BS 8905:2011

BSI Standards Publication

Framework for the assessment of the sustainable use of materials – Guidance

Publishing and copyright information

ISBN 978 0 580 70453 6

ICS 03.100.99; 13.020.20

The following BSI references relate to the work on this standard:
Committee reference MI/1; SDS/1
Draft for comment 10/30216208 DC

Publication history

First published August 2011

Amendments issued since publication

Date	Text affected

Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 32, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 August 2011. It was prepared jointly by Technical Committees MI/1, *Materials Industries*, and SDS/1, *Sustainable development co-ordination*. A list of organizations represented on these committees can be obtained on request to their secretaries.

Information about this document

This British Standard builds on the guidance given in the other parts of the BS 8900 series of standards on sustainability and environmental management, with particular relevance to the use of materials through the supply chain.

Annex A of this British Standard discusses several methods and tools that are trade marked. In each case, information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of the products named.

Use of this document

As a guide, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

This British Standard provides a framework for the concepts, techniques, tools and methodologies that can be used to support decisions surrounding the sustainable use of materials.

Sustainable development is defined by BS 8900:2006 as "an enduring, balanced approach to economic activity, environmental responsibility and social progress". Materials are an essential part of everyday life and the use of materials contributes to the quality of living standards: the houses that we live in, the food that we eat, the vehicles in which we travel and the way we communicate.

NOTE For the purposes of this British Standard, the terms "materials", "components" and "products" are interchangeable, depending on where the user is in the supply chain and on the stage of the life cycle. In essence, a material is an input that is processed is some way, a component is an input that is assembled, and a product is the output. The product of one part of the supply chain can become a material or component of the next.

An expanding global population and increasing social need for an improved quality of life will create even higher demands on raw materials and natural resources. This framework recognizes that current levels of resource consumption related to materials exceed that which can be replaced by natural means, and as a consequence absolute sustainability is not currently attainable. This document sets out a framework to guide decision making in the sustainable use of materials in relative terms.

The sustainable use of materials seeks to attain positive social, environmental and economic contributions and to minimize negative impacts. The social, environmental and economic aspects form the basis of any sustainability assessment.

It is important to note that the evaluation of the three aspects can be subjective and will require the consideration of a number of stakeholder views. This will affect the complexity of the decision-making process, but will help to avoid decisions being taken on the basis of narrow or short-term views that could lead to undesirable consequences when considered in a broader and longer-term context.

A number of reference sources are included to support the evaluation of the three aspects of sustainability.

1 Scope

This British Standard provides a framework for the assessment of social, economic and environmental issues in the sustainable use of materials. The framework can be applied to all parts of the supply chain and is intended to support decision making about the sustainable use of any type of material.

This standard covers consideration of:

a) the social, economic and environmental aspects throughout the material lifecycle, covering:

   1) sourcing of materials;

   2) conversion of materials into products;

   3) performance of a product over its functional lifetime;

   4) end of life of the product and either the reuse, remanufacture, recycling or disposal of the product; and

   5) end of life of a material and either the reuse, remanufacture, recycling or disposal of the material,

with particular emphasis on social performance in the use phase of a product life and environmental performance over the full life cycle, and taking into consideration the longer term and local economic issues;

b) how to balance these aspects against stakeholder priorities in terms of sustainable development;

c) guidance on the use of decision support tools to assess the relative sustainability of material choice; and

d) the importance of data quality when carrying out a sustainability assessment.

NOTE This standard assumes that the project brief and material design options have been agreed prior to the use of the assessment framework.

The standard does not provide:

i) comparisons between specific materials;

ii) advice on the properties of materials and products; or

iii) recommendations on specific software tools to support the evaluation and comparisons of social, economic and environmental aspects.

2 Terms and definitions

For the purpose of this British Standard the following terms and definitions apply.

2.1 component
part of an assembled product

2.2 base case
reference point from which the assessment of improvements or otherwise is made

2.3 end-of-life
life cycle stage where the product, component or material is no longer required or is unable to fulfil its purpose, at which point the product, component or material contained therein becomes available for reuse, recycling, recovery or disposal

NOTE 1 The product or component end-of-life scenario is likely to be determined by the designer on an application-by-application basis. When a product or component comes to the end of its useful life it does not necessarily mean that the materials it is composed of are at the end of their useful life. The sustainability assessment ought to take account of this.

NOTE 2 In sustainability terms design for end-of-life is important because good design could facilitate the reuse, recycling or recovery of components or materials contained in a product.

2.4 life cycle
consecutive and interlinked stages of a product system, from raw material sourcing and extraction, through production of materials, to the final product, and including product use, maintenance or service operation to end-of-life options

2.5 life cycle assessment (LCA)
technique for assessing the environmental aspects and potential impacts associated with a product, by:

- compiling an inventory of relevant inputs and outputs of a product system;

- evaluating the potential environmental impacts associated with those inputs and outputs;
- interpreting the results of the inventory analysis and impact assessment phases in relation to the objectives of the study

NOTE Typically, an LCA is associated with environmental assessments, but social LCA is now starting to be used.

2.6 life cycle thinking
process of considering the consecutive and interlinked stages of a product system, from raw material extraction, through production of materials, components to products, through product use, maintenance or service operation to end-of-life options

2.7 organization
group of people and facilities with an arrangement of responsibilities, authorities and relationships

EXAMPLES

Company, corporation, firm, enterprise, institution, charity, sole trader or association, or parts or combinations thereof.

NOTE 1 The arrangement is generally orderly.

NOTE 2 An organization can be public or private.

[BS EN ISO 9000:2005]

2.8 parameter
measurement or value relevant to the sustainability assessment

2.9 product system
system utilizing products or a range of individual products to provide a functional service

2.10 recovery
collection of products, components or materials with the intention of avoiding waste and with the purpose of reuse or recycling

2.11 recycle
action of reprocessing a product, component or material for use in a future product, component or material

2.12 reuse
operation by which a product, component or material can be used for the same functional purpose at end-of-life

2.13 sourcing
process of procuring materials, components or products

2.14 stakeholder
individual, group or organization with an interest in any decision or activity of an organization

[BS ISO 26000:2010]

2.15 supply chain
system of organizations and networks involved in the transformation of raw and end-of-life materials into a final product or product system

2.16 sustainability assessment
appraisal that compares the sustainability consequences of material choice against stakeholder priorities according to the boundary and scope of the intended study

2.17 use
utilizing a product in its intended purpose

3 Sustainability and materials

Through materials innovation, and by developing new and more effective material applications, the sustainability attributes and functionality of materials are continuously improving. Sustainability requires a balanced decision-making process that takes account of social, environmental and economic aspects (see Annex A, Annex B and Annex C). These three aspects of sustainability should be considered to be interdependent because a change in one aspect can impact on another. For example, trying to achieve an environmental improvement, such as reduced emissions of greenhouse gases, might also have an economic implication in regions where emissions trading has been introduced. When considering sustainable development, the benefits potentially attained through any improvements have to be weighted against the potentially negative impacts that could be caused by the consequences of making that improvement. This is assessed by carrying out a full sustainability assessment, and needs to be based upon life cycle thinking and provide information on benefits set against impacts.

4 Framework for a sustainability assessment of material

Having identified the material options meeting the design requirements and functional performance, these should be subjected to a sustainability assessment consisting of the following three phases.

