighbouring communities. Dust, vibration, noise, visual and congestion impacts from haulage are all potential impacts on roadside / local residents and businesses.
Economy	Diverting waste from landfill has significant benefits for avoiding costs associated with taxation, and for positively contributing to local and regional infrastructure designed to handle and recycle materials, and generate energy from waste.
Soil	Generation of certain types of waste also has the potential to contaminate soils. A resource efficient approach seeks to minimise the volume of excavated arisings designated as 'contaminated', and through the application of a Materials Management Plan divert potential waste from landfill.
Water / Biodiversity	Disposal of waste to landfill generates leachate which, if not properly managed, can cause significant harm to aquatic and terrestrial environments and the ecology that those environments support. Diverting waste (particularly hazardous waste) from landfill reduces the potential for leachate.
Air quality	Extraction, processing, transportation, installation and maintenance of materials typically require the consumption of energy; as a result, atmospheric emissions (including greenhouse gases) are released. This is true of materials both on and off active sites. Disposal of waste to landfill also has the potential to contribute to adverse impacts on air quality, through the generation and release of gases such as methane, carbon dioxide and (as a far smaller percentage) Volatile Organic Compounds (VOC).
Carbon	Materials embody carbon (and other greenhouse gas) emissions as a result of their manufacture and transport, particularly during construction when large quantities of natural resources are consumed. In this, a resource efficient approach is considered a carbon efficient approach. Transport and processing / disposal of waste also gives rise to carbon dioxide emissions, as well as other greenhouse gases.

10.5 ASSESSMENT CRITERIA

10.5.1 The general criteria used for assessing the significance of effects within the AoS are set out in the methodology in Section 3 of the AoS to which this appendix is attached. Identification of significance is set out in Table 10.2, below.

Table 10.2: Identification of Significant Effects in the AoS

++	*Significant positive effect*
+	*Positive effect*
-	*Negative effect*
--	*Significant negative effect*
+/-, ++/--	*Mixed positive and negative effect*

?	*Uncertain effect*
0	*No relationship / neutral effect*

10.5.2 It should be noted that schemes are assessed individually against the requirements of the SEA Regulations and presented together for comparison. This means that although the nature of effects can vary between schemes, the significance may be the same.

10.6 SUMMARY OF BASELINE AND ISSUES

NATIONAL BASELINE

Commercial Waste

10.6.1 Commercial waste comprises inert, non-hazardous and hazardous arisings which result from trade or businesses and their operations; it excludes household, agricultural and industrial waste types. Airport operations generate significant volumes of commercial waste each year.

10.6.2 In 2012, the total commercial waste generation in the UK was estimated to be 27.5 million tonnes; England accounted for approximately 22.6 (80%) million tonnes of this[17]. Commercial waste generation in 2012 represented a decrease of 0.5% (from 27.6 million tonnes) since the previous national survey in 2009. In 2012, commercial waste accounted for 14% of all UK waste (200 million tonnes)[18].

Construction and Demolition Waste

10.6.3 In 2014, it is estimated that 120 million tonnes of construction and demolition waste arisings were produced in the UK, contributing to over half (60%) of the total waste generated. This is an increase from around 100 million tonnes in 2010 and around 110 million tonnes in 2012.

10.6.4 Materials for Construction

10.6.5 Minerals and metals are a combination of natural (non–renewable) and other resources vital for the construction, manufacturing and energy industries. Opportunities and supporting infrastructure for reclaiming, re-using and recycling construction materials are increasingly available in the UK.

10.6.6 Subject to appropriate quality protocols, prime examples of re-use and recycling construction materials include:

- Secondary outputs from industrial and manufacturing processes (pulverised fuel ash and ground granulated blast furnace) are increasingly reclaimed in the UK and used as a constituent of concrete;
- Steel - which is the primary metal used in construction - is widely recycled (91%) and reused (5%) in the UK, at end of first life[19];
- Around 17% of the UK's current need for aggregate is achieved through recycled (crushed and processed) concrete[20]; and

[17] Defra, 2017. *Digest of Waste and Resource Statistics – 2017 edition*. [online] Accessed: 02/09/2017.
[18] Defra, 2016. *UK Statistics on Waste – 2016 Update.* [online] Accessed: 02//2017.
[19] Institute of Civil Engineers, 2014. *Briefing: Reuse and recycling rates of UK steel demolition arisings*. [online] Accessed 22/12/2015.
[20] Material Products Association, 2013. *MPA Cement Fact Sheet 6, Use of recycled aggregates in concrete*, p. 1. [online] Accessed 22/12/2015.

- Glass can be readily re-used or crushed and recycled in a variety of construction applications, including embankment and backfill, capping, pipe bedding[21] and drainage / filtration media.

10.6.7 Land permitted for mineral extraction accounts for about 0.3% of the total land area in the UK.[22]

FUTURE BASELINE AND ISSUES

Future Policy and Legislation

10.6.8 The EU published, in December 2015, proposals to promote the circular economy by 'closing the loop' on waste.

10.6.9 The proposals comprise two elements:

- A Circular Economy Action Plan aimed at improving resource efficiency and reducing waste through a variety of actions (for example, from production and consumption, to management and the market for secondary raw materials) that will protect the environment, and save money whilst stimulating economic growth.
- Proposals to amend waste legislation, including the Waste Framework and Landfill Directives. These were adopted at Council on 22nd May 2018, with an expected transposition deadline of June or July 2020.

10.6.10 Legislative target amendments which are relevant to airport operations are likely to include:

- a common EU target for recycling 65% of municipal waste by 2035;
- a common EU target for recycling 70% of packaging waste by 2030; and
- a binding landfill target to reduce landfill to a maximum of 10% of municipal waste by 2035[23].

10.6.11 In 2010, WRAP published its report '*Securing the future – The role of resource efficiency*'[24]. The report quantifies how resource efficiency actions, as well as reducing greenhouse gas emissions, can reduce impacts concerning abstracted water, ecological footprint and the use of specific resources.

