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10YFP Global Action for Sustainable Consumption and Production

Hotspots Analysis

An overarching methodological framework and guidance for product and sector level application

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Glossary of terms

Characterisation model: A model which describes the relationship between individual data points sometimes referred to as "inventory data" (e.g., consumption of resources, emissions, wastes, employment data, economic costs) and an impact or indicator (e.g., climate change, biodiversity, staff training and education, households in poverty). The characterisation model yields characterisation factors that are used as multiplication factors to convert inventory data to a single indicator result.

Data Quality: Characteristics of data such as age, technological, geographical and temporal representativeness, specificity and comprehensiveness that determine their ability to satisfy stated requirements.

Functional Unit: A measure of the function of the studied system to which inputs and outputs can be related.

Hotspot A life cycle stage, process or elementary flow which accounts for a significant proportion of the impact of the functional unit.

Hotspots Analysis: The rapid assimilation and analysis of a range of information sources, including life cycle based studies, market, and scientific research, expert opinion and stakeholder concerns. The outputs from this analysis can then be used to identify and prioritise potential actions around the most significant economic, environmental and social sustainability impacts or benefits associated with a specific country, city, industry sector, organization, product portfolio, product category or individual product or service. Hotspots analysis is often used as a pre-cursor to developing more detailed or granular sustainability information.

Life Cycle Assessment: Life Cycle Assessment (LCA) is a tool for the systematic evaluation of the environmental aspects of a product or service system through all stages of its life cycle.

Life Cycle Thinking: Life Cycle Thinking (LCT) is about going beyond the traditional focus on production site and manufacturing processes to include environmental, social and economic impacts of a product over its entire life cycle.

Methodological Framework: A Methodological Framework outlines key steps that are common to hotspots analysis at any scale of application (including but not limited to national, city, sectoral, product category, product specific). This framework is not a standard operating procedure but is aimed at embedding a certain level of consistency of approach to hotspots analysis, despite its application. This framework is also meant to be the basis for more specific guidance that will be developed for various levels of application.

Normalisation: The process by which impact assessment results are multiplied by factors that represent the overall impact per reference unit (e.g., a country, an average citizen). Normalised results express the relative shares of the impact(s) of the hotspots analysis in terms of the total contributions to each impact category per reference unit.

Sensitivity analysis: A technique to determine how different values of an independent variable influence the results of a hotspots analysis. This can be used to provide an assessment of confidence in the results, in this case that a hotspot has / has not been identified.

Shall, should and may: This Guidance uses precise terminology and distinguishes between requirements and recommendations, (i.e., between the words 'shall', 'should' and 'may'). Terminology is based on ISO/TS 14072 and ISO 14044/ISO 14040, in that order. 'Shall' is only used when this strength of obligation is also required in the aforementioned standard documents, while 'should' is used to identify recommended elements that can be disregarded with proper justification. Finally, 'may' is used for other allowed elements or alternatives.

Stakeholders: The term stakeholders covers anyone who has a direct or indirect interest in the project or organization in question as they can affect or are affected by the activities that take place. Stakeholders include, amongst others, employees, customers, suppliers, communities, shareholders, governmental and non-governmental organizations. The definition of key stakeholders may vary, however, in this guidance key stakeholders are considered to be:

- Those most directly affected by the outcomes of the activities that take place. Other stakeholders would be those more indirectly affected by the outcomes or those whose interests define them as stakeholders, but who are not directly affected.
- Those likely to be able to contribute positively throughout the process given their experience or previous involvement with the sector/ product(s).
- Those who may potentially be a hindrance to action if they are not satisfied with the outcomes of the process.

Key stakeholders should be involved in the process at every stage, as opposed to a broader group of stakeholders who may be involved at a smaller number of defined points in the process where their input is relevant.

Uncertainty analysis: A systematic procedure to quantify the uncertainty introduced in the results of a life cycle inventory analysis due to the cumulative effects of model imprecision, input uncertainty and data variability (ISO14040:2006)

Executive summary

The information-age has led to a proliferation of content, ranging from the assimilation and analytical challenges associated with 'big data' through to ever-increasing publication lists of research and innovation findings. The major challenge for businesses, policy-makers, academic researchers and consumers is deciding where and how to act to have the maximum impact. For any action a balance must be struck between speed of response and pragmatism and the need to be informed by reliable and trustworthy science-based evidence.

A growing number of different analytical disciplines are using a prioritisation method called 'hotspotting' or 'hotspots analysis'. It is being used to filter and distil often-large volumes of information to identify and prioritise hotspots for further investigation or action by industry, governments and other stakeholders. This may include piloting or implementing actions on the basis of the findings from the hotspots analysis.

Hotspots analysis is being used around the world to address significant[1] sustainability challenges by helping to provide focus in an era of information overload. Case studies are provided in this document.

When applied to Life Cycle Assessment, the benefits of hotspots analysis include ensuring:

- Focus on priority issues (e.g., waste, water, materials of concern)
- Focus on the right life cycle stage (e.g., material acquisition, manufacturing, use, end of life)
- Focus on the right actors (e.g., producers, manufacturers, suppliers, retailers, customers, government officials) to evaluate, influence and implement solutions
- Implications of trade-offs are understood
- Resources (e.g., time, money) can be effectively allocated to actions.

1 "Significant" in this framework is defined as "those that matter the most"

However, there is not currently a common global approach to hotspots analysis; nor has there been any effort to bring together or share best practice amongst those organisations or initiatives currently developing and using these methods. Nor is there any accepted guidance on how to translate and apply the results of hotspots analysis into meaningful sustainability information and insight for use by industry, governments and other stakeholders.

Recognising that this situation may result in a range of negative impacts, including a lack of consistency in methodological approach, difficulties in comparing the results of hotspots studies and the potential for conflicting sustainability information in the marketplace; the Life Cycle Initiative established a new Flagship Project to address these and other issues in 2013.

The principal objectives of this Flagship Project are:

- To produce a common methodological framework and global guidance for sustainability hotspots analysis;
- To produce a protocol for the appropriate use and communication of sustainability information derived from hotspots analysis.

This document has been prepared in response to the first of these objectives. The second objective was addressed through the development of the hotspots analysis communication guidance document titled "*Communicating hotspots: The effective use of sustainability information to drive action and improve performance*" that can be found on the Life Cycle Initiative website[2]. Both documents have been prepared jointly with the Consumer Information Programme of the 10 Year Framework of Programmes on Sustainable Consumption and Production (10YFP CI-SCP),[3] which supports the provision of quality information

2 http://lifecycleinitiative.org
3 http://www.scpclearinghouse.org/consumer-information-scp

on goods and services, to engage consumers in sustainable consumption and make it easier for them to act on their sustainability intentions.

The methodological framework provides information that is of use to those wishing to commission or carry out a hotspots analysis in a life cycle context. However, as a framework, rather than a standard, it provides a degree of flexibility to enable hotspots analysis to be used in differing circumstances. The specific directions given for different situations (e.g., assessment of hotspots for products, sectors) underscore that there is no 'one-size-fits-all' application of hotspots analysis. The framework aims to be equally applicable to businesses and other organisations (e.g., NGOs and academic institutions), governments as well as individual researchers.

It aims to provide a consistent approach to hotspots analysis. As an action-oriented methodology, the key outcome is to identify where the greatest opportunity for improvement against an impact occurs, rather than communicating a precisely quantified current impact. Other organisations (e.g., trade associations) may wish to offer more specific guidance on implementing hotspots analysis for their own sectors or circumstances based upon this framework.

This Methodological Framework aims to support those wishing to commission, conduct or use hotspots analysis studies, including stakeholders of the 10YFP in their efforts to prioritize their actions to accelerate a shift towards Sustainable Consumption and Production (SCP); the audience for the use of this framework includes practitioners

Figure ES1: Eight key steps common to Hotspots Analysis

and technical experts, stakeholders, developers and participants of hotspots analysis methodology development.

The skill set required for its use varies depending on the role and type of expertise being brought to the hotspots analysis identification process. However, it is expected that users have:

- Some familiarity with life cycle thinking and/or value chain thinking and methods;
- A reasonable understanding of the quantitative and/or qualitative impacts relevant to the scope of the hotspots analysis;
- Some knowledge of the interventions being considered or taking place in relation to the hotspots identified in the study;
- Some experience of systems thinking and the ability to make linkages (lateral/holistic thinking);
- Some experience of facilitating multi-stakeholder studies, including consensus building around study priorities and the actions to be taken to address any hotspots identified; and
- The ability to interpret and understand the findings from a hotspots analysis study and use this information to make well-informed decisions about the actions to be taken.

For those less familiar with these issues, the Methodological Framework provides the information, terminology and insights required to engage specialists or external experts as appropriate.

This Methodological Framework outlines the 8 key steps that are common to hotspots analysis (Figure ES1).

The steps follow the Deming Cycle (Plan, Do, Check, Act), like the Deming Cycle, hotspots analysis is an iterative approach. Though steps naturally form a sequence, there will be a need to revisit steps in the process to refine the analysis as it develops. For each step the outputs and key actions are detailed, as well as case studies to help frame each step.

This methodological framework is developed with a sustainability mindset. Hotspots analysis methodologies typically use a life cycle thinking approach, while providing the flexibility to take into consideration quantitative and qualitative data and information drawn from a range of sources (e.g., scientific research, market studies) and acknowledging the views and priorities of key stakeholders involved in or likely to be affected by the findings from a study. This allows for the results of the hotspots analysis to be comprehensive and collaborative with considerable dialogue and deliberation; and allowing for a focus on an action-orientated approach that reflects the hotspots identified and seeks to find the best ways to address them.

At the end of the report are presented two supplementary guidance modules which address issues which are specific to hotspots analysis carried out at a product and a sector level; they cover points of differentiation which apply to individual steps and should be used in conjunction with the overarching methodological framework.

1. Introduction

1.1 About the project / study

The project constitutes the second phase of the Life Cycle Initiative Flagship Project 3a - 'Hotspots Analysis and Sustainability Information' and contributes to the work plan of the Consumer Information Programme of the 10 Year Framework of Programmes on Sustainable Consumption and Production (10YFP). This report has been financed by the Life Cycle Initiative and the project "Advancing and measuring sustainable consumption and production (SCP) for a low-carbon economy in newly industrialised countries (Advance SCP)". The Advance SCP project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag.

Phase 1[4] of the project, which occurred between May and December 2014, involved the identification and mapping of existing hotspots studies, initiatives, methodologies and tools from around the world. For an overview of the methodology used for the Phase 1 study and a summary of the findings of the shortlisted Hotspots Analysis Methodologies see Annex 3.

Phase 2 of the project, which began in March 2016, builds on the research undertaken during Phase 1 and seeks to create an overarching methodological framework for hotspots analysis with more detailed guidance on how to conduct sector and product category hotspots analysis; and on the appropriate use and communication of sustainability information derived from these two levels of application. It should also be noted that Phase 2 started with an assessment of a further six hotspots analysis methodologies identified after Phase 1 was completed.

Ultimately Phase 2 has produced:

- A common methodological framework and global guidance for sustainability hotspots analysis;
- A protocol (guidance) for the appropriate use and communication of sustainability information derived from hotspots analysis.

These tools will be used to evaluate and, if possible, implement a range of options to bring together the findings from existing hotspots studies to provide a richer, global picture of sustainability hotspots in the economy and society.

4 http://www.lifecycleinitiative.org/wp-content/uploads/2014/12/UNEP-Hotspots-Mapping-Project-Final-Report-Phase-1.pdf

> While a tool on 'hotspots analysis' can be helpful in many regards, there is currently no common global approach to hotspots analysis; nor has there been any effort to bring together or share best practice amongst those organisations or initiatives currently developing these methods. Nor do any accepted principles or guidance exist on how to translate and apply the results of this hotspots analysis into meaningful sustainability information and insight for use by industry, governments and other stakeholders.
>
> Source: The International Life Cycle Board of the Life Cycle Initiative

1.2 Audience for this methodological framework and required skill set

This Methodological Framework aims to support those wishing to commission, conduct or use hotspots analysis studies, including the support of stakeholders of the 10YFP in their efforts to prioritize their actions to accelerate a shift towards Sustainable Consumption and Production (SCP); the audience for the use of this framework includes practitioners and technical experts, stakeholders, developers and participants of hotspots analysis methodology development. This could include the following:

- Chief Sustainability Officers, company sustainability/technical team members and senior decision-makers (e.g., enterprise risk management, innovation managers) who are seeking to focus their resources on key sustainability issues
- Senior officials of non-governmental organizations (NGOs) working specifically in the area of hotspots analysis and their expert team members
- Academics and researchers who work specifically on applied life cycle thinking, analysis and management approaches, including hotspots analysis
- Public policy-makers and government officials who are seeking to use hotspots analysis in evidence-based policy development and implementation as a way of prioritising their activities and resources
- Civil society bodies, professional institutes and industry trade associations who want to use hotspots analysis to build consensus around an agreed set of priority hotspots and the actions required to address them
- Subject matter experts and consultants who want to use hotspots analysis to support relevant stakeholders and clients

Skill Set

The skill set of the users of this methodological framework would vary depending on their role and type of expertise they bring to the hotspots analysis identification process. However, it is expected that users have:

- Some familiarity with life cycle thinking and/or value chain thinking and methods;
- A reasonable understanding of the quantitative and/or qualitative impacts relevant to the scope of the hotspots analysis (for all or some of the life cycle or value chain phases; key activities or processes relevant to the sector or product category in question);
- Some knowledge of some of the interventions being considered or taking place in relation to the hotspots identified in the study, in order to help identify and prioritise any interventions or actions to address the hotspots identified during the study;
- Some experience of systems thinking and the ability to make linkages (lateral/holistic thinking);
- Some experience of facilitating multi-stakeholder studies, including consensus building around study priorities and the actions to be taken to address any hotspots identified; and
- The ability to interpret and understand the findings from a hotspots analysis study and use this information to make well-informed decisions about the actions to be taken.

For those less familiar with these issues, the Methodological Framework provides the information, terminology and insights required to engage specialists or external experts as appropriate.

For some background and context to hotspots analysis, including distinctions between Hotspots Analysis and Life Cycle Assessment, see Annex 1.

1.3 Guiding principles

The design and application of this "overarching" Methodological Framework for conducting hotspots analysis shall be guided by the principles outlined below.

