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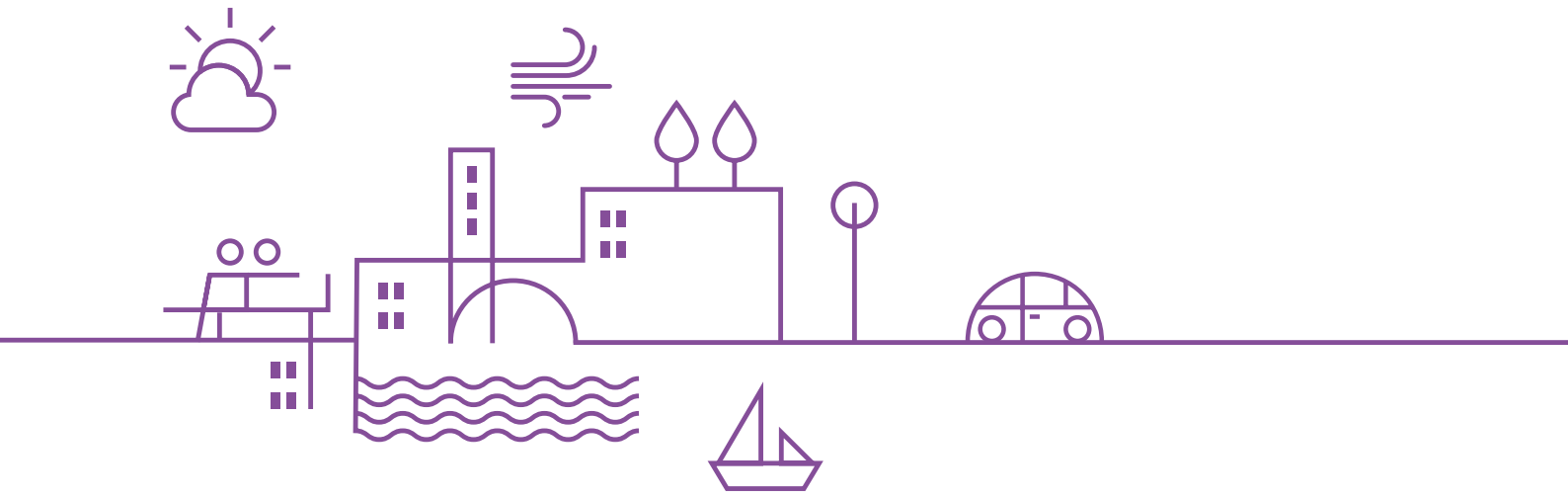
IEMA guide to:
Materials and Waste in Environmental Impact Assessment

Guidance for a proportionate approach



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1. Aims

This document offers guidance and recommendations for EIA practitioners and stakeholders concerned with the impacts and effects of materials and waste on the environment. The guidance provides considerations for screening, scoping, consultation, assessment, and subsequent reporting and monitoring.

The aim of this document is to provide initial guidance on the key terms, concepts and considerations for assessing the environmental impacts and effects of materials and waste, as part of the EIA process. This includes providing practitioners with a process and checklist applicable to each stage of the EIA process.

To achieve its aim, this guidance seeks to answer four key questions:

1. What principles should govern the assessment process?
2. What are the impacts and effects associated with materials and waste?
3. What should an assessment of materials and waste entail?
4. What key messages should industry take away to help apply and advance best practice in the UK?

This guidance recognises that there will be principles and approaches that are relevant to all development sectors, and some that are specific to each. Similarly, some principles and approaches will be relevant to developments of all scales and natures, but some will not. Practitioners are expected to apply the content using their experience and professional judgement, as is appropriate for different developments under consideration.

2. Disclaimers

As this guidance represents a 'first' for this subject at an industry-wide level, it is acknowledged that it is likely to need to be refined and updated in coming years. The overarching aims of the guidance are unlikely to change, but the authors will welcome the opportunity to advance the approach in future, for the benefit of developers and practitioners, alike.

The authors of this document also note that changing policies, laws and attitudes to materials and waste management (for example, the recent attention focussed on plastics, food and household waste) will need to be more specifically accounted for in future updates. Practitioners remain responsible for understanding and accurately responding to key issues that influence the outcomes of environmental assessment.

Whilst it is acknowledged that the United Kingdom's exit from the European Union may eventually alter national statutory requirements relating to EIA, European Directives have been referred to in this document. Now that the United Kingdom has exited the European Union, a transition period will maintain the influence of EU law in the UK, to provide legal certainty to businesses and individuals. After this time, updates to this guidance are likely to be necessary.

It should be noted that this initial edition of the IEMA guidance does not include case studies from real-life scenarios and developments. The authors wish to use this guidance to inspire improved and more consistent practice in materials and waste assessment, and to collate case studies for the next version.

3. Competencies required for assessing materials and waste

UK Regulations require that:

'In order to ensure the completeness and quality of the environmental statement... (a) the developer must ensure that the environmental statement is prepared by competent experts; and (b) the environmental statement must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts.'

The Materials & Waste Topic Lead is expected to be the primary competent expert for this subject matter; however, an EIA Co-ordinator would also be expected to have a working understanding of the definitions, terminology and principles. The Materials & Waste Topic Lead's level of understanding should include (but not be limited to):

- a degree, other professional qualifications, or relevant experience relating to the built environment sector, materials and waste, sustainable resource management, and the circular economy;
- a working knowledge or appreciation of the main materials used on developments, their properties and features that render them able (or not) to be managed in accordance with the highest tiers of the Waste Hierarchy;
- a working knowledge or appreciation of credits available in industry-recognised certification standards such as BREEAM[i] and CEEQUAL[ii], and materials assessment toolkits, e.g. the Green Guide to Specification;[1]
- knowledge of the role that local, regional, national and international supply chains play in developments, how external organisations can help reduce environmental impacts and effects, and the application of the Proximity Principle; and
- involvement with, or delivery of, lifecycle assessments.

As well as a sound knowledge of the key principles concerning materials and waste, the Materials & Waste Topic Lead must have a good understanding of EIA principles, including the ability to:

- define the scope of an environmental assessment, including its temporal and spatial boundaries (to ensure a proportional approach);
- determine potential environmental impacts and effects (whether positive or negative);
- understand the mechanisms established by legislation, policy and accepted practice, to adequately reduce potential impacts; and
- define significant environmental effects for consideration within EIA.

Within all core environmental assessment documentation, it is the responsibility of the Materials & Waste Topic Lead to ensure that their competence, and the competence of those supporting the production of content, is clearly evidenced.

i. Building Research Establishment Environmental Assessment Method.
ii. Civil Engineering Environmental Quality Assessment and Award Scheme.

4. Preliminary reading

The intended audience for this guidance is EIA practitioners and stakeholders concerned with the management of materials and waste within the environmental assessment process. The audience is assumed to have a working knowledge of EIA in the UK, and to be able to take into account any country-specific requirements.

It is recommended that, as part of applying this guidance, those who do not have a working knowledge of delivering EIAs, or who simply wish to refresh their understanding, undertake preliminary reading on the way in which the process is undertaken, particularly in relation to the application of EIA within the design process and the use of Environmental Management Plans (EMP) as a control mechanism. Useful information can be found in the following Institute of Environmental Management & Assessment (IEMA) documents:

- Environmental Impact Assessment Guide to: Shaping Quality Development;[2] and
- Environmental Impact Assessment Guide to: Delivering Quality Development.[3]

These sources of information have informed the content and structure of this guidance, but their technical content is not duplicated.

Note: **This guidance has been developed to provide consistency in the assessment of materials and waste, in particular where there is an absence of sector-specific guidance. Where a developer or client has produced their own assessment approach, EIA practitioners should look for opportunities to draw upon the content of this IEMA guidance, and to align their approach where there is the flexibility to do so.**

5. Materials and waste management, and EIA

In the built environment sector, our understanding of the impacts and effects of consuming and disposing of resources, the practice of sustainable resource management, and – in a wider context – the circular economy, has evolved considerably in the last decade. Development synergies, industrial symbioses, market-intelligent decisions and supply chain information continue to grow and become more accessible.

To help provide a frame for the consistent understanding of key terms, IEMA defines 'resource efficiency' as 'maximising the use of materials with minimal waste production.' IEMA also defines 'resource effectiveness', which advances 'resource efficiency' as a concept, as 'the process of optimising the use of resources across their lifecycle, to minimise harm to the natural environment and society, and to increasingly generate sustainability benefits.' [4]

In its engagement with members, IEMA has found that organisations already driving changes in resource-efficient practice are looking at the whole-life environmental and sustainability implications of the materials they use across their value chain[5]. Such resource-efficient activity often requires a level of deeper thinking by comparison with that which is intrinsic to linear models for materials and waste management, and which organisations have traditionally applied in the approach to the design and development of products and services. Actions typically include working in partnership with clients, suppliers and wider stakeholders and can require more holistic approaches to encourage behavioural change in, for example, the consumption of goods, products and services, including those within the construction sector. Embracing innovation (e.g. the use of products with recycled content, products designed for recovery at end of life, and materials with an extended design life) and digital solutions (e.g. construction logistics software) is also increasingly recognised as a key factor to enhance sustainable resource management practices. The publication of the Government's Resources & Waste Strategy for England,[6] in December 2018, emphasised the focus that it will give to this issue.

IEMA has also published a Thought Piece on Disruptive Technologies & Sustainability,[7] which may be of interest to the readership of this guidance.

IEMA has previously stressed that UK EIA is a mature process sat within a series of well-established consenting regimes that emphasise robust evidence-based decision-making; this does, however, tend to result in a general reluctance towards the adoption of novel and new approaches in industry.[8] Notwithstanding this, this guidance has been produced specifically to advance industry's understanding of methods by which to assess the environmental impacts and effects of consuming materials, and the production and disposal of waste. As part of this, the main drivers for taking action are that – in the UK – the effective management of materials and waste (inert, non-hazardous and hazardous) is still highly dependent on the:

- strength of national and local policy;
- capability and availability of geographically accessible infrastructure;
- skill and experience of the individuals in management positions;
- robustness of systems designed to ensure continuity of information between development lifecycle stages;
- consistency and rigour with which approaches are applied;
- scale and nature of developments: larger developments tend to require more materials and generate larger volumes of waste, and hence be supported by more comprehensive assessments because of their potential to affect a wider number and range of regulatory and other stakeholders; they are also likely to come under greater scrutiny e.g. under the Development Consent Order (DCO) process. [iii]

iii. A consent granted and issued by Ministers for Nationally Significant Infrastructure Projects (NSIP); a Development Consent Order consists of an approval for planning permission, as well as other separate consents.

EIA practitioners responsible for the environmental assessment of materials and waste must be aware of the key principles, and ensure developments benefit from a robust, consistent and best practice approach to minimising potentially significant adverse effects.

5.1 The regulatory basis for action

5.1.1 European context

In May 2017, the EIA Directive 2014/52/EU[9] (amending 2011/92/EU) was updated to incorporate definitive requirements for the identification, evaluation and assessment of the likely significant environmental effects of materials and waste; these advances were subsequently transposed into UK Regulations.[10]

Specifically, the 2014 amendments to the Directive aim to enhance the role that the assessment process makes in delivering sustainable resource management. For example, it:

- seeks to ensure that *'resource efficiency (is) increased'* and confirms how *'resource efficiency (has) become more important in policy making';*
- refers to the *'Roadmap to a Resource Efficient Europe'*; thereby strengthening the link between sustainable resource management and EIA.

The change in tone regarding resource efficiency in EIA is encapsulated in the Directive's articles and annexes:

- *'A description of the likely significant effects of the project on the environment resulting from … the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources … and the disposal and recovery of waste'.*
- A description of the likely significant effects of the development should include *'the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources'.*

5.1.2 UK EIA Regulations

England and Wales, Scotland, and Northern Ireland each have their own EIA Regulations that enact the EIA Directive.

In England and Wales, EIA Regulations include The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[11],[12] (as amended) and The Infrastructure Planning (Environmental Impact Assessment) Regulations (2017).[13]

In Scotland, The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[14] apply; in Northern Ireland, EIA is principally enacted by The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.[15]

These are the key statutory instruments that enshrine EIA in law (noting that some development sectors, such as forestry and land drainage, are subject to separate EIA Regulations).

For materials and waste, the Regulations require that (quoted from the English EIA Regulations):

- *'The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*
  - » land, soil …

- *The characteristics of development must be considered with particular regard to—*
  - » the use of natural resources, in particular land, soil ...;
  - » the production of waste;
- *A description of the development is provided, including in particular:*
  - » a description of the main characteristics of the operational phase of the development (in particular any production process), for instance ... the nature and quantity of the materials and natural resources (including ... land, soil) used;
  - » an estimate, by type and quantity, of expected residues and emissions such as ... the quantities and types of waste produced during the construction and operation phases.
- *A description of the likely significant effects of the development on the environment resulting from, inter alia:*
  - » the use of natural resources, in particular land, soil ... considering as far as possible the sustainable availability of these resources;
  - » the ... disposal and recovery of waste;
  - » the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.'