10.6.12 The Green Alliance's report '*Resource Resilient UK*'[25], published in 2013, offers further proposals and a draft action plan for a circular economy. This is advanced by the Environmental Audit Committee's report: '*Growing a circular economy: ending the throwaway society*'.[26]

10.6.13 In combination, the cited reports offer the following recommendations for achieving a circular economy in the UK:

- Clarifying exposure to risk regarding materials consumption;

[21] Department for Transport, 2004. *Design Manual for Roads and Bridges, Volume 7, Pavement Design & Maintenance, HD Conservation and the Use of Secondary and Recycled Materials*. [online] Accessed 22/12/2015.
[22] Office for National Statistics, 2013. *UK Environmental Accounts 2013.* [online] Accessed 22/12/2015.
[23] European Commission, 2017. *Circular Economy Strategy*. [online] Accessed 02/10/2017.
[24] WRAP, 2010. *Securing the future – the role of resource efficiency*. [online] Accessed 08/07/2016.
[25] Circular Economy Task Force, 2013. *Resource Resilient UK*. [online] Accessed 08/07/2016.
[26] Environmental Audit Committee, 2014. *Growing a circular economy: ending the throwaway society*. [online] Accessed 08/07/2016.

- Taxes which support, and broker co-operation in, resource efficiency;
- Extended Producer Responsibility, material design with circularity in mind, and 'take back' schemes;
- Standardising recycling services;
- Improving resource efficiency data;
- Evolving supporting infrastructure, and making more efficient use of existing infrastructure;
- Setting policy and standards; and
- Behavioural changes and incentivisation.

10.6.14 Separately, the Government's 25 Year Environment Plan has a much greater emphasis on integrated decision making, seeking to manage pressures on the environment in a much more holistic way, addressing the problems at all the stages they occur. The plan uses the insights of natural capital thinking to provide a framework to help government, businesses and individuals make better decisions to improve the environment, including in areas such as resource use and waste.

10.6.15 The UK's Carbon Budgets and targets[27] (Table 10.3) will also have an increasingly significant influence on the way in which materials' lifecycles are managed.

Table 10.3: UK Carbon Budget and Targets

Budget	Carbon Budget Level	% Reduction Below Base Year
1st Carbon budget (2008-12)	3,018 MtCO2e	25%
2nd Carbon budget (2013-17)	2,782 MtCO2e	31%
3rd Carbon budget (2018-22)	2,544 MtCO2e	37% by 2020
4th Carbon budget (2023-27)	1,950 MtCO2e	51% by 2025
5th Carbon budget (2028-32)	1,725 MtCO2e	57% by 2030

10.6.16 Whilst neither the EU Circular Economy Package (and circular economy initiatives in the UK) nor the 25 year plan for the natural environment are yet enforced through UK legislation, they are, in combination with the UK's Carbon Budget and targets, likely to markedly change the way in which resources and waste are identified, assessed and managed in the future.

Waste Arisings

10.6.17 Defra's central forecast is that commercial and industrial waste arisings in 2020/21 in England will be 21.12 million tonnes.[28] On the basis that commercial waste comprised 53% of commercial and industrial waste in 2012[29] it can be estimated that commercial waste arisings in 2020 will be approximately 25.5 million tonnes (lower than the 27.6 million tonnes generated in 2009).

10.6.18 The EU *Waste Framework Directive* binds the UK to recovering at least 70% by weight of construction and demolition waste by 2020[30]. Currently, the UK is meeting and exceeding this

[27] Committee on Climate Change, 2016. *UK Carbon Budgets & Targets*. [online] Accessed 29/01/2016.
[28] Defra Internal Modelling (as of 26/09/2017).
[29] Defra, 2017. *Digest of Waste and Resource Statistics – 2017 edition*. [online] Accessed: 02/10/2017
[30] European Commission, 2008. *Directive 2008/98/EC on Waste (Waste Framework Directive)*. [online] Accessed 12/08/2016.

target with a non-hazardous construction and demolition waste arisings recovery rate of 86.5%, equating to 38 million tonnes recovered in 2012[31].

10.6.19 Whilst arisings for 2020 are forecast to decrease as construction, demolition and commercial activities become increasingly resource efficient, it is reasonable to foresee that waste will still be produced and sent to landfill in significant volumes (millions of tonnes).

Resource Consumption

10.6.20 Compounding potential economic, social and environmental impacts associated with future waste arisings is the likely need to continue to consume large volumes of non-renewable resources in the UK. In particular, population growth and the need for new homes (and infrastructure) will continue to drive demand for minerals and metals.

10.6.21 The UK Minerals Forum has quoted that "*under any future scenario to 2050 there will be a continuing need to access and use newly-extracted minerals despite increased use of renewable energy and recycling, together with waste minimisation, and improved resource and energy efficiency*."[32].

Summary

10.6.22 In summary, policy, legislative and other drivers will continue to place increasing emphasis on resource efficient practice in future construction, demolition and commercial activities. The emphasis will be on reducing the consumption of resources, increasing re-use and recycling, and reducing disposal of waste to landfill.

10.6.23 Whilst waste arisings forecast by Defra show a decrease over time (to 2020), the adoption of increasingly effective landfill diversion measures will remain a central mandate in the UK, particularly in the construction sector.

10.7 MITIGATION INCLUDED IN ASSESSMENT

LGW-2R[33]

10.7.1 Two main mitigation strategies for minimising construction, demolition and excavation waste were proposed within the LGW-2R scheme. These strategies included:

- Increasing the capacity of the Care Centre (the current on-site integrated waste treatment centre) and providing additional waste treatment facilities; and
- Increased off-site treatment of significant tonnages of residual non-hazardous and hazardous wastes arising from demolition activities.

10.7.2 It was also proposed that recycling of up to 70% of all operational airport waste will take place by utilising the current (on-site) Care Centre facilities. New, on-site Energy from Waste (EfW) and Anaerobic Digestion (AD) plants were both proposed for the handling of residual waste and organic waste, respectively.