This Methodological framework shall provide guidance enabling hotspots analysis to be:

- **Usable**: The emphasis of hotspots analysis is providing information that can be acted upon.
- **Transparent**: It must be clear what the purpose of the analysis is, what the data sources are, how the analysis was undertaken and how the conclusions were reached. Confidentiality requirements and any gaps in the evidence should be identified.
- **Suitably/appropriately robust**: The analysis must be sufficiently robust to support the decisions that will be made based upon it.
- **Inclusive**: The analysis should ensure an open, participatory consultation with all interested stakeholders at relevant phases and shall be responsive to stakeholders needs (including cultural and geographical relevance; level of technical understanding and ability to make decisions and take action).
- **Comprehensive**: (range of metrics) The analysis should cover all relevant aspects of the life cycle relevant to the level of application (e.g., sector, product) for a range of indicators which may or may not be considered in traditional LCA approaches (e.g., biodiversity, ethical concerns).

Whilst analysis of changes over time and updates to hotspots analyses shall be self-consistent, the methodological framework provides flexibility. As comparison is not one of the purposes of hotspots analysis, different studies based on the same functional unit may take different approaches depending on the purpose of each study and specific circumstances (e.g., availability of data). Additionally, whilst developing this methodological framework, it was realised that communication of hotspots analysis also need a guidance. Thus, a hotspots analysis communication guidance document titled "*Communicating hotspots: The effective use of sustainability information to drive action and improve performance*" was developed and released as supplementary material. The hotspots analysis communication guidance document provides guidance on principles of communication and visualisation, including examples, and can be found on the Life Cycle Initiative website[5].

5 http://lifecycleinitiative.org

2. Hotspots Analysis: general step-by-step process

Figure 1: Methodological Framework process steps

The figure above outlines key steps that are common to hotspots analysis at any scale of application[6]. It reinforces the fact that the approach is in line with existing standards, which follow the Deming Cycle (Plan, Do, Check, Act). It is important to note from the outset that hotspots analysis is an iterative approach. Though steps naturally form a sequence, there will be a need to revisit steps in the process to refine the analysis as it develops.

The Framework uses precise terminology and distinguishes between requirements and recommendations (i.e., between the words 'shall', 'should' and 'may'). Terminology is based on ISO/TS 14072 and ISO 14044/ISO 14040, in that order. 'Shall' is only used when this strength of obligation is also required in the aforementioned standard documents, while 'should' is used to identify recommended elements that can be disregarded with proper justification. Finally, 'may' is used for other allowed elements or alternatives. As a framework, 'may' is used where options are presented for completing each step. It forms the basis for more specific guidance that could be developed for various levels of application.

Table 1 (p. 18) summarises the methodological steps in Hotspots Analysis and the associated key actions.

The pages that follow provide more details on each of the eight key process steps within the overarching Methodological Framework for hotspots analysis.

6 From national right down to product specific

Table 1 Methodological steps in Hotspots Analysis and associated key actions

Methodological Step	Key Actions
1. Define goal & scope	• Convene key stakeholders (internal or external) representing the sector / product / product category of interest. • Clearly understand information you are ultimately seeking and how you will use the results of the hotspots analysis. • Identify the goal and scope of your project to better delineate the impacts within scope and the likely sources of available data and information required to support the analysis.
2. Gather data, seek expert advice	• Utilize both quantitative and qualitative sources of data. • Quantitative data may come from a variety of sources including: full or partial life cycle assessments, primary and secondary life cycle data (proxies if required), scientific reports, product or sector specific studies, market analysis, etc. • Qualitative information could come from non-technical reports or narratives from technical reports where data is not accessible. Qualitative input and semi-quantitative data may also come directly from conversations with experts and key stakeholders. • Document these inputs within a spreadsheet or software program and generate the results in a simple graphical output or matrix that would facilitate an understanding of the most significant life cycle impacts and also more easily facilitate discussion and decision-making, especially among non-technical stakeholders.
3. Identify and validate hotspots	• Assemble key stakeholders, project team or Working Group and present results of the previous step. • Engage these stakeholders in a facilitated discussion that encompasses the degree to which each impact identified occurs at each life cycle or value chain phase of the product or product category; or as a result of specific sub-sector or sector-wide activities. • Solicit agreement from stakeholders on the degree of impact, and based on collective expertise and professional judgement – either validate or adjust the degree of impact based on the feasibility of affecting change or reducing impact (i.e., influence of stakeholders, technical and commercial considerations, timing, cost, environmental and social impact trade-offs, etc.)
4. Respond to data and stake-holder gaps	• During meeting with Working Group, identify any gaps that will potentially hinder actions to address one or more impacts identified for action and develop recommendations to address these gaps.
5. Identify and prioritize actions	• The heat-map or output of the hotspots analysis is not the “end game” but rather the “start of a conversation” among the key stakeholders that leads to prioritization and selection of remedial actions. • As part of conversation with key stakeholders or Working Group, identify and agree upon a list of initial actions based on the results of the hotspots analysis. • Clearly document any decisions on actions and priorities for reference.
6. Review and validate initial findings with key stakeholders & experts	• Provide written communication summarizing the results of your hotspots analysis, including proposed actions with all relevant stakeholders including those external to your Working Group. • Invite all stakeholders to provide written feedback including validation of results and proposed actions, as well as recommendations. • This phase of engagement may require a few weeks to allow stakeholders to have an in depth review and provide value-added feedback. It is important to plan for this time, and include perhaps an additional week or two buffer time in order to obtain feedback from a critical number of key stakeholders or perhaps those of particular concern (e.g., those who may potentially be a hindrance to action).
7. Disseminate findings	• Convene Working Group to present and review written feedback received from all stakeholders. • Discuss feasibility of each comment and determine whether it should be implemented, require further information or should be parked for future consideration/implantation. • Document agreed actions for each comment. • Disseminate findings more widely to those stakeholders outside of the Working Group who are affected by them; or able to implement or support impact reduction measures aimed at addressing identified hotspots.
8. Review and revisit hotspots analysis	• Periodically review with Working Group or key stakeholders, the hotspots analysis, utilizing new information or data to validate previously identified hotspots and actions. This review may also be used to identify new life cycle hotspots. • Any changes to hotspots analysis methodology, engagement of additional stakeholders, etc. should be evaluated and implemented.

STEP 1

Define, clarify and solicit agreement of the goal and scope

Output

The output of step 1 shall be a written goal and scope identifying the purpose of the hotspots analysis, the issues to be addressed, the boundaries of the analysis, the resources required and the approach to stakeholder engagement.

Key actions

Convene key stakeholders representing the sector/ product/ product category of interest.

Clearly understand information you are ultimately seeking and how you will use the results of the hotspots analysis.

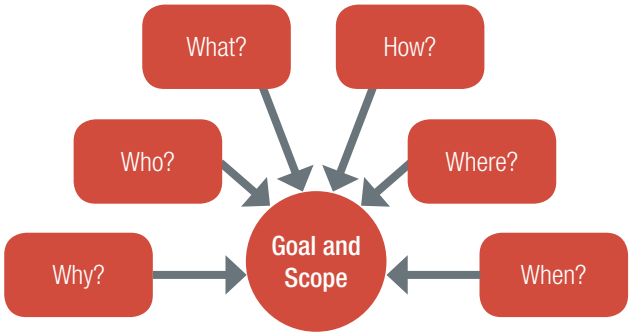


Figure 2: Defining, clarifying and soliciting agreement of the goal and scope

Identify the goal and scope of your project to better delineate the impacts within scope and the likely sources of available data and information required to support the analysis.

More detail

The goal and scope shall be defined, clarified and agreed utilizing, wherever possible, a life cycle approach, including identification of the target audience for the hotspots analysis (stakeholder mapping and engagement) and gaining a good understanding of their practical needs. Answers to the following questions (Figure 2) shall be included within the recorded goal and scope. These should be considered in an iterative, parallel manner rather than sequentially.

Why?

A clear goal and scope is required to ensure that from the outset all participants are clear on the purpose of the hotspots analysis. Why is the study being undertaken? What is the intended use and how will it be communicated to stakeholders? Do different stakeholders have different information and communications needs? For example, does the goal include: making subsequent improvements; informing

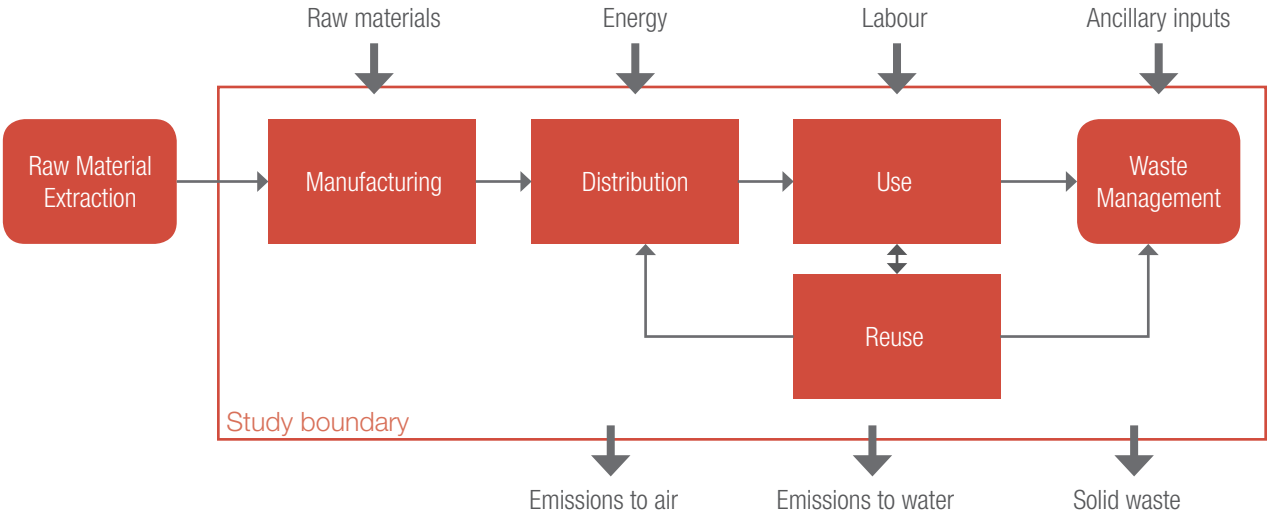


Figure 3: Example boundary diagram – product category level study

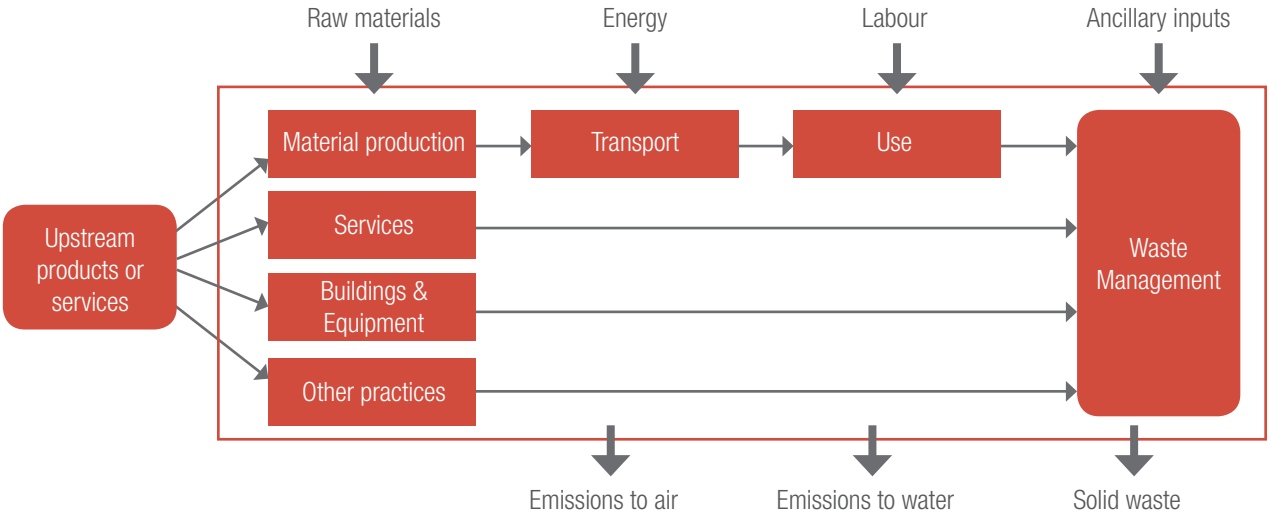


Figure 4: Example boundary diagram – sector-level study

CASE STUDY 1: PRODUCT SUSTAINABILITY FORUM

WRAP works with the food and drink sector via Courtauld 2025, a voluntary agreement with the clear goal of cutting the resources needed to provide our food and drink by one-fifth over ten years. Signatories and Governments of the UK have expressed a desire to reduce the environmental impact of products in the grocery sector. In order to better understand where the greatest impacts occurred the Product Sustainability Forum, a collaboration of organisations made up of grocery retailers and suppliers, academics, NGOs and UK Government representatives, was established.

In 2013 they published 'An initial assessment of the environmental impact of grocery products.' This met the requirement to identify and prioritise products and life cycle stages which contributed the most to greenhouse gas emissions, energy consumption, water use and waste. A range of practical materials to help the sector implement changes were subsequently produced in response to these.

Reference: http://www.wrap.org.uk/content/product-sustainability-forum

product design; purchasing practices; road testing solutions; providing the customer with guidance on how to use or dispose of a product responsibly; developing a sector improvement roadmap or standard, or; helping to narrow the scope of a more detailed subsequent study?

What?

This question aims to define the boundaries of the assessment. Clear boundaries are essential to ensure that appropriate information is obtained and used within the analysis, and a diagram should be included as a clear way of communicating the boundaries. Example boundary diagrams for product and sector level studies are provided in Figure 3 and Figure 4 respectively.

A life cycle approach should be taken where the hotspots analysis covers issues from raw material acquisition to the impact of the final consumer. This is to ensure that hotspots are not overlooked through omission. The level of analysis required will depend upon the goals of the study. For example, is the goal to get an approximate understanding of where significant impacts occur across the life cycle of a product, or to obtain accurate data specific to a particular supply chain? Is it to identify the organisations with the greatest impact or ability to affect change in a sector?