5.1.3 UK Policy

The publication of the Resources & Waste Strategy [iv] for England confirmed the intention of the Government to put sustainable resource management at the centre of its strategic ambitions on resources and waste. This guidance seeks to echo the ethos of the Strategy, which is designed to *'...preserve material resources by minimising waste, promoting resource efficiency and moving towards a circular economy...'. The Strategy also recognises the need to make 'more thoughtful decisions' early in a project lifecycle, encouraging 'resource-efficient product design'* and increasing recycling rates in construction.

In Scotland, the Government's Circular Economy Strategy[16] takes the targets and ambitions in its Zero Waste Plan[17] and in Safeguarding Scotland's Resources[18] and places them firmly in the context of actions for a more circular economy.

The Welsh Government's Towards Zero Waste[19] strategy describes a long-term framework for resource efficiency and waste management to 2050. It stresses that the construction sector will be 'expected to reuse and recycle 90% of its wastes by 2025'. A Circular Economy Fund has also been announced[20] to *'help Wales reach the milestones of 70% recycling by 2025 and 100% recycling by 2050'*.

The Northern Ireland Waste Management Strategy[21] seeks to *'move waste up the Waste Hierarchy towards reuse and prevention'. It sets a recovery target of '70% for all non-hazardous construction and demolition waste by 2020'*.

iv. IEMA has actively engaged on the development of the Resources & Waste Strategy, meeting with Defra to discuss its own recommendations paper (Input on the Upcoming Resources & Waste Strategy [link]) on key focus areas to include in the Strategy. These areas included the need for maximising resource utilisation and resource effectiveness (the latter: optimising the efficient use of resources across their lifecycle to minimise harm to the natural environment and society and increasingly generate sustainability benefits).

Should you wish to participate further in these activities and receive notifications on this topic, contact IEMA on cenetwork@iema.net.

5.1.4 The Environment Bill

Since the EU Referendum took place in June 2016, IEMA has worked with its members and actively participated in the Broadway Initiative,[22] which advocated for an ambitious new Environment Bill, now published.[23]

The Bill sets out resource efficiency and waste reduction as one of four key priority areas. It does this by mandating the management of 'recyclable relevant waste' (glass, metal, plastic, paper and card, and food waste) from household, industry and commercial activities.

It also necessitates the provision of more comprehensive information on products manufactured, imported, distributed, sold or supplied. This supports the fact that improvements in data concerning the environmental performance (or impacts) of products is increasingly required across industry, including within environmental assessment.

5.2 The drive for proportionality

At this time, no definition of 'natural resources' is provided within EIA legislation. Furthermore, this term is extremely broad and could (arguably) embrace almost any physical or tangible/valued element of the natural environment. To this end, EIA practitioners must be responsible for setting clear assessment boundaries, to help focus on those impacts with the greatest potential for significant effects, and hence to deliver a proportionate approach to the EIA process.

IEMA's Delivering Proportionate EIA[24] is a useful strategic text in this capacity; it identifies actions practitioners should seek to adopt to overcome unnecessarily lengthy or detailed environmental assessment documentation.

It is recommended that benchmarks and comparisons from other developments of a similar size, type and assessment methodology are drawn upon, where appropriate.

6. How are 'materials' and 'waste' defined in EIA?

As previously described, EIA Regulations set out requirements for the assessment of natural resources, and the disposal and recovery (including reuse and recycling) of waste.

To take proper account of these requirements, this guidance splits the definition of 'materials' and 'waste' (the overarching terms used in this guidance) into four main sub-elements. These sub-elements, and the way they interrelate, should be given due consideration throughout the EIA process.

6.1 Materials

Materials are substances used in each lifecycle stage of a development, with a particular focus on the construction, operation and maintenance, and decommissioning or 'end of first life' (deconstruction, demounting, demolition and disposal) phases.

The consumption of materials is generally considered to have adverse environmental impacts and effects.

Definitions for 'materials' and 'excavated arisings' are now provided.

1. MATERIALS

- 'Materials' are physical resources that are used across the lifecycle of a development. Examples include concrete, aggregate, asphalt, bricks, ballast, mortar, glass and timber.
- Materials would typically be expected to be in solid form, though this guidance does not preclude the consideration of liquids from the assessment process.
- Gases are generally excluded from the definition of materials in this guidance.

2. EXCAVATED ARISINGS

- Soil, rock or similar resources generated by excavations either from within the boundary of a development, or from another source (e.g. a donor site), that have been proven to:
  - » be clean and naturally occurring material that will be reused on the site of origin, within 12 months; or
  - » meet relevant waste exemption criteria; or
  - » fall within the scope of and meet the following CL:AIRE Definition of Waste: Development Industry Code of Practice (DoW CoP)[25] criteria where it is proven that:
    1. material is suitable for use;
    2. reuse of excavated material is a certainty;
    3. only the required volume of material will be used; and
    4. the material will not harm the environment or human health.

Note: Any material which is not considered to fall within the above definition is defined as waste.

6.2 Waste

Waste is defined by the Waste Framework Directive (Directive 2008/98/EC)[26] as *'any substance or object which the holder discards or intends or is required to discard'*.

The Directive definition includes any substance or object that is discarded for disposal or that has not been subject to acceptable recovery (including reuse and recycling).

Where waste is disposed of, resources are lost, and the potential for indirect impacts exists (e.g. atmospheric emissions, pollution of water bodies, and visual impact).

A note on the assessment of processing and recovery facilities

In this, the first edition of 'Materials and Waste in Environmental Impact Assessment', it has been decided that whilst waste processing and recovery facilities may not be able to divert all received resources from landfill, these operations are a beneficiary of incoming feedstock, and are – ultimately – being used to drive arisings up the Waste Hierarchy. They, hence, create conditions that support the national and wider drive to a circular economy.

Accordingly, this guidance does not consider waste processing and recovery facilities as sensitive receptors, rather: they are part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal. Waste processing and recovery facilities are, hence, different to landfills, in that the latter are finite resources. This aspect of assessment is discussed in further detail in ***Section 10.***

3. WASTE FOR RECOVERY (INCLUDING REUSE AND RECYCLING)

- Excavated and other arisings from a site that require treatment as part of recovery. Only when acceptable recovery has been achieved would such arisings be potentially considered to have lost their status as waste.
- A well-established recovery process is the use of Quality Protocols for waste processing (on- or off-site) to create products or materials for reuse; an example is the application of the Aggregates Quality Protocol.[27] Other examples of recovery processes include the treatment of waste (for example, soils) to achieve British Standards, and take back schemes for treatment (physical, chemical, biological) and re-manufacture.
- The use of 'waste to fuel' treatment processes (including incineration) that generate energy is also considered a recovery process. It is a less preferential option within the Waste Hierarchy but is still recognised to minimise adverse effects associated with landfill disposal.
- The recovery of waste would not typically be considered sufficient to trigger the EIA process. Rather, the assessment of recovered waste can most effectively be used as part of the mitigation approach to minimise adverse effects associated with waste disposal to landfill.

4. WASTE FOR DISPOSAL

- Any substance or object that is discarded to landfill, and that has not been subject to acceptable recovery (including recycling). This includes inert, non-hazardous and hazardous waste types.

7. What principles should govern the assessment process?

Five key principles underpin the assessment of materials and waste during EIA; they are:

1. The consumption of materials, and the generation and disposal of waste, result in **adverse environmental effects.**

2. Where materials are consumed, and waste is generated, it is acknowledged that – depending on how they are managed – **indirect adverse effects** may arise (from haulage, noise, dust, nuisance, vehicle emissions and water pollution). Such effects are assessed by other EIA disciplines.

3. All EIA topic leads (not just those responsible for materials and waste) should continue to take responsibility for inspiring and incentivising the **production and refinement of materials and waste data and information**, from the earliest planning and design lifecycle stages, through detailed design, procurement, construction, operation (including maintenance and refurbishment) and – where practicable and proportionate – end of life.

4. Whilst understanding full lifecycle sustainable resource management is an important part of reducing adverse environmental impacts, in practice, **data availability may restrict a consideration of end-of-life impacts and, hence, practitioners may – to follow a proportionate approach – need to focus on the construction and operational phases**. When more robust information becomes available, future editions of this guidance may be advanced to consider other lifecycle stages e.g. end of life.

5. The EIA process should seek to deliver outcomes that align with the highest tiers of the **Waste Hierarchy**, and the **Proximity Principle**, and should be used to encourage and evidence transitions towards a **Circular Economy.**

8. What are the impacts and effects associated with materials and waste?

8.1 Sensitive receptors

To help practitioners assess with consistency the impacts and effects of consuming materials, and from generating and disposing of waste, the following descriptions of 'sensitive receptors' are provided.

- Materials are, in their own right, sensitive receptors. Consuming materials impacts upon their immediate and (in the case of primary materials) long-term availability; this results in the depletion of natural resources and adversely impacts the environment.
- For waste, the sensitive receptor is landfill capacity. Landfill is a finite resource, and hence – through the ongoing disposal of waste – there is a continued need to expand existing and develop new facilities. This requires the depletion of natural and other resources which, in turn, adversely impacts the environment.

8.2 Impact and effects

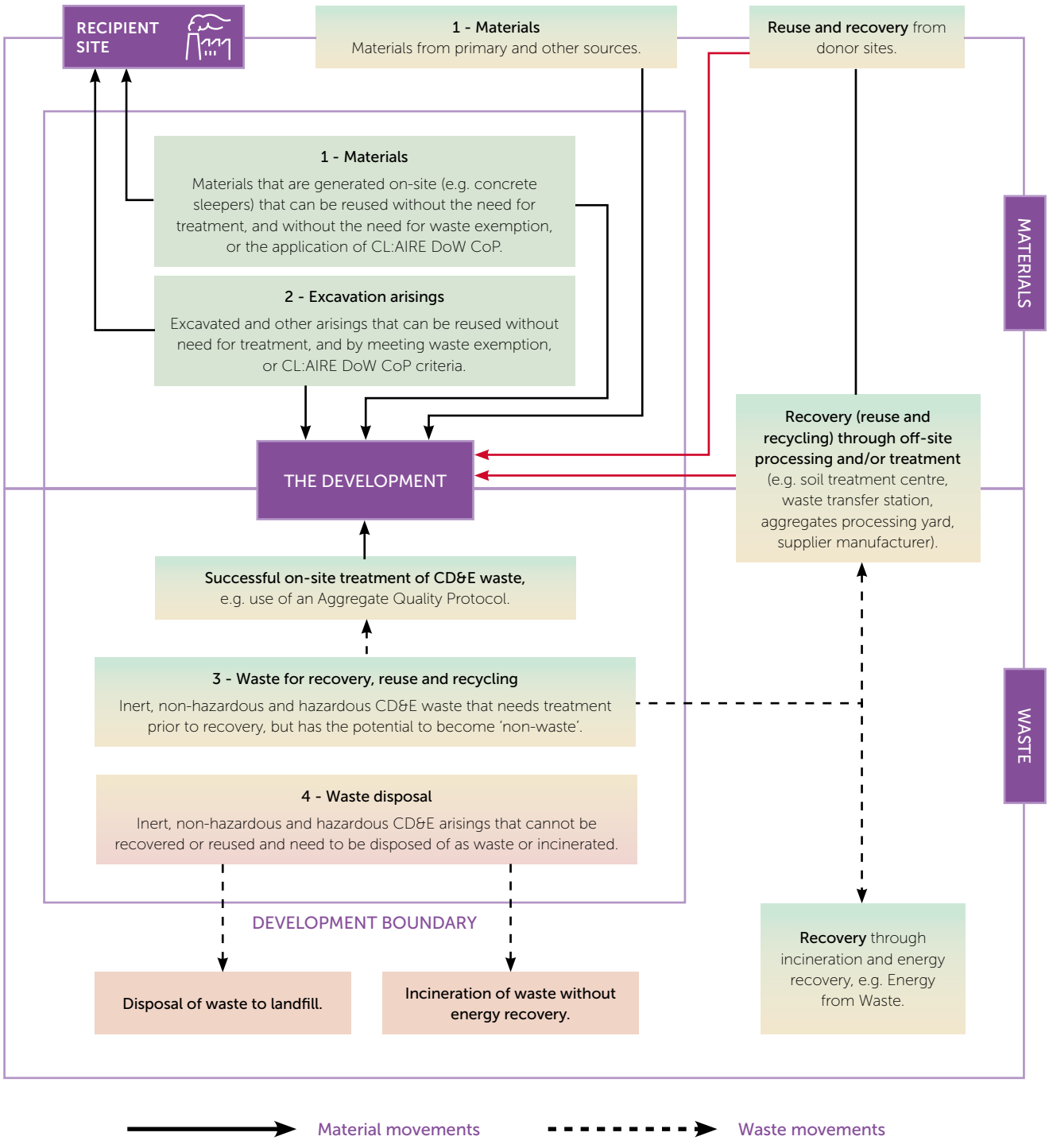
The main impacts (changes) and effects (consequences) of materials consumption and waste disposal are now discussed and detailed further in the following table; examples of indirect impacts associated with materials and waste are also provided for information. Whilst these impacts would typically be assessed as part of EIA, this would not form part of a materials and waste assessment (see **Interaction with other EIA chapters**). The Materials & Waste Topic Lead (defined in **Competencies required for assessing materials and waste**) should engage with other topic leads, as necessary, to ensure consistency.