[31] Institute of Civil Engineers, 2014. B*riefing: Reuse and recycling rates of UK steel demolition arisings*. [online] Accessed 22/12/2015.
[32] UK Minerals Forum, 2014. *Future Minerals Scenarios for the UK,* p. 1, Executive Summary. [online] Accessed 22/12/2015.
[33] Jacobs, 2014. *10. Place: Assessment*, pp. 107-111. [online] Accessed 22/12/2015.

LHR-ENR[34]

10.7.3 Strategies for minimising construction, demolition and excavation waste were proposed by LHR-ENR, including:

- Development of a Waste Management Plan (WMP) to include guidance on waste prevention, segregation, storage, handling, transportation, reuse, recycling, treatment and disposal of specific waste streams;
- Excavated topsoil and agricultural subsoil will be reused as fill where reasonably practicable and as close to the point of excavation as practicable;
- The reuse of clean excavated material soils on-site (topsoil and agricultural soils), and importation of fill material to site;
- Preparation of a Materials Management Plan (MMP) in accordance with best practice set down by the Contaminated Land: Applications In Real Environments (CL:AIRE) Code of Practice;[35]
- Use of surplus excavated material from other developments in London and South East for fill applications;
- Crushing, segregating and on-site reuse of demolition waste; and
- Segregation, bulking and storage of construction waste onsite before transporting waste off-site to achieve high levels of recycling and recovery.

10.7.4 It is stated in the scheme promoter's submission for LHR-ENR that operational waste management will continue to be managed through the Heathrow Airport Limited waste contract. Materials will be segregated and EfW technology (the Lakeside facility) will be used to manage residual and international catering waste.

10.7.5 The scheme promoter's submission also states that on-site waste treatment facilities will manage organic waste; no further details are provided.

LHR-NWR[36]

10.7.6 Two main management / mitigation strategies for minimising construction waste arisings were proposed for the LHR-NWR. These strategies included:

- Development of a Masterplan to take into account potential waste impacts on communities and the natural environment; and
- Development of a Site Waste Management Plan (SWMP) which would seek to minimise the volume of waste disposed to landfills, and increase recycling rates of arisings generated during the construction phase.

10.7.7 The LHR-NWR scheme also included a commitment to reduce waste arisings per passenger by 14% and increase recycling to at least 80%. A number of specific operational mitigation measures (decreasing newspapers and magazines at gates, collaborations with retail owners to reduce waste at source) were proposed to support these statements.

10.7.8 Additional operational waste would be managed by waste brokers and off-site treatment facilities, though no consultation with the owners of these facilities has yet been conducted.

[34] Jacobs, 2014. *10. Place Assessment*, pp. 135-137. [online] Accessed 22/12/2015.
[35] CL:AIRE, 2015. *Code of Practice Materials Management Plan*. [online] Accessed 29/01/2015.
[36] Jacobs, 2014. 10. *Place: Assessment*, pp. 102-127. [online] Accessed: 22/12/2015.

10.7.9 It is important to note that the demolition and re-provisioning of the existing Lakeside EfW facility to an adjacent site is proposed by the promoter as part of the LHR-NWR scheme. However, it is not yet known whether the logistics and timings of the re-provisioning will precede the demolition of the Lakeside EfW facility, and hence ensure operational continuity. This issue is explored further in Sections 10.9.11 to 10.9.16.

10.8 APPROACH TO ASSESSMENT OF RESOURCES AND WASTE

10.8.1 Impacts at the strategic level have been assessed for both the construction and operational phases. For instance: effects on natural and other resources caused by construction activities arise as a result of material extraction, processing, manufacturing, transportation and installation. Waste effects are the result of a number of construction activities, particularly earthworks and site preparation.

10.8.2 During operation, impacts arising from material consumption would emerge through daily airport activities (procurement and use of domestic items such as paper, cardboard, food, and cans – among others) in addition to those associated with maintenance, refurbishment and replacement of physical assets.

10.8.3 Mitigation measures for impacts identified within this assessment are provided in Section 10.10. The assessment of impacts in this chapter does *not* take into account the mitigation measures set out in Section 10.10 because there is not yet a full understanding of the extent to which each scheme could adopt and apply the full suite of measures.

10.8.4 The methodology for this high level desk based assessment is based on a good practice approach to the evaluation of resources and waste impacts, and takes influence from the Highways Agency's Interim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources.[37]

10.9 ASSESSMENT OF SHORTLISTED SCHEMES

AoS Objective 15: To minimise consumption of natural, particularly virgin non-renewable, resources.

10.9.1 For Objective 15, the assessment findings for all three schemes are, at this stage, the same. The delivery of each of these major new infrastructural schemes will require the consumption of large volumes of construction material.

10.9.2 At this stage there is no comparable information on the likely quantities of construction material to be consumed, or the anticipated nature / management of those materials in relation to the Waste (Resource Efficiency) Hierarchy.

10.9.3 For all three schemes, the consumption of materials during construction and operation (resources comprising goods, products and componentry) would typically require the extraction – at least in part – of virgin, non-renewable resources.

10.9.4 Environmental, social and economic impacts would arise (and opportunities present themselves) across the lifecycle of these materials from the point they are mined, extracted or harvested in their virgin state, through any subsequent manufacture, fabrication, transportation, installation, use, maintenance and end of useful life disposal. Examples of negative impacts include:

- → Consumption of non-renewable resources (direct);

[37] Highways Agency, 2011. I*nterim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources*. [online] Accessed 12/01/2016.

- Limiting availability of resources to local and regional projects (direct);
- Degradation / depletion of the natural environment (direct);
- Generation of waste and subsequent impacts on landfill (direct);
- Greenhouse gas emissions and water scarcity (climate change) (indirect);
- Effects on labour, including standards (indirect); and
- Effects on communities (both direct and indirect).

10.9.5 Many of the described impacts associated with the extraction of raw materials and the manufacture of goods and products using natural resources occur remotely from a project site, and often outside the country in which construction work is undertaken. Whilst extraction and manufacturing processes may be subject to their own local sustainability assessments, it is the responsibility of the entity that procures materials and products to take appropriate and proportional steps to encourage and support its supply chain in actively minimising associated risks.