Phase 1: Scoping

- Set the aims, objective and scope of the sustainability assessment
- Identify and engage with relevant stakeholder groups
- Develop a list of prioritized parameters for each of the three aspects of sustainability

Phase 2: Data collection and assessment

- For the base case and each alternative material design choice:
  - establish aims, objective and scope for each parameter assessment;
  - acquire data and check quality;
  - assess parameters;
  - validate results of each parameter and check sensitivity to assumptions;
  - combine parameters to assess overall sustainability;
  - analyse wider consequences of this design option (optional)
- Compare sustainability assessment for each material design choice against base case to make decision

Phase: 3 Reporting

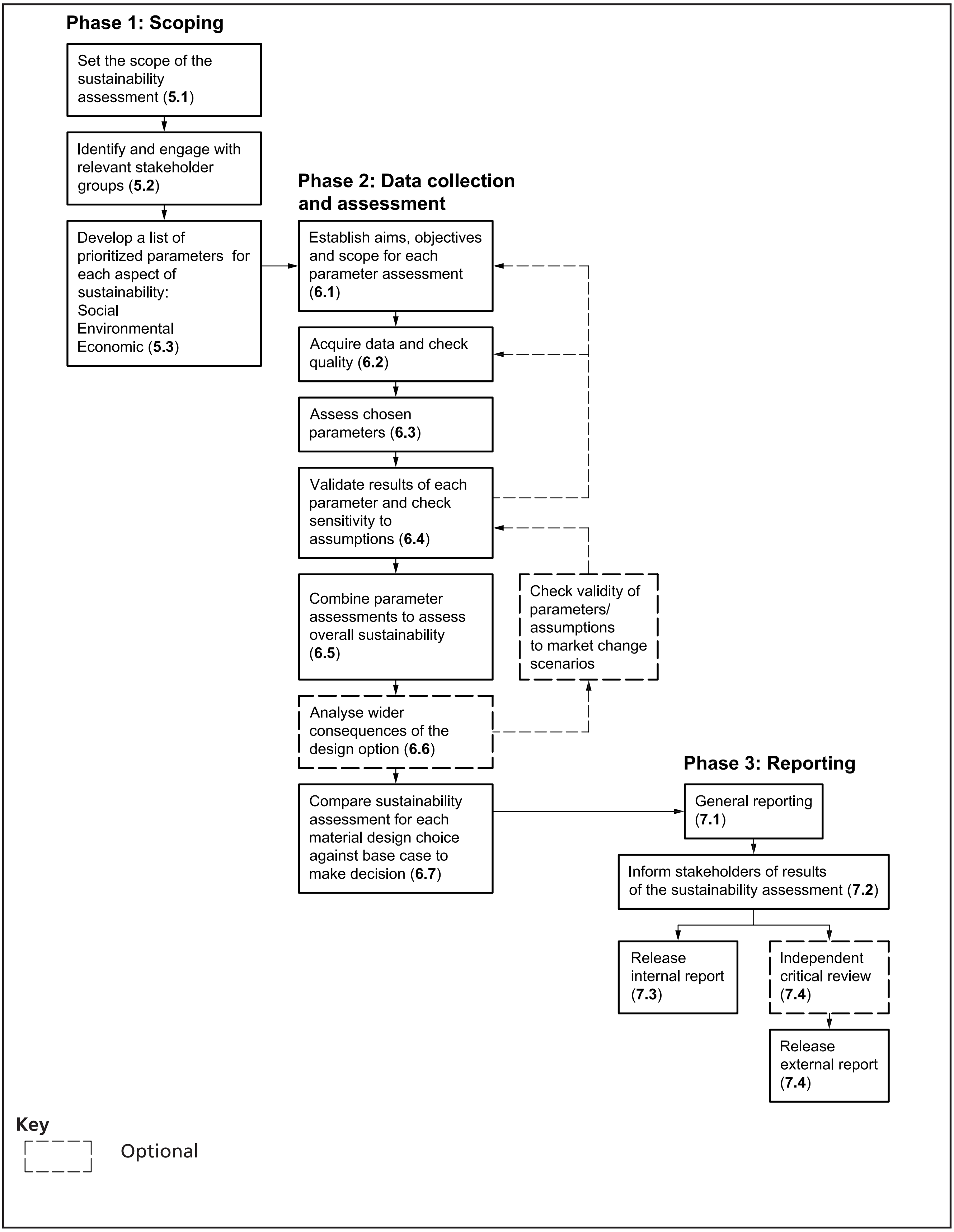
- General reporting
- Inform stakeholders of results of the sustainability assessment
- Release report to internal stakeholders
- Release final external report following an independent critical review

The framework involves an element of iteration, which further improves the rigour and inclusiveness of the assessment and provides assurance that the initial aims of the sustainability assessment can be met. Care should be taken to ensure that the transparency of any exclusions are considered in data collection and verification.

As a sustainability assessment can only be relative, a reference or base case should be defined for comparison with the alternative solutions to assess whether each alternative is more or less sustainable than a base case (e.g. an existing product, a benchmark or an aspirational goal).

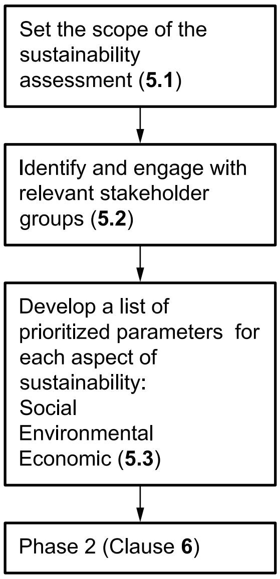
Figure 1 illustrates the phases of an effective sustainability assessment and Annex D (Figure D.1) demonstrates how comparative assessments of material choice may be conducted.

Figure 1 **The sustainability assessment process for a material**



5 Phase 1: Scoping (see Figure 2)

Figure 2 **Phase 1: Scoping**



5.1 Setting the aims, objective and scope of the sustainability assessment

It is critical to define the scope of the assessment and to check that this is aligned with the original aims. Scoping defines what is and what is not to be included in the assessment, and the user needs to check that the scoping definitions at each stage remain relevant and are sufficiently inclusive to achieve the desired aims and objectives. Without a well-drafted scope it is impossible to make a worthwhile comparative assessment.

The scope should clearly set out the following aspects of the assessment.

a) The aim: the overall goal of the sustainability assessment.

b) The objective: the deliverables needed to achieve that aim.

c) The boundaries of the assessment: what is to be included and explicitly what is not (the life cycle stages, geographical coverage and end-of-life options).

A well-drafted scope will make subsequent phases of the assessment simpler and easier. If there is insufficient information to allow a scope to be well-drafted, then additional information should be sought where possible.

As successive steps in the assessment are performed it might be necessary to update the scope as any assumptions and data quality are validated.

The base case and proposed alternative material solutions should also be identified at this stage because it is useful to identify the key differences between each alternative and the base case.

5.2 Identifying and engaging with relevant stakeholder groups

A stakeholder engagement exercise should be carried out to identify and understand the key issues associated with the assessment and thereby ensure that the assessment is aligned with the needs of key stakeholders. The aim is to avoid decisions being made without taking due consideration of the views of key stakeholders, and thereby increase the likelihood of success regarding the viability of the decision.

The key stakeholders of the assessment need to be identified, their opinions sought and their priorities identified. Stakeholders should be selected on a case-by-case basis, and may be internal or external. Consultation may range from the simple, as where only the designer's views are sought, to the complex, where a range of interested parties with differing views are involved.

The organization should consider engagement with a wide range of stakeholders so that priorities are identified and potential benefits and concerns taken into consideration. Engaging stakeholders is an important stage in prioritizing the three aspects of sustainability, and ensures an awareness of the key areas of concern and interest.

Further guidance on stakeholder engagement can be found in BS 8900:2006, **4.2**, and BS ISO 26000:2010, **5.3** and **5.4**.