The goal shall also outline the criteria for which hotspots will be assessed. While this need not necessarily specify impact categories to begin with, it shall at least identify whether the study is considering social, environmental, ethical, governance or other issues and how these will be determined. These decisions will inform the type of quantified / qualitative information which will be required for the analysis, which may or may not align with a traditional LCA approach. Subsequently, the impact categories and assessment methods shall be agreed – a number of methods that can be used for the identification of impact categories are explored below. Users should look to draw up a "long list" of impact categories using some or all of the methods described below, before prioritising these based on input from a group of selected relevant stakeholders.

Impact Categories

The methodological framework does not identify how impact categories may be defined, or how inventory data[7] may be translated into impacts. Many texts on Life Cycle Impact Assessment cover commonly used indicators, such as global warming potential and water footprint. However, for many issues, such as biodiversity or land use change, there is no commonly agreed method. It is likely that in such cases the hotspots analysis will be qualitative or criteria will be specific to that study. Users should also be aware of the Life Cycle Initiative's on-going work on Environmental Life Cycle Impact Assessment Indicators (Flagship Project 1b[8]) is aiming to harmonise and improve methods in some of these areas, including biodiversity, human health and resource consumption.

Examples of environmental, social and economic indicators used in LCA and their definitions can be found in Dreyer et al (2010) Ekener-Petersen and Finnveden (2012) and Goedkoop et al (2009).

For social, economic or governance indicators not commonly included in LCA or where no single accepted methodology or indicator exists for a particular aspect, users may consider taking inspiration from methodologies identified in phase 1 of this project. These are summarised in Annex 3, with many of these methodologies covering a range of environmental, social, economic and governance impacts. At the sector level, the Sustainability Index for North American Public Gardens and the FAO's Sustainability Assessment of Food and Agriculture Systems include indicators across all four areas. For products, a number of methodologies identified include social, economic or governance indicators in addition to environmental indicators. Users can also consider using existing reporting standards such as Global Reporting Initiative to identify potentially relevant impacts.

Impact categories may be selected and prioritised through a number of different methods. These include:

7 Inventory data refers to the raw unweighted data gathered during the project. For environmental aspects this would include all the resources consumed (e.g., minerals, water, biological, land resources) and emissions and wastes generated. For social aspects, inventory data would include survey responses or raw data on employment, equality, training, accessibility etc. This inventory data is translated into impacts through a mix of characterisation, prioritisation and weighting depending on the methods involved.

8 http://www.lifecycleinitiative.org/activities/phase-iii/global-guidance-on-environmental-life-cycle-impact-assessment-indicators/

Distance to target. Impact categories may be selected based on issues which have already been recognised as important in national policy, corporate commitments or other commitments, such as the global commitment to reducing greenhouse gas emissions arising from the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement. Hotspots may be identified within the context of these drivers of action. This may be applicable to qualitative and quantitative issues.

Materiality. This requires a focus on issues which are important to internal and external stakeholders (see *Who?*) and can be influenced. This definition of materiality is distinct from legal definitions. Materiality may involve a subjective selection of issues based on the prior knowledge and values of stakeholders, for example through a survey of residents adjacent to a facility or consumers. Consideration of materiality should refer back to the purpose of the analysis (e.g., regulatory compliance, product improvement) to ensure appropriate issues are considered. Through the analysis, it may transpire that such issues are not critical. It is nonetheless important that they are included to demonstrate the avoidance of bias in assessments and enable relevant conclusions to be drawn. This may be particularly useful in identifying the importance of issues which cannot otherwise be quantified.

Exploratory. An issue may have recently risen in prominence, and the commissioner of the hotspots analysis may want to understand their exposure to this. Depending on the maturity of knowledge on the topic this may also be more applicable to qualitative issues.

For further information

Dreyer, L. C., Hauschild, M. Z., Schierbeck, J. (2010) Characterisation of social impacts in LCA Part 1: Development of indicators for labour rights. The International Journal of Life Cycle Assessment 15:247–259.

Ekener-Petersen E., Finnveden G. (2012) Potential hotspots identified by social LCA–Part 1: A case study of a laptop computer. The International Journal of Life Cycle Assessment.

Goedkoop M.J., Heijungs R, Huijbregts M., De Schryver A.;Struijs J., Van Zelm R, (2009) ReCiPe 2008, A life cycle impact assessment method which comprises harmonised category indicators at the midpoint and the endpoint level; First edition Report I: Characterisation 6 January 2009, http://www.lcia-recipe.net

How?

At this stage the level of robustness should be agreed. The level of robustness will inform how the data is gathered, used and communicated; and any quality thresholds that must be passed to meet the goal of the study. Considerations in setting the level of robustness for the study include:

- Level of primary data collection required: For example a screening study to identify major hotspots might be based on publically available information. Conversely, a study aiming to track improvement in a company's products over time would be more likely to require more detailed primary information.
- Assumptions / simplifications to be made: What assumptions are being made and how might these affect the level of detail in the results e.g., using data for one product as a proxy for another
- What will be the approach where gaps exist: Could proxy data be used or should primary research be commissioned?

Scoping this out will then allow you to consider whether you have the appropriate skills to define these criteria and if not how these may be obtained (e.g., through training, partnerships, outreach). The user should engage with key technical stakeholders to establish the level of robustness required in the study as understanding these requirements will inform the best way of carrying out the analysis. This will then link to the discussion of "Who?" needs to be involved in the study.

To meet the objectives of the hotspots analysis, data quality criteria should be agreed for the assessment.

A data collection hierarchy should be established to prioritise efforts (e.g., public data, literature review, primary data, then personal communication, then unpublished corporate or government data). This will be informed by the goal and scope of the study. For example, if the objective is rapid screening then a literature review may be a starting point. However, if the objective is to understand a specific value chain primary data may be the starting point. Depending on the defined goal of the study, the types of information required may vary significantly. Potential data sources include:

- **Life Cycle Assessment Studies**. Life Cycle Assessment provides information on the relationship between a specified functional unit and specified environmental impacts. Studies carried out in line with international standards (e.g., ISO 14040) should give clear information linked to a clear functional unit. Subject to review, the findings of existing LCA studies may be transferable and provide sufficient information to enable hotspots to be identified.
- **Corporate Social Responsibility Reports**. Many organisations publish reports covering their environmental, social and ethical performance. Such reports may provide data which can be used in assessing hotspots, either on their own or in conjunction with reports from other organisations. Standards for sustainability reporting, developed by organisations such as the Global Reporting Initiative, can be used to assess the quality of the information available.
- **Economic Data**. Market/sales data can be helpful in establishing the quantities of goods and services that could be considered in defining a functional unit, and identifying subsequent data needs (e.g., Bill of Materials, purchasing data) to identify impacts from a life cycle perspective. Sector economic data may be available at the level of an organisation, trade association, region or nation through information collected by businesses, associations and national statistics bodies.
- **Input-Output Tables and Studies**. By linking economic flows with other flows (e.g., materials, greenhouse gas emissions, labour) environmentally – extended input output information can be used to identify hotspots and causal links through a supply chain. A number of models exist at global and national levels (e.g., GTAP) which describe such relationships.
- **Single Issue Studies**. For many impacts, information and data sources may exist which focus on that issue only. This may include work from academia and NGOs.

Where qualitative data sources are being used, the goal and scope should establish how this qualitative data is to be used – will some form of ranking or points system be used to convert the qualitative information into a quantitative metric and why has the suggested method been chosen?

It is sometimes worth questioning existing data structures and classifications as breakthrough insights often come from unpicking the established norms or thinking laterally. New data classifications or content introduced from different disciplines or sources can reveal valuable new perspectives. For example, it may become apparent that what at first appear to be very different consumer goods, product categories are all dependent on a specific raw material or ingredient (e.g., palm oil, timber, soy, beef), raising the profile of the raw material to a potential hotspot by virtue of the fact that it is being used across multiple products.

In some cases, data or information on key aspects may be missing. This is most frequently the case with "beyond LCA[9]" impacts, including socio-economic impacts, governance impacts or environmental impacts that are not driven by either resource consumption or emissions (e.g., biodiversity, land use). Potential data black-spots should be identified as early as possible, allowing for stakeholder outreach, surveys or additional research to be conducted to gather high-quality qualitative data. A further discussion on establishing a data hierarchy and managing data sources is presented below.

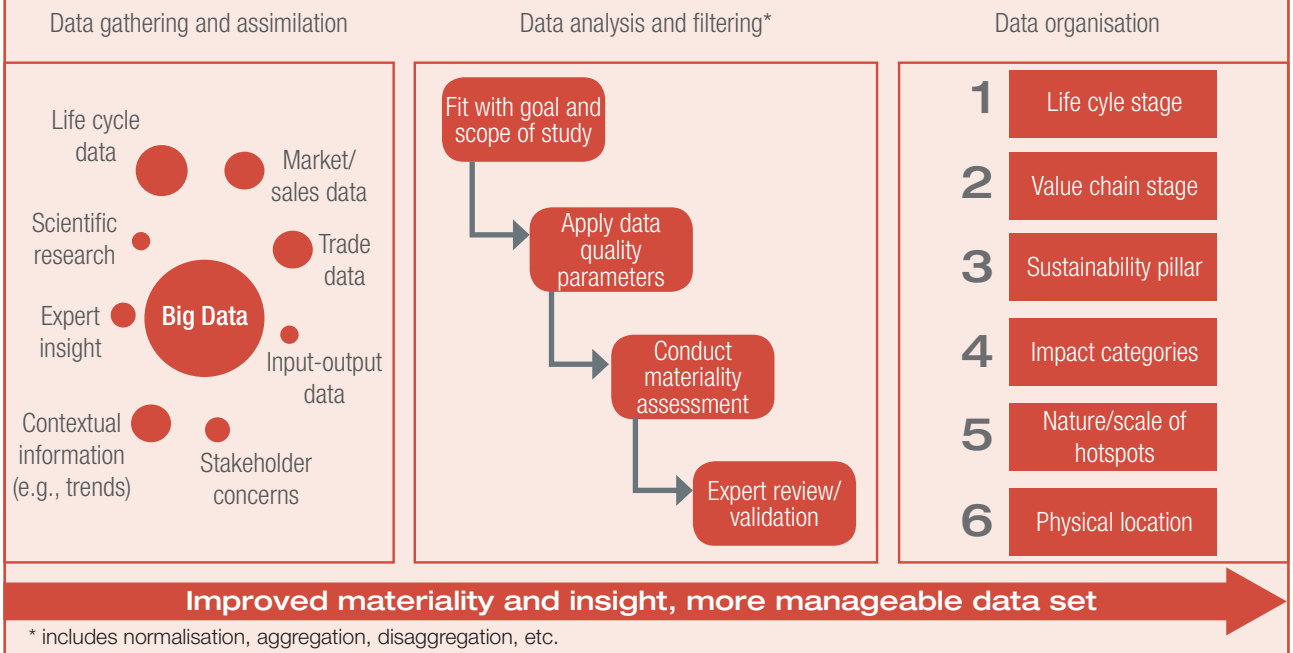
Who?

Roles in the hotspots analysis, including the intended audience, should be agreed on during

9 In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via Life Cycle Assessment (as encompassed by Environmental Life Cycle Assessment, Social Life Cycle Assessment and Life Cycle Costing). "Beyond LCA" should not be interpreted as better than or superior to Life Cycle Assessment. 2LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

Establishing a data hierarchy: cutting through "big data"

Hotspots analysis generally draws on data from a wide range of both quantitative and qualitative data sources. This often leads to a large set of data, which then needs to be organized and prioritized before the analysis can take place. A number of data sources are shown in Figure 5 below including LCA data, input-output data, trade or market common sources of data or information used in hotspots analysis data, scientific research, expert insight or input from stakeholders.



* includes normalisation, aggregation, disaggregation, etc.

Figure 5: Common sources of data or information used in Hotspots Analysis

the goal and scope phase. For each of the tasks within the hotspots analysis, the most relevant/ technically capable team member should be identified and assigned to that role. In many cases, multiple roles may be taken on by a single team member. However, the process of assigning roles within the project team helps to define the project structure and identify potential skills gaps within the project team.

Each working group should have a single person with oversight of the project who will be involved from beginning to end. This ensures continuity and adherence to the aims of the project and the methodology. They also act as a central contact point for other team members and stakeholders, giving background to those team members or stakeholders not involved at every stage and allowing questions on various aspects of the project to be directed to the relevant person.

Other roles to be defined within the project team include:

- **Stakeholder lead**: Responsible for identifying stakeholders and ensuring their involvement at the relevant stage or stages based on their capabilities, influence, etc.
- **Technical lead**: At the start of the project the technical lead ensures that the aims of the project, the study boundaries and the data requirements are consistent and relevant for the product category or sector under study. The technical lead's main role is in developing, prioritising and implementing a list of actions arising from the results of the hotspots analysis.
- **Indicators and Prioritisation lead**: Responsible for leading work on the identification and prioritisation of hotspots. This team member has responsibility for producing the final list of indicators taking into account all

of the input from project team members and relevant stakeholders.

- **Communication lead**: Responsible for overseeing all forms of communication arising from the hotspots analysis. The communication lead will be responsible for ensuring that these are consistent with the aims of the project, are suitable for the audience and are appropriate for the level of robustness of the study. The communication lead should be involved at project kick-off as this is where the audience should be identified. The communication lead will also ensure that the intended audience are satisfied with the outputs of the study insofar as is possible. Hotspots analyses that are not intended for public communication should still have a team member responsible for communicating the results to the intended audience of the project team and a closed group of relevant stakeholders.

When involving stakeholders it is important to consider which stakeholders should be engaged at which stage. This could include, for example, stakeholders who understand hotspots analysis and the system being studied (e.g., a product, sector) participating in scoping the study, and customers being involved in prioritising impacts for assessment and action. One suggested method is to create a table listing all stakeholders highlighting which stakeholders should be engaged at which stages and the desired level of engagement at each stage (e.g., involved in prioritising indicators versus providing feedback on social indicators selected).