10.9.6 Consumption of construction materials needs to be managed carefully throughout the planning, design, procurement, construction and operational phases of a scheme, to ensure associated environmental, social and economic impacts are minimised as far as reasonably practicable.

10.9.7 Design, procurement and construction activities play a particularly important role in minimising lifecycle impacts from material consumption, whilst maximising opportunities to align with the highest tiers of the Waste (Resource Efficiency) Hierarchy. Where good, best practice and exemplar principles of resource efficiency are not applied during these three lifecycle stages, opportunities to minimise impacts are typically lost or their effect greatly minimised.

10.9.8 To this end, and particularly for major programmes of work involving construction and (subsequent) significant operations, it is critical that the types and volumes of material to be consumed are understood and managed from early planning stages. Without this knowledge, effective and timely action cannot be taken to minimise impacts.

CONSTRUCTION

10.9.9 It is anticipated that construction materials for all schemes will include (the majority by volume): excavation fill and geosystems, concrete and precast structures, aggregate, metal (particularly reinforcing / structural steel, and wiring), glass, timber, plastics and drainage, brickwork, mortars, tiling and paving, plasterboard, and componentry / technology. Consumption of natural (particularly virgin non-renewable) materials by the schemes will be have a direct, negative effect. These effects would likely be reduced through the reuse of materials and other arisings generated during construction, and the inclusion of secondary / recycled content in products deployed.

10.9.10 Indirect effects would include impacts on regions and countries where materials are originally extracted, during the consumption of energy and water in extraction and manufacture, and (particularly those conurbations local to construction) nuisance effects on communities during materials transportation. These effects may be a combination of one or more negative (see Section 10.9.4) and positive (local economic) outcomes, the nature and scale of which will be highly dependent on the type of resource consumed and local conditions.

10.9.11 The proposed LHR-NWR scheme will involve the demolition and potential re-provisioning of the Lakeside EfW Plant. The Lakeside EfW Plant comprises an EfW and materials recovery facility, and has been fully operational since 2010. The plant is fed by arisings from a number of waste authorities within the London region, but also as far away as Dorset, and is capable of recovering energy from over 410,000 tonnes of residual (non-recyclable) waste per year

from local authorities and businesses. The facility generates 37 MW of electricity: enough to power 50,000 homes[38].

10.9.12 The demolition and re-provision of the Lakeside, associated plant and supporting infrastructure would require significant consumption of materials *in addition* to the consumption required for the other aspects of the LHR-NWR scheme.

10.9.13 In combination, the demolition and potential re-provisioning of the Lakeside EfW Plant would be likely to exacerbate the negative environmental, social and economic impacts from material consumption associated with the LHR-NWR scheme.

10.9.14 There are also potential planning and business continuity issues for waste authorities to be considered in the re-provisioning of the EfW Plant; for example, increased transportation costs and alternative routing for some authorities' waste could be required. Burdens on alternative waste management / recycling infrastructure might also be realised, in addition to indirect negative impacts on local traffic conditions.

10.9.15 It should be noted that were the Plant to be re-provided elsewhere, it could offer an opportunity to improve the facility, and to provide heat energy either to the preferred scheme or to another local user.

10.9.16 Cumulative impacts during construction are anticipated to arise from increasing consumption and demand for building materials from airport expansion alongside other major programmes of works in the South East. Major development projects include road and rail schemes being delivered within the region in support of the National Networks National Policy Statement, and in addition, High Speed 2 which would be administered under separate legislation. The various local authorities which are located in the vicinity of the expansion schemes, and the wider region, also have various plans for housing, commercial and infrastructure development.

OPERATION

10.9.17 Consumption of materials (concrete and precast structures, aggregate, metal (particularly reinforcing / structural steel, and wiring), glass, timber, plastics and drainage, brickwork, mortars, tiling and paving, plasterboard and componentry / technology, for example) will continue during the operational life of the preferred scheme. Different processing, treatment and residual impacts will arise from each, which will be dependent on the way in which materials are procured and managed.

The volume and consumption profile of these materials will be far smaller than during construction, but the spatial and extent of impacts may remain largely the same.

AoS Objective 16: To minimise the generation of waste in accordance with the principles of the Resource Efficiency Hierarchy.

10.9.18 For Objective 16, the assessment findings for the *construction* phase of all three schemes are, at this stage, the same: whilst the management / mitigation strategies proposed by the scheme promoters are likely to reduce the *magnitude* of any effects, the delivery of each of these major new infrastructural schemes will still generate significant volumes of waste that could require disposal at landfill.

10.9.19 At this stage there is no comparable information on the likely quantities of waste to be generated during construction for LHR-ENR. LHR-NWR or LGW-2R, or the anticipated nature / management of these arisings in relation to the Waste (Resource Efficiency) Hierarchy.

[38] Grundon, 2016. *Energy from Waste*. [online] Accessed 20/08/2015.

10.9.20 Forecast data for waste arisings generated during *operation* have been provided for all three schemes.

10.9.21 Waste generated and sent to landfill during construction and operation will be an on-going management issue, and will continue to have negative effects on the environment long into and beyond the operational phase. The principal negative effects of sending waste to landfill include:

- Landfill taxation (£costs) (direct);
- Reduction of local and regional landfill capacity (direct);
- Visual, noise, health and other nuisance impacts on local communities (direct);
- Environmental degradation / pollution (direct); and
- Greenhouse gas emissions (indirect).

10.9.22 Waste arisings need to be managed carefully throughout the planning, design, procurement, construction and operational phases of a scheme, to ensure associated environmental, social and economic impacts are either eliminated or minimised as far as reasonably practicable.