5.3 Developing a list of prioritized parameters for each aspect of sustainability

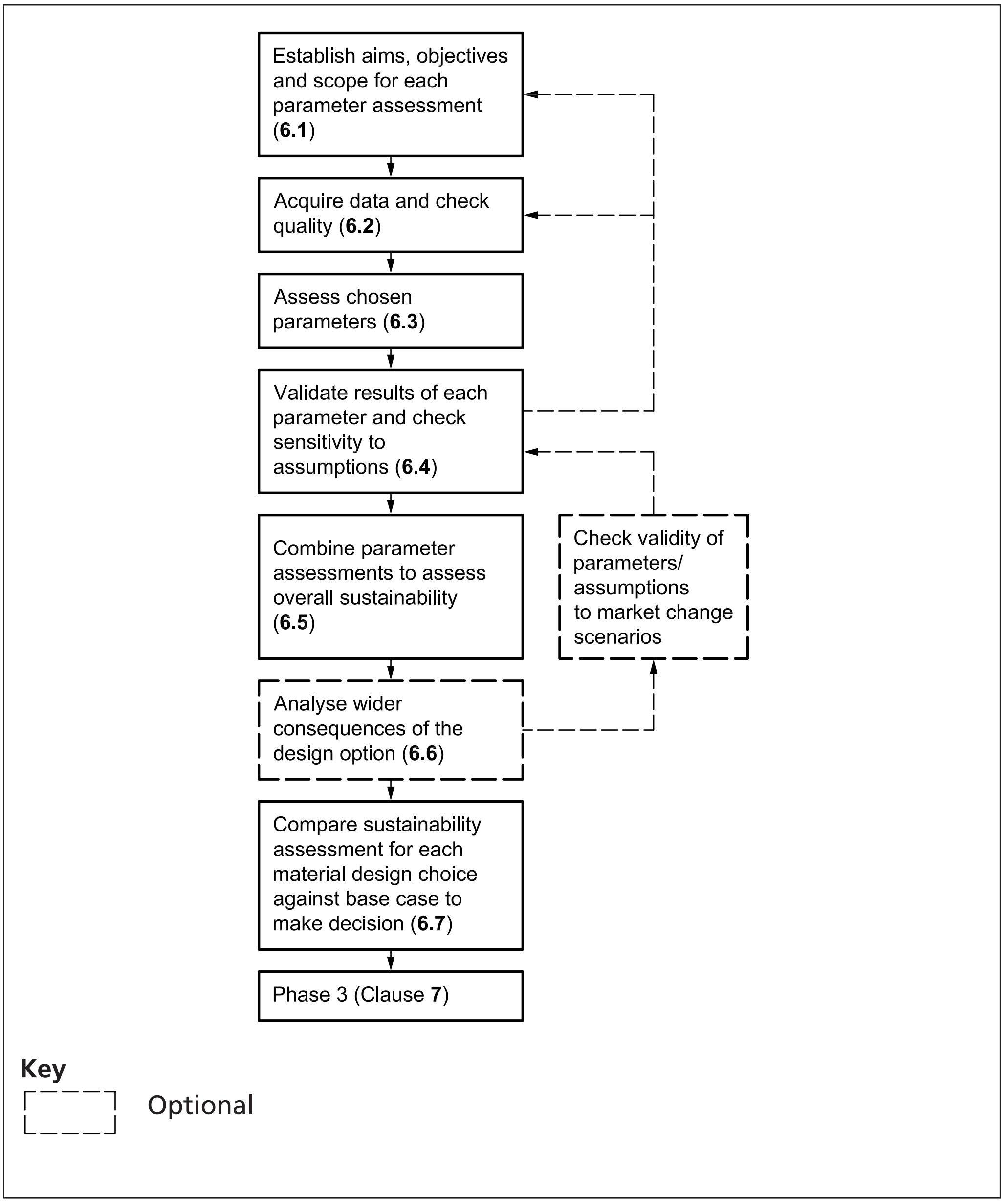
The stakeholder engagement process should guide the selection of the relevant sustainability parameters against which the performance of the material options is to be measured. Examples of sustainability parameters could include health and safety, comfort, dust, noise, fossil fuel use and employment, and each of these could fall within more than one aspect; hence there can be interdependence between some sustainability parameters.

A prioritized list will assist the decision making when interpreting the results of the sustainability assessment.

Where different stakeholders have indicated different priorities, a judgement needs to be made as to the relative importance of each parameter. In this case it might be necessary to introduce a weighting scheme to take into account the relative importance of each parameter and stakeholder.

6 Phase 2: Data collection and assessment (see Figure 3)

Figure 3 **Phase 2: Data collection and assessment**



6.1 Establishing the aims, objective and scope for each parameter assessment

The prioritized list of sustainability parameters (see **5.3**) needs to be assessed using appropriate methodologies relevant to each aspect of sustainability. For each parameter to be assessed, the scope and boundary of each assessment need to be established.

Where possible, a quantitative assessment should be carried out for each parameter, but where this is not possible a qualitative judgement should be made with reference to stakeholder priorities.

For each parameter data should be gathered across each of the life cycle stages, according to the boundary and scope of the assessment. Where this cannot be achieved, this should be explained in the report and be transparent to stakeholders.

It might be necessary, as part of the assessment, to consider the consequential effects of the material selection (see **6.6**).

6.2 Acquiring data and checking quality

In order to assess a particular sustainability parameter, robust data should be collected by the selected method(s) (see **6.1**), and the data source recorded. When identifying data for use in the sustainability assessment, consideration should be given to the following [1)].

a) Time-related coverage: age of data and the minimum length of time over which data are collected (data that are time specific to the product being assessed are preferred).

b) Geographical origin: geographical area from which data are collected (e.g. district, country, region) (data that are geographically specific to the product being assessed are preferred).

c) Technology coverage: whether the data relate to a specific technology or a mix of technologies (data that are technology specific to the product being assessed are preferred).

d) Accuracy of, for example, data, models and assumptions.

e) Transparency of the data source, data, credibility and status.

f) Precision: measure of the variability of the data values for data expressed (e.g. variance).

Consideration should also be given to the following.

1) Completeness: the percentage of data flow that is measured or estimated.

2) Consistency: qualitative assessment of whether the assessment methodology is applied uniformly to the various components of the analysis.

3) Reproducibility: qualitative assessment of the extent to which information about the method and data values would allow an independent practitioner to reproduce the results reported in the study.

Ultimately, there needs to be confidence in the quality of the data used in the assessment.

NOTE Data about the material can be preserved for the life of a product to allow future users to make informed decisions on recycling and reuse. Guidance on this is given in Annex E.

6.3 Assessing chosen parameters

Each of the sustainability parameters in the prioritized list needs to be assessed individually, using appropriate methodologies relevant to the parameter. This guidance does not set out to describe any method in particular and some guidance can be found in Annex A, Annex B and Annex C.

For some parameters it might be difficult to quantify the exact benefit and, as such, a judgement should be made on the relative benefits compared to the base case.

As with other conclusions, this judgement should be transparent when the results are reported.

[1)] Adapted from BS EN ISO 14044:2006, **4.2.3.6.2**.

6.4 Validating results of each parameter and checking sensitivity to assumptions

The results of the assessment should be checked to determine whether they make sense. The sensitivity of results to key assumptions should also be examined. If a problem is identified, then it might be necessary to repeat the process from setting the scope and boundary of the parameters (see **6.1**) or reviewing the quality and consistency of the data used (see **6.2**).

6.5 Combining parameter assessments to assess overall sustainability

The results of each of the parameter assessments for the particular material design choice need to be compiled in one assessment. This can be achieved by identifying the strengths and weaknesses of the selected parameters at each stage in the life cycle or through the use of a more complex scoring mechanism in which values are assigned to the results for each parameter and a total obtained for each life cycle stage based on stakeholder considerations. For example, a higher financial cost during one stage of the life cycle might be outweighed by the environmental or social benefits at a different stage.

6.6 Analysing wider consequences of the design option (optional)

An analysis may be carried out to understand the potential consequences of the results indicating that one material option is better than others in terms of sustainability. This decision could, for example, lead to changes in the market demand, so the data relevant to the sourcing of the material might change as a consequence. For example, a material might be sourced currently from renewable energy route, but if the market demand doubles could the additional material also be resourced from a renewable energy route? This is termed "consequential analysis".

6.7 Comparing sustainability assessment for each material design choice against base case to make decision

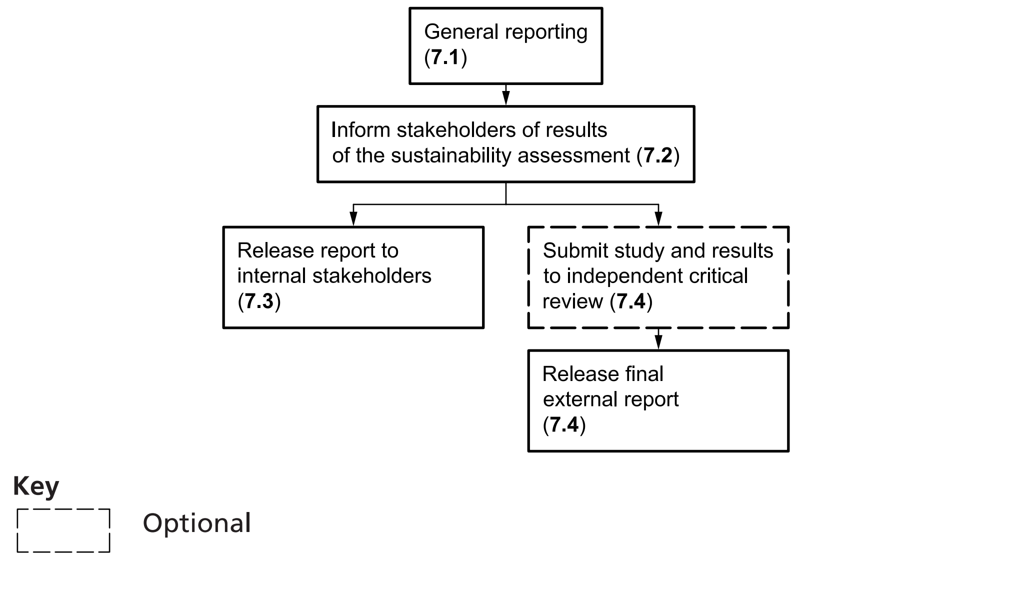
The outputs from the stakeholder engagement process (**5.3**) and the sustainability assessment phase for each material design option (**6.5** and **6.6**) need to be considered together to in order to guide the final decision.