Relevant stakeholders should be consulted on, but not limited to, the following issues:

- The primary and secondary goals of the study;
- The scale or level at which the study is to be conducted (e.g., national, city, sectoral, product, etc.);
- The study boundary (e.g., geographical scope/ location; production and consumption; industry sector / product categories / individual products to be covered; whole life cycle or a collaborative gate to gate approach; temporal boundary; etc.);
- The issues and impact categories / sub-categories to be covered by the study (i.e., a materiality assessment to identify the importance of issues to stakeholders, including environment, social, economic, governance, or mix of these) and associated characterisation models (where required/necessary);
- The type and nature of the outputs or deliverables for the study, including how the findings are likely to be used (e.g., to inform a sector standard, to provide the evidence for a voluntary agreement or industry collaboration);
- Other relevant businesses, organizations or key stakeholders that should be consulted or engaged during the course of the study. Stakeholders should be identified and prioritised using a systematic approach to yield a comprehensive and representative group. Stakeholders should represent a range of geographies, interests, communities and types of organisation. As such, stakeholder engagement should be accessible to both expert and non-expert participants (see further guidance on stakeholder identification and prioritisation in the glossary);
- Any other existing initiatives that are relevant to the study, including potential collaborators, topic or sector / product category experts;
- Any potential sources of data or information for use in the study; and
- Their willingness to participate in a multi-stakeholder steering group and working groups (e.g., methodology development; peer review; product category-specific activities; tool and resource development; communications, piloting / road-testing of solutions to address hotspots).

Where?

Hotspots analysis shall consider all the geographies in which impacts occur. This may require additional research or engagement with suppliers or expert stakeholders to establish which geographies are affected by the product category or sector being studied. This process helps to minimise the risk of failing to identify a potential geographical hotspot e.g., products passing through intermediate suppliers or a transport company whose employment practices could be classed under the Modern Slavery Act.

Common criticisms of some existing studies are a narrow focus on the local geography of the

CASE STUDY 2: STAKEHOLDER IDENTIFICATION WITHIN ISO14001: 2015 AND THE INTERNATIONAL FINANCE CORPORATION (IFC)

The 2015 revision to the standard for Environmental Management Systems introduces life cycle thinking for the first time, shifting the focus of compliance with the standard from site based activity to considering the whole value chain.

An early step in developing and implementing an Environmental Management System is to understand the context of the organisation. This involves understanding internal and external issues which are relevant to the organisation and affect its ability to achieve the intended outcomes of the Environmental Management System. The needs and expectations of interested parties should be determined and reviewed. Interested parties are identified as a "person or organization that can affect, be affected by, or perceive itself to be affected by a decision or activity". Some expectations will become compliance obligations (i.e., the organisation commits to meeting these expectations). In hotspots analysis, these would then be included in the goal and scope of the analysis.

There are a number of methods for stakeholder identification and prioritization, including those outlined for the ZOPP[1] (Zeroing in On People and Processes) project planning method and those outlined by the IFC in their stakeholder engagement handbook. In the IFC's approach, the stakeholder identification and analysis stage, begins with the following three steps:

1. **Identify those stakeholders directly and indirectly affected by the project**: This step establishes the project's area of influence, with the focus on the areas potentially impacted by the project or organisation. This analysis should include all geographies impacted directly and indirectly throughout the supply chain. From a hotspots analysis perspective, this means that the scope of the stakeholder engagement process should not be restricted to the primary geography of the organisation conducting the analysis. This process will begin to reveal the groups most likely to be affected by the project/organisation.
2. **Identify those whose "interests" determine them as stakeholders**: This step aims to capture any remaining stakeholders not captured in the previous step. These will generally be stakeholders who are not directly affected, but whose interests make them stakeholders. Examples here may include NGOs or other associations whose area of interest and activity may be influenced by the project/organisation.
3. **Be strategic and prioritize**: The first two stages of this process will likely yield a long list of stakeholders that cannot all be engaged with. These stakeholders should therefore be prioritised to yield a group that is representative and comprehensive, but also manageable. These stakeholders should be prioritised based on a number of relevant factors such as how adversely they might be affected, how vulnerable they may be, their interests and how these may influence the project. Areas of influence could include a stakeholders potential to enhance the project or contribute to identifying and scoping issues or which stakeholders might have detrimental effect on the project should they oppose it.

References

- ISO14001:2015 Environmental management systems -- Requirements with guidance for use. https://committee.iso.org/sites/tc207sc1/home/projects/published/iso-14001---environmental-manage.html
- Deutsche Gesellschaft für Technische Zusammenarbeit (1997) ZOPP Objectives-oriented Project Planning http://gametlibrary.worldbank.org/FILES/194_Guidelines%20for%20Project%20Planning%20using%20ZOPP%20-%20GTZ.pdf
- IFC (2007) Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets http://www.ifc.org/hb-stakeholderengagement

1 http://gametlibrary.worldbank.org/FILES/194_Guidelines%20for%20Project%20Planning%20using%20ZOPP%20-%20GTZ.pdf

study commissioner or the omission of potentially significant impacts in emerging economies due to a lack of data. A comprehensive assessment of the relevant geographies will help to establish the broader socio-political context in which the hotspots analysis is being conducted. For sectoral assessments it may be necessary to gain insight into the economic and social development role that sector has in the various geographies under study. For example, mechanisation of a traditionally manual industrial sector may reduce some environmental impacts, but may also result in significant unemployment within a sector.

Geography also informs which stakeholders should be engaged (see "Who?") and what the appropriate forms of engagement will be. Practitioners should be aware that methods commonly used to gather qualitative data in their home geography may not be appropriate for all cultures and geographies. Is a multiple choice Likert scale[10] likely to be understood and will stakeholders feel confident to answer honestly? Is the method being used likely to exclude stakeholders without internet access? Contacts in the local geography, such as universities (particularly social science departments), local NGOs or government departments can help to ensure that the methods being used to gather data are culturally appropriate.

10 A Likert scale asks users to rate the extent to which they agree or disagree with a statement. A five point Likert for example would generally include the following responses "strongly agree, agree, neutral, disagree and strongly disagree".

When?

Is the study a snapshot of a moment in time, or does it take a longer period of time into account? All information collected for the hotspots analysis should relate to the time period in question, for example the lifetime of a product. The goal and scope should also suggest a timeline and methodology for review of the study (see section 8 for further details on conducting reviews of hotspots analysis). The time period relevant for the study will be informed by a number of factors including:

- **Representativeness of individual years**: If there have been significant technological changes in recent times data from previous years may not be representative. Conversely, if a sector has experienced significant market fluctuations a single year of data may not be representative.
- **Development timescales**: What are the product development timescales and how do these inform the study period both in terms of data gathering and potential future reviews? At both a product and sector level, what is the market outlook or what are the timescales for current initiatives that may influence product/ sectoral development.

STEP 2

Gather data, seek expert insight, knowledge building and analysis

Output

The output of step 2 is agreement on how to collect, organize and analyse data in line with the goal and scope of the study.

Key actions

- Utilize both quantitative and qualitative sources of data.
  - » Quantitative data may come from a variety of sources including: full or partial life cycle assessments, primary (e.g., collected directly) and secondary (e.g., from database or literature) life cycle data (proxies if required), scientific reports, product or sector specific studies, market analysis, etc.
  - » Qualitative information could come from non-technical reports or narratives from technical reports where data is not accessible. Qualitative input may also come directly from conversations with experts and key stakeholders.
    - ° Document these inputs within a spreadsheet or software program and generate the results in a simple graphical output or matrix that would facilitate an understanding of the most significant life cycle impacts and also more easily facilitate discussion and decision-making, especially among non-technical stakeholders.

More detail

This will be an iterative process and may involve refinement to the goal and scope of the study. As determined in the goal and scope (*How?*), data gathering may include literature review (e.g., national or sectoral data-sets, existing footprinting studies and scientific research); expert insight (e.g., face-to-face meetings, online questionnaires) collecting primary data (e.g., market or sales data) or making assumptions / extrapolations (e.g., based on proxy data).

Analyses should use a combination of filters to cut off often large data sets to arrive at a prioritised set of data and information that highlights the key issues, aspects and impacts that the study ultimately focuses on. These filters include whether the data collected meets the goal and scope of the study, satisfies the data quality parameters, and provides useful insights.

The goal and scope should establish the data quality parameters for the study. These should also be taken into account when interpreting the results of the analysis, as data quality and uncertainty

will determine what are the most appropriate communication mechanisms for the analysis. Validation of data with expert stakeholders will ensure that the data used are appropriate for the goals of the study. Data not included in the final analysis may still be listed in any more detailed report or output as this can help the audience understand how the final dataset was derived and which data sources were considered.

Using the filters listed above can lead to a number of important insights. Firstly, quantitative life cycle data may not be the most appropriate data source in all cases, particularly where "beyond LCA[11]" impacts are being considered or where the boundaries of existing LCA/LCI datasets are not appropriately matched with those of the hotspots analysis being conducted. Secondly, it may identify data quality issues for resolution, and thirdly it may identify data is available with inconsistent boundaries.

Data needs to be organised and structured in a logical and consistent manner, and shall relate clearly to the unit of analysis. The recommendation is that this should be initially organised based on life cycle stages. The number of life cycle stages defined will determine how many hotspots are identified and may influence how hotspots are defined (see step 3 for guidance on defining and identifying hotspots). Table 2 shows the split of life cycle stages in 3 different approaches, with up to 8 stages identified.

Whilst permutations are possible, this approach is broadly applicable to sorting/filtering data.

It may be helpful to sort data by additional methods during the data gathering phase to help identify gaps and visualise data quality through a colour coded data table/matrix. The suggested hierarchy for organisation of data is as follows:

1. Life cycle stage[12]
2. Value chain stage[13]
3. Sustainability pillar
4. Impact categories
5. Nature/scale of hotspots
6. Physical location

Note that not all of the above will apply to every study. Therefore, if organising data by life cycle stage is not applicable, as may be the case for some sector level applications, value chain stage should be considered and so on.

Keeping everything in context

The interpretation and summarising of the body of research produced during a hotspots analysis

11 In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via Life Cycle Assessment (as encompassed by Environmental Life Cycle Assessment, Social Life Cycle Assessment and Life Cycle Costing). "Beyond LCA" should not be interpreted as better than or superior to Life Cycle Assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

12 The Life cycle stage is the point in the product life cycle within which a Hotspot has been identified

13 The Value chain stage highlights were a Hotspot is physically located

Table 2: The split of life cycle stages in 3 different approaches

WRAP	EU Organisation Environmental Footprint (OEF) and Product Environmental Footprint (PEF)	ISO14025 Environmental Product Declarations
5 Stages	**8 Stages**	Product Specific Requirements, typically covering **4 Stages:**
Raw Materials	Raw material acquisition and pre-processing	Production
Manufacturing	Capital goods (optional)	Transport
Packaging	Production of the main product	Customer use
Distribution	Production of ancillary materials	End of life
Use Stage including end of life	Product distribution and storage	
	Use stage (if in scope)	
	Transports/Logistics	
	End-of-life	

CASE STUDY 3: DATA GATHERING FOR A SECTOR. THE AMERICAN PUBLIC GARDENS ASSOCIATION.

Longwood Gardens and the American Public Gardens Association (APGA) utilized hotspots analysis to identify and prioritize input into the development of its Sustainability Index and Proven Practice Workbook for the public garden sector. To help determine the scope of activities, and the impact categories for evaluation in the hotspots analysis, Longwood Gardens and APGA convened a Peer Advisory Group (PAG) to provide input to agree these key parameters for the study. The PAG spent considerable time defining the scope and adjusting the methodology to make it relevant to their sector. Flexibility in methodological approach was key to the success of this effort.

Longwood Gardens, APGA and PAG members decided that given the scope and scale of operations in public gardens it was more efficient to use an online survey formatted to gather the data/information requirements for the impacts identified across the operations and activities typical to a public garden; as well as conduct some initial analysis of this data. Table 3 below shows the sustainability issues covered in the survey.

Environment	Social	Governance and Conduct
• Environmental Policy • Environmental Management Systems • Green Purchasing/ Procurement • Energy Efficiency and Alternative Energy of Operations • Climate Change (GHGs) • Emissions to Air (Non-GHG) • Emissions/ Discharge to Water • Water Use/ Efficiency • Waste Management (Solid, Non-hazardous) • Toxics/ Hazardous Waste Management • Material Use: Dematerialization/ Efficiency and Hazardous/ Toxics • Biodiversity/ Natural Resources Management • Environmental Impact of Product and Services • Environmental Value Chain Management	• Social Policy • Management System and Reporting System • Human Resource Investment • Employees: Salaries and Benefits • Employees: Working Conditions • Employees: Health and Safety • Local Communities: Health and Safety • Employees: Non-Discrimination/ Equal Opportunity • Employees: Child Labour • Employees: Forced Labour • Employees: Freedom of Association • Local Communities: Indigenous (Aboriginal) Peoples • Local Communities: Development • Products/ Service • Social Value Chain Management • Society and Global Community: Human Rights and Development	• High-level Commitment to Sustainability • Ethics • Governance and Accountability • Stakeholder Engagement **Financial** • Strategic Planning • Financial Reporting and Disclosure • Investor Relations • Investments • Risk Management • Internal and External Reporting Systems • Financial Planning and Analysis • Non-Financial Programs • Profitability • Balance Sheet Strength • Market Capitalization • Productivity • Economic Impact • Non-Financial Indicators • Suppliers

Table 3: Sustainability issues covered in the APGA on-line survey
Reference: https://publicgardens.org/sustainability-index

study can often provide the greatest insights. Whilst 'systems thinking' is often easier said than done, taking the time to step back and consider the full picture can prove invaluable and a useful precursor to identifying which aspects and impacts are likely to be significant enough to be classified as hotspots.

Uncertainty testing or mapping should be used as appropriate to understand the reasons behind different impact values or factors for the same products categories or sub-sectors. Uncertainty testing generally involves testing the range around key variables or looking at the potential extremes within a set of data.

Where no variables or ranges are available, uncertainty mapping may be used to qualitatively explore what potential uncertainties or quality issues may affect a dataset. This may take the form of a rating system or a series of yes/no questions that can be used to classify critical quality/coverage aspects of a dataset. Uncertainty testing/mapping leads to a better understanding of the key variables driving or mitigating impacts or the impact of gaps in evidence on the goals of the study. It also provides useful insight on areas requiring further research and improved data.

Two case studies are presented on p. 30 and p. 31. Case Study 3 from the American Public Gardens Association covers data gathering across a sector encompassing a diverse range of activities and consequently a large number of potential indicators and impact areas. Case Study 4 comes from the UN Environment Eco-Innovation project funded by the European Commission, a project which is using life cycle thinking to improve production and consumption patterns in developing and transition economies.