Similarly, the indirect impacts of off-site waste management facilities and material production facilities are generally assumed to be assessed (and where necessary mitigated) under the planning and permitting regime for those sites and thus do not normally require assessment as part of an EIA for a development that uses such facilities for material supply or waste management.

Element	Direct impacts	Adverse effects	Indirect impacts
Materials	Consumption of resources	Depletion of resources, resulting in the temporary or permanent degradation of the natural environment	Release of greenhouse gas emissions (through transportation) Water consumption Visual impacts, noise, vibration, disruption to traffic and other potential causes of nuisance Human health, e.g. if conflict minerals are used
Waste	Generation and disposal of waste	Reduction in landfill capacity Unsustainable use or loss of resources to landfill that results in the temporary or permanent degradation of the natural environment	Release of greenhouse gas emissions (through transportation and management) Ecological impacts (e.g. offshore disposal of dredged arisings) Visual impacts, noise, vibration, disruption to traffic and other potential causes of nuisance

The diagram overleaf shows the interaction of materials and wastes across and within a development boundary. The terms set out should be used within the EIA process to encourage the consistent use, and a common understanding, of terminology and the movement of materials.

8.3 Sources and recipients of materials and waste



9 What should an assessment of materials and waste entail?

9.1 Considerations for screening

'Screening' determines whether a proposed development requires EIA.

In accordance with Schedule 3 of the UK EIA Regulations, the consumption of materials, and/or production and disposal of waste, should be considered as potential triggers of EIA.

As part of this screening process, the Materials & Waste Topic Lead should identify initial information about materials and waste, to assist in determining if matters relating to this topic have the potential for significant environmental effects. This information will be necessary to contribute to the request for a screening opinion from the decision-maker.

At this stage, information is likely to be high-level and may be qualitative or semi-quantitative. The scale, nature and timing of a proposed development may give a good indication as to the likely impacts and effects related to materials and waste. A description of these aspects (relative to other similar developments through – for example – benchmarking) is likely to be useful information to present as part of the screening process.

During screening, it may be possible to collect and present high-level information on primary mitigation, especially where elements of the design have been established and documented as part of the early and conceptual development works. Materials & Waste Topic Leads should seek to incorporate a description of such primary mitigation (and other) measures into screening documentation, citing (where appropriate) the level of confidence regarding delivery, and the extent to which they are likely to avoid the potential for significant adverse environmental effects.

Whether a development meets the criteria for EIA or not, information collected during screening is likely to be of value to any subsequent action taken to minimise or avoid the environmental impacts and effects of materials and waste, and should be recorded.

9.2 Considerations for scoping

'Scoping' is the process that determines the aspects of the environment that may be significantly affected, in order that the range of topics to be considered and the detail into which the assessment needs to go, can be agreed. In turn, this determines the level and type of information to be reported in subsequent environmental assessment documentation.

The Materials & Waste Topic Lead needs to determine whether the materials and waste aspects of a development are likely to have significant adverse environmental effects, and hence decide whether to scope them (or any defined sub-element) into an EIA. Where the topic (or sub-element) is scoped-in, it is also necessary to define the level of detail to be provided, and the assessment methods to be adopted, to provide a robust but proportionate assessment.

The Materials & Waste Topic Lead should first consider the influence of both (as described herein) 'primary' and 'tertiary' measures on the potential for significant adverse environmental effects (noting that secondary measures – which are discussed in detail in **Considerations for environmental assessment** are those that will typically emerge from the environmental assessment process). An understanding of primary (embedded) and tertiary (inexorable) measures will ensure that any assessment of materials and waste, whether scoped-in or not, is based on a firm foundation of evidence.

9.3 Primary (embedded) mitigation

In this guidance, primary mitigation is the prevention or reduction of adverse effects through the resource-efficient design, construction and/or lifetime operation of a development (for example, choosing a highway option that avoids an allocated mineral site), or making the decision to leave a large building or structure in-situ (rather than demolish it).

Primary mitigation measures are an intrinsic part of the development, and do not require additional action to be taken. Such measures are often identified as a result of the interaction between the EIA and engineering specialists within a development team, who are able to identify and agree by consensus resource-efficient design solutions.

Utilising and refining any information collated during screening, a confirmation of primary mitigation measures for materials and waste, as well as any guaranteed monitoring requirements, should be worked up and agreed with the developer, design team and any statutory stakeholders – for example, local waste disposal and collection authorities.

Ensuring development-specific commitments for sustainable resource management are set and agreed at the outset of planning and design works has the potential to reduce the likelihood of significant adverse effects throughout the lifecycle of that development.

Some examples of primary mitigation measures for materials and waste, could (where these are firmly committed to, and will achieve a level of 'best practice' that accords with the professional judgement of the Materials & Waste Topic Lead), include:

- refining or changing designs or development objectives to reduce the volume of materials consumed, and to minimise the risk of associated adverse impacts;
- developing a Waste Options Assessment Study[v] or an Outline EMP (incorporating a comprehensive strategy for the resource efficient management of materials across the full development lifecycle) that directly improves the management of materials and waste;
- setting out sustainable procurement criteria for materials and waste, and to encourage circular economy action; and/or
- application of circular economy approaches such as design for off-site construction, for disassembly, and for material and product reassignment, reuse and recycling, during both operational and end-of-life phases.

Where primary mitigation measures are in place and it can be robustly and comprehensively demonstrated that they are sufficient to prevent potentially significant adverse environmental effects, it may be possible to scope out materials and waste (or a specific sub-element) from further assessment.

Where the above-stated conditions are not met (either partially or fully), or there is a lack of clarity, or uncertainty, about the extent to which they will be applied, a comprehensive scoping exercise is highly recommended.

In summary: **scoping out materials and/or waste from environmental assessment based on primary measures alone would require evidence to demonstrate that there is clarity and certainty about the nature of mitigation(s) and the method by which that mitigation(s) would be secured.**

v. A Waste Options Assessment Study establishes (for example) the expected waste types and volumes from a development, the techniques and technologies to be used to manage that waste, and the associated opportunities for waste avoidance, reuse, recycling, or other diversion from landfill.

9.4 Tertiary (inexorable) mitigation

Tertiary measures are those that are in place with or without the iterative EIA process, and where regulatory intervention would be expected if they were not followed. Activities include those that will be undertaken to meet existing legislative requirements, or those that are considered standard practices used to manage commonly occurring environmental effects.

As part of establishing tertiary measures, it is important to ensure that due consideration is given to existing consenting regimes (e.g. Environmental Permitting Regulations) that may require or obligate particular environmental standards and mitigations for materials and waste.

Where consenting regimes are known to be in place, where they can be evidenced, and where a Materials & Waste Topic Lead has confidence in their robustness and use to prevent potentially significant adverse environmental effects, relevant details should be set out and consideration given to scoping out materials and waste (or any defined sub-element) from further assessment.

For example, should Environmental Permitting heavily regulate an industrial operational process to limit the production and disposal of waste (for example, where radioactive wastes are to be generated and managed during the decommissioning of a nuclear site or facility), it may be that this element of the development lifecycle can be scoped out of the assessment. This would leave all other wastes to be generated during the construction and operational phases of the development 'scoped in', and subject to environmental assessment.

9.5 Primary and tertiary mitigation: a summary

The extent of confidence in primary and tertiary measures is subject to the professional judgement of a Materials & Waste Topic Lead, in combination with advice provided by the EIA Co-ordinator.

Wherever:

- effective primary and/or tertiary measures are not in place;
- primary and/or tertiary measures comprise novel approaches or those without clear provenance;
- there is insufficient evidence that the potential for significant adverse environmental effects will be precluded; and/or
- there is any reasonable professional consideration that a development has the potential to result in significant adverse environmental effects from materials and waste...

...the topic should be scoped in, and a comprehensive baselining exercise undertaken.

9.6 Engaging with the design process

To ensure an accurate and robust scoping process is undertaken by a Materials & Waste Topic Lead (with support from an EIA Co-ordinator), engaging with the design process as early as possible is critical. EIA scoping should be based on an appreciation of the available information and intended development proposals, their scale and nature, the timing for delivery, and any nuances therein.

Involvement with, and an understanding of, a design will help to ensure that a Materials & Waste Topic Lead and EIA Co-ordinator can be confident of the:

- extent to which primary and tertiary measures will positively influence the management of materials and waste throughout a development's lifecycle;
- scope of any subsequent assessment proposed to be undertaken; and
- potential for significant effects.

9.7 Defining the study area

An EIA practitioner should establish a suitable study area within which baseline data for materials and waste will be collected. The definition of a study area will depend on both the location of a development, the types of materials required and waste to be generated.

Where materials can be sourced, and wastes managed, locally, the study area may be commensurately small. Where sourcing and management is required at a regional, national and international level, the study area would be expected to be defined accordingly.

Two study areas are proposed for materials and waste:

1. The **development study area** comprises the scheme or project footprint (the red line boundary or limits of deviation), and any areas required for temporary access, site compounds, working platforms and other enabling activities.
2. The **expansive study area** extends to the availability of construction materials, and capacity of waste management infrastructure and remaining landfill void, within a defined (for example, a mineral and waste planning) region, or – as appropriate – across multiple regions.

9.8 Baseline information

Where scoping has determined that materials and/or waste (or a specific sub-element) have the potential for significant environmental effects, the adjacent baseline information should be sought. Information should be tailored to the nature of a development, ready for use in the scoping process, and proportionate to the scale of materials used and waste generated by the development.

In specific cases, where the collection of current or historical trends in the capacity/availability of non-landfill waste management infrastructure (materials recovery, transfer and treatment, reuse, recycling, use of waste, and incineration facilities) would – in the professional judgement of the Materials & Waste Topic Lead – provide useful context to the assessment process, baseline data may be collected. It remains the Materials & Waste Topic Lead's responsibility to ensure that baseline data collected is proportionate to the scale and nature of the development in question.

Regional baseline information (i.e. at the Waste Planning Authority, county or other regional scale) should be targeted as a priority. Where a study area covers more than one region, information from each region should be collated for the baseline.

Sometimes, this may not be possible for hazardous waste due to its specialist nature and the limited availability of hazardous waste management facilities. Similarly, it may not be possible to obtain regional data for all key construction materials.

Where applicable, the consumption of materials, production of excavated arisings, and generation and disposal of waste should be described and quantified for the existing (pre-development scenario) activities and operations within the development study area, and for an agreed future scenario (the 'do minimum' or 'do nothing' scenario). This will provide a context in which the assessment of effects can be more accurately undertaken.

Materials

- Regional and/or national availability (stocks, production, sales, other) of the main materials – by volume or weight, as available or deemed appropriate – required for the site preparation, construction and/or operation of a development; information on 'availability' can generally be obtained at a national – and sometimes at a regional – level.
- Minerals Safeguarding Areas and Allocated Mineral Sites within or (where a development's adjacency might preclude future access) adjacent to the red line boundary of a development.
- Where data are available, the planned use or presence of 'critical raw materials'* (materials that are of high importance within the EU economy, but where security of supply is at great risk) may also be useful baseline information for scoping.

* Critical Raw Materials[28]

Waste

- The availability and capacity of regional and – where appropriate – national landfill facilities. Landfill void data should be collated for both inert and non-inert (non-hazardous and hazardous) landfill types, where available.
- Historical and future trends in waste processing, recovery and/or landfill void capacity (especially where increases can be forecast or otherwise ascertained) also offer a useful insight as to the capability of these facilities, especially during the planned construction phase of a development.

9.9 Sources of baseline information

Reliable and detailed sources of baseline information and data on materials and waste include those from:

- the Environment Agency (particularly the Waste Data Interrogator);[29]
- the Department for Environment, Food & Rural Affairs (Defra);
- government organisations responsible for the environment in the devolved administrations, particularly Natural Resources Wales, the Scottish Environment Protection Agency, and the Northern Ireland Environment Agency;
- planning authorities, particularly their Minerals & Waste Local Plans (or equivalents) and Local Plan Annual Monitoring Reports. Local Supplementary Planning Guidance (SPG) relating to waste management may also be available;
- the Minerals Products Association;
- the British Geological Society; and
- regional and national working parties, bodies and federations that represent specific materials (and associated activities) in the UK (such as UK Steel and the Forestry Commission).

It may, in certain circumstances, also be permissible and advantageous to engage directly with regional developments and processing/recovery management facilities, and thereby acquire location-specific information that can then be used in the assessment of impacts and effects associated with materials. EIA topic leads should only approach private companies with the express permission of the developer or client, to avoid breach of commercial confidentiality and/or potential conflicts of interest.

9.10 Limitations, realism, proportionality

This guidance recognises that identifying and establishing development and baseline information at the scoping stage can be challenging. Moreover, Materials & Waste Topic Leads are likely to be heavily reliant on the quality and availability of information in the public domain.

Extensive research into, and data acquisition on, baseline information may be possible where budgets and timescales allow, but this scenario would not be expected to be typical. Some of the main limitations to establishing a scoping baseline are now described.