This allows an overall view to be taken of the relative sustainability of a particular solution over the complete life cycle.

In some cases it will be simple to identify the most sustainable option, but it is more likely that alternative solutions will a have range of strengths and weaknesses so that it might be difficult to identify the most sustainable material choice. In this case a judgement will have to be made on the basis of the results presented; the assessments could be revisited to see if any improvements are possible in terms of data or material choice, or a decision could be based solely on stakeholders' priorities.

7 Phase 3: Reporting (see Figure 4)

Figure 4 **Phase 3: Reporting**



7.1 General reporting

Once completed, the output of the assessment might need to be externally reported. Depending on the use of the assessment, different levels of reporting scrutiny need to be applied (see **7.2** to **7.4**).

If the data are to be used only internally then it probably suffices to ensure that the report is sufficiently detailed to allow the work to be replicated at a later date.

If the data are to be used for external communications then a more rigorous check of the assessment should be made. This could be done by an independent third party who was not involved in the original assessment.

7.2 Informing stakeholders of results of the sustainability assessment

Stakeholders who have taken part in the sustainability assessment should be informed about the results of the exercise and the decisions that will be taken as a consequence. If significant concerns about the outputs and conclusions of the sustainability assessment are raised by the stakeholders, this should be documented in the final report. In some cases, it might be necessary to repeat the exercise, taking into account their concerns.

7.3 Releasing report to internal stakeholders

The report is then released internally, together with an explanation of the consequences of the outputs and conclusions and how they affect internal stakeholders.

7.4 Releasing final external report following an independent critical review

Where it is intended to use the conclusions of the report, and subsequent materials choices, to make public claims about the organization's sustainability and that of its products, then it is essential that the sustainability assessment is transparent and credible. To ensure this, the organization should arrange for its external report to undergo an independent critical review by a technically qualified, trustworthy independent third party who will ensure that the assessment, report and conclusions have sufficient veracity to uphold the claims made. If an organization intends to report externally/publicly, it should be prepared to provide documentary evidence to support stakeholder engagement, parameters of the assessment, and data collection and methodology.

Annex A (informative) Social aspect of sustainability

A.1 Overview

Compared with economic and environmental considerations the methodology for assessing the social aspect is at a relatively early stage of maturity.

Social aspect considerations can be addressed by considering:

a) the sourcing of materials and the social implications along the supply chain, which, depending on the scope of the assessment, could include consideration of raw material extraction, manufacturing, assembly, recovery and recycling through to final disposal or depletion of material;

b) the social value contribution of the use phase of a product or product system, and how the materials selection can enhance this social value (see **A.3**);

c) the consequential effects materials selection could have on the availability of materials, which can also have implications for the efficiency with which materials are used and applied and also for potential strategies for materials recovery, e.g. reuse and recycling.

At a macro scale, materials flow analysis can be used to understand the flow of materials across geographical and political boundaries, which could affect social and economic activities, such as employment and standards of living. These considerations are dealt with in **A.2** to **A.4**.

Corporate performance and product performance are not directly related, but stakeholders might (or might not) regard responsible sourcing in the supply chain as an important element of social value consideration in a product. Aspects that need to be considered on responsible sourcing are outlined in **A.2**.

A.2 Sourcing materials

To achieve sustainable supply chains it will be necessary for information to be provided on the social and environmental performance of the relevant organizations, in addition to the normal economic requirements. The social issues might include information about:

a) employment and labour conditions;

b) pollution prevention and abatement;

c) community health;

d) safety and security;

e) land acquisition and involuntary resettlement;

f) biodiversity, ecosystem services and sustainable natural resource management; and

g) indigenous peoples and cultural heritage.

Guidelines that can be used to support stakeholder engagement (see **5.2**) and sustainable supply chain management include:

- OECD’s Guidelines for Multinational Enterprises [2];
- BITC Marketplace Responsibility Principles [3];
- GRI Sustainability Reporting Framework [4];
- IFC Performance Standards on Social and Environmental Sustainability [5];
- UN Global Compact [6];
- BS ISO 26000;

- SA8000; and
- AA1000 AccountAbility Standard.

These methods can permit organizations to differentiate themselves as socially responsible and thereby enhance brand image, reputation and investor confidence, and minimize and mitigate any social impacts that could arise as a result of their operations.

A.3 Materials application

The concept of the social value of materials in individual products and applications is not widely recognized. However, a product or process can be considered socially advantageous when compared to alternative products or processes if it contributes more to the attainment of social goals.

All materials have the potential to be transformed into useful products, and it is the application of these products that provides a service to society. It is this service to society that captures a material's inherent social value. The product might contain a number of different materials that contribute to its functionality and which could also add value to the user's experience.

One of the challenges in the assessment of social value is to incorporate qualitative aspects, such as appearance (e.g. visual appeal), comfort, durability, strength and safety, into a full sustainability assessment. For example, the experience of comfort of a seat might depend upon an individual's preferences and expectations, and yet levels of comfort will still be an important aspect of the design.

A.4 Social value in markets and sectors

The social value considerations for markets or specific sectors will differ as a result of user preference and demand.

In the automotive sector, design considerations, such as safety, comfort, quality of drive, reliability and visual appeal, although subject to individual preferences, are all important social value aspects of vehicle engineering design. There is a need to provide guidance on the material contribution to these social factors and to consider the relative importance of these set against the economic aspects (e.g. affordability and commercial viability) and environmental aspects (e.g. the global warming potential of a vehicle over its lifespan). The assessment of social value can depend upon qualitative as well as quantitative indicators and it is a challenge to standardize some of the qualitative aspects.

Considerations of social value contribution for urban infrastructure need to take account of the value to society, such as economic development, employment, public mobility, access to services, culture and social events, as well as visual appeal and feelings of safety and well-being. Materials selection can contribute to many of these aspects and can also influence the impacts of infrastructure development. This could include cost and speed of build, safety and health-related impacts such as noise and atmospheric pollution, and also consider potential disruption to the local economy.

A.5 Evaluating social performance

At present, no single, overriding methodology exists to assess corporate contributions to society. However, there is extensive literature detailing assessments and principles that can be utilized in evaluating an organization's social performance (see **A.6, A.7** and **A.8**).

When evaluating social performance, consideration needs to be given at both the macro and micro levels. At a macro level, social performance ought to address issues surrounding society, cultures and communities, with consideration of what social value society gains from a product or process.

A.6 General guidelines

OECD Guidelines for Multinational Enterprises [2]

The OECD Guidelines are considered to be principles of corporate governance, focusing on the disclosure of social and environmental issues for multinational enterprises. The Guidelines aim to ensure that the operations of enterprises are in line with government policies, and thereby strengthen the basis of mutual confidence between enterprises and the societies in which they operate. The Guidelines will help improve the foreign investment climate and enhance the contribution to sustainable development made by multinational enterprises. Businesses are expected to contribute to economic, social and environmental progress.

Business in the Community: The Marketplace Responsibility Principles [3]

The Principles are designed to act as a framework to enable companies to assess their marketplace strategies. The principles provide a structure to identify the main corporate responsibility issues with customers, suppliers and governments as well, as helping to assess the impacts of products and services. The Principles mirror the nine criteria of the European Foundation for Quality Management Excellence Model (see http://www.efqm.org/en/tabid/392/default.aspx).

ILO Tripartite Declaration of Principles Concerning Multinational Enterprises (MNEs) and Social Policy [7]

The Tripartite Declaration of Principles are considered the ILO's key tool for promoting labour standards and principles in the corporate world. The principles offer guidelines to multinational enterprises, governments, and employers' and workers' organizations in such areas as employment, training, conditions of work and life, and industrial relations.