CASE STUDY 4: EUROPEAN COMMISSION- UN ENVIRONMENT ECO-INNOVATION PROJECT

In partnership with the European Commission (EC), UN Environment is currently implementing a four-year project to promote resource efficiency and eco-innovation. The project aims to change consumption and production patterns in developing and transition economies by encouraging businesses to reduce their environmental footprint. Identifying opportunities and challenges for a particular market requires data to be gathered and analysed concerning the life cycle of the products in that market and the contextual factors that may be influencing the market.

Developing a better understanding of life cycle of a market's products can be achieved through 'Life Cycle Thinking'. Life Cycle Thinking is a mostly qualitative approach to understand how our choices influence what happens at each of the stages of the life cycle of a product or service. Questions to consider include:

- Where and when are the most significant costs incurred across the life cycle of the product?
- What are the most significant resources (energy, materials and water) consumed throughout the product life cycle?
- Where are resources being wasted or underutilized?
- Where are there toxic chemicals used and how are they prevented from impacting the environment or human health?
- How does the product value chain impact on local stakeholders?
- Which stakeholders benefit from the product, and which are negatively impacted?
- How could greater value be derived from the product life cycle?

Reference: UNEP (2014) Eco-Innovation Manual
http://www.unep.org/resourceefficiency/Business/Eco-Innovation/TheEco-InnovationProject/Eco-innovationManual/tabid/1059803/Default.aspx

STEP 3

Identify and validate Hotspots

Output

The output of step 3 shall be the identification of hotspots associated with the unit of analysis.

Key actions

- Assemble key stakeholders or Working Group and present the initial findings from step 2.
- Engage these stakeholders in a facilitated discussion that encompasses the degree to which each impact identified occurs at each life cycle or value chain phase of the product or product category; or as a result of specific sub-sector or sector-wide activities.
- Solicit agreement from stakeholders on the degree of impact, and based on collective expertise and professional judgement – either validate or adjust the degree of impact based on the feasibility of affecting change or reducing impact (i.e., influence of stakeholders, technical and commercial considerations, timing, cost, environmental and social impact trade-offs, etc.)

More detail

The evidence collected in step 2 shall be used to build a picture of the likely issues and impact hotspots that will need to be addressed. Having identified and allocated impacts to each life cycle stage, there is then a need to either normalise the results or agree that each impact category will be assessed in isolation.

Normalisation. ISO 14044 (ISO 2006) advises that normalisation allows results to be expressed using a common reference impact. This supports the comparison between alternatives using reference numerical scores. The normalisation factors express the total impact occurring in a reference region for a certain impact category (e.g., climate change, eutrophication, etc.) within a reference year. For guidance in a European context, please see Benini et al (2014) Normalisation method and data for Environmental Footprints. This approach is suited to quantified impacts only.

Weighting and Materiality. Weighting is a more subjective step which can be applied to quantitative and qualitative impacts. It involves multiplying the (normalised) results of each of the impact categories with a weighting factor that expresses the relative importance of the impact category. This may be based on the importance (materiality) ascribed to an issue by stakeholders as part of establishing the goal and scope of the study. For example, stakeholders may be asked to prioritise

the issues important to them. This prioritisation could be used to inform the weighting of different issues.

Monetary Valuation. Monetary Valuation is a specific form of weighting applicable to quantitative and qualitative impacts. The environmental impacts identified in the hotspots analysis are dependent on natural resources and ecosystem services. These have associated costs and benefits. Some of these are reflected in market prices, such as the cost of energy or water use, but many are not. Quantifying these environmental costs and benefits financially is another way of prioritising hotspots, and could be used internally to inform capital allocation decisions or externally, for example as part of sustainability reporting. A range of techniques are available which can be applied to quantiative and qualitative issues (e.g., hedonic pricing). The Natural Capital Protocol, The Monetisation Club and draft ISO 14008 standard provides further guidance on this issue.

Having attributed impacts to each life cycle stage and normalised / weighted the impacts to allow them to be prioritised, hotspots can be defined. Two approaches may be used. These are illustrated in the figure below.

In the first approach a hotspot shall always be a percentage greater than if the impacts were evenly distributed across life cycle stages. So, if there are 5 life cycle stages, a hotspot should not be defined lower than 20% of the impact category, and if there are 7 stages, it should not be lower than 14%.

Where the hotspot has been identified based on qualitative information, it will not be possible to identify a hotspot with quantitative precision. To ensure that hotspots are covered, the analysis should therefore be confident that the majority of impacts (i.e., over 50%) are covered.

Depending upon the number of impact categories selected, the number of hotspots may vary. In step 5 the ability to address these will be considered, but whilst they may not all be addressed, this does not mean that their status as hotspots is affected.

Consideration should be given to how these can be most effectively communicated with stakeholders identified in step 1. This should include graphical representation alongside interpretation and narration on the findings. The preparation and refinement of videos, presentations, info-graphics or sector / product 'heat maps' should provide an overview of the hotspots identified in the study, the issues or impact categories associated with them and their location in the economy, sector, product lifecycle or value chain.

Hotspot	Warmspot	Cold Spot
A life cycle stage whose contribution to the impact category is greater than even distribution of that impact across the life cycle stages.	A life cycle stage whose contribution is approximately equivalent to an even distribution of the impact across the life cycle stages.	A life cycle stage whose contribution to any impact category is less than even distribution of that impact across the life cycle stages

Hotspot	Cold Spot
All life cycle stages collectively contributing more than 50% to any impact category.	All life cycle stages collectively contributing less than 50% to any impact category.

Figure 6: Options for identifying hotspots

CASE STUDY 5: IDENTIFYING AND VALIDATING HOTSPOTS THROUGH THE EU ENVIRONMENTAL FOOTPRINT INITIATIVE AND WRAP COURTAULD 2025

As part of the EU Environmental Footprint Pilot Process, hotspot identification serves the purpose of "warning" an organisation about the areas where they should focus their attention in order to improve the environmental performance of a product[1] or an organisation[2]. Hotspot identification may be used as an internal eco-design tool or for public communication. Where the process is internal, hotspots can be defined based on the inventory analysis. However, where the results are for public communication a more detailed approach is employed.

A hotspot can be identified at different levels of granularity: life cycle stage, process or elementary flow. In the context of PEF/OEF pilot phase methods a hotspot is defined as: (1) all life cycle stages, (2) all processes and (3) all elementary flows contributing at least 50% to any impact category before normalisation and weighting. The most relevant impact categories are also identified.

In addition to hotspots, most relevant stages, processes and flows are identified based on coverage of total impact. Eight life cycle stages are specified for a hotspots analysis.

Worked examples are provided which guide users of the Environmental Footprint methodology in how to identify hotspots at each level of detail.

WRAP and Courtauld 2025

Courtauld 2025 is a voluntary agreement to cut the resource needed to provide our food and drink by one-fifth over ten years. In understanding the impact of products, five life cycle stages have been identified and used consistently across all products. The top 50 products have been prioritised based on their contribution to materials flows in the sector, greenhouse gas emissions, energy use, water footprint and waste arising across their whole life cycle. For each product, a hotspot is considered to be any stage which contributes 25% or more to one of these environmental impacts. A secondary hotspot has also been identified where this contributes 15-25% of the overall impact of the product.

References

European Commission (2016) Guidance for the implementation of the EU Product Environmental Footprint (PEF) during the Environmental Footprint (EF) pilot phase Version 5.2 – February 2016 http://ec.europa.eu/environment/eussd/smgp/

European Commission (2016) Guidance for the implementation of the EU Organisation Environmental Footprint (OEF) during the Environmental Footprint (EF) Pilot Phase Version 4.0 – February 2016 http://ec.europa.eu/environment/eussd/smgp/

http://www.wrap.org.uk/psf

1 Product Environmental Footprint (PEF)
2 Organisation Environmental Footprint (OEF)

STEP 4

Responding to data and stakeholder gaps

Output

The output of step 4 shall be a consideration of the impact of gaps in data and stakeholders, and recommendations of whether these should be tolerated or acted upon.

Key actions

During meeting with project team, identify any gaps that will potentially hinder actions to address one or more impacts identified for action and develop recommendations to address these gaps.

More detail

Step 4 is part of an iterative process, reviewing steps 2 and 3. It is important to consider the significance of any data gaps, specifically whether hotspots have been misidentified due to a lack of data, or data of insufficient quality. There are three choices when faced with a gap:

- Agree that the gap is not significant and can be tolerated.
- Agree that the gap is significant and could affect the outcomes of the analysis and any subsequent action plan. A plan should be developed to bridge the gap. This may involve engaging with additional stakeholders, gathering further data, using proxy data or extrapolating from data.
- Agree to disagree. Where a gap exists through lack of participation from other organisations, it may be that it can only be acknowledged, even though it is potentially significant.

The degree of activity required for this step should be informed by the goal and scope; and by the resources (money, personnel and time) available. In the first instance, consideration should be given to filling data gaps. This may include, for example, supplementing secondary with primary data or vice-versa, or utilising data that did not meet the initial quality criteria if it is considered indicative of the likely magnitude of impacts. Where data is not available, consideration may then be given to expert judgement to assess the significance of the gap and potential implication on the hotspots identified. The identification of experts should refer back to step 1.

When using proxy data or expert judgment to provide a quantitative input, the sensitivity of the conclusions to this shall be tested. This shall be through sensitivity analysis, which involves applying differing values in place of the missing data and sense checking the level at which this

CASE STUDY 6: FOOD AND DRINK PRODUCTS

In an attempt to bridge data gaps for bio-based products, LCA practitioners can use either proxy data sets existing environmental data for apples to represent pears) or extrapolated data (e.g., derive new data for pears by modifying data for apples considering pear-specific production characteristics). Milà i Canals et al (2011) present a number of case studies that explore the challenges and consequences of using these two approaches. The use of proxy data sets is the quickest and easiest solution for bridging data gaps but also has the highest uncertainty. In contrast, data extrapolation methods may require extensive expert knowledge and are thus harder to use but give more robust results in bridging data gaps. They can also provide a sound basis for understanding variability in bio-based product data. If resources (time, budget, and expertise) are limited, the use of averaged proxy data may be an acceptable compromise for initial or screening assessments.

WRAP's 2013 publication 'An initial assessment of the environmental impact of grocery products' sought data on 230 food and drink, personal care and household products sold in the UK. However, cradle-to-retail data of sufficient quality were only available for 174 products. Data gaps were filled where possible through the use of proxy data (e.g., shampoo as a proxy for hair conditioner). Further gaps were filled in by using a worst-case estimation of 5 kg CO2e/kg for products sold in quantities less than 30 million kg per year. This threshold was chosen as 30 million kg per year represented less than 0.1% of total mass of grocery products sold (around 46,000 million kg per year). Therefore it was thought acceptable to use an estimated GHG emission factor in the absence of suitable data or proxy data. This left 13 products for which no suitable proxy data or worst-case estimation could be made. These products were clearly identified in the study report.

Bienge et al (2010) utilised Sustainability Hot Spot Analysis (SHSA) as a qualitative approach based on stakeholder involvement to integrate social and environmental dimensions along the entire value chain and to identify relevant aspects for a product specific sustainability management. The paper illustrates single steps and results of the SHSA for a case study application to the strawberry value chain. Data availability for ecological and social impact analysis at product level differs. Whereas the ecological assessment can usually be based on relatively well available scientific literature and LCA studies, social LCA results and scientific literature about social implications of products are rare. The SHSA therefore includes stakeholder evaluation and verification to ensure the robust, i.e., safe in terms of direction, sustainability assessment of products based on the experiences of the stakeholders and experts.

A range of quantified and qualitative indicators were identified and scored based upon their relevance and weighted, following the methodology developed by Wallbaum and Kummer (2006). External stakeholders and experts were consulted to critically review the results in terms of weighting and completion. As a result, nine environmental and 13 social hotspots are identified.

References

Katrin Bienge, Justus von Geibler and Michael Lettenmeier 'Sustainability Hot Spot Analysis: A streamlined lifecycle assessment towards sustainable food chains', Paper presented at the 9th European IFSA Symposium,4–7 July 2010, Vienna (Austria) http://ifsa.boku.ac.at/cms/fileadmin/Proceeding2010/2010_WS4.4_Bienge.pdf

Milà i Canals, L., Azapagic, A., Doka, G., Jefferies, D., King, H., Mutel, C., Nemecek, T., Roches, A., Sim, S., Stichnothe, H., Thoma, G. and Williams, A. (2011), Approaches for Addressing Life Cycle Assessment Data Gaps for Bio-based Products. Journal of Industrial Ecology, 15: 707–725. doi:10.1111/j.1530-9290.2011.00369.x

Wallbaum, H. and N. Kummer (2006) Entwicklung einer Hot-Spot-Analyse zur Identifizierung der Ressourcenintensitäten in Produktketten und ihre exemplarische Anwendung, Wuppertal Institut für Klima, Umwelt und Energie and triple innova.

WRAP (2013) An initial assessment of the environmental impact of grocery products http://www.wrap.org.uk/priorityproducts

affects the outcome of the analysis. For example, if the proxy data does not affect the outcome until it is varied by 50%, this may give more confidence that even though the proxy data did not meet initial quality criteria, this is unlikely to be a significant influence on the results. However, if the variation is small, it may be considered a significant gap which requires further action. This approach is distinct from uncertainty analysis, which seeks to quantify the level of uncertainty around data points.

Where expert judgement is used for a qualitative input, this shall be clearly communicated through the hotspots analysis. Consideration should be given to how bias towards the status quo can be avoided.

Where gaps remain, it may be that no action is taken to fill these, where they are deemed insignificant or unfeasible to fill. All gaps and their implications shall be clearly communicated to relevant stakeholders, as well as recommendations associated with the gap (i.e., whether further action is required to fill this – e.g., commissioning a new study to fill significant data gaps).

Where a gap is considered relevant to a hotspot, this may be flagged as a potential hotspot. The distinction between a hotspot identified through quantitative and qualitative means should be clearly made.

It is also essential to review the representation of stakeholders. Does the project team include stakeholders representing different sub-sectors within a sector, or different life cycle or value chain stages which are emerging as hotspots, or all three? Step 1 should be revisited and the best way of identifying and engaging with these groups identified. Whilst efforts should be made to engage with all appropriate stakeholders, it is acknowledged that this may be challenging for a variety of reasons. Where participation is not gained, this shall be recorded.