Materials

- Accumulating clear evidence to demonstrate that environmental permitting or other tertiary measures have required prior environmental assessment of materials (for example, during the extraction of resources), and that environmental assessment has been effective, is recognised to be a challenge in industry.
- Furthermore, tracing materials (and components of those resources) back to their source is unlikely to be commensurate with a proportionate approach, and securing evidence as proof may prove equally burdensome.
- These issues are likely to be compounded with materials sourced from outside the UK.

Waste

- It is recognised that some landfill operators do not release information for reasons of commercial confidentiality. The resulting data gaps may reduce the value of the data that is made publicly available, and therefore also a practitioner's ability to rely on it. Any uncertainty should be presented as part of documented outputs.
- There is also a general lag (in years) in materials, landfill and waste processing capacity data in the UK. This has implications for EIA practitioners presenting a 'current picture'; appropriate caveats/assumptions should be stated.

9.11 Considerations for environmental assessment

The collection, interpretation and use of the following information on materials and waste (for the construction, and operation and maintenance phases, at least) should be targeted during environmental assessment.

The following comprises information that should ideally be sourced to generate a meaningful assessment against the baseline. However, it is acknowledged that, depending on the type and scale of development, it may not be consistently available during the EIA process. It is anticipated that Materials & Waste Topic Lead will collect and interpret as much information as is practicable and reliable to the assessment and that any associated limitations are reported. The practitioner must be sufficiently experienced to be able to judge the balance between rigour and proportionality.

Materials

- The type and volume of materials to be consumed during construction (for example, a Bill of Quantities or Schedule of Rates) and operation.
- Information on any materials that will comprise entirely (or incorporate) secondary or recycled content.
- Information on any known sustainability credentials of materials to be consumed (for example, through the use of Ecolabels or Environmental Production Declarations (EPD)) including the expected benefit.
- The region or country from which materials are likely to be sourced.
- The volume or weight of excavated arisings that will be reused or recycled (or stockpiled for future reuse or recycling), either on-site or off-site.
- The type and volume of materials that will be recovered from off-site sources (e.g. donor sites) for use on the development.
- Details of on-site storage and stockpiling arrangements for excavated and other arisings, and for construction laydown areas, any supporting logistical details.
- The presence of underlying or adjacent allocated mineral sites.
- The cut and fill balance for the development.

Waste

- The volume or weight of waste that will be recovered and diverted from landfill, either on-site or off-site. Where information regarding recovery and diversion from landfill volumes or weights is unavailable, practitioners should assess the likely composition of a waste stream and (using relevant statistics, e.g. regional or national data) make reasonable assertions on disposal. Where no information exists and it is not possible to assess compositions, it should be presumed that all waste is disposed of to landfill in order to ensure a worst-case assessment is applied.
- Details of on-site storage and segregation arrangements for waste, and any supporting logistical information.
- Any physical, chemical or other processing requirements that should be deployed to ensure waste is managed to retain utility and value.
- The type and volume of waste to be discarded to landfill.

9.12 Sources of development information

For **demolition works**, a quantity surveyor or demolition contractor is likely be able to provide a forecast of the volumes and expected composition of demolition waste.

Contractors responsible for **site preparation works and remediation** are typically able to issue net cut and fill balances, volumetric requirements for imported materials and products, and data on arisings that will be untreatable or unsuitable for recovery (including reuse and recycling).

Developers and their quantity surveyors are typically able to provide estimates of **construction materials and waste:** a Bill of Quantities, or Schedule of Rates, should be requested. Published data from organisations such as the Building Research Establishment (BRE) and the Waste and Resources Action Programme (WRAP) may be useful in generating waste estimates. Depending on the development type, a developer may be well placed to provide operational waste estimates. Alternatively, operational waste estimates for a range of development types can be estimated from equations provided in Table 1 within British Standard BS 5906:2005 Waste management in buildings – Code of Practice[30] or, in some cases, by using local authority waste storage guidance (where publicly available).

The availability, rigour and level of detail of collected information is expected to increase as the design of a development advances. Accordingly, data will, as the EIA process advances, typically move from a qualitative position to an increasingly quantitative one. This may not, however, be the case for developments applied for in outline with some or all matters reserved; in such cases it will be necessary to make reasonable worst-case assumptions to inform the assessment, with any later inconsistencies dealt with at the reserved matters stage, which may even require an update of or addendum to environmental assessment documentation.

Throughout the EIA process, Materials & Waste Topic Leads should therefore seek to iteratively refine qualitative statements with increasingly robust and quantitative evidence. This should be achieved through ongoing and regular engagement with a range of specialists, including developers, architects, designers, environmental specialists, construction contractors, statutory bodies and industry representatives.

9.13 Secondary mitigation (additional measures)

Secondary measures are foreseeable actions brought out by the environmental assessment process, and that have not previously been achieved through primary and tertiary mechanisms.

Where the process of impact reduction through design or existing legislation (primary and tertiary measures) has been exhausted, it is at the environmental assessment phase that any adopted or planned secondary measures for enhancement and mitigation should be considered. Any mitigation relied upon in the assessment of effects from materials and waste must be firmly committed to and based upon proven techniques.

An assessment should also identify and consider potential issues affecting waste management and mitigation. For example:

- Is there restricted access to a site that would limit or change the type of haulage vehicles used, and therefore the number of vehicle movements?
- Is there sufficient space for the segregation and storage of arisings and waste to facilitate sustainable management?

Measures should be considered, applied and evidenced for the design, construction, operation and (potentially) procurement phases of a development. Examples are described in the table overleaf.

As part of an assessment, an EIA practitioner should consider ways to help a developer go *beyond* legal compliance. For example, best practice recommendations or enhancement actions should be identified and listed in addition to committed mitigation measures, to continue to support a drive towards waste reduction, resource efficiency and a circular economy.

Opportunities for action over and above committed mitigation measures should be discussed and agreed with a developer prior to incorporation, to ensure there is realistic ambition to pursue them outside the planning system, and that there is logistical and financial backing to support them. Where measures cannot be guaranteed, they should not feature in the assessment of effects, but can be incorporated as 'best practice actions, subject to feasibility'.

Element	Measure	Enhancement or mitigation	Application during...	Example compliance / monitoring
Materials	Use off-site construction and pre-fabrication of structures and components, thereby encouraging a process of assembly rather than construction.	Mitigation	Design, construction	Incorporate evidence on engineering plans, layouts and / or in Building Information Modelling (BIM) to show where pre-fabricated structures and components will be deployed.
	Design for deconstruction, disassembly, material reuse and recycling, including material and product reassignment at end-of-life.	Mitigation, enhancement	Design, operation and maintenance, decommissioning	
	Reuse of excavated and other arisings on-site or on other approved developments.	Mitigation	Design, construction	Compliance with Site Waste Management Plan (SWMP), Materials Management Plan (MMP), and CL:AIRE Definition of Waste Code of Practice requirements.
	Incorporation of sustainable features in materials and products to reduce adverse environmental impacts.	Mitigation, enhancement	Design, procurement, operation and maintenance	Maintain records of material resources that were specified and acquired in accordance with BES [vi] 6001 Responsible Sourcing of Construction Products.
Waste	Engage contractors throughout the design development process to identify further enhancement and mitigation measures, and opportunities to reduce waste through collaboration and synergies between developments.	Mitigation, enhancement	Procurement, construction	Meeting minutes or other records of how waste is to be recovered. Procurement engagement records.
	Identify and quantify opportunities to achieve on-site and off-site reuse and recycling of waste.	Mitigation	Design, construction	Engineering plans and schematic drawings to show locations for different waste types and volumes with the potential to be recovered.
	Identify opportunities for advanced on-site waste treatment, e.g. land remediation or composting facilities, for deployment in the operational phase.	Mitigation, enhancement	Operation	Business case developed and approved for the installation of on-site waste treatment facilities.

vi. Building Research Establishment Environmental & Sustainability Standard.

10. What is a significant environmental effect for materials and waste?

At this time, *quantifiably* establishing the significance of one or more effects from materials and waste presents a challenge to industry.

Organisations and major developments (particularly those subject to a DCO or Transport Works Act Order[vii]) may wish to generate and set their own criteria and thresholds for assessment, based on historical and industry-specific information they feel is appropriate to the particular conditions and requirements of developments under their control.

Where organisations and major developments do develop their own criteria, it is suggested that, where possible, they be aligned with the general approach and expected outcomes that this guidance seeks to achieve. Where criteria and thresholds for assessment are set in this way, they should be reviewed and tested regularly to ensure their ongoing validity.

In most cases, the determination of significance will be the product of professional judgement of the Materials & Waste Topic Lead and EIA Co-ordinator, with specific regard to:

- the sensitivity or importance (value) of receptors (as defined in Section 8.1), and the magnitude of impact on these receptors; and
- the extent to which primary, secondary and tertiary measures are expected to minimise impacts and effects.

In all cases, identifying the principal sources of materials, the type and quantity of waste streams that a development is expected to generate, and the timescales over which these are likely to require management, are all critical aspects of a robust assessment. This information is vital in assessing the impacts of a development on the sensitive receptors identified in baseline conditions, to determine the resultant significance of effect.

10.1 Assessment methodologies

This section of the guidance describes preferred methods for assessing sensitivity and magnitude of impact from materials and waste, during construction, and operation and maintenance.

Whichever method is applied, a summary of the key assumptions and limitations associated with the chosen approach should be given, with full justification in relation to the size and nature of the development in question.

A justification for the thresholds used in this section is provided in **Annex A.**

Note: *Due to uncertainties relating to future technologies and infrastructure, this first edition of the guidance does not incorporate a proposed methodology to assess impacts and effects during decommissioning or end of first life. It is recommended, however, to drive best practice through knowledge transfer, that a Materials & Waste Topic Lead records and presents as part of an environmental assessment, any design approaches to maximise resource efficiency and circular economy outcomes at these lifecycle stages.*

vii. The method by which a new railway or tramway in England and Wales is authorised; the Order does not include nationally significant rail schemes in England – these require development consent.

10.2 Assessing sensitivity

10.2.1 Materials

Materials can be a receptor as well as a source of effect.

The sensitivity of materials relates to the availability and type of resources to be consumed by a development. The sensitivity of materials can be determined by identifying where **one or more** of the criteria from the following thresholds are met. *On balance, the key materials* [viii] *required for the construction and/or operation of a development...*

Negligible	Low	Medium	High	Very High
Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; **and/or** Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials.*	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; **and/or** Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; **and/or** Are available comprising some sustainable features and benefits compared to industry-standard materials.	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; **and/or** Comprise little or no sustainable features and benefits compared to industry-standard materials.	Are known to be insufficient in terms of production, supply and/or stock; **and/or** Comprise no sustainable features and benefits compared to industry-standard materials.

** Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.*

viii. The method by which a new railway or tramway in England and Wales is authorised; the Order does not include nationally significant rail schemes in England – these require development consent.

10.2.2 Waste

The sensitivity of waste relates to availability of regional (and where appropriate, national) landfill void capacity in the absence of the proposed development. Landfill capacity is recognised as an unsustainable and increasingly scarce option for managing waste.

Note: *In this guidance, it is considered that infrastructure that is used to process and recover arisings (and hence divert them from landfill) is a beneficiary of waste feedstock, and has the ability to reduce adverse impacts. Such facilities are therefore an influencing factor in the reduction of the magnitude of waste impacts on landfill void capacity, rather than being a sensitive receptor in their own right.*

To this end, and as described in ***Baseline Information*** *understanding the capacity and capability of waste processing and recovery facilities in a region or nationally, remains an integral part of the assessment process, and has a central role in accurately defining impacts and resultant effects.*

The sensitivity of landfill void capacity is assessed by applying the following two-step process, which should be completed in the absence of a proposed development:

1. the volume of waste for disposal that is expected to be generated within a defined study area (regionally or nationally) is calculated by analysing available data (particularly, in the Environment Agency Waste Data Interrogator, from Defra[31] [32] and Local Plan Annual Monitoring Reports), and by providing justified forecasts over the construction and/or operational phase of a development; and then:

2. the volume of forecast waste for disposal within the defined study area (Step 1) is then compared to the remaining landfill void capacity (taking into account any consented increases in future capacity), to identify expected losses over the construction and/or operational phase of a development.

Where the Materials & Waste Topic Lead considers it beneficial to the assessment process, future landfill void capacity should be forecast using statistical trend analysis; this would particularly be the case where data for regional or national waste production is either unavailable, or considered by an EIA practitioner to be insufficiently robust. An example of such trend analysis could include the use of the Microsoft Excel 'FORECAST' function on historical waste production data.

The following information should be used to determine the sensitivity of landfill void capacity.

Across construction and/or operation phases, the baseline/future baseline (i.e. without development) of **regional (or where justified, national) inert and non-hazardous** landfill void capacity is expected to...

Negligible	Low	Medium	High	Very High
...remain unchanged, or is expected to increase through a committed change in capacity.	...reduce minimally: by <1% as a result of wastes forecast.	...reduce noticeably: by 1-5% as a result of wastes forecast.	...reduce considerably: by 6-10% as a result of wastes forecast.	... reduce very considerably (by >10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.

Across the construction and/or operation phases, the baseline/future baseline (i.e. without development) of **regional (or where justified, national) hazardous** landfill void capacity is expected to...