A.7 International models

The Global Reporting Initiative (GRI) G3 Guidelines [8]

The GRI 3 Guidelines provide a reporting framework and associated guidance for organizations to disclose their sustainability performance. The framework provides a common language in which an organization can choose to report its social performance and facilitate transparency and accountability. The initiative provides stakeholders with a universally-applicable, comparable framework from which to understand disclosed information. The Guidelines were designed by multiple stakeholders and there are supplements for specific industries and sectors.

International Finance Corporation Performance Standards on Social and Environmental Sustainability [5]

There are eight performance standards that clearly state the IFC's requirements applicable to all IFC projects. Requirements relate to integrated social environmental assessments, core labour standards, greenhouse gas emissions and community health and safety standards. Performance Standard 1 establishes the importance of integrated assessment, effective community engagement and the management of social and environmental performance throughout the life of a project. Performance Standards 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate.

A.8 International standards

AccountAbility AA1000

The AA1000 series are principles-based standards designed to help organizations become more accountable, responsible and sustainable. They address issues affecting governance, business models and organizational strategy, as well as providing operational guidance on sustainability assurance and stakeholder engagement. The standards have been designed to the integrated thinking required by the low carbon and green economy, and support integrated reporting and assurance.

The AA1000 series consists of three documents:

- the AA1000 Accountability Principles Standard;
- the AA1000 Assurance Standard; and
- the AA1000 Stakeholder Engagement Standard.

Social Accountability International: SA8000

The SA8000 Standard is an auditable certification standard based on international workplace norms of the International Labour Organisation (ILO) conventions, the Universal Declaration of Human Rights and the UN Convention on the Rights of the Child. Standard elements include:

- child labour;
- forced labour;
- health and safety;
- freedom of association and the right to collective bargaining;
- discrimination;
- discipline;
- working hours;
- compensations; and
- management systems.

Ethical Trading Initiative (ETI) Base Code [9]

The ETI Base Code is an internationally recognized code of labour practice based on key ILO conventions:

- employment freely chosen;
- freedom of association and the right to collective bargaining;
- safe and hygienic working conditions;
- child labour is not used;
- payment of living wages;
- working hours are not excessive;
- discrimination is not practised;
- provision of regular employment;
- no harsh or inhumane treatment is allowed.

Though not in itself a certification system, members commit themselves to implementing the Code and are required to report annually on progress.

Annex B (informative) Environmental aspect of sustainability

B.1 General

The environmental aspect of sustainability is commonly perceived to be methodologically the most advanced of the three aspects, but environmental issues are so broad that the interpretation of priorities can be complex and require alignment with stakeholder views.

The environmental aspect can have impacts and benefits at both a global/regional and local level.

The range of environmental impacts can include the following, among others.

a) Global level impacts
   1) Global warming potential (GWP)
   2) Stratospheric ozone depletion
   3) Human toxicity
   4) Acidification
   5) Eutrophication
   6) Ecotoxicity
   7) Land use
   8) Resource depletion and/or resource consumption
   9) Photochemical oxidation

b) Local level impacts
   1) Air quality
   2) Water quality
   3) Land quality
   4) Noise
   5) Transport
   6) Ecological
   7) Water use
   8) Waste and landfill usage
   9) Biodiversity

In order to support the decision-making process the main methods of assessing the environmental aspect of sustainability include the following.

i) Life cycle assessment (LCA) is a tool for adding together the potential environmental impacts throughout a material or product's life cycle. It deals well with quantification of global impacts, even though some of the impacts might be particular to a certain location/region.

ii) Environmental impact assessment (EIA) is typically used to assess local environmental impacts to air, water, land and ecology, and those arising from nuisance. This can be qualitative as well as quantitative, and depends on the sensitivity of local environmental receptors. In the EU the EIA Directive 85/337 EEC, as amended by 97/11/EC and 2003/35/EC [10], outlines a Europe-wide procedure for assessing the environmental impacts of major projects. Smaller-scale developments tend to be managed through national regulations.

When assessing the environmental aspect of sustainability the following ought to be considered.

- The sourcing of materials and the environmental implications along the supply chain, which include raw material extraction, manufacturing, assembly, recovery and recycling through to final disposal or depletion of material, including any intermediate transportation stages.
- The environmental contribution of the use phase of a product or product system, and how the materials selection can impact on this.
- The consequential environmental effects on the availability of materials, which can also have implications for the efficiency with which materials are used and applied and also for potential strategies for materials recovery, e.g. reuse and recycling.

The environmental impacts of any material can be considered in terms of upstream impacts, i.e. sourcing of materials and manufacture, in-use application, and the potential downstream end-of-life. These are described individually in **B.2** to **B.5**.

B.2 Sourcing of materials

It is important to consider environmental impacts from upstream processing and acquisition of materials. The information required is often presented as a "cradle-to-gate" value, including manufacture.

The locality or provenance of a material can have a large environmental impact due to transportation requirements. The impact is affected by the mode used and its efficiency, rather than simply the mileage. Materials transported by efficient large scale oceanic shipping, for example, are often burdened with a higher impact from port-to-site trucking. This impact ought, however, to be considered in the context of the material's full environmental impact.

Specifically with reference to the GWP of renewable materials, consideration ought to be given to both the beneficial aspects of carbon sequestration in the materials and associated impacts due to the carbon balance in soils occurring from recent land use change.

Environmental information might also be available about the impact of the material's extraction from mining or growing. This can detail the effect on surrounding flora and fauna and any conservation measures relating to bio-diversity that have been put in place.

Where a material is sought from a secondary and/or recycled source this material could carry the environmental burden of any recycling processes and also, depending on the methodology, some of the impact of the material's initial sourcing and manufacture. This will depend on whether the previous life cycle is allocated wholly to the material's previous use or whether this is shared with the new life cycle. It ought to be noted that alternative methodologies drive different behaviours; specifically, either the collection of recycled material as mature recycling routes develop or the use of recycled material that would otherwise go to waste. This is a complex issue that can have a large bearing on how the overall impact is calculated.

There are three concepts around material sourcing.

a) Non-renewable materials are those for which the energy and raw materials invested in their production are also lost when the materials' availability to society is lost at the end of their lifetimes. This could be due to going to landfill, incineration or other means.

b) Permanently available materials are those for which efforts are made to retain for use in society the energy and raw materials invested in their production at the end of the product life, either through reuse or recycling, with no loss of quality no matter how many times the material is recycled.

c) Renewable materials are those for which the energy and raw materials invested in their production come from a renewable source. At the end of their lifetimes the materials could either be lost to society or retained.

B.3 Manufacture of materials

The transformation of materials into components or products generally requires the use of energy and the consumption of other materials/substances. The environmental impacts of these inputs need to be considered. This is often combined with the material sourcing data to provide cradle-to-gate values for the final product. Due to the energy requirements of this process the energy source, along with process efficiency, will affect the environmental impact.

With regards to efficiency, consideration ought also to be given to the effect of future scale-ups of new or novel technologies that have not yet made use of the economies of scale.

In general, impacts associated with the infrastructure and manufacturing tools required to make the product generally have little bearing on the product impact as the burden is commonly spread over many years of production and large volumes of products. However, a sensitivity check ought to be carried out to confirm this, and the local environmental impacts of the associated buildings or factory could be important.

B.4 Application of materials

When assessing the environmental impact of materials in individual products and applications, the in-use environmental aspects of the product need to be assessed.

During the use phase it is generally not the materials but the use of the product containing them that causes the environmental impact.

The use of a product can cause an environmental impact, but the choice of a particular material could reduce or increase this impact. This needs to be balanced against the impacts at other stages of the life cycle to obtain a holistic view.

Again, global and local environmental impacts, and the benefits of a product application, ought to be considered at this stage.

There might be some less obvious benefits of material choice for a product, such as quality and longevity, allowing a longer product lifespan, and thereby negating the need for replacement. This could, in turn, reduce overall impact when the whole life cycle is considered.

B.5 End-of-life and reuse

Sustainable design ought to take into account what is going to happen to a product at the end-of-life. This is driven by government, economics and stakeholders. For a product development there ought to be a strategy for managing the cost-effective treatment of the product at the end-of-life. This ought to influence both the design and the materials that are used in the product. How these materials are reused, recovered or disposed of ought to be aligned to the waste hierarchy. The first level of end-of-life ought to be reuse or remanufacture of the product itself; following that, the product ought to be designed for disassembly to allow reuse or recycling of the components/materials contained in that product; and the last resort ought to be to ensure that the appropriate waste disposal route is chosen.