CONSTRUCTION

10.9.23 LGW-2R has included waste forecasts for construction, demolition, and excavation arisings as follows:

Table 10.4: LGW-2R Waste Forecasts for Construction, Demolition and Excavation Arisings

Construction Activity	Forecast Volume (Mt)
Construction	0.8
Demolition	0.3
Excavation	0.5
Total	1.6

10.9.24 Whilst no forecast data were provided for construction, demolition or excavation arisings associated with LHR-NWR and LHR-ENR schemes, in the context of the LGW-2R construction waste forecasts (and given the likely scale of the LHR-NWR and LHR-ENR schemes) it is anticipated that construction, demolition and excavation arisings from these latter two proposals will also be significant i.e. millions of tonnes in each case.

10.9.25 It is probable that a significant proportion of waste generated during the construction, demolition and excavation activities required to deliver any one of the scheme proposals could be disposed of at the lower rate of taxation (£2.65 per tonne from 1 April 2016), if it were identified as being inert through Loss on Ignition testing.[39]

10.9.26 Whilst the disposal of inert waste to landfill is likely to have some economic implications for the preferred scheme, the potential cost implications from non-hazardous waste to landfill taxation (set at £84.40 per tonne from 1 April 2016) could be considerable for all schemes.

[39] HMRC, 2015. *Loss on Ignition Testing, Excise Notice LFT1: A General Guide to Landfill Tax*, Section 6.7.2. [online] Accessed 25/04/2016.

For example, if 10% of the LGW-2R forecast arisings were sent to landfill as non-hazardous waste, £13.5M in landfill taxation would be accrued.

10.9.27 Further assessment will be required to forecast the volume and proportion of inert and non-hazardous waste arisings that will need to be sent to landfill from each of the scheme proposals, and the economic impact of associated taxation.

10.9.28 The scale of environmental and social impacts associated with arisings from site has the potential to be commensurately large: nuisance (particularly from highway transportation) and impacts on landfill capacity will be felt most at a local and regional scale. Nationally and internationally, issues concerning consumption of non-renewable resources, environmental degradation, climate change and worker conditions would likely arise.

10.9.29 The LHR-NWR scheme would involve the demolition and potential subsequent re-provisioning of the Lakeside EfW Plant.

10.9.30 The demolition and re-provisioning of this sizeable building and associated plant (and any supporting infrastructure) would generate considerable waste arisings *in addition* to those generated by the other elements of the LHR-NWR scheme.

10.9.31 As stated in Section 10.9.14, there are also planning and business continuity issues for waste authorities to be considered in the case of the EfW Plant, though re-provisioning could be an opportunity to improve available facilities and recover heat energy for local use.

10.9.32 In combination, the demolition and re-provisioning of the plant would likely greatly exacerbate the negative environmental, social and economic impacts from waste associated with the LHR-NWR scheme.

10.9.33 Considering the likely duration and scale of the construction phase of the schemes, cumulative effects would likely arise due to combined waste streams generated alongside other major programme of works in the South East. These major development projects include major road and rail schemes being delivered within the region in support of the Rail and Rail Investment Strategies, and – more broadly – the National Networks NPS; in addition, High Speed 2, which would be administered under separate legislation. The various local authorities which are located in the vicinity of the expansion schemes, and in the wider region, also have various plans for housing, commercial and infrastructure development.

OPERATION

10.9.34 The AC assessment of the three expansion schemes included forecast data for waste arisings during operation. In summary, these data were:

Table 10.5: Forecasts for Waste Arisings during Operation

Criterion	LGW-2R	LHR-NWR	LHR-ENR
Operational waste (tonnes per annum) to 2050 based on the high level traffic scenario and no growth in waste per passenger	18,000 [40]	47,500 [41]	49,800 [42]
Operational waste (tonnes per annum) to 2050 based on the high level traffic scenario, incorporating waste prevention measures	9,500 [40]	36,500 [41]	38,300 [42]
Volume range of waste (tonnes per annum) recycled if commitments to 70% recycling by 2020 are achieved and maintained	6,650 - 12,600 [43]	25,550 - 33,250 [41]	26,810 - 34,860 [42]

LGW-2R

10.9.35 Based on current forecasts, LGW-2R could generate up to 18,000 tonnes per annum of operational waste by 2050. This volume is based on a high level traffic scenario without growth in passenger waste, but could be as low as 9,500 tonnes per annum if waste prevention measures are successfully implemented.

10.9.36 Diversion of waste from landfill would – in part – be achieved by development of new on-site recycling infrastructure to process operational waste. EfW plant and AD plants are both proposed to handle residual waste and organic waste respectively.

10.9.37 With an optimum recycling rate of 70% from 2020 for operational airport waste, between 6,650 and 12,600 tonnes per annum would be recycled.

LHR-ENR

10.9.38 Based on current forecasts, LHR-ENR could generate up to 47,500 tonnes per annum of operational waste by 2050. This volume is based on a high level traffic scenario, but could be as low as 36,500 if waste prevention measures are successfully implemented.

10.9.39 Activities to divert waste from landfill would be achieved predominantly through the existing Heathrow Airport Limited waste contract and with residual and international catering waste being segregated and transported to the (extant) Lakeside EfW facility.

10.9.40 With an optimum recycling rate of 70% from 2020 for operational airport waste, between 25,550 and 33,250 tonnes per annum would be recycled.

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40 Jacobs, 2014. *10. Place: Assessment*, Table 5.3, p. 106. [online] Accessed 02/01/2016.
41 Jacobs, 2014. *10. Place: Assessment*, Table 5.24, p. 133 [online] Accessed 02/01/2016.
42 Jacobs, 2014. *10. Place: Assessment*, Table 5.11, p. 117 [online] Accessed 02/01/2016.
43 Jacobs, 2014. *10. Place*: Assessment, Table 5.4, p. 107 [online] Accessed 02/01/2016.

LHR-NWR

10.9.41 Based on current forecasts, LHR-NWR could generate up to 49,800 tonnes per annum of operational waste by 2050. This volume is based on the high level traffic scenario, but could be as low as 38,300 tonnes per annum if waste prevention measures are successfully implemented.

10.9.42 Waste reduction would be targeted through specific operational mitigation measures, for example: decreasing newspapers and magazines at gates, and collaborations with retail owners to reduce waste at source. The diversion of waste from landfill would be achieved – in part – by using licensed waste brokers and off-site treatment facilities.