STEP 5

Identify and prioritize actions

Output

The output of step 5 shall be a shortlist of prioritised actions based on their impact and feasibility.

Key actions

- The heat-map or output of the hotspots analysis is not the “end game” but rather the “start of a conversation” among the key stakeholders that leads to prioritization and selection of remedial actions.
- As part of conversation with key stakeholders or project team, identify and agree upon a list of initial actions based on the results of the hotspots analysis.
- Clearly document any decisions on actions and priorities for reference.

More details

Having identified the hotspots and reviewed the stakeholders required to address them, the next step is to identify and prioritise actions to eliminate or reduce the impact of the hotspots. There are two important issues to recognise at this point. The first is that there may not be feasible options to address every hotspot. The second is that even after action has been taken, a hotspot may still be a hotspot. For example, in considering the water footprint of the food supply chain, water use in agriculture is likely to be a clear hotspot. However, it may be that the opportunity to reduce the water footprint is greater and more cost effective at another stage in the life cycle.

This does not devalue the process of identifying hotspots in any way. Rather, it allows life cycle stages to be prioritised for review and identification of actions, which may relate to other hotspots, or may even be stages not identified as hotspots. The hotspots should be further explored to identify the activities, processes or flows that drive them. Potential actions may be identified through a number of approaches.

Greater Depth of Analysis. To better understand a hotspot, and therefore the potential actions which could be taken, it may be necessary to further collect / disaggregate data by processes within the life cycle stage, and then by elementary flows (e.g., by manufacturing activity and then by material or energy entering or leaving the system). Where primary data has been used in the hotspots analysis, this may already be available.

Benchmarking. Benchmarking may be possible based on the unit of analysis or an element of it (e.g., impact of similar organisations of a sector) and best-in-class performance identified. Lessons can then be learned from this. Discourse with relevant stakeholders, including suppliers, retailers, technology providers, local communities and customers, may help to identify further options.

Scale of Activity. Potential actions may also exist at different scales. For example, some may be available to individual organisations, whilst others may require collaborative action across a sector, along a value chain or across sectors (e.g., bringing together government, academia business and individuals). Changes may be incremental in nature (e.g., an efficiency gain) or step changes (e.g., a different business model or a breakthrough technology).

Initially, a long list of options should be developed with differing levels of impact, cost, timescales and effectiveness. In developing and reviewing this long list with relevant stakeholders, the hotspots shall be clearly communicated to ensure that they are prioritised. The involvement of stakeholders is key to ensuring that actions draw on available knowledge or insights, and are not biased by lack of knowledge. Involving stakeholders will also allow for existing actions to be identified and lessons learned.

The criteria for shortlisting these shall link back to the goal and scope, and should be agreed with the relevant decision makers, who may be in different organisations. Key considerations in selecting actions are likely to include, but not be limited to, the size of the potential impact, how easy it is to address some or all of the impact, compliance with legal requirements, compliance with corporate commitments and value chain or reputational risk. Feasibility considerations may include technical feasibility and economic feasibility, expressed in either payback period, Net Present Value or Return On Investment. Monetary Valuation approaches to weighting the results of the hotspots analysis may therefore aid presentation to decision makers, though other approaches may be better suited to communicate with other stakeholders. Where social sustainability hotspots are identified during the course of a study, other approaches may also be appropriate – e.g., social return on investment (a systematic, principles-based analytic tool for measuring and accounting for a much broader concept of value (than conventional cost benefit analysis or economic return on investment), taking into account social, economic and environmental factors).

Figure 7: Moving from a long list of actions to a short list through participation of stakeholders

Where actions are identified which are best implemented by a stakeholder other than the commissioner of the Hotspots Analysis, further engagement may be required to make the case for this action. The actions may be reviewed collaboratively among stakeholders or in isolation by organisations that have been identified as best placed to bring about change. The evidence requirements to make the case for action with each stakeholder should be clearly identified, as the nature and depth of evidence required may vary.

As well as incurring costs, actions to address hotspots may yield savings, and also potentially offer a market opportunity. This should be part of the decision making process where relevant. In some cases, collaboration and the principle of creating shared value (co-investment in solutions and sharing of the benefits/returns on investment) will be essential, as the costs of taking action may fall to one part of the value chain whilst the benefits, in whole or part, accrue elsewhere.

The identified opportunities to address hotspots shall be reviewed and prioritised for action. The process for agreeing actions should be documented and the justification recorded. Actions identified may be trialled or applied at a large scale. Where actions are collaborative in nature, a shared action plan or guidance materials may be required to ensure broad participation. Plans for monitoring and reporting should also be put in place.

The organisations involved should agree with whom the progress will be communicated, and how. The separate hotspots analysis communications guidance developed alongside this methodological framework provides the fundamental principles for communication and visualisation that can be applied to any communications required throughout and following the completion of a study. At this stage, a well-documented and agreed upon process, reasons and triggers for shortlisting hotspots and actions allows for clarity in choosing actors to implement actions, and acts as a basis for revisiting hotspots and actions at a later stage (step 8). This step, when developed in a robust manner, acts as the basis for actions to be identified, prioritised and agreed with those best placed to affect change; and saves the time required to obtain consensus/ agreement on revisiting/ changing hotspots, actions and those responsible for implementing them.

CASE STUDY 7: PRIORITIZING ACTIONS THROUGH ISO14001: 2015

Significant environmental aspects represent where an organisation interacts with the environment, and can be seen as equivalent to hotspots, in that they are used to identify and prioritise a range of activities for improvement based upon their environmental impacts.

Having identified the significant environmental aspects of an organisation, the ISO 14001 standard then requires organisations to assess the risk associated with threats and opportunities and to take action to address these risks.

Objectives should be set in the context of the organisations' environmental policy, and based upon the organisations' significant environmental aspects, compliance obligations and risks associated with threats and opportunities. Before committing to action, the feasibility of objectives should be assessed. Feasibility may be informed by resource availability, including finance, technology and other issues. The focus is on objectives that can be measured where possible..

CASE STUDY 8: PRIORITIZING VALUE CHAIN INTERVENTIONS

Development organisations are often tasked with selecting from a wide array of value chains to meet their objectives and must have a strategy for doing so, including the selection criteria to be used and the actors and project partners involved. An initial step in value chain development is to assess various potential sectors or value chains to determine which of these the project might have the greatest impact upon through interventions according to specific development needs.

GIZ have developed guidelines for value chain selection that combine four different dimensions of value chains/sustainable development: economic, environmental, social and institutional goals and project mandates. Hotspots Analysis is used as a qualitative tool to identify environmental hotspots along the value chain and is often done through stakeholder consultation. A hotspot indicates critical problems related to inefficient resource use, high Greenhouse Gas (GHG) emissions and other environmental problems that may occur throughout the value chain.

Reference

Schneeman, J., and Vredeveld,T., (2015) Guidelines for Value Chain Selection Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) https://www.giz.de/fachexpertise/downloads/giz2015-en-guidelines-value-chain-selection.pdf

STEP 6

Review initial findings

Output

Findings reviewed by experts and key stakeholders

Key actions

Provide written communication summarizing the results of your hotspots analysis, including proposed actions, to all key stakeholders including those external to your Working Group.

Invite all stakeholders to provide written feedback including validation of results and proposed actions, as well as recommendations.

This phase of engagement may require a few weeks to allow stakeholders to have an in-depth review and provide value-added feedback. It is important to plan for this time, and include perhaps an additional week or two buffer time in order to obtain feedback from a critical number of key stakeholders or perhaps those of particular concern (e.g., those who may potentially be a hindrance to action).

More detail

Having identified hotspots, potential actions, gaps in data and activity, the analysis and initial findings should be reviewed with experts and key stakeholders. The purpose of the review should be to ensure that the analysis is fit for purpose. This means that: it is consistent with the goal and scope; that the impact categories have been assessed appropriately; and that appropriate actions – and those that are able to undertake them - have been identified.

Review and revision should be an on-going process throughout the hotspots analysis, which is itself likely to be an iterative process. After reviewing the initial findings it may be necessary to return to an earlier stage to refine the goal and scope, improve data quality or re-engage with stakeholders. This more formal review step precedes final communication of the results, and so is an opportunity for correction / clarification.

The initial findings should be reviewed to ensure that stakeholders who either affect or are affected by a hotspot understand them.

Consideration should be given to the need for an independent third-party review panel. To ensure that the panel is able to comment authoritatively, it should comprise individuals with experience in Hotspots Analysis or a related approach such as Life Cycle Assessment, experience of the specific product or sector under review, and understanding of prioritised impact categories.

The need for a panel will depend on the goal and scope of the hotspots analysis and whether public communication would be considered more robust following the use of a review panel.

The review should not validate the original goal and scope, but should consider whether recommended actions are commensurate with the goal and scope. Review criteria should be established and followed, either by a review panel or the analysis authors and clients. These should consider compliance with the goal and scope, the suitability of quantitative and qualitative inputs and their interpretation, the appropriate identification of hotspots and whether the actions proposed are commensurate with the hotspot. The communication of the results from hotspots analysis is likely to provide validation, which could act as an input to the review process. The hotspots analysis communications guidance identifies communication and visualisation principles, and the types of validation that may be obtained from different stakeholders and target audiences.

A review report should be prepared and discussed with the authors and clients. Amendments / responses should be agreed and responses to the review recorded. Further guidance on critical review is contained within ISO14040: 2006.

CASE STUDY 9: ASSOCIATION OF HOME APPLIANCE MANUFACTURERS (AHAM) AND THE WATER QUALITY ASSOCIATION (WQA)

Industry associations such as the Association of Home Appliance Manufacturers (AHAM) and the Water Quality Association (WQA) convened a core working group or task force to provide input at each phase of their respective hotspots analyses. The goal of the working group was to identify the hotspots for which criteria would be incorporated into sustainability standards for appliance products.

In these examples, stakeholders were product manufacturers with an array of technical expertise and considerable depth of technical and commercial experience. AHAM and WQA developed a scoping document, which summarized the hotspots analysis methodology, results and proposed actions.

This document was then circulated among key stakeholders external to the working groups and task forces, along with a feedback template to document their feedback in a consistent format to help their Working Groups to simplify review of comments and to address these effectively.

Additionally, WQA convened individual webinars with each key stakeholder external to its Working Group, to engage on the project, to describe initial findings, to answer questions from stakeholders, to provide guidance and request written feedback on the initial findings and proposed corrective actions for impacts identified. Further information in this case study is provided in Module 3: Sector Level Supplementary Guidance.

STEP 7

Presentation and communication

Output

Presentation and communication of findings to a wider audience

Key actions

- Convene Working Group to present and review written feedback received from all stakeholders.
- Discuss feasibility of each comment and determine whether it should be implemented, require further information or should be parked for future consideration/implantation.
- Document agreed actions for each comment.
- Disseminate findings more widely to those stakeholders outside of the Working Group who are affected by them; or able to implement or support impact reduction measures aimed at addressing identified hotspots.

More detail

Presentation and communication of findings to a wider audience allows for validation of hotspots analysis (HSA) results, initiating actions and collaboration, designing pilots and reviewing progress over time. The hotspots analysis communication guidance document titled "*Communicating hotspots: The effective use of sustainability information to drive action and improve performance*" provides guidance on the principles of communication and visualisation of the results from a hotspots analysis study as presented below[14] (Figure 8, next page).

The communications guidance will help the target audience determine the most appropriate messages (based on the evidence from the study), the most effective communications vehicles to use and the calls to action for different audiences based on the goal, scope and objectives of the study and the stakeholders involved. They will also help set the objectives and agree the desired outcomes for each communication.

The format of the material produced at the end of hotspots analysis project will be highly dependent on a number of factors including the initial goal and scope of the study, the specification of deliverables, the outcomes of the final study, the audience (and whether they are technical or non-technical) and the desired outcomes from communicating with a wider audience.

Prior to producing any final communication, it is important to take note of any changes in the study objectives, as hotspots analysis projects can be

14 The hotspots analysis communication guidance document can be found at http://lifecycleinitiative.org

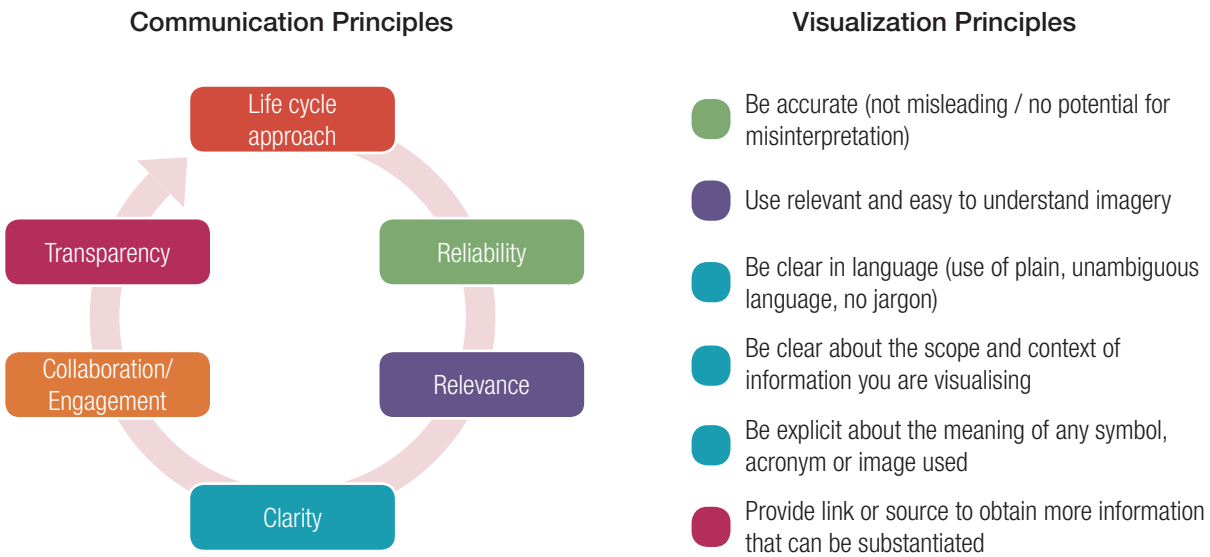


Figure 8: Principles of communication and visualisation of the results from a hotspots analysis study
(from "*Communicating hotspots: The effective use of sustainability information to drive action and improve performance*")

CASE STUDY 10: OPPORTUNITY, COMMUNICATION AND VALIDATION THROUGH COLLABORATION

WRAP supported whole chain collaboration between Co-operative Food and its pork supplier, Tulip. The goal was to was to pinpoint 'hotspots' of material use, GHG emissions, water and waste and then to find ways of using less resources without compromising commercial performance. The scope was the whole value chain, from the farmers who rear pigs to the households that consume bacon and gammon (ham) products.