In order to assess the environmental impacts of end-of-life decisions, the value of recycling or reuse needs to be understood at material level, both pre- and post-product use, and at product level.

In order to make decisions about end-of-life, robust data need to be collected and consistent methodologies applied.

Among possible end-of-life outcomes, materials with a high economic end-of-life value ought to have mature and well-defined recycling routes, although overriding economic factors might mean not all material is recycled. Materials with a low economic end-of-life value may be sent to landfill as the easiest option, or they may, with forethought and planning, be reclaimed for reuse.

However, the EU Waste Framework Directive 2008 [10] requires the application of the waste hierarchy as a priority order.

i) Waste prevention (reduction): buy and use less of a material (this is a consideration before initial purchase).

ii) Preparing for reuse: use the material again in its original form for the same purpose; the ease of reuse being the consideration, e.g. design for disassembly.

iii) Recycle: incorporate materials into new products.

iv) Other recovery (e.g. energy recovery): using materials for energy production, e.g. Energy from Waste schemes (EfW).

v) Disposal: by incineration (material is burned without energy capture) or discarding (the material is deposited in the natural environment, e.g. landfill).

Annex C (informative) Economic aspect of sustainability

C.1 General and geographical scope of economic impacts

A particular material choice will have an economic impact that could affect any of the following:

a) potential revenue for supply chain providers and manufacturers;

b) the local economy in which the material has influence;

c) the local economy in which the supply chain providers and manufacturers operate;

d) the local economy in which the materials and products are used, and any local economies later in the supply chain;

e) the local economy that is affected by the reuse, recycling or disposal of the materials;

f) the national and/or regional economy; and

g) the international economy.

While many economic impacts of material selection can be identified as elements of a particular part of the life cycle, some considerations relate to the entire life cycle, including:

1) any increases or decreases in total life cycle cost, including ongoing maintenance costs, replacement costs and intervals;

2) the likely impact of a particular materials selection on long-term profitability;

3) the cost of owning the material, balanced with the increase or decrease in value of the product when in use; and

4) a particular material selection resulting in costs internally that are otherwise borne by external parties.

There are a number of factors to take into account when establishing the economic impact of a particular material choice. These factors can be categorized as economic impacts relating to:

i) the whole life cycle of the material;

ii) procurement of the material;

iii) the material during processing;

iv) the material while in use; and

v) the fate of the material at end-of-life.

It is important, when assessing the total cost of ownership (see **C.3**) relating to a particular materials choice, that this is not confused with acquisition cost. There is evidence that this confusion occurs, as the acquisition costs can be seen as the initial project costs.

A useful way of approaching life cycle costs (see **C.3**) is to make an assessment of the total project cost, which is the sum of the acquisition cost, facility management cost and the cost of disposal. Facility management costs can often be many times greater than the acquisition costs, and are thus significant. Disposal costs are becoming more significant since the pressure on landfill space is increasing and regulatory pressures are making certain end-of-life options economically unattractive.

Each impact ought to be applied to each of the different geographical scenarios to establish the likely economic impacts on the organization itself, the various local economies affected, the regional/national economy and the international economy.

A number of concepts and tools can be used to establish the risks to economic sustainability relating to the use of the materials options. These include:

- externalities (**C.2**);
- life cycle costing/total costs of ownership (**C.3**); and
- materials cost flow accounting (**C.4**).

C.2 Externalities

Externalities are costs or benefits incurred by any party that are not transmitted through prices, where the party affected does not agree to the action giving rise to the cost or benefit. Some negative externalities can be attributed to market failure, meaning the price mechanism does not act to allocate the costs efficiently. An organization that does not take into account the existence of negative externalities runs the risk of these leading to external events that put the economic well-being of the organization in doubt.

Markets, as well as individual organizations, can also fail when governments intervene to protect their economies from future resource scarcity. For example, national governments have banned the export of certain materials to protect domestic security. These actions can have a significant impact on other economies and the availability (and cost) of those materials.

There is a complex interchange between a wide range of economic factors that contribute to an increase, or otherwise, in the economic value of manufactured goods. These externalities can arise in a number of different ways.

Increasing the value of manufactured goods requires input from a number of social and environmental sources. For example, materials such as aluminium and petrochemicals can be turned into manufactured goods. Through processing and manufacturing, use and disposal, certain environmental costs can be incurred. The economic value of the manufactured capital produced by the material might well be enhanced by the route chosen, but this could be at an unacceptable cost to the environment. The increased economic value of the goods could also enhance, or detract from, the welfare of employees affected by the choice of material and the communities in which they are based.

Examples of negative externalities relating to materials selection and use include:

a) environmental costs borne by the taxpayer to clean up a contaminated industrial site;

b) choice of a particular material over another leading to effects in the local economy affected by the loss of a major customer, such as unemployment;

c) health and safety costs when choice of a particular material leads to injury or illness; and

d) over-abstraction of water by an industrial plant depriving local communities of drinking water, or over-abstraction from a coastal aquifer causing salinization of the local water supply; in both these cases the costs are borne by the local communities and not by the company that abstracted the water.

Examples of positive externalities relating to materials selection and use include:

1) choice of a particular material leading to better educational opportunities in the local economy from which the material is procured, due to enhanced economic well-being in the area; and

2) choice of a particular material leading to a reduction in the amount of energy used in manufacture, leading to increased profits and, in turn, improvement in the organization's pension fund, meaning retired employees have increased economic security in old age.

It is important that the decision makers do not simply concentrate on economic impacts that are reflected in price changes, but also take into account externalities where the organization itself might not perceive a cost or benefit, but could create problems that reduce the sustainability of the organization. These externalities could affect the environment, people and communities. The organization ought to ensure that, when sourcing, manufacturing, using and considering end-of-life options for the material, such impacts are considered and reported.

C.3 Life cycle costing

The life cycle cost (LCC) of a material relates to the total cost of its extraction, manufacture, use, reuse, recovery, recycling, disposal or depletion. The LCC of a product relates to the total cost of ownership over the lifetime of a particular asset. These costs include:

a) financial costs;

b) environmental and social costs, with a quantification of the numerical values of these costs; and

c) an estimation of planning, design, construction and acquisition, operations, maintenance, renewal and rehabilitation, depreciation and cost of finance, and replacement or disposal.

A generic guide to LCC is given in BS 3811, BS 3843 and PAS 55.

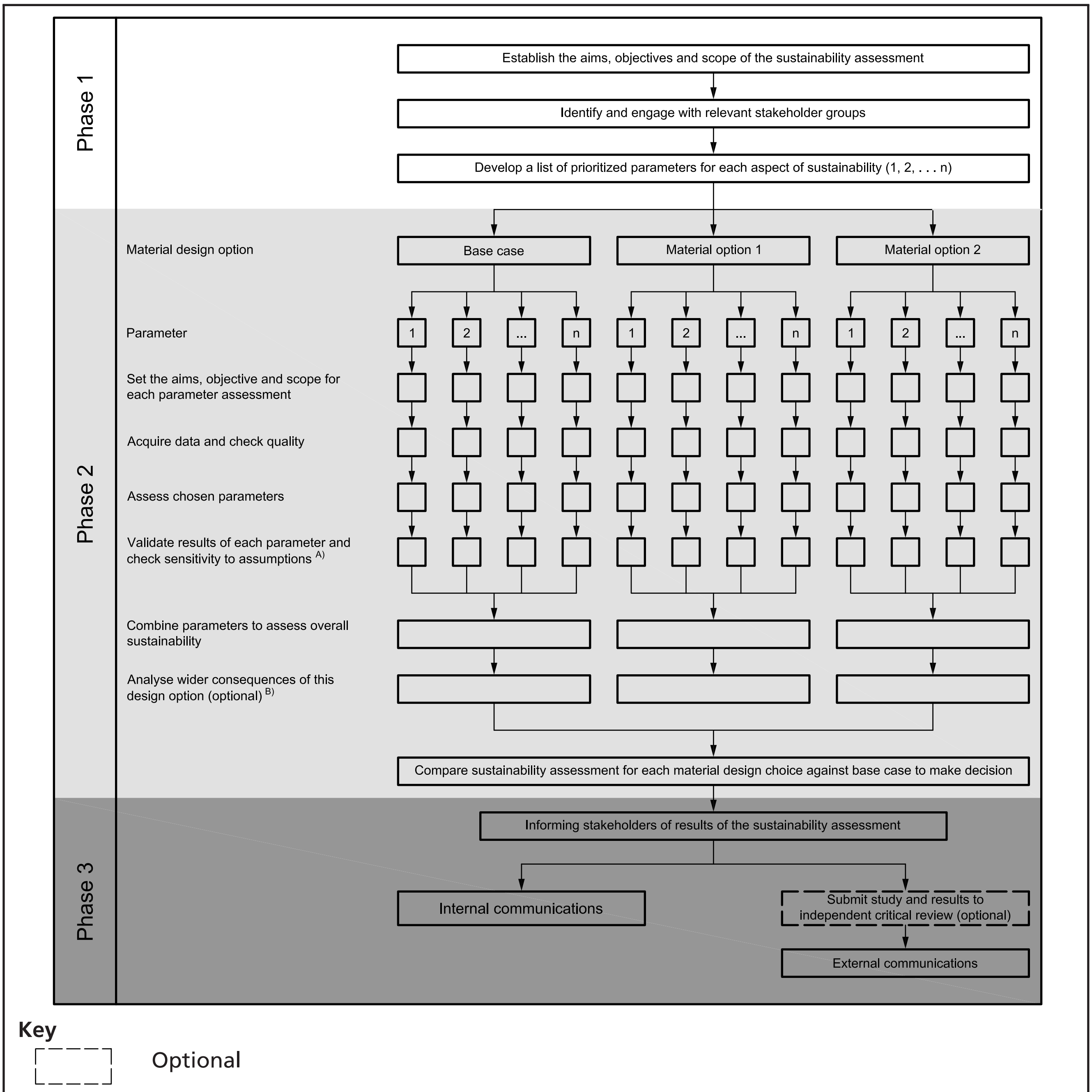
Sector-specific methods are provided in PD 156865, BS ISO 15686-5 and BS EN ISO 15663-1.