Negligible	Low	Medium	High	Very High
...remain unchanged, or is expected to increase through a committed change in capacity.	...reduce minimally: by <0.1% as a result of wastes forecast.	...reduce noticeably: by 0.1-0.5% as a result of wastes forecast.	...reduce considerably: by 0.5-1% as a result of wastes forecast.	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.

10.3 Assessing magnitude

Where the:

- Construction phase is being assessed, the magnitude of impact should be considered from the point at which site access is gained, through demolition, site remediation, enabling works, and construction, to development commissioning.

- Operational phase is being assessed, the magnitude of impact should be assessed over the course of any one full and justifiably representative year within the first three years of commissioning.

10.3.1 Materials

The methodology for assessing the magnitude of impact from materials comprises a percentage-based approach that determines the influence of materials consumption on the baseline market capacity (production, stocks or sales), in construction and/or operation, in combination with the potential to sterilise (substantially) one or more allocated mineral site.

The assessment is made by determining whether, through a development, the consumption of:

No change	Negligible	Minor	Moderate	Major
...no materials is required.	...no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.	...one or more materials is between 1-5% by volume of the regional* baseline availability; **and/or** the development has the potential to adversely and substantially# impact access to one or more allocated mineral site (in their entirety), placing their future use at risk.	...one or more materials is between 6-10% by volume of the regional* baseline availability; **and/or** one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.	...one or more materials is >10% by volume of the regional* baseline availability; **and/or** more than one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.

* or where justified, national.

justified using professional judgement, based on the scale and nature of the allocated mineral site being assessed.

10.3.2 Waste

At the time of publication, a single and unified method for assessing the magnitude of impact from the generation and disposal of waste is felt to be too restrictive by comparison with the number and variety of development types potentially subject to environmental assessment.

This guidance, therefore, offers two methods and (in the following table) describes their relative merits.

Methods	Summary
W1 – Void Capacity	• A detailed methodology • Robust approach based on available industry data • Most likely to be appropriate for larger and more complex developments • Recommended for statutory EIAs • Could stray into a disproportionate assessment if not managed diligently
W2 – Landfill Diversion	• A simpler approach • Less robust than W1 • Appropriate for smaller and less-complex developments • Likely to be utilised only for non-statutory EIA

It is the responsibility of the Materials & Waste Topic Lead to select and justify the method that best suits the scale and nature of the development under consideration. Whichever method is chosen, the justifications must be clearly stated in environmental assessment documentation.

Methods W1 and W2 should not be combined either in part or fully, as this would cause ambiguity and a lack of clarity in reporting.

In specific cases, the Materials & Waste Topic Lead may wish to use baseline data collected on the availability and capacity of non-landfill waste management infrastructure (in conjunction with any identified trends) to provide a more comprehensive context for assessing the magnitude of impacts, and to establish a greater level of certainty regarding planning commitments that have the capacity to support landfill diversion. Where this is the case, the way in which the data collected has influenced the outcome of an assessment should be provided.

(1) Method W1 – Void Capacity

Using Method W1, the magnitude of impact from waste is assessed by determining the percentage of the remaining landfill void capacity that will be depleted by waste produced during the construction and/or operation phases of the development.

INERT AND NON-HAZARDOUS WASTE

No change	Negligible	Minor	Moderate	Major
Zero waste generation and disposal from the development.	Waste generated by the development will reduce **regional*** landfill void capacity baseline# by **<1%**.	Waste generated by the development will reduce **regional*** landfill void capacity baseline# by **1-5%.**	Waste generated by the development will reduce **regional*** landfill void capacity baseline# by **6-10%.**	Waste generated by the development will reduce **regional*** landfill void capacity baseline# by **>10%**.

* or where justified, national.

forecast as the worst-case scenario, during a defined construction and/or operational phase.

HAZARDOUS WASTE

No change	Negligible	Minor	Moderate	Major
Zero waste generation and disposal from development	Waste generated by the development will reduce **national** landfill void capacity baseline # by **<0.1%**	Waste generated by the development will reduce **national** landfill void capacity baseline # by **<0.1-0.5%**	Waste generated by the development will reduce **national** landfill void capacity baseline # by **<0.5-1%**	Waste generated by the development will reduce **national** landfill void capacity baseline # by **>1%**

forecast as the worst-case scenario, during a defined construction and/or operational phase.

(2) Method W2 – Landfill Diversion

Using Method W2, developments are compared to a good practice landfill diversion rate of 90% (as achieved and exceeded by major UK developments and organisations such as: HS2[33], Crossrail[34], London 2012 Olympics[35], London Heathrow Airport[36] and other construction and demolition activities in the UK[37]) to determine magnitude of impact.

To ensure that the 'no change' magnitude threshold is accurately established, a landfill diversion rate of 100% is set. Equal increments of 30% are established between 90% and 0%.

In applying this method, a Materials & Waste Topic Lead should take into account the size, nature and expected capability of developments to minimise waste in construction and/or operation. For example, some small-scale developments may produce commensurately low volumes of waste, but because of the nature of that waste, it cannot be diverted from landfill. Similarly, large developments may divert high percentages of waste from landfill, but the remaining impact on void capacity is considerable. These nuances should be identified and recorded in an environmental assessment and factored into the significance of effects reported.

It is recognised that, for some development types, achieving these diversion rates in operation may be challenging – not least because they may not be within the control of the developer. However, this methodology is proposed to ensure that developments that anticipate low landfill diversion rates in operation necessitate more rigorous enhancement and mitigation in practice. This supports the drive towards more sustainable resource management, especially where tertiary mitigation cannot be relied upon.

In all environmental assessment, the impacts and effects of inert, non-hazardous and hazardous wastes should be evaluated separately.

In construction and/or operation, a development is expected to achieve...

No change	Negligible	Minor	Moderate	Major
...100% landfill diversion.	...90-99% landfill diversion.	...60-89% landfill diversion.	...30-59% landfill diversion.	...<30% landfill diversion.

10.4 Assessing cumulative effects

At the time of publication, relatively little guidance regarding Cumulative Effects Assessment (CEA) is available. The main references for EIA practitioners are:

- Guideline for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions;[ix]
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;[x] and
- Advice Note 17: Cumulative Effects Assessment. [xi]

A review of the above guidance establishes two distinct types of effect that need to be assessed:

- the interaction between **all of the different developments in the same area** (sometimes referred to as '**inter**-project effects'); and
- the interaction between the various impacts **within a single development** (sometimes referred to as '**intra**-project effects').

Given the lack of widely adopted guidance on CEA, or a defined format in which to report it, this guidance does not set out a prescribed approach for materials and waste. However, practitioners are reminded that:

- CEA should involve a combination of competent experts with multi-disciplinary experience in the preparation of Environmental Statements, alongside input from competent experts from each 'in scope' discipline.
- The findings of a materials and waste assessment should inform the CEA for the development in question.
- Details of other developments considered within an inter-project CEA should include information about the availability, quality and certainty of materials and waste data, the development's likely start date and construction duration, and also the planning status. Reference should be provided for the information sources used.

As an evolving area of practice, IEMA is currently investigating the production of new guidance to aid practitioners with the assessment of cumulative and interaction effects within EIA.

10.5 Benchmarking and sensitivity analysis

Where is it not possible to accurately estimate all waste arisings (for example, where extensive groundworks are expected, but they are yet to be defined; or where there is limited or no data for other developments that are to be assessed as part of CEA), benchmarking or sensitivity analyses can be used to help forecast 'expected' data that could be used in an assessment.

Similarly, sensitivity analysis can be used to determine how a doubling or tripling (for example) of early forecasts of development waste arisings would alter baseline arisings, impacts and the potential for significant effects.

Wherever data have been derived from benchmarks or sensitivity analysis, suitable caveats and assumptions must be set out in the associated environmental assessment documentation.

ix. Guideline for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1999)

x. Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment report (European Commission, 2017);

xi. Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (2019) [link]

10.6 Comparability between different environmental assessments

This guidance recognises that using a percentage-based approach for determining the sensitivity of landfill capacity does present a certain limitation on the extent to which different environmental assessments can be directly compared. For example, an assessment that considers a landfill with limited capacity that is also not expected to reduce greatly over time, cannot be easily compared to an assessment taking into account a landfill with a very large remaining capacity that is expected to reduce considerably over time.

However, this guidance has not been prepared to establish a methodology by which the sensitivity of different landfills can be directly compared; instead, it seeks to provide a robust and repeatable methodology by which the sensitivity of landfill capacity can be assessed on a case-by-case basis.

To this end, where a development is located:

- Adjacent to a regional boundary, it is expected that the Materials & Waste Topic Lead should justify whether to assess the combined sensitivity of landfill capacities across both (or more) regions, or just one.
- Across one or more regional boundaries, the Materials & Waste Topic Lead would be expected to assess the combined sensitivity of landfill capacity across those regions.

11. Defining the effect threshold

Using baseline and assessment data and forecasts, an assessment of a development's impacts (the magnitude of change on sensitive receptors) can be undertaken to allow the effects (the consequence) to be identified and its significance evaluated. The potential for significant environmental effects is determined by considering the scale and nature of impacts within the context of the sensitivity of receptors affected.

The following table and definitions provide an example of effect thresholds that could be used in EIA.

		Magnitude of impact				
Sensitivity (or value) of receptor		No change	Negligible	Minor	Moderate	Major
	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

When describing a **pre-mitigation scenario**, the potential effects of consuming materials and disposing of waste should take into account any **primary (embedded) and tertiary (inexorable) mitigation** applicable to a development.

When describing the **post-mitigation scenario** (the process of identifying residual effects), the effect of consuming materials and disposing of waste should be considered by taking into account any **primary (embedded) and tertiary (inexorable) mitigation** applicable to a development, and **secondary (additional) mitigation** that has been committed to (or that there is certainty of being committed to) through environmental assessment.

11.1 Determining whether an effect is significant, or not

Once the effect threshold has been determined, the following table provides an example of how Materials & Waste Topic Leads may determine whether environmental effects are potentially significant, or not. Whilst the use of this table is not prescriptive, Materials & Waste Topic Leads should seek to justify, with proportionate evidence, where a decision on significance does not align with the advice set out in this guidance.

Where a threshold is 'slight or moderate' i.e. transcends the significant – or not – effect boundary (shown by the dotted line, in the image below), professional judgement should be used in combination with documented justification, to determine a final outcome.

The cautious significance boundary applied responds to the need for developers and EIA practitioners to – in unison – continue to take an increasing responsibility for managing materials and wastes sustainably, with a view to incentivising sustainable resource management and (ultimately) a circular economy.

Effect	Materials	Waste
Neutral	Not significant	Not significant
Slight		
Moderate	Significant	Significant
Large		
Very large		

12. What is the expected outcome of an assessment of materials and waste?

The expected outcome of the assessment of materials and waste in EIA is a series of clear statements, underpinned by information and data, that give decision-makers confidence that the:

- impacts of consuming materials, and generating/ disposing of waste, have been practicably minimised across a development's construction and operational lifecycle stages;
- the influence of recovering (reused and recycled) excavated arisings, and managing waste in accordance with the Waste Hierarchy and Proximity Principle, has been duly explored and set out;
- combined and cumulative effects of (including potential synergies between) developments have been identified and opportunities for circular economies and sustainable resource management adequately explored;
- measures required to achieve these outcomes are committed to (for example, within an EMP, a SWMP, and/or a MMP), and preparations have been made to; and
  - » communicate these requirements between development delivery phases; and
  - » monitor progress against each.
- potential for residual significant adverse environmental effects are (wherever possible) precluded, but if not, articulated and justified.

13.Interaction with other EIA chapters

As well as focussing on its own receptors (the availability of resources and landfill capacity), the management of materials and waste can be a source of effects on receptors considered by other EIA topics. Materials and waste may also present opportunities for other topics to deliver mitigation or enhancement. Effective and early communication within an EIA team is necessary to ensure all opportunities are appropriately considered.

Both EIA Co-ordinators and Materials & Waste Topic Leads are responsible for ensuring that information and measures set out in Materials & Waste chapters of environmental assessment documentation are aligned with and support information and findings communicated in (in particular):

- Air Quality – providing information about the haulage of materials, excavated arisings and waste, both to and from a development, to allow an assessment of vehicular emissions and the potential for dust generation.
- Climate Change – determining the impacts and effects of greenhouse gas emissions and resilience to future climatic conditions.
- Ecology – assessing the way in which materials and arisings can be used within ecological enhancement design features; and the way in which any vegetation or trees that are legally removed by a development are recovered, reused, recycled or otherwise diverted from landfill.
- Geology & Soils – covering issues of contaminated land and resource sterilisation.
- Landscape – providing information on how materials and arisings can be reused on- or off-site, as part of landscaping design.
- Noise – evaluating sound, noise and vibration impacts associated with the haulage of materials, excavated arisings and waste to and from a development.
- Socio-economics – providing information on materials and waste to support the assessment of intra-project cumulative effects arising from noise and vibration, air quality, traffic and transport and visual amenity – all of which have the potential to impact community amenity and employment economics.
- Traffic & Transport – providing information about waste and materials, to inform the production of vehicle movement data, which in turn supports the assessment of impacts and effects relating to air quality, and noise and vibration.
- Water & Drainage – assessing potential pollution and discharge from the stockpiling of materials, excavated arisings and waste; and the generation, management and disposal of dredge arisings in offshore locations.