Five hotspots were identified and best practice identified for each of these. Co-operative Food subsequently engaged with pork producers through the Co-operative Food Producer Group. A new role was identified for the group to disseminate best practice and agree Key Performance Indicators. Those hotspots on which communication and validation were critical are:

1. **Out-of-specification pigs at intake**: A very strong correlation between pig weight and the % of the pigs falling outside specification on back fat. This was validated through a benchmarking exercise which was undertaken that showed a few individual batches accounted for a high percentage of out of specification pigs. Communication channels were identified through the Co-operative Food's Producer Group, which could include, for example, identifying what the good performing farmers are doing that should be communicated and replicated. —>

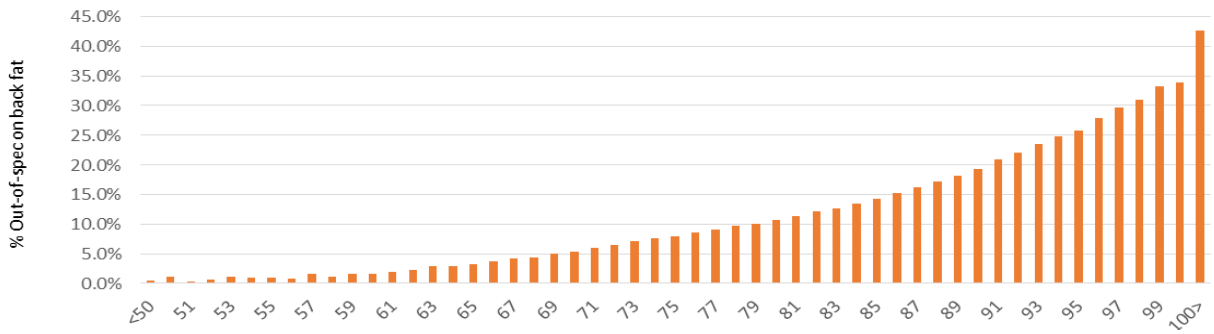


Figure 9: Correlation between back fat and weight

dynamic in nature. Documenting and commenting on these changes can help frame the project for the audience and ensure that stakeholders understand that any changes from the original goal and scope have been made with careful consideration, consultation and analysis.

Consideration shall be given to what the objectives of communication are. Examples of objectives from final communication would include:

- Gaining support internally or externally for further work (e.g., pilot projects to address identified hotspots);
- Establishing collaborations with other organisations or groups;
- Feeding in to on-going initiatives;
- Initiating dialogue on actions with policy makers; or
- Gaining feedback to validate results and informing stakeholders on how to take appropriate actions to address the hotspots.

The balance of what is being communicated must also be considered when establishing the most appropriate form(s) of communication. Is the focus of the communication on the results from the hotspots analysis, the methodology used or the improvement opportunities and future actions?

Establishing clear objectives will also help identify the target audience for communication. In some cases, multiple audiences and objectives might be identified, which will, in turn, determine the style of communication. Engaging with relevant

2. **Yield variability in bacon processing**: A review of production data showed that yield rates can fluctuate by over 10%. The first phase of tackling this issue was to ensure that the variability was being captured and not causing inconsistency in final products. To tackle yield variability, a programme of re-training the inspection staff, and introducing a Red/Amber/Green performance tracker to monitor the performance of each production run - covering yield rate, giveaway and throughput KPIs was set up. This ensured yield losses were validated, communicated, and acted upon.
3. **Retail losses on gammon**: A review of data on retail losses (markdowns and wastage) on gammon and bacon highlighted that whereas the losses in bacon represented 1.8% of sales value, for gammon this was 9%. A strong correlation was identified between losses and the demographics of store customers. Having validated this information and communicated it internally, product ranges were rationalised and product ranges reviewed. Case fills were also reviewed to match the content to the store format. These actions have delivered declared annual retail savings of £395,000 – and identified significant further opportunities.
4. **Consumer waste**: Finally to tackle consumer food waste, Tulip and Co-operative Food have both been taking a number of actions to help reduce consumer waste. For example, offering a range of different pack sizes to cater for the varying size of households; and introducing a re-sealable packaging system. The Co-operative Food has also been going through a process of retesting the product life for all their protein products and has found that it is possible to add 1-3 days without compromising product safety or quality. The protocols for testing the product lives of meat and fish are historic and a review of labelling on mince, necessitated because of changes in EU labelling regulations, led The Co-operative Food to review these protocols. This approach is now being extended to cover all protein categories – and is anticipated to save over £1 million.

Reference

WRAP (2016) Collaboration in the pork supply chain saves £395,000 and identifies further opportunities http://www.wrap.org.uk/content/whole-chain-resource-efficiency

stakeholders in an iterative manner across all of the steps of conducting a hotspots analysis, allows you to:

- Build a clear picture of your target audiences, what you need from them and what they need from you;
- Identify the best ways to reach them (directly or indirectly, through channels that they trust);
- Use the most effective communications vehicles for each of your audiences;
- Gain a better understanding of the tone of voice to use to ensure that the information you provide is actionable and actions are agreed and implemented.

In many cases, a range of different communication styles should be adopted from presentations and one-page summaries to detailed technical reports or online tools. Ensuring a clear objective and target audience for each communications output is likely to significantly enhance its effectiveness. It also allows for validation of results from hotspots analysis and provides basis to revisit and review the hotspots analysis at a later stage.

The hotspots analysis communication guidance presents information on the different types of validation, from technical validation that ensures that your communications match the evidence from your study; to the validation of the most effective communications vehicle to use and the impact of your communications (i.e., how your audiences have used and responded to the information you have provided them with).

Case study 10 (see previous page spread) explains the process and results of communication and validation through collaboration between co-operative food and its pork supplier, supported by WRAP. This case study was selected to showcase how the results from hotspots analysis can be communicated and validated to enable action.

STEP 8

Revisit hotspots and actions identified

Output

Method established to ensure that hotspots and actions are revisited and updated periodically

Key actions

- Periodically review with Working Group or key stakeholders the hotspots analysis, utilizing new information or data to validate previously identified hotspots and actions. This review may also be used to identify new life cycle hotspots.
- Any changes to hotspots analysis methodology, engagement of additional stakeholders, etc. should be evaluated and implemented.

More details

A method should be established to ensure that hotspots are revisited after a specified period or when certain trigger points occur (e.g., where the impact of a prioritised hotpot has been reduced to an acceptable level and resources become available to tackle the next hotspots on a rolling list). This is likely to depend on the goal, scope, objective and timeframe of the hotspots analysis; and the time required for agreed actions to be undertaken.

Revisiting hotspots and actions may take place after an agreed upon time by the relevant stakeholders involved in the hotspots analysis, in order to incorporate the results of the actions taken and to validate their impact; to review any factors that may change the ranking of hotspots or key stakeholders ability to address them; and to agree, plan and action next steps.

Revisiting hotspots allows the study to be re-evaluated against new life cycle/technical data, scientific research, national, sector, market or sales trends, changes to stakeholder perceptions, the emergence of new solutions, innovations or technologies that allow hotspots to be addressed more effectively, new issues arising and progress made/challenges encountered in managing previously identified hotspots.

When undertaking hotspots analysis, these intervals or triggers should be identified to ensure that a review will take place in a systematic manner. When identifying these potential intervals or triggers practitioners should consider how and why hotspots may evolve. These anticipated trends will then inform the criteria used to set a review in motion.

When conducting a review of the hotspots, a number of approaches may be used. One approach is to examine the evolution of key hotspots or data points, to see if any significant re-ordering of hotspots has occurred or needs to occur. This approach can be used to identify progress against recommendations identified from previous analyses or give an indication that a broader, more detailed review of hotspots is required.

A periodic review of the step-by-step process can help to ensure that the goal, scope and requirements of the study remain relevant. Where changes are identified, e.g., as a result of feedback from stakeholders or a change of focus due to a new application of a product or new sectoral trends, the step-by-step process should be reviewed to ensure that it remains relevant and comprehensive.

Reviews also provide a significant opportunity to revisit any data gaps that were previously identified and to incorporate improved data or methods. Filling in gaps as data becomes more readily available or comprehensive may lead to a re-ordering or re-prioritisation of hotspots that may require (re)engagement with stakeholders to ensure that previously identified actions and recommendations remain relevant; or to determine whether new actions are required.

Practitioners should also examine how improvement opportunities have evolved since the last review. As actions previously deemed unviable, untested or uneconomical become more accessible, the overall prioritisation of hotspots and recommendations can change. Documentation of potential improvement opportunities that may become viable in the future can serve both as a trigger to revisit a hotspots analysis and as a reminder to practitioners of opportunities to be followed up during a review. The outcome from the communication of the hotspots analysis is likely to provide inputs to the review process. The hotspots analysis communication guidance identifies the possible validation that can be obtained from the target audience- direct, indirect, technical and non-technical. Such validation, along with the actions taken on various hotspots should act as an input to the review process.

Hotspots and actions can be revisited on a "rolling basis" (as the triggers/ selection criteria already defined by the stakeholders become applicable) or at a certain "defined period/ periodic basis" (such as every 6 months or 1 year, as agreed by stakeholders at the start of the hotspots analysis process) or on a "hybrid basis" (i.e. a combination of rolling and periodic basis, where the hotspots and actions are revisited as the triggers/ selection criteria become viable or as the defined time period expires, whichever comes first). Examples of such triggers/ selection criteria include:

- Financial viability: improved access to resources, technological solution becomes cost-effective, or changes to cost-benefit ratios allows action to be taken
- Regulatory viability: changes in legislation or regulation place a new emphasis on identified hotspots creating a new imperative for action
- Changes in policy that support action: e.g., new economic, environmental, social or industry policies; new funding or research opportunities; tax breaks for investments in environment technologies; increased openness to public/private partnerships
- Access to new/improved data: that fills previous data gaps, improves data quality and reduces uncertainty, allowing existing hotspots or actions to be validated and taken forward; or for new ones to be identified
- Technological availability or viability: enabling action to be taken as access to new technology improves

Case Study 11 on the International Aluminium Institute (see below) elaborates the process of revisiting hotspots analysis over a period of time including deeper collaboration with the stakeholders in order to find and address sustainability related challenges of the Aluminium sector.

CASE STUDY 11: INTERNATIONAL ALUMINIUM INSTITUTE

The International Aluminium Institute's "Alumina Technology Roadmap" provides an outlook on the sustainability challenges of the alumina industry up to 2030 and how these should be addressed. The first report was published in 2001, and identified six focus themes for research and development in areas including resource efficiency, process and knowledge management and safety/human exposure.

An update in 2006 built on the experience of the previous five years and took the previous six themes and linked them to 12 priority R&D needs many of which were applicable to multiple themes. This report also introduced a ranking for these R&D needs to identify high, medium and low priority R&D needs. The group also identified that more structured organisation might be required to move projects forward and ensure cross-party collaboration. This resulted in the formation of a Bauxite & Alumina Committee (BAC) within IAI and greater input from the Alumina Technical Panel, comprised of the R&D managers from major alumina producers.

An update in 2010 was undertaken to ensure greater industry coverage, with particular focus on gaining input from Chinese alumina producers. It was decided that with a significant increase in participation, a full re-prioritisation should be undertaken, with the questionnaire developed in collaboration with the technical panel and then sent out to all BAC members and members of the Chinese industry. Further input was also sought from other stakeholders to understand how their priorities and challenges might differ from those of the industry. These stakeholders included research institutions, engineering companies, equipment and reagent suppliers, and government agencies. The 2010 revision also developed a more specific vision and strategic goals for the industry up to 2030, which can be used to communicate what the future of the industry is to a broad range of stakeholders.

Reference: http://www.world-aluminium.org/

3. Hotspots Analysis: applications and limitations, sector and product guidance with case studies

3.1 Hotspots analysis applications and limitations

This methodological framework is developed with a sustainability mindset. Hotspots analysis methodologies typically use life cycle thinking approach, while providing the flexibility of taking into consideration quantitative and qualitative data/ information from various stakeholders. This allows for the results of the hotspots analysis to be comprehensive and collaborative with considerable dialogue and deliberation keeping actions to reduce the impacts in mind. Figure 18 (p. 69)– "Application of Hotspots analysis: different data sources and example study outputs" of this methodological framework – provides a visual representation of the various applications of hotspots analysis.

The limitations of hotspots analysis include the lack of a single method and databases to conduct all HSA studies, like in the case of LCA studies. This makes comparison between two hotspots analysis results difficult unless they are identical. Further, depending on the goal and scope of the study, Hotspots Analysis requires deeper planning, collaboration and iteration to achieve results and action. However, this limitation is not related to the primary objective of hotspots analysis; to identify and act to address hotspots. Comparability is not required in order to identify and prioritise opportunities for intervention.

Hotspots analysis can be applied at different scales including product, product category, sector, city and national levels. In the chapters that follow, two supplementary guidance modules address issues specific to a hotspots analysis carried out at a sector and product level; they cover points of differentiation which apply to individual steps and should be used in conjunction with the overarching methodological framework.

3.2 Sector level supplementary guidance

This module addresses issues which are specific to a hotspots analysis carried out at a sector level. It covers points of differentiation which apply to steps 1, 2, 4 and 5. This supplementary guidance should be used in conjunction with the overarching methodological framework. Individual sectors may wish to provide guidance which is further tailored to their circumstances.

STEP 1 DEFINE, CLARIFY AND SOLICIT AGREEMENT OF THE GOAL AND SCOPE

When defining the goal and scope, the sector to be assessed shall be defined and clearly communicated.

A sector may be defined in a number of ways. These are summarised in the United Nations Inventory of Classifications. Three examples are provided here for consideration.