10.9.43 With an optimum recycling rate of 70% from 2020 for operational airport waste, between 26,810 and 34,860 tonnes per annum would be recycled.

Objective 15: To Minimise Consumption of Natural, Particularly Virgin Non-Renewable Resources

Question 29: Will it be Possible to Minimise the Consumption of Natural Resources?

SEA Criteria	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact (including receptor)	Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.
Direct/ Indirect/ Cumulative	**Direct, Indirect and Cumulative** **Direct** consumption of natural (particularly virgin non-renewable) materials. Negative **indirect effects** where materials are originally extracted, and for those communities local to construction which may experience nuisance effects during materials transportation. **Cumulative impacts** from increasing consumption of construction materials alongside other major programmes of works in the South East.	**Direct, Indirect and Cumulative** **Direct** consumption of natural (particularly virgin non-renewable) materials. Negative **indirect effects** where materials are originally extracted, and for those communities local to construction which may experience nuisance effects during materials transportation. **Cumulative impacts** from increasing consumption of construction materials alongside other major programmes of works in the South East.	**Direct, Indirect and Cumulative** **Direct** consumption of natural (particularly virgin non-renewable) materials. Negative **indirect effects** where materials are originally extracted, and for those communities local to construction which may experience nuisance effects during materials transportation. **Cumulative impacts** from increasing consumption of construction materials alongside other major programmes of works in the South East.
Probability (High, Medium, Low, Very Low)	**High** Due to the nature of large scale infrastructure projects, it is certain that the consumption of natural, non-renewable resources will occur during construction and operation.	**High** Due to the nature of large scale infrastructure projects, it is certain that the consumption of natural, non-renewable resources will occur during construction and operation.	**High** Due to the nature of large scale infrastructure projects, it is certain that the consumption of natural, non-renewable resources will occur during construction and operation.
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Construction, Short-term, Continuous Operation, Long-term, Intermittent**	**Construction, Short-term, Continuous Operation, Long-term, Intermittent**	**Construction, Short-term, Continuous Operation, Long-term, Intermittent**
Permanent/ Temporary **Irreversible/ Reversible**	**Permanent / Irreversible** Consumption of non-renewable natural resources.	**Permanent / Irreversible** Consumption of non-renewable natural resources.	**Permanent / Irreversible** Consumption of non-renewable natural resources.

Question 29: Will it be Possible to Minimise the Consumption of Natural Resources?

SEA Criteria	LGW-2R	LHR-ENR	LHR-NWR
Magnitude and Spatial Extent, incl. Transboundary	**International, Medium** Typically, construction materials are not wholly sourced within the UK. The magnitude of associated effects is not, however, quantifiable at the time of this assessment. Nevertheless, whilst it is expected that impacts associated with material consumption will be very low in terms of *total* UK / global resource availability, local and regional availability of major construction materials (including those with sustainability credentials) may be more negatively impacted in the build up to and during on-site activities.	**International, Medium** Typically, construction materials are not wholly sourced within the UK. The magnitude of associated effects is not, however, quantifiable at the time of this assessment. Nevertheless, whilst it is expected that impacts associated with material consumption will be very low in terms of *total* UK / global resource availability, local and regional availability of major construction materials (including those with sustainability credentials) may be more negatively impacted in the build up to and during on-site activities.	**International, Medium** Typically, construction materials are not wholly sourced within the UK. The magnitude of associated effects is not, however, quantifiable at the time of this assessment. Nevertheless, whilst it is expected that impacts associated with material consumption will be very low in terms of *total* UK / global resource availability, local and regional availability of major construction materials (including those with sustainability credentials) may be more negatively impacted in the build up to and during on-site activities.
Assumptions and Limitation	The assessment is based on *anticipated* impacts and effects from airport schemes of the nature and scale as those put forward by the scheme promoters. The assessment is limited by the absence of construction material consumption forecasts.	The assessment is based on *anticipated* impacts and effects from airport schemes of the nature and scale as those put forward by the scheme promoters. The assessment is limited by the absence of construction material consumption forecasts.	The assessment is based on *anticipated* impacts and effects from airport schemes of the nature and scale as those put forward by the scheme promoters. The assessment is limited by the absence of construction material consumption forecasts.
Significance	**Significant Negative effect (--)**	**Significant Negative effect (--)**	**Significant Negative effect (--)**
	Direct, indirect and cumulative effects from consumption of natural resources; high probability effects during construction (short-term, continuous) and operation (long-term intermittent); permanent and irreversible; medium magnitude and international extent.	Direct, indirect and cumulative effects from consumption of natural resources; high probability effects during construction (short-term, continuous) and operation (long-term intermittent); permanent and irreversible; medium magnitude and international extent.	Direct, indirect and cumulative effects from consumption of natural resources; high probability effects during construction (short-term, continuous) and operation (long-term intermittent); permanent and irreversible; medium magnitude and international extent.

Objective 16: To Minimise the Generation of Waste in Accordance with the Principles of the Resource Efficiency Hierarchy

Question 30: Will it be Possible to Minimise Waste Generated during Construction and Operation?

SEA Criteria	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact (incl. receptor)	Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are the lowest of all three schemes, across all operational scenarios.	Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are marginally lower than the highest forecasts (LHR-NWR), across all operational scenarios.	Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are the highest of all three schemes, across all operational scenarios
Direct/ Indirect/ Cumulative	**Direct, Indirect and Cumulative** **Direct** and **indirect** impacts will arise from waste generated during construction, demolition and excavation works, and from operational activities. **Cumulative impacts** from waste generated at the same time as other major programmes of works in the South East.	**Direct, Indirect and Cumulative** **Direct** and **indirect** impacts will arise from waste generated during construction, demolition and excavation works, and from operational activities. **Cumulative impacts** from waste generated at the same time as other major programmes of works in the South East.	**Direct, Indirect and Cumulative** **Direct** and **indirect** impacts will arise from waste generated during construction, demolition and excavation works, and from operational activities. **Cumulative impacts** from waste generated at the same time as other major programmes of works in the South East.
Probability (High, Medium, Low, Very Low)	**High** Due to the nature of large scale infrastructure projects, it is certain that waste will be generated in significant volumes during construction and in operation.	**High** Due to the nature of large scale infrastructure projects, it is certain that waste will be generated in significant volumes during construction and in operation.	**High** Due to the nature of large scale infrastructure projects, it is certain that waste will be generated in significant volumes during construction and in operation.