C.4 Materials flow cost accounting

Material flow cost accounting (MFCA) is a tool that enables an organization to account for movement and waste throughout the life cycle of a material, and is intended for internal use within the organization. This enables the organization to characterize the materials flows and processes undertaken by its resources, and helps to establish greater efficiencies and cost savings. ISO 14051 (in preparation) will offer a common platform for MFCA by providing a general framework. This methodology will be applicable to all organizations, regardless of their scales, types, locations, structures, activities, products and services.

Annex D (informative) Sustainability assessment process

Figure D.1 **Sustainability assessment process**



A) This might result in a reassessment of the aims, objective and scope for each parameter assessment and the acquisition of further/new data.

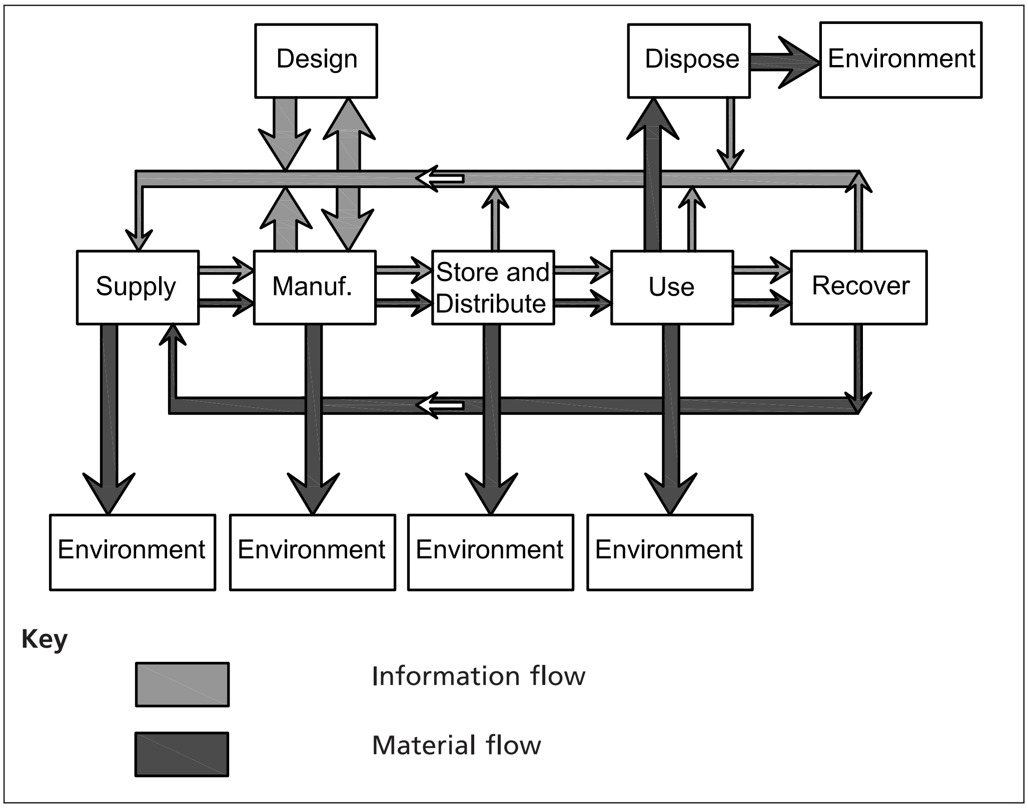
B) This involves assessing possible the possible impacts of the material design choice on market change scenarios, which might prompt re-evaluation of the significance of each parameter in the sustainability assessment.

Annex E (informative) Information management for the sustainable use of materials

E.1 The communication of technical information

Throughout the life cycle of a product there is a communication of technical information, in the form of engineering data (see Figure E.1), in parallel with the progress of the product through all of the stages of the product life cycle (design, manufacture, storage, distribution, use, recovery, etc). The availability of complete information about a product at the end of its life is likely to increase its value because this information will make it easier to reuse or re-manufacture the product and possibly extend the use of its material content.

Figure E.1 **Communication of material and information between the processes in the life cycle of a product**



Engineering information about a product ought therefore to be regarded with the same importance as the product itself.

Engineering data are created and processed in software systems and the flow of information, represented by data, through the stages of the life cycle will require the transfer of data between many different systems, with many different methods of working. Every software system has its own, unique internal method of representing the data it processes, and this form of the product information cannot be processed directly by alternative systems that have different internal representations. Communication of engineering data to different software systems is therefore not possible without some method of ensuring that the data representation in the message can be understood by the receiving system. The lifetime of engineering software systems is often less than the lifetime of many products. There is, therefore, a strong requirement to ensure that, if the product data are to be retained in computer-processable form, they will still be understandable in this form many years after the computer system in which they originated is obsolete or no longer available.

The sustainable use of materials therefore requires the sustainable management of digital engineering product information throughout the product life cycle.

The sustainable management of digital engineering product information requires two technologies to ensure that the information can still be accessed and understandable at the end of the product life:

a) the information needs to be in a standardized, computer-understandable representation of data that is independent from proprietary software; and

b) the data need to be conserved in a digital archival system.

E.2 Standardized representations for computerized engineering information

A solution for the standardized representation of engineering information has been developed by a global engineering project managed by ISO Technical Committee 184, *Automation and integration*, Sub-committee 4, *Industrial data* (ISO TC184/SC4). ISO TC184/SC4 has developed a technology (product data technology) based on a series of standards for the representation of engineering data in computer-processable form. The objective of these standards is to provide a neutral mechanism capable of describing product data throughout the life cycle of the product, independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange between different systems, but also as a basis for implementing and sharing product databases and for archiving.

The information representation is sustainable because the meaning of the information is retained separately from the data. To transfer information using these standards a computer system needs only one translator from its internal representation to the standard representation, and the receiving system only needs one translator from the standard version to its own internal form. These standards have been developed for many engineering situations and are used in many industry sectors. The following are examples of standards relevant to the conservation of products and materials.

- ISO 10303-203: 3D CAD data representation and exchange – representation of product shape;
- ISO 10303-214: design and assembly of automobiles – representation of the design and assembly of any product;
- ISO 10303-209: design and manufacture of composite products – representation of the finite element analysis and internal structure of layered composite products;
- ISO 10303-223: design and manufacture of cast products – description of the shape and machining features of cast products;
- ISO 10303-239: product life cycle support – record of the changes and modifications made to complex products throughout the life cycle.