14. A checklist for action

The following checklist offers a basis for action during the main stages of the EIA process:

SCREENING

- Is the scale, nature and timing of development understood?
- Is it possible to identify any project-specific data on materials and waste, or comparable/ historical data for developments of a similar scale and/or nature?
- What primary mitigation for materials and waste is relevant to the development, and can be presented as evidence to support the overall screening decision?

SCOPING

- Has the study area been defined?

If yes:

- Can primary mitigation measures for materials and waste be refined (from screening), or new (including tertiary) measures evidenced?
- Is there appropriate assurance in the validity of data, information and evidence concerning primary and tertiary mitigation measures?
- In the professional judgement of the Materials & Waste Topic Lead, are the primary and tertiary measures agreed to be sufficient to preclude the potential for significant adverse environmental effects and therefore scope out materials and/or waste, or any sub-element?

If the answer to any of the above three questions is 'no':

- Have key sources of information and data for materials and waste been established?
- Has the method for determining the significance of effects from materials and waste been agreed as appropriate and justified, and described?
- Has a comprehensive baselining exercise been undertaken, using robust and recognised sources of data and information on regional (and where appropriate, national) materials and waste?
- Taking into account all previous stages, have materials and waste, or any defined sub-element, been justifiably scoped in/out based on the project judgement of the Materials and Topic Lead and EIA Co-ordinator?

ENVIRONMENTAL ASSESSMENT

- Has a relationship been established with those responsible for delivering other environmental assessment documents which interact with, and relate to, materials and waste?
- Has a list of information and data required to undertake an environmental assessment of materials and waste been issued to the developer, its representative, or another party e.g. Development Engineers or Quantity Surveyors?
- Have any secondary measures (including those relating to working towards a circular economy) been committed to, and the commensurate reduction of adverse environmental impacts qualified or (better) quantified?
- Have monitoring mechanisms appropriate to managing and reporting on the efficacy of measures to avoid the potential for significant adverse environmental effects, been established and approved?
- Has an assessment of materials and waste-sensitive receptors vs. the magnitude of impact from a development, been undertaken and reported?
- Has the significance of effects from the development been described and justified, both prior to and after the adoption of secondary mitigation?

15 What key messages should industry take away to help apply and advance best practice in the UK?

- Materials and waste are both topics that have great potential for a disproportionate approach during EIA. Practitioners should remain vigilant to this risk and collaborate with EIA Co-ordinators to ensure assessments are fit for purpose.

- Materials and waste can be both sources of adverse environmental effects and topics through which great opportunities for the minimisation of a range of different types of impact can be realised. Maximising these opportunities is most effectively achieved through early engagement between developers, clients, stakeholders and EIA teams. In particular, adopting the principles of resource-efficient design, and taking action that drives circularity across a development lifecycle, are critical to success in this context.

- This guidance advocates the accumulation and sharing of information on robust and defensible examples of primary and tertiary mitigation measures, to help inform the decision-making throughout the EIA process. Equally, closer collaboration between topic leads is required to deliver balanced and high-quality assessments, that maximise opportunities to prevent potentially significant adverse effects.

- Better-quality data and information on the composition and source of material resources (including materials for reuse), and waste generated, recovered and disposed of, is required in the UK. Currently, certain information (particularly at and between regional levels) is inconsistent and in some cases limited/unavailable. Updates to data can also suffer from considerable time-lags (years); this means available data are not always contemporary, thus increasing the challenge of delivering robust assessments of materials and waste for EIA practitioners. The more up-to-date the data that can be generated and shared on material resources and landfill capacity, the more accurate and effective the assessment process will be.

- Using our current understanding of modern and emerging construction and demolition techniques, industry must apply its knowledge of impacts and effects across both the construction and operational lifecycle stages of a development. Over time, it is expected that an increasing appreciation of such techniques may allow the scope of this guidance to be extended to other lifecycle stages (particularly, end of life) to help make the EIA process even more robust and comprehensive, and better support the transition to a circular economy.

- Organisations and individuals involved in EIA should continue to establish approaches that allow circular economy practice to be applied to reduce environmental impacts and drive enhancements. Practitioners should seek to increase their learning on this subject by, for example, referring to the BSI Framework for implementing the principles of the circular economy in organizations (8001:2017).[38]

- Whilst not the direct subject of discussion in this guidance, it is expected that tools and processes such as lifecycle assessment, Building Information Modelling and BSRIA [xii] Soft Landings[39] will increasingly be integrated in the EIA process to permit a more detailed understanding of impacts and effects across developmental lifecycles.

In summary, this guidance encourages the continued sharing of knowledge and information across industry on effective criteria and thresholds for undertaking the assessment of materials and waste in EIA. Continuing to communicate and learn from others' approaches to managing materials and waste, and methods by which to integrate, for example, an ecosystem approach [xiii] (explained in more detail, overleaf) more explicitly in the process, remain central to the successful evolution of environmental assessment of this topic. Accordingly, it is expected that the practice of materials and waste assessment in EIA will continue to evolve, and this guidance will also advance commensurately. Improved data availability, digitisation of the EIA process and changes brought about by legislation are also expected to positively influence future editions of this document.

xii. Building Services Research and Information Association.

xiii. An ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way' (The Convention on Biological Diversity [link]).

16. EIA and an ecosystem approach

EIA helps to shape the siting and design of development such that the economic and social needs of development can be met, whilst limiting the erosion of natural capital and minimising the impact on local communities and economies. EIA is, therefore, a tool that can support the move towards a more sustainable future.

In August 2011, IEMA produced a report on The State of EIA Practice in the UK.[40] The report identifies six areas where action was needed to ensure IEMA's vision for EIA practice was delivered, including developing new partnerships to enhance EIA activity, and realising the benefits of effective EIA coordination.

In a 2012 practitioner note, IEMA set out further guidance on how to enhance activity under a number of these areas: in particular, by raising awareness of ecosystem services, and providing advice on how to consider an ecosystems approach in EIA. A key objective of the note was to contribute to the engagement of communities in the process of shaping new development to find the best environmental outcomes.

Whilst not the core subject of this guidance, IEMA supports the proportionate application of an ecosystem (natural capital) approach to help identify issues that might otherwise be missed, provide a holistic view of the effect of a development, and to increase understanding of secondary, cumulative and inter-relationship effects on ecosystems as a whole. In doing so, the development planning system would benefit from a more robust and quantified environmental and social evidence base, thereby enabling developments to foster increasingly sustainable outcomes.[41]

This guidance has been developed to support the increasing application of an ecosystem approach within environmental assessment. It does so to encourage practitioners to better understand the impacts of (i) consuming non-renewable resources, and (ii) waste disposal, through a consistent and proportionate approach to preventing the potential for significant adverse environmental effects. As the science of ecosystem services evolves, it is expected this guidance will be advanced to keep pace.

ANNEX A - Threshold justifications for waste

To establish the percentage thresholds that have been used in this guidance to characterise the sensitivity of, and magnitude of impact upon, landfill void capacity (waste only), trends for inert and non-hazardous waste, and hazardous waste, as provided through the Environment Agency Waste Data Interrogator, have been scrutinised for the last five years of available data.

Whilst historical data trends for landfill void space in Northern Ireland are currently unavailable for inclusion in the model, independent analysis completed in 2017[42] suggests that capacity to 2020 could fall by as much as 40%, thereby compounding the assertions in this Annex.

Country	Data review period	Average combined landfill capacity in review period ('000 m3)	Average combined landfill capacity for most recent year ('000 m3)	Change by comparison to data for most recent year (2018) (%)
England	2014-2018	149,767	134,856	-10%
Scotland	2014-2018	19,436	15,074	-18%
Wales	2009-2013	32,825	30,170	-8%
			Average	**-12%**

On average, and across England, Wales and Scotland, average landfill capacity across all waste types has reduced by 12% during the review period.

Without specifying different assessment percentages for different UK administrations, and acknowledging the temporal and comparability limitations of the data used, it is reasonable to assert that a major adverse impact on landfill capacity would arise should loss experienced in the assessment period (for simplicity) of **greater than 10%** be predicted. This applies to both sensitivity (the forecast reduction in capacity to a development's proposed operational year, without a development) and magnitude (a development's impact on forecast landfill capacity during construction and/or operation).

In this guidance document, the difference in threshold percentages used for inert and non-hazardous waste, and those used for hazardous waste, reflect the fact that overall, hazardous waste landfill capacity is at least an order of magnitude (10x) lower for the most recent year for which data are available (2018). Note that this order of magnitude is even greater in Scotland; this difference is made even starker when compared to England's total hazardous capacity (99% more capacious than Scotland, within the 5-year review period).

ANNEX B – Worked example: Residential development in England

DEVELOPMENT OVERVIEW

Oakdale View is a residential housing development comprising 800 new homes, and associated infrastructure (roads, green infrastructure, drainage). The site is currently in agricultural fields with minimal demolition anticipated. The anticipated construction programme is three years.

SCREENING

Data in relation to the anticipated materials use and waste generation for the development were not available during screening.

Neither commitments to reduce the adverse effects of materials and waste from the development, nor development-specific mitigation measures, had been agreed at this stage.

Comparable developments within the region from within the last three years were reviewed for benchmarking purposes. The data available suggests that the majority of construction, demolition and excavation (CD&E) wastes from developments of a similar scale and nature were sent for off-site recycling, and that regional infrastructure had enough capacity.

The development is defined as a 'Schedule 2 development' and a formal screening opinion was sought from the local authority.

SCOPING

The EIA practitioner identified the following study areas for the assessment:

- the development study area for both materials and waste is the development footprint;
- the expansive study area for materials is the national supply of key construction resources;
- the expansive study area for non-hazardous waste (including inert waste) is defined waste infrastructure capacity in the South East of England;
- the expansive study area for hazardous waste is defined as hazardous waste landfill void in England.

Baseline information was collated for both materials and waste using publicly available data including:

- the Waste Planning Authority's published Local Waste Plan;
- data from the Environment Agency's Waste Data Interrogator (most recent year); and
- published data on materials demand, from relevant organisations such as the Forestry Commission.

At this stage, committed mitigation measures for the development included:

- the construction of a landscape buffer to protect the Sites of Special Scientific Interest (SSSI) adjacent to the proposed development, using site won (excavated) materials in preference to imported materials;
- production of an outline (design) Site Waste Management Plan, to be advanced during construction;
- commitment to using aggregates with 50% recycled content by weight; and
- the hosting of a designing out waste workshop and incorporation of outcomes into the design.

The primary study area does not include, and is not in the proximity of, an allocated mineral site and hence effects on these sites were scoped out of the assessment. In addition, effects on the availability of materials during operation were also scoped out of the assessment; as forecast effects were, using professional judgement, considered negligible in relation to the scale and nature of the development.

Project phase	Effects	Scoped in/out
Construction	Changes in demand for materials	✓
	Changes in baseline waste arisings	✓
	Changes in available landfill capacity	✓
	Changes to an allocated mineral site	✗
Operation	Changes in availability of materials	✗
	Changes in baseline waste arisings	✓
	Changes in landfill capacity	✓

The scoping report was submitted to the local planning authority for their scoping opinion on matters to be scoped in and out of the EIA assessment. No amendments to the scope of the assessment for materials and waste were required.

ENVIRONMENTAL STATEMENT

The materials and waste chapter of the Environmental Statement was produced using the following information:

- a Bill of Quantities, including waste estimates generated using the client's own internal benchmarking data;
- cut and fill balance for the development, including any requirements to import materials;
- Sustainable Procurement requirements for construction materials, as drafted for the development by the client; and
- indicative stockpile locations and environmental mitigation for materials used in the development's earthworks (including bunds and landscaping features).

Baseline data (as detailed in the scoping report) was reviewed to confirm that the latest data had been used in the assessment. No additional relevant sources of information were identified.

Given that a detailed construction programme was not available, the materials usage and waste generation were divided equally across the three-year construction programme for the assessment.

Additional (secondary) mitigation measures were identified in conjunction with the client and earthworks contractor including:

- specification and use of industry standard sizes for materials and products, wherever possible (e.g. standard height plasterboard sheets);
- reviewing opportunities to utilise excavated materials from other developments in proximity, using a MMP under the CL:AIRE Code of Practice;
- setting down site rules for good practice for procurement, on-site handling and storage of materials to prevent wastage;
- production and maintenance of a SWMP during the design and construction phases of the development;
- incorporating source segregation of waste and providing enough space to do so at all stages of the development;
- provision of adequate internal storage space and containers for residential units;
- provision of adequate segregated food waste storage for residential units;
- residual and recyclable residential wastes to be stored and collected separately via provision of clearly marked and/or colour-coded bins aligned with the local authority's guidance and infrastructure.

Once additional mitigation measures had been identified, the EIA practitioner undertook an assessment of the effects of materials and waste from the development to identify those that were significant. The assessment methodology detailed in this guidance was then applied to the following outcomes.