Question 30: Will it be Possible to Minimise Waste Generated during Construction and Operation?

SEA Criteria	LGW-2R	LHR-ENR	LHR-NWR
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Duration** Construction: short-term Operation: long-term **Frequency** Construction: continuous Operation: continuous	**Duration** Construction: short-term Operation: long-term **Frequency** Construction: continuous Operation: continuous	**Duration** Construction: short-term Operation: long-term **Frequency** Construction: continuous Operation: continuous
Permanent/ Temporary **Irreversible/ Reversible**	**Permanent / Irreversible** Non-hazardous and hazardous waste will, throughout both construction and operation of all schemes, negatively contribute to landfill impacts. Considerable lengths of time (equal to or beyond the likely operational lifetime of the scheme) and management activities will be required to return landfills to a state fit for development.	**Permanent / Irreversible** Non-hazardous and hazardous waste will, throughout both construction and operation of all schemes, negatively contribute to landfill impacts. Considerable lengths of time (equal to or beyond the likely operational lifetime of the scheme) and management activities will be required to return landfills to a state fit for development.	**Permanent / Irreversible** Non-hazardous and hazardous waste will, throughout both construction and operation of all schemes, negatively contribute to landfill impacts. Considerable lengths of time (equal to or beyond the likely operational lifetime of the scheme) and management activities will be required to return landfills to a state fit for development.
Magnitude and Spatial Extent, incl. Transboundary	**Regional, Medium** It is expected that impacts associated with waste arisings will be medium in terms of local and regional landfill capacity.	**Regional, Medium** It is expected that impacts associated with waste arisings will be medium in terms of local and regional landfill capacity.	**Regional, Medium** It is expected that impacts associated with waste arisings will be medium in terms of local and regional landfill capacity.

Question 30: Will it be Possible to Minimise Waste Generated during Construction and Operation?

SEA Criteria	LGW-2R	LHR-ENR	LHR-NWR
Assumptions and Limitation	LGW-2R has provided three forecast data for construction, demolition and excavation waste. However, the AoS assessment has been limited by the lack of: → specific detail regarding, and analysis of, construction, demolition and excavation waste arisings forecast for LGW-2R (this includes a lack of detail on the extent to which minimisation of waste is possible during associated activities). * → detailed analysis carried out on existing or future regional capacity to manage operational waste.	The AoS assessment has been limited by the lack of: → detail regarding, and analysis of, construction, demolition and excavation waste arisings forecast for LHR-ENR (this includes a lack of detail on the extent to which minimisation of waste is possible during associated activities). → detailed analysis carried out on existing or future regional capacity to manage operational waste.	The AoS assessment has been limited by the lack of: → detail regarding, and analysis of, construction, demolition and excavation waste arisings forecast for LHR-NWR (this includes a lack of detail on the extent to which minimisation of waste is possible during associated activities). → detailed analysis carried out on existing or future regional capacity to manage operational waste. → details on the impacts associated with, and feasibility of, the AC and the promoter's proposal to re-provision the existing Lakeside EfW facility.
Significance	**Significant Negative effect (--)**	**Significant Negative effect (--)**	**Significant Negative effect (--)**
	Direct, indirect and cumulative effects from generation of waste; high probability of effects during construction and operation; long term and continuous; permanent and irreversible; medium magnitude and regional extent.	Direct, indirect and cumulative effects from generation of waste; high probability of effects during construction and operation; long term and continuous; permanent and irreversible; medium magnitude and regional extent.	Direct, indirect and cumulative effects from generation of waste; high probability of effects during construction and operation; long term and continuous; permanent and irreversible; medium magnitude and regional extent.

10.10 MITIGATION

10.10.1 At the next stage of project development, there are a number of mechanisms that are considered appropriate for minimising impacts associated with resource consumption and waste.

10.10.2 Section 10.10.3 sets out the mitigation measures proposed by the scheme promoters, and range of additional measures to complement and advance these. In combination, these measures represent resource efficiency best and exemplar practice for scheme delivery and operation.

10.10.3 By adopting the following measures, the preferred scheme promoter will be able to more effectively take into account the pending ambitions and requirements of a circular economy in the UK. The scheme promoter may need to consider the appropriateness of applying all stated measures.

- Development of a Masterplan to identify and mark out potential waste impacts on communities and the natural environment (planning);
- Negative effects during construction and operation could be mitigated in part by operating in the highest tiers of the Waste (Resource Efficiency) Hierarchy. This could require the adoption of the principles of resource efficiency, with opportunities maximised by designing for re-use and recovery, resource optimisation, off-site construction, resource efficient procurement, and designing for the future[44] (design);
- Establishing a Proximity Principle Strategy, to ensure arisings generated are handled, stored and managed as close as possible to the point of origin (design);
- On-site good practice behavioural incentives and training schemes (construction);
- Development of a WMP to include guidance on waste prevention, segregation, storage, handling, transportation, reuse, recycling, treatment and disposal of specific waste streams (construction);
- Preparation of a CL:AIRE Code of Practice MMP (construction);
- Loss on Ignition testing is maximised to ensure that all wastes identified as qualifying for the lower rate of landfill tax (inert, £2.65 per tonne) are effectively segregated and diverted from landfill (construction);
- Segregation, bulking and secure storage of construction and excavation arisings to enhance the potential for on- and off-site re-use and recycling; reclamation and processing of demolition materials to encourage on-site re-use (construction);
- Re-use of excavated topsoil and agricultural subsoil as fill where reasonably practicable and as close to the point of excavation as practicable (construction);
- Re-use of surplus excavated material from other developments in London and South East for fill applications (construction);
- Re-use of construction materials, incorporation of recycled / secondary content in products, and deployment of materials with other sustainability credentials (construction);
- Development and implementation of a Resource (including waste) Management Strategy, including a Passenger Behavioural Change Programme and accompanying waste segregation facilities (operation);

[44] WRAP, 2015. *Designing for Resource Efficiency, The Five Principles*. [online] Accessed 24/12/2015.