E.3 The standardized computer representation of material properties

ISO 10303-235 enables the complete description of the properties of a product, including the processes by which these properties were obtained. The description can include the chemical composition and the structure of the material. Properties can be represented as either single measure values or as a mathematical expression with the uncertainties and reliabilities of all types of values. ISO 10303-235 can represent any property of any product measured, or assigned, by any method and provides an audit trail from the value of a property used in design or manufacture to its origins in the testing or measurement processes. A description of ISO 10303-235 has been published in the CODATA Data Science Journal 2009 [11].

E.4 Framework for the preservation of digital information

The preservation of digital information is an issue for any organization that produces electronic records requiring a lifetime longer than the software that is used to create them. The aim is to be able to use the information in digital form in the future, even though the original system that created it is no longer available. Failure to address this issue could lead to the irretrievable loss of intellectual property.

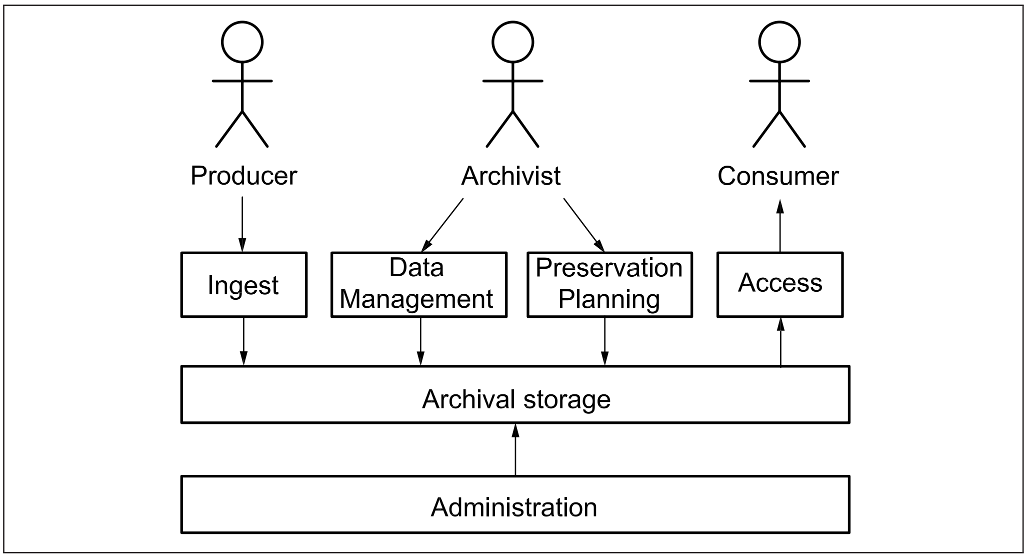
Standards for the conservation of digital information are in their infancy. However, ISO is encouraging the development of good practices and has endorsed the Reference Model for an Open Archival Information System (OAIS), developed by NASA. The Reference Model is standardized in ISO 14721:2003.

The OAIS model separates the archiving of digital information into the following six functions.

- Ingest: putting records into the archive, including the metadata to allow them to be found, extracted and used many years hence.
- Data management: the controlled editing and quality control of the data input into the archive.
- Storage: the physical storage of the records, the creation of an appropriate backup policy, regular migration to up-to-date media, etc.
- Access: finding records within the archive and disseminating them to appropriate consumers (this includes ensuring the security of the information and only disclosing it to authorized users).
- Preservation planning: ensuring that the contents of an archive remain more than just a meaningless stream of digital bits [the importance of standards such as ISO 10303-235 is that the meaning (semantics) of the information is conserved together with the data format (syntax)];
- Administration: the operation of the archive system, including its maintenance.

These six functional entities are illustrated schematically in Figure E.2.

Figure E.2 **Framework for the conservation of digital information**



Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 3811, *Glossary of terms used in terotechnology*

BS 3843, *Guide to terotechnology (the economic management of assets)*

BS 8900:2006, *Guidance for managing sustainable development*

BS EN ISO 9000:2005, Quality management systems – *Fundamentals and vocabulary*

BS EN ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines*

BS EN ISO 15663-1, *Petroleum and natural gas industries – Part 1: Life cycle costing – Methodology*

BS ISO 2382-2, *Data processing – Vocabulary – Part 2: Arithmetic and logic operations*

BS ISO 15686-5, *Buildings and constructed assets – Service life planning – Life cycle costing*

BS ISO 26000:2010, *Guidance on social responsibility*

ISO 10303-203, *Industrial automation systems and integration – Product data representation and exchange – Part 203: Application protocol: Configuration controlled design*

ISO 10303-209, *Industrial automation systems and integration – Product data representation and exchange – Part 209: Application protocol: Electronic assembly, interconnection, and packaging design*

ISO 10303-214, *Industrial automation systems and integration – Product data representation and exchange – Part 214: Application protocol: Core data for automotive mechanical design processes*

ISO 10303-223, *Industrial automation systems and integration – Product data representation and exchange – Part 223: Application protocol: Exchange of design and manufacturing product information for cast parts*

ISO 10303-235, *Industrial automation systems and integration – Product data representation and exchange – Part 235: Application protocol: Engineering properties for product design and verification*

ISO 10303-239, *Industrial automation systems and integration – Product data representation and exchange – Part 239: Application protocol: Product life cycle support*

ISO 14051, *Environmental management – Material flow cost accounting – General framework* (in preparation)

ISO 14721:2003, *Space data and information transfer systems – Open archival information systems – Reference model*

PAS 55, *Asset management – Specification for the optimized management of physical assets*

PD 156865, *Standardized method of life cycle costing for construction procurement – A supplement to BS ISO 15686-5. Buildings and constructed assets – Service life planning – Life cycle costing*

SA8000, *Social Accountability Standard* (http://www.sa-intl.org/_data/n_0001/resources/live/2008StdEnglishFinal.pdf)

AA1000, *AccountAbility Principles Standard* (http://www.accountability.org/images/content/0/7/074/AA1000APS%202008.pdf)

AA1000, *Assurance Standard* (http://www.accountability.org/images/content/0/5/056/AA1000AS%202008.pdf)

AA1000, *Stakeholder Engagement Standard* (http://www.accountability.org/images/content/3/6/362/AA1000SES%202010%20PRINT.PDF)

Other publications

[1] EUROPEAN COUNCIL AND PARLIAMENT. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Waste Framework Directive) (Text with EEA relevance) *OJ L 312, 22.11.2008, p. 3–30*.

[2] ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. Guidelines for Multinational Enterprises. Paris: OECD Publishing, 2008. (http://www.oecd.org/document/28/0,3343,EN_2649_34889_2397532_1_1_1_1,00.html).

[3] BUSINESS IN THE COMMUNITY. Marketplace Responsibility Principles. London: Business in the Community, 2008

(http://www.bitc.org.uk/resources/publications/marketplace_1.html**).**

[4] GLOBAL REPORTING INITIATIVE. GRI Sustainability Reporting Framework. Amsterdam: GRI. (http://www.globalreporting.org/ReportingFramework/ReportingFrameworkOverview/).

[5] INTERNATIONAL FINANCE CORPORATION. Performance Standards on Social and Environmental Sustainability. 2006 (http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards).

[6] UNITED NATIONS. Global Compact

[7] INTERNATIONAL LABOUR ORGANISATION. Tripartite Declaration of Principles Concerning Multinational Enterprises (MNEs) and Social Policy. Geneva: ILO, 2001.

(http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/normativeinstrument/kd00121.pdf).

[8] GLOBAL REPORTING INITIATIVE. G3 Sustainability Reporting Guidelines. Amsterdam: GRI

(http://www.globalreporting.org/ReportingFramework/G3Guidelines/#1).

[9] ETHICAL TRADING INITIATIVE. ETI Base Code (http://www.ethicaltrade.org/sites/default/files/resources/ETI%20Base%20Code%20-%20English_0.pdf).

[10] EUROPEAN COUNCIL AND PARLIAMENT. Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment 85/337/EEC. Reference: Official Journal NO. L 175, 05/07/1985 P. 0040 – 0048, as amended by Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. Official Journal NO. L 073, 14/03/1997 P. 0005, and Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC - Statement by the Commission. *Official Journal L 156, 25/06/2003 P. 0017 – 0025*.

[11] SWINDELLS, N. CODATA Data Science Journal 2009, vol. 8 PP. 190-200 (http://www.jstage.jst.go.jp/browse/dsj/8/0/_contents).

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