CONSTRUCTION EFFECTS

Factor		Baseline Availability	Development Estimates	Sensitivity Assessment	Magnitude Assessment	Significant
Allocated mineral site		No allocated mineral sites within or close to the primary study area	N/A	Negligible	No Change	Neutral (not significant)
Material Availability [xvi]	Aggregates	12,000,000 tpa	151,786 tpa (consumed)	Negligible	Minor	Neutral (not significant)
	Asphalt	1,200,000 tpa	10,573 tpa (consumed)	Low	Negligible	Neutral (not significant)
	Concrete	6,400,000 tpa	3,790 tpa (consumed)	Low	Negligible	Neutral (not significant)
	Steel	9,000,000 tpa	70 tpa (consumed)	Very High	Negligible	Slight (not significant)
	Timber	3,000,000 tpa	214 tpa (consumed)	Very High	Negligible	Slight (not significant)
Waste	Inert/non-hazardous landfill void (regional)[xv]	14,395,356 tpa	88,123 tpa (generated)	Low	Negligible	Neutral (not significant)
	Hazardous landfill void (national)	22,617,986 tpa	25 tpa (generated)	Negligible	No change	Neutral (not significant)

OPERATIONAL EFFECTS

Operational materials use has been scoped out of the assessment.

Factor		Baseline	Development Generation Estimates	Sensitivity Assessment	Magnitude Assessment	Significance
Waste	Inert/non-hazardous landfill void (regional) [11]	19,300,000 tpa	2,908	Negligible	No change	Neutral (not significant)
	Hazardous landfill void (national)	38,857,332 tpa	0	N/A	N/A	N/A

The development was assessed to have no potential for significant residual adverse environmental effects with respect to materials and waste.

xiv. Typical data sources include the Mineral Products Association, UK Steel and the Forestry Commission (where timber is required).

xv. Landfill void used in the assessment has been calculated by subtracting regional waste arisings from available landfill capacity.

ANNEX C - Worked Example: A new road development in England

This worked example is for a single-lane carriageway development, as might be delivered by a local authority in the UK. The development is a new section of highway, which will be developed predominantly offline. The development is 5km in length and will require modifications to existing infrastructure at the connections to the existing highway. The replacement of a footbridge is also required.

It is expected that the construction process will last for two years and, in addition to general construction activities, will include the:

- clearance/excavation of vegetation, topsoil, subsurface ground, and small sections of existing highway (i.e. bituminous material); and
- demolition of an existing footbridge (which is in a state of disrepair).

The client expects its team to generate realistic and cost-effective commitments and measures to help improve the overall sustainability performance of the development, for approval during conceptual design.

SCREENING

During screening, no client/designer commitments have been agreed to reduce impacts (and resultant effects) from materials consumption or waste disposal. Additionally, no development-specific primary (embedded)/tertiary (inexorable) mitigation measures have been identified with enough certainty to be formalised as development commitments.

Data regarding anticipated material requirements, and waste to be generated, is not yet available.

Comparable developments in nearby regions from the past three years were identified by the client, to help identify available benchmarking data. Whilst limited information was found, it was established that most of the arisings from these developments were sent to landfill due to the fact that the capacity of regional recovery infrastructure was known to have fallen steadily over the last decade. These earlier developments were also not able to source material requirements from within the region, instead having to rely on a national-level supply chain for the main construction resources: aggregates, asphalt, cement, concrete and steel. The status of regional procurement opportunities remains unchanged.

Although local plans indicate that capacity of the regional reuse and recovery infrastructure will become increasingly buoyant in the next five years, it is still expected that a high proportion of arisings from the development would be required to be landfilled.

As part of the overall request for a screening opinion, it has been recommended that the scheme is considered an 'EIA development' under Schedule 2 of the EIA Regulations 2017. The development falls under Schedule 2 part 10(f) as its overall footprint exceeds 1 hectare (the threshold for a highways development).

SCOPING

Engagement with the client and its designers during scoping has confirmed construction of the development is projected for 2022 to 2024.

The EIA practitioner identified the study area for the development. For the purposes of the assessment, two study areas were defined:

1. development study area – comprising the development footprint, and any areas required for temporary access, site compounds, working platforms and other enabling activities; and the
2. expansive study area – which extends to:
    - » national supply of key materials;
    - » regional inert and non-hazardous landfill capacity; and
    - » national hazardous void landfill capacity.

A baseline review of material availability for 2022 to 2024 in the region of the development was unavailable; as such, baseline data was gathered from national sources. Baseline information was gathered in relation to landfill void capacity; reasonable assumptions were made to forecast (using simple trend analyses) a per annum void capacity between 2022 and 2024 (on a regional basis for inert/non-hazardous waste and a national basis for hazardous waste).

Utilising the benchmark information collated, the knowledge of development-specific primary (embedded)/tertiary (inexorable) mitigation measures, obtained from the client/designers, and the baseline information gathered, an assessment was undertaken. The assessment established that materials and waste effects had the potential to be significant. Elements that were not identified as having the potential to have significant effects, were proposed to be 'scoped out'. The results of the scoping process for the development, are now outlined:

Scoped in:

- » effects of the development on allocated mineral sites in the vicinity;
- » effects of the development on the consumption of materials during construction;
- » effects of the development on regional inert and non-hazardous void landfill capacity during construction;
- » effects of the development on national hazardous void landfill capacity during construction.

Scoped out:

- » effects of the development on regional inert and non-hazardous landfill capacity during operation;
- » effects of the development on national hazardous landfill capacity during operation;
- » effects of the development on the availability of materials during operation.

Effects associated with the operational phase were proposed to be 'scoped out', due to the nature of the development, and knowledge of similar developments' limited operational material usage and waste disposal requirements.

The decommissioning lifecycle phase was 'scoped out', as the client/designers have advised that the development has a design life of greater than 60 years and as such it was not considered possible to reliably forecast decommissioning requirements and infrastructure this far in the future. However, other developments may 'scope in' decommissioning.

For each of the 'scoped in' effects, a series of high-level secondary ('additional') mitigation measures were identified. The measures centred on commitments to minimise waste generation and maximise resource efficiency through design.

The scoping report, the output of the scoping process, was subsequently submitted to the appropriate planning authority for its scoping opinion on the document, including those elements 'scoped in' and 'scoped out' of subsequent environmental assessment.

ENVIRONMENTAL STATEMENT CHAPTER

During the preparation of the materials and waste ES chapter, the following information was provided by the client and its designers:

- a Bill of Quantities (also known as a 'Schedule of Rates') which detailed a 'first draft' of the type and volume of materials expected to be required to construct the development;
- a Pre-Demolition Audit Report for the existing footbridge, which detailed the types and quantities of arisings (including waste), and the potential for the components of the demolished structure to be reused or recycled;
- an indicative list of the type of materials which have the potential to incorporate recycled content and/or be sourced from a sustainable supply chain (e.g. Forest Stewardship Council certified timber);
- details of the volume and type of materials to be excavated (e.g. contaminated or uncontaminated) and the likely suitability of these materials to be reused either on- or off-site (noting that the ground investigation results were not yet available to inform the assessment);
- the overall cut and fill balance for the development.

A contractor had not been appointed to provide early construction advice on the development and, as such, it was not possible to reliably gather the following information:

- the region, country or nation from which materials were likely to be sourced, as this would be dependent upon a variety of factors such as material costs, transportation costs, and the contractors' commitment for local sourcing;
- the stockpiling arrangements (if any) for excavated arisings;
- the type and volume of materials that could be recovered from off-site sources, for use on the development (i.e. surplus materials from other developments that the contractor has delivered);
- details of logistical arrangements for material deliveries, material storage arrangements, waste segregation, transport and processing arrangements.

A desk-based review was undertaken by the EIA practitioner to expand and review the information gathered during the scoping process to:

- identify the presence, or proximity, of any allocated mineral site and identify the likelihood of the site being used in consultation with the local planning authority (i.e. pre-existing planning applications, proximate mineral extraction facilities – among others);
- a review of the expected availability of materials between 2022 to 2024 at the national level, to check for any additional sources of information or updates to reports/data; and
- a review of the projected regional landfill void capacity for 2022 to 2024, to check for any additional sources of information or updates to reports/data.

Based on the information provided by the client and its designers, the materials and waste EIA practitioner identified the likely volume of waste that will be recovered and diverted from landfill using the WRAP standard reuse/recycling rates.[xvi] Where it was not possible to use the WRAP rates, a worst-case scenario was assumed (i.e. landfill disposal).

xvi. Information available from a variety of sources such as 'WRAP (2008). Reference Guide: Net Waste Tool'.

In collaboration with the wider environmental team and the client/designers, the EIA practitioner identified a list of primary (embedded)/tertiary (inexorable) mitigation measures which should be considered prior to assessment. For the development in question, these were inclusive of, but not limited to:

Materials:

- committing to the use of off-site manufacture and pre-fabrication of materials and products, for example, the primary structural elements and supporting beams of the to-be-replaced footbridge;
- ensuring the reuse of all suitable uncontaminated excavated materials, as part of the cut and fill balance, in necessary landscaping features of the design.

Waste:

- reduction of materials wastage through procurement, storage and handling;
- use of modern methods of construction and logistics, encouraging waste reduction and improved materials resource efficiency;
- ensuring that the to-be-appointed contractor enters into agreements with waste contractors to maximise the recovery of segregated site wastes (e.g. metals);
- ensuring that all suppliers of materials use returnable, reusable, or practicably recyclable packaging;
- making arrangements for adequate storage facilities for all recoverable waste streams;
- ensuring that a SWMP is developed and implemented by the to-be-appointed contractor, to ensure all wastes are collected, transported, stored and disposed of sustainably.

Using this information, the EIA practitioner undertook an assessment of effects. A series of detailed tables were produced to depict both the baseline information and the anticipated material usage and waste arisings from the development. A summary table was then produced to enable a comparison and to clearly assess likely significant effects.

Factor		Baseline Availability	Development Projections [xvii]		Sensitivity	Magnitude	Significance
Allocated Mineral Site		No allocated mineral sites within or close to the primary study area (i.e. the development footprint)	-		Negligible	No Change	Neutral (not significant)
Material Availability [xviii]	Aggregate	225,000,000 tpa	18,540 tpa (consumed)		Low	Negligible	Slight adverse (not significant)
	Asphalt	24,000,000 tpa	7,548 tpa (consumed)				
	Cement	13,000,000 tpa	4,507 tpa (consumed)				
	Concrete	81,000,000 tpa	50,501 tpa (consumed)				
	Steel	10,448,200 tpa	2,478 tpa (consumed)				
Void Landfill Capacity	Non-Hazardous/ Inert (Regional)	2,400,000 tonnes	Waste Arisings	40,502 tpa (generated)	Low	Major	Moderate adverse (significant)
Waste Arisings Projected (destined for landfill)		5,100 tpa (generated)					
Void Landfill Capacity	Hazardous (National)	2,600 tonnes		3 tpa (generated)	Very High	Minor	Large adverse (significant)
Waste Arisings Projected (destined for landfill)		56 tpa (generated)					

xvii. The development has been divided by three, to obtain a 'per annum' figure which can be directly compared to the baseline. If a detailed construction programme is available, the EIA practitioner should calculate a more refined estimate and use the worst-case year for the development in terms of material usage and arisings.

xviii. Typical data sources include the Mineral Products Association, UK Steel and the Forestry Commission (the latter, where timber is required).

WASTE

Further to the assessment (tabulated above), the EIA practitioner sought to identify proportionate and practicable secondary ('additional') mitigation measures to reduce the potential for significant adverse environmental effects associated with waste. Measures were discussed with the client and its designers prior to inclusion in the ES. Secondary ('additional') mitigation measures were inclusive of but not limited to:

- preparation of both a Design Site Waste Management Plan (to be drafted and populated during design, and adopted/maintained in construction) and a MMP;
- early engagement with contractors to identify appropriate project key performance indicators/ metrics, possible enhancement and monitoring measures (for example, waste exemption licenses), and to identify opportunities to reduce waste through collaboration and regional synergies.

The EIA practitioner was then able to assess the likely sensitivity and magnitude of the impacts with the secondary ('additional') mitigation measures in place. This assessment found:

- Impacts from the generation of waste during construction indicated that for inert/non-hazardous waste, sensitivity would remain low, but the magnitude of change would reduce to moderate. The effects associated with inert/non-hazardous waste disposal would therefore be expected to reduce to 'slight' (not significant).
- The sensitivity of hazardous waste landfill capacity would remain very high; however, the magnitude of impact would reduce to negligible. Therefore, the effects associated with hazardous waste arisings would be expected to reduce to 'slight' (not significant).

The EIA practitioner also identified and reported monitoring measures which included continual review and updates to the SWMP and MMP; the client also agreed in writing to act on this. These measures would enable the SWMP to monitor site waste effectively to reduce potential harm to the sensitive receptors (landfill) during the construction phase of the development. Monitoring using the MMP would enable the reuse of natural soils and arisings including made-ground (contaminated or otherwise) on the development.

ALLOCATED MINERAL SITES AND MATERIALS

It should be noted that it was not necessary to identify secondary ('additional') mitigation measures for allocated mineral sites, as none were present within or close to the development.