- Specific operational mitigation measures to prevent and reduce waste, recycling effectively and integrating resource efficiency measures in the supply chain (operation);
- Increasing the capacity of on-site integrated waste treatment, including on-site EfW and AD plants with heat recovery, as appropriate (operation); and
- Further studies to assess quantities of resources used and waste generated, in addition to the effects on existing waste management in the region so that further mitigation measures can be identified (see limitations below).

10.11 ASSUMPTIONS AND LIMITATIONS

10.11.1 The limitations on the availability of information at this stage of the assessment include:

- No preliminary calculations have been provided for the number, size and types of structure required, or the anticipated types and volumes of major construction materials that would be associated;
- No information was given on major construction material suppliers and whether they are likely to have future capacity to provide resources of a suitable quality and quantity;
- No information was provided on construction waste arisings, forecasted using BRE benchmarking data or similar;
- No information to quantify the waste impacts from, and construction materials required for, the loss / re-provision of the Lakeside EfW Plant - although it has been assumed that this will be significant;
- Similarly, no investigation has yet been undertaken into the wider geographical, logistical and contractual issues that might arise for waste authorities if the Plant was to be relocated;
- No assessment of the impact of construction waste arisings on available treatment facilities / landfill capacity.

10.11.2 The absence of the above information limits the specificity with which conclusions can be drawn on the impacts associated with the construction and operation of each scheme although potential significant effects have been identified. Further study and assessment is required during design to resolve these gaps. To this end, *anticipated* effects have been considered and presented.

10.12 CONCLUSIONS

10.12.1 The conclusions presented in this section are set out by objective, firstly consumption of resources and then waste disposal.

10.12.2 As part of the conclusions drawn, it should be noted that new policy and increasingly stringent legislation are likely to materially influence future assessments of impact and the mitigation measures considered appropriate for aviation scheme lifecycles. Future assessments should be mindful of advances to these particular initiatives.

AoS Objective 15: To minimise consumption of natural, particularly virgin non-renewable, resources

10.12.3 Environmental, social and economic impacts exist across the lifecycle of construction materials consumed for the LGW-2R, LHR-ENR and LHR-NWR schemes. Impacts will arise from the point materials are mined, extracted or harvested in their virgin state, to their subsequent manufacture, fabrication, transportation, installation, use, maintenance and end of useful life disposal. Likely impacts include:

- Consumption of non-renewable resources (direct);
- Degradation / depletion of the natural environment (direct);
- Generation of waste and impacts on landfill (direct);
- Carbon emissions and water scarcity (climate change) (indirect);
- Violation of human rights and labour standards (indirect); and
- Nuisance to communities (indirect).

10.12.4 Consumption of construction materials needs to be managed carefully throughout the planning, design, procurement, construction and operational phases of a scheme, to ensure associated environmental, social and economic impacts are eliminated or minimised as far as reasonably practicable.

10.12.5 There is currently no data or information on the likely volume, type or breadth of materials required to deliver the construction and operation of LGW-2R, LHR-ENR or LHR-NWR. It is therefore not possible to differentiate between the relative potential performance of each proposed scheme at this stage.

10.12.6 The Lakeside EfW Plant, is proposed to be demolished and re-provided as part of the LHR-NWR scheme and has the potential to increase further any overall negative impacts associated with construction material consumption. This impact has not been quantified and could exacerbate the negative environmental, social and economic impacts associated with the LHR-NWR scheme, both within the London region and in other more distant counties that also rely on its service.

10.12.7 Due to scale of the infrastructure proposed, the *anticipated* effects of material consumption are assessed to be Significant Negative for LGW-2R, LHR-ENR and LHR-NWR.

AoS Objective 16: To minimise the generation of waste in accordance with the principles of the Resource Efficiency Hierarchy

10.12.8 The disposal of waste to landfill during construction and operation of LGW-2R, LHR-ENR and LHR-NWR would have a number of negative impacts:

- Landfill taxation (£costs) (direct);
- Visual, noise, health and other nuisance impacts on local communities (direct);
- Environmental degradation / pollution (direct); and
- Greenhouse gas emissions (indirect).

10.12.9 Forecast data on waste arisings from the construction phase have been provided only by LGW-2R, where a total of 1.6M tonnes of arisings have been predicted. LHR-ENR and LHR-NWR have provided no comparable forecast; however, given the anticipated scale of such infrastructure projects, waste arisings from the excavation, construction and demolition works associated with these latter schemes has the potential to be in the order of magnitude of 'millions of tonnes'.

10.12.10 Operational waste forecasts from passengers are presented in detail across a range of scenarios and years between 2030 and 2050 for LGW-2R, LHR-ENR and LHR-NWR. LGW-2R has substantially lower operational waste forecasts when compared with the other two schemes, and thus has the potential to have least negative impact in this context. The effects of implementing waste reduction activities at site have also been presented.

10.12.11 No estimate of the quantities of waste arising from the proposed demolition of the Lakeside EfW Plant (unique to the LHR-NWR) has been submitted for assessment.

10.12.12 There are potentially significant planning, and business continuity issues to be considered in the EfW Plant re-provisioning. Increased transportation costs and alternative routing for some waste authorities – both within the London region and further afield - would also be required.

10.12.13 In combination, the demolition and re-provisioning of the Lakeside EfW Plant would likely greatly exacerbate the negative environmental, social and economic impacts associated with the LHR-NWR scheme.

10.12.14 Due to scale of the infrastructure proposed, the *anticipated* effects of waste arisings are assessed to be Significant Negative for LGW-2R, LHR-ENR and LHR-NWR.