Similarly, no mitigation measures were applied to the impacts from the use of materials during construction, as the associated effects were found to be not significant.

Nevertheless, the EIA practitioner set out a number of good practice measures that were committed to by the client, outside the planning process. They included:

- identification and specification of material resources that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products;
- designing for resource optimisation: simplifying layout and form, using standard sizes, maximising the use of renewable materials, and materials with recycled or secondary content, and setting zero net importation as a development goal;
- identifying opportunities to minimise the export and import of material resources.

The EIA practitioner indicated within the environmental assessment findings that, should the above commitments be adopted into their fullest extent, whilst the sensitivity would remain low and the magnitude of change would remain negligible, the effects associated with materials would be expected to drop from 'slight adverse' to 'neutral' (and, hence, remaining not significant).

ASSUMPTIONS AND LIMITATIONS OF THE ASSESSMENT

Towards the end of the ES chapter for materials and waste, the EIA practitioner provided clear references to assumptions and limitations. This section was of importance to the planning authority and readers of the chapter, as it offered oversight of where the author had had to make decisions to maintain the proportionality of the assessments. Such assumptions and limitations included the approach to the lag in available baseline data and the phasing of project construction.

ANNEX D - Terminology

Allocated mineral site	Mineral deposits specifically identified in a Local Plan as those that will be mined or extracted. Allocated mineral sites may be different to Mineral Safeguarding Areas, also defined in this Annex.
Bill of Quantities (BoQ)	A document containing details on the volumes of excavated arisings from, and materials required for, a development. Also 'Schedule of Rates'.
Building Information Modelling (BIM)	Digital modelling and management of information for the representation of physical and functional places and structures.
Circular economy	An approach to materials management that aims to replace the wasteful linear model of resource use with a regenerative model that is deliberately designed to continuously cycle the materials already in use within the system. Materials are divided into two groups – biological (e.g. food) and technical (e.g. manufactured components). The cycle of biological materials is generally considered to be relatively rapid and has strong links to the movement of materials through natural processes (e.g. composting). However, technical materials are generally designed to cycle in a high-quality state for longer periods (e.g. through maintenance, reuse and redistribution of goods) before their components are eventually remanufactured, or, where this is not possible, recycled as base raw material inputs to the system (e.g. plastics).[43]
Conflict minerals	Minerals mined in conditions of armed conflict and human rights abuses, and which are sold or traded by armed groups.[44]
Construction, Demolition and Excavation (CD&E)	Arisings and waste from the demolition of buildings and structures, site preparation and clearance, remediation, excavation and construction activities.
Construction materials	Physical substances from primary (virgin) and non-primary (i.e. reused, secondary, and recycled) sources that are used to deliver construction.
Critical raw materials	Materials that are considered to have high importance within the EU economy, but where security of supply is at great risk.
Donor site	A development or defined area of land that offers up (donates) wastes or materials to be treated and/or reused.
Environmental effect	The consequence of an environmental impact. Effects may be classified as beneficial or adverse, and temporary or permanent.

Environmental impact	Any change caused in the natural environment by an action. Impacts may be classified as direct, indirect, secondary, cumulative, and short, medium or long term.
Environmental Impact Assessment (EIA)	The statutory process for assessing the impacts, and evaluating and reporting the likely significant environmental effects, of a proposed development.
Environmental Management Plan (EMP)	A document (or set of documents) that set out how potential impacts will be assessed, managed and monitored and how complaints and corrective actions will be dealt with during a particular lifecycle stage of a development, e.g. construction, operation or decommissioning.
Environmental Product Declaration (EPD)	Certification that independently quantifies and verifies the lifecycle impacts of products and goods, as cited in the ISO14025 Environmental Labels and Declarations.
Excavated arisings	For the purposes of this guidance, this term is restricted to those materials that fall within the scope of, and meet the reuse criteria set out in: 1. relevant waste exemption criteria[45]; or 2. is exempt from the scope of the Waste Framework Directive in accordance with Article 2.1(c), which refers to: "uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated"; 3. the CL:AIRE Definition of Waste: Development Industry Code of Practice. These arisings include: » soil, both topsoil and sub-soil, parent material and underlying geology; » soil and mineral-based dredgings; » ground-based infrastructure that is capable of reuse within earthworks developments, e.g. road base, concrete floors; » made-ground; » source segregated aggregate material arising from demolition activities, such as crushed brick and concrete, to be reused on the site of production within earthworks developments or as sub-base or drainage materials; and » stockpiled excavated materials that include the above. Note: any material which it is not considered to fall within the above definition would be defined as waste.
Landfill capacity	The known, forecast or estimated remaining landfill void space, either individually, regionally or nationally; generally measured in cubic metres or tonnes.

Lifecycle stages	The defined phases of a development, generally accepted to be planning, design, procurement, construction, operation, maintenance and refurbishment, and end of life.
Materials	Substances and objects which will be used during any lifecycle stage of a development.
Materials Management Plan (MMP)	A mechanism by which site developers can comply with regulations for excavated ground materials, and through which the diversion from landfill of such arisings can be targeted.
Mineral Safeguarding Area (MSA)	As defined on page 69 of the National Planning Policy Framework [**link**]: an area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Natural capital	The stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people (Natural Capital Coalition [**link**]).
Natural resources	Any physical, tangible and valued element of the natural environment (e.g. soil, land, water and biodiversity).
Preparing for reuse	Checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing.
Primary materials	Physical substances from non-renewables sources, i.e. those that cannot or will not be replaced in short (non-geological) periods of time. Also referred to as 'virgin' materials.
Primary (embedded) mitigation	Modifications to the location or design of the development made during the pre-application phase that are an inherent part of a development, and do not require additional action to be taken.
Proportionate EIA	Adding value to the consenting process by making the process and outputs more efficient and effective.
Recovery	Any operation which results in a waste serving a useful purpose by replacing materials which would otherwise have been used to fulfil that particular function. Recovery also includes waste being prepared to fulfil that particular function.[46]

Recycling	Any recovery operation where waste is reprocessed into products, materials or substances whether for its original or other purposes. Recycling includes the reprocessing of organic material, but excludes energy recovery and the reprocessing of waste into materials to be used as fuels or for backfilling operations.
Regional	Defined geographical areas or physical extents in the United Kingdom. For the purposes of this guidance, the maximum recommended physical extents are: North East England, North West England, Yorkshire and the Humber, East Midlands, West Midlands, East of England, Greater London, South East England, South West England, Scotland, Wales, and Northern Ireland.
Renewable materials	Materials from sources that can or will be replenished over short (non-geological) periods of time (e.g. timber).
Resource effectiveness	Optimising the use of resources across their lifecycle, to minimise harm to the natural environment and society, and to increasingly generate sustainability benefits.
Resource sterilisation	Preventing the future extraction of a material or resource, typically by constructing buildings or infrastructure over or adjacent to a deposit.
Reuse	Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.
Secondary materials	Useful by-products from manufacturing or industrial processes.
Secondary mitigation	Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in an environmental assessment documentation.
Special waste	In Scotland, hazardous waste is referred to as special waste. All references to hazardous waste within this document include special waste, as defined and applied in Scotland.
Tertiary (inexorable) mitigation	Actions that would occur with or without input from an EIA feeding into the design process. This includes action that will be undertaken to meet other existing legislative requirements, or that are considered to be standard practices used to manage commonly occurring environmental impacts and effects.

Waste	Defined in line with Article 3(1) of the Waste Framework Directive (Council Directive 2008/98/EC) as: 'any substance or object which the holder discards or intends or is required to discard'. Waste is commonly split into the following classifications: - **Inert:** waste which meets one or more of the following criteria: a. does not undergo any significant physical, chemical or biological transformations; b. does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and c. where the total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater. - **Hazardous:** defined in line with Article 3(2) of the Waste Framework Directive (Council Directive 2008/98/EC) as: 'waste which displays one or more of the hazardous properties listed in Annex III' of the Directive. - **Non-hazardous:** waste that is classified neither as inert nor hazardous.
Waste Hierarchy	Establishes an order of preference for the management of waste, to maximise the prevention of waste, whilst minimising disposal. The Waste (Management) Hierarchy is established in the Waste Framework Directive (Directive 2008/98/EC), and prescribes the following: PREVENTION — Most preferred option PREPARING FOR REUSE RECYCLING RECOVERY DISPOSAL — Least preferred option

ANNEX E - Further reading, information and tools

Building Research Establishment (BRE) Environmental Assessment Methodology (BREEAM) [link]

Building Research Establishment (BRE) Waste Benchmark Data, 2012 [link]

Building Research Establishment (BRE) SMARTWaste [link]

Civil Environmental Engineering Quality Assessment & Award Scheme (CEEQUAL) [link]

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Closing the loop – An EU action plan for the Circular Economy (Dec 2015) [link]

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Department for Environment, Food & Rural Affairs (Defra) Guidance on the legal definition of waste and its application (2012) [link]

Institute of Civil Engineers (ICE) Demolition Protocol (2008)

Natural Scotland, Making Things Last, A Circular Economy Strategy for Scotland (Feb 2016) [link]

National Policy Statements for England and Wales [link]

Waste & Resources Action Programme (WRAP) Designing out Waste: A design team guide for civil engineering [link]

Waste & Resources Action Programme (WRAP) Designing out Waste: A design team guide for buildings [link]

Waste & Resources Action Programme (WRAP) NetWaste Tool [link]

Waste & Resources Action Programme (WRAP) Practical Solutions for Sustainable Construction: Achieving Good Practice Waste Minimisation and Management – Guidance for construction clients, design teams and contractors [link]

ANNEX F – References

1 The Green Guide to Specification online [link]

2 IEMA (Nov 2015) Environmental Impact Assessment Guide to: Shaping Quality Development [link]

3 IEMA (Jul 2016) Environmental Impact Assessment Guide to: Delivering Quality Development [link]

4 IEMA (2013) From Waste to Resources: Implementing Sustainable Resource Management in Your Business [link]

5 Ibid

6 Defra (2018) Our Waste, Our Resources: A Strategy for England [link]

7 IEMA Thought Piece on Disruptive Technologies and Sustainability (2019) [link]

8 IEMA (2017) Delivering Proportionate EIA – A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice [link]

9 Directive 2014/52/EU of the European Parliament and of the Council (16 April 2014) amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment [link]

10 Directive 2011/92/EU of the European Parliament and of the Council (13 December 2011) on the assessment of the effects of certain public and private projects on the environment [link]

11 The Town and Country Planning (Environmental Impact Assessment) (England) Regulations (2017) [link]

12 The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations (2017) [link]

13 Statutory Instruments 2017 No. 572, Infrastructure Planning (Environmental Impact Assessment) Regulations (2017) [link]

14 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations (2017) [link]

15 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 [link]

16 Scottish Government (2016) Making Things Last: A Circular Economy Strategy for Scotland [link]

17 Scottish Government (2014) Scotland's Zero Waste Plan [link]

18 Scottish Government (2013) Safeguarding Scotland's Resources: a blueprint for a more resource-efficient and circular economy [link]

19 Welsh Assembly Government (2010) Towards Zero Waste. One Wales: One Planet [link]

20 Welsh Assembly Government (2019) £6.5 million Circular Economy Fund launches to increase the use of recycled materials [link]

21 DAERA (2015) Delivering Resource Efficiency – Northern Ireland Waste Management Strategy [link]

22 The Broadway Initiative [link]

23 The Environment Bill [link]

24 IEMA Delivering proportionate EIA – a collaborative strategy for enhancing UK Environmental Impact Assessment Practice [link]

25 CL:AIRE Definition of Waste –- Development Industry Code of Practice [link]

26 European Commission, Waste Framework Directive (Directive 2008/98/EC) [link]

27 Environment Agency, Quality Protocol: Aggregates from Inert Waste [link]

28 European Commission, Critical Raw Materials [link]

29 Environment Agency, Waste Data Interrogator [link]

30 BS 5906:2005, Waste management in buildings, Code of Practice [link]

31 Defra, WasteDataFlow, Local Authority Waste Management [link]

32 Defra, Construction & Demolition Waste Management [link]

33 HS2 Construction, Demolition and Excavation Waste Strategy (HS2-HS2-EV-STR-000-000004), available through HS2 Ltd

34 Crossrail, Materials and Waste [link]

35 London 2012 Olympics, Learning Legacy, Construction Waste Management on the Olympic Park (2011) [link]

36 Heathrow Airport Limited, Towards a sustainable Heathrow: Focus on waste, page 1 (2011) [link]

37 Defra, Government Statistical Service, UK Statistics on Waste (2018) [link]

38 BSI (2017) Framework for implementing the principles of the circular economy in organizations – Guide [link]

39 Building Services Research and Information Association, Soft Landings [link]

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42 Lar Uladh Mid Ulster District Council (2017) Northern Ireland Landfill Capacity Report [link]

43 IEMA (2013) From Waste to Resources: Implementing Sustainable Resource Management in Your Business [link]

44 Foreign & Commonwealth Office, Conflict Minerals [link]

45 Environment Agency, Waste Exemptions: Using Waste [link]

46 EuroStat Statistics Explained: Glossary [link]

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