Activity Classifications. A sector may comprise organisations which operate common activities (e.g., mining, smelting, forming, retail, waste collection). These may be defined by reference to Standard Industrial Classifications or equivalent schemes. The WRI / WBCSD GHG Protocol uses this approach http://www.ghgprotocol.org/

Product Classifications. A sector may comprise organisations with shared interest in raw materials and/or products. For example, the textiles sector may cover a range of products such as clothing, household linens and carpets which share common life cycle stages, activities and hotspots.

Classifications of Expenditure According to Purpose. Many sectors can be defined based upon the purpose they serve. For example, the tourism sector comprises a disparate range of activities and products (e.g., transportation, accommodation, food service, health services, leisure activities) whose common purpose is provide services to a visitor for a defined period of time.

Having defined the sector, the coverage shall then also be defined. This may be based, for example, on membership of a trade association, coverage of a certain proportion of a sector measured in number of units or turnover or market share, or the provision of a purpose in a specific geographical location.

There is potential for representativeness by different indicators to give mixed coverage. For example, it may be possible to cover over half of sector financial output by working with a small number of organisations, with a large group of smaller organisations potentially excluded. Consideration should therefore be given on how to engage with Small and Medium Sized Enterprises. A case study on how AHAM addressed this issue is provided at the end of this module.

In all instances, a boundary diagram for the assessment shall be developed and agreed which clearly communicates the scope for the hotspots analysis. The membership of the hotspots analysis project should be considered in light of this to identify stakeholders from outside the sector whose participation will aid the quality of analysis and ability to address hotspots.

STEP 2 GATHER DATA, SEEK EXPERT INSIGHT, KNOWLEDGE BUILDING AND ANALYSIS

A sector hotspots analysis shall consider impacts which are controlled and influenced by the sector. This means that it is essential that a life cycle approach is taken into account for resources and energy which are supplied to the sector, and supplied by the sector. This may involve working with stakeholders outside the sector to gather information.

STEP 4 RESPOND TO DATA AND STAKEHOLDER GAPS

Where data gaps and/or hotspots identified sit outside of the sector, the composition of the project team and steering group should be reconsidered. Do additional partners need to be introduced into the process? How could they be involved? Depending on the nature of relationships, formal or informal routes to filling gaps in data and stakeholders may be pursued. Responses to hotspots are addressed in step 5.

STEP 5 IDENTIFY AND PRIORITIZE ACTIONS

Through any definition, a sector hotspots analysis is likely to identify hotspots which are shared horizontally by similar organisations and vertically by their value chains. In considering actions, the impact of collaborative and stand-alone actions should be considered. For example, it may be that a sector adopting common buying / sourcing standards can have a greater impact on a hotspot in the supply chain than individual action.

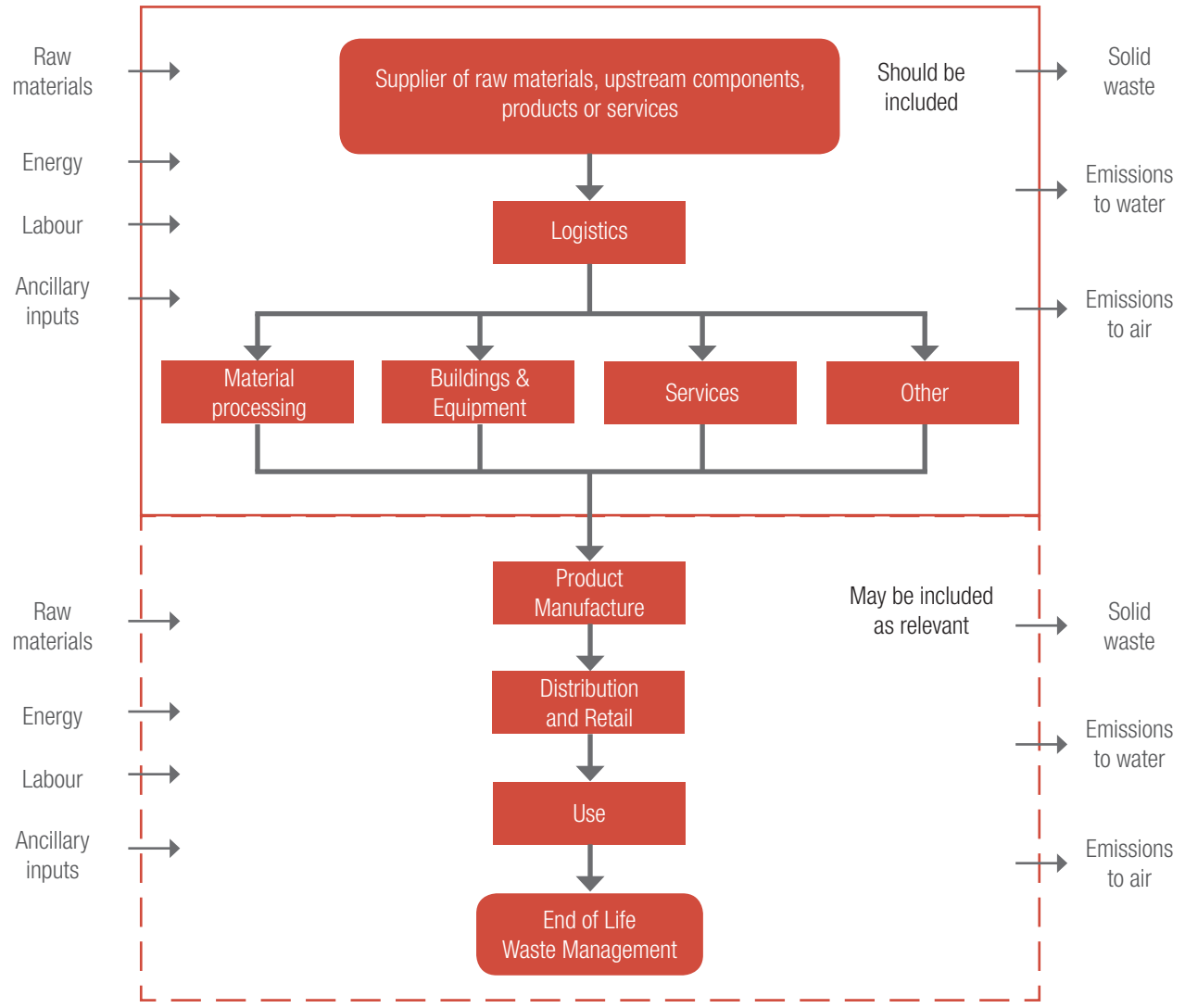


Figure 10: Example study boundary diagram – sector activity level

3.3 AHAM: sector case study

This section presents the Association of Home Appliance Manufacturers' (AHAM) work to develop a suite of sustainable appliance standards as a case study for developing a hotspots analysis method. The first of these was the Sustainability Standard for Household Refrigeration Appliances (AHAM 7001-2012). This case study even though presented as a sector level case study can be considered as a combination of both sector level and product level hotposts analysis; hotspots analysis at different scales can be combined in one study/project.

STEP 1: DEFINE, CLARIFY AND SOLICIT AGREEMENT OF THE GOAL AND SCOPE

The goal and scope identifies the purpose of the hotspots analysis, the issues to be addressed, the boundaries of the analysis, the resources required and the approach to stakeholder engagement. Ultimately, the goal and scope can be summarised as answering the questions of why, who, what, how, where and when, although the order in which these are defined is not fixed and the process of finding answers will most likely be iterative.

Work during the goal and scope phase sets the tone for the rest of the project so will ultimately decide whether the analysis delivers on its aims.

Why?

Traditionally a major consumer of power within the home, home appliances such as refrigerators, washing machines, dishwashers and clothes dryers have been at the forefront of progress in energy efficiency with significant improvements made in this area since the mid-1970s. Modern refrigerators, for example, consume two-thirds less electricity than the 1970s average. Separate initiatives have tackled other issues such as the removal of CFCs from fridges in the 1980s and 1990s and participation in schemes to encourage recycling of appliances at the end of their useful life.

Despite progress in these areas, AHAM members found themselves responding to an increasing number of questions about the sustainability of their products from a broad range of stakeholders including retailers, consumers, NGOs, government and regulators. AHAM also observed that there were some methodologies in development related to sustainability in the appliance or broader consumer goods sectors. These methodologies had a range of aims and differing levels of input from industry groups, creating a risk that AHAM would be required to report against a wide variety of methodologies and that some of these might not be well matched to the structure and complexities of the industry.

"AHAM should take the lead in the development of sustainability standards for its members' products."

- AHAM Board, April 2010. High-level support across the industry ensured that the time and resources necessary could be devoted to developing the AHAM sustainability standards.

Finally, there was recognition within the appliance industry that energy efficiency measures would start to yield diminishing returns as appliances reached the limit of what was technically feasible and that success in energy efficiency meant that other aspects might become more of a priority.

In this context, AHAM discussed a number of potential ways forward with its members including standard development led by AHAM, aligning with one or more of the methodologies in development or adopting a wait-and-see approach while continuing to respond to questions on a case-by-case basis. At AHAM's annual meeting in 2010, members voted overwhelmingly to see AHAM take the lead in the development of sustainability standard for its members' products. This gave the AHAM Board a strong mandate to pursue this approach, knowing that they had the support of those who would eventually have to use the standard. This "top-down" support from senior executives at the major industry players was a critical success factor for the project.

Having established this support, AHAM set out its aim - to produce sustainability standards for the main home appliance categories, the outputs of which would be used to drive improvement across the sector and communicate with consumers, NGOs, government and retailers.

Who?

Early, cross-industry support for the work to develop the standard meant that the major industry players were engaged and were willing to devote time and resource to the process from the beginning. Therefore, the challenge within the industry was to ensure that small to medium scale manufacturers could be engaged in the development process. Ensuring usability for smaller organisations is a major challenge for many impact assessment, reporting and compliance tools. The question is how to ensure that the hotspots analysis is suitably robust, transparent and comprehensive while remaining usable and inclusive and therefore complies with the five overarching principles of hotspots analysis.

To combat this problem, AHAM agreed to subsidise the participation of smaller companies, allowing them to be involved in development and access resources and support to road-test the methodology. Although larger companies effectively subsidising their (smaller) competitors might have been initially hard for some companies to accept, methodologies developed at the exclusion of smaller companies risk losing credibility or being seen as a barrier to competition and trade. AHAM also engaged with UL Environments, CSA and Five Winds who helped to steer and inform the development process and act as intermediaries where necessary.

AHAM were aiming to communicate the results of the hotspots analyses to a wide audience

Stakeholder engagement was at the heart of the development of AHAM's sustainability standards, starting early and continuing throughout. In the earliest stages of development, AHAM sought to have one-on-one discussions with a cross-section of stakeholders including the US EPA, Environmental Defence Fund and the retailers association RILA to inform them of what was being done by AHAM and why.

The early dialogue helped to establish what various stakeholders wanted the standard to achieve and how that aligned with the initial goals of AHAM and its members. This in turn helped to inform what might need to be included for the methodology to be viewed as a success to different stakeholders.

AHAM also found that engagement "early and often" with stakeholders provided a sense of ownership over what was being developed. This increased the pool of potential promoters and users of the standard and also helped to limit the number of parallel developments, a key concern for AHAM member companies who were responding to an ever-increasing number of scorecards and requests for information.

AHAM went through a process of identifying the stakeholders and mapping these against the standard development process to define key checkpoints for stakeholder input. Broadly, AHAM's key stakeholders fell into four groups - retailers, government, NGOs and a broad group of other stakeholders. Another finding from AHAM was that there is value in engaging with stakeholders which may not historically have a good relationship with the sector or that are seen as hostile. These stakeholders may well not be persuaded to the sector's viewpoint, but including them creates awareness that different perspectives exist and demonstrates that these have been considered during development. Ultimately, it is impossible to take on board all stakeholder viewpoints so the key is to demonstrate which issues there is consensus on and to transparently communicate where those developing the methodology have "agreed to disagree" with stakeholders. Key elements of the stakeholder engagement process undertaken by AHAM are shown in Figure 11 (next page).

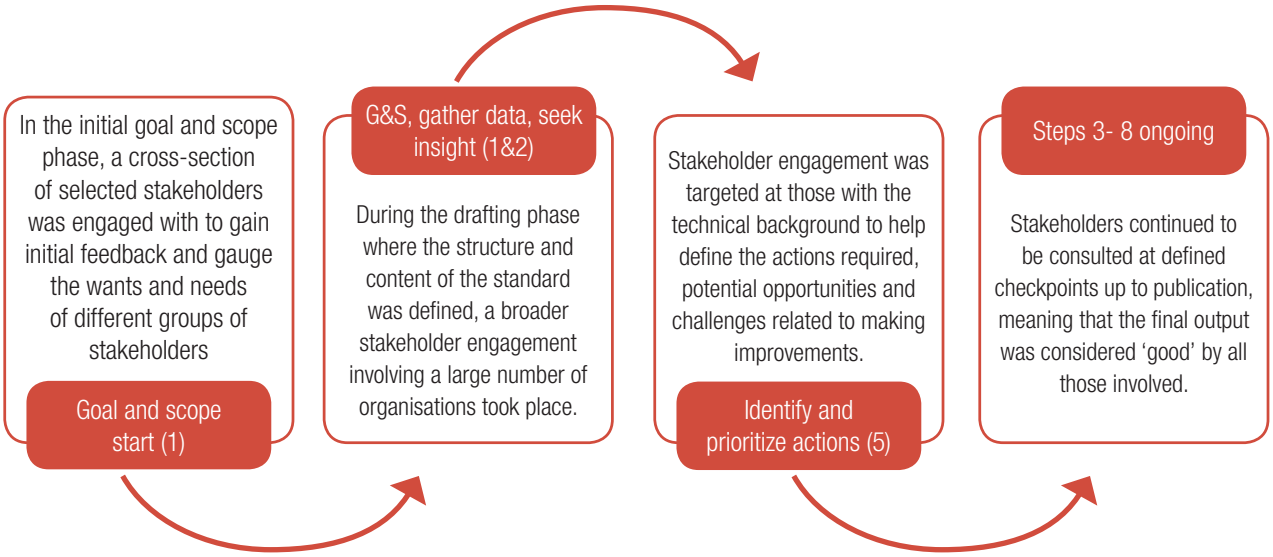


Figure 11: Key elements of the stakeholder engagement process undertaken by AHAM
Numbers in parentheses indicate the methodology step during which the stakeholder engagement should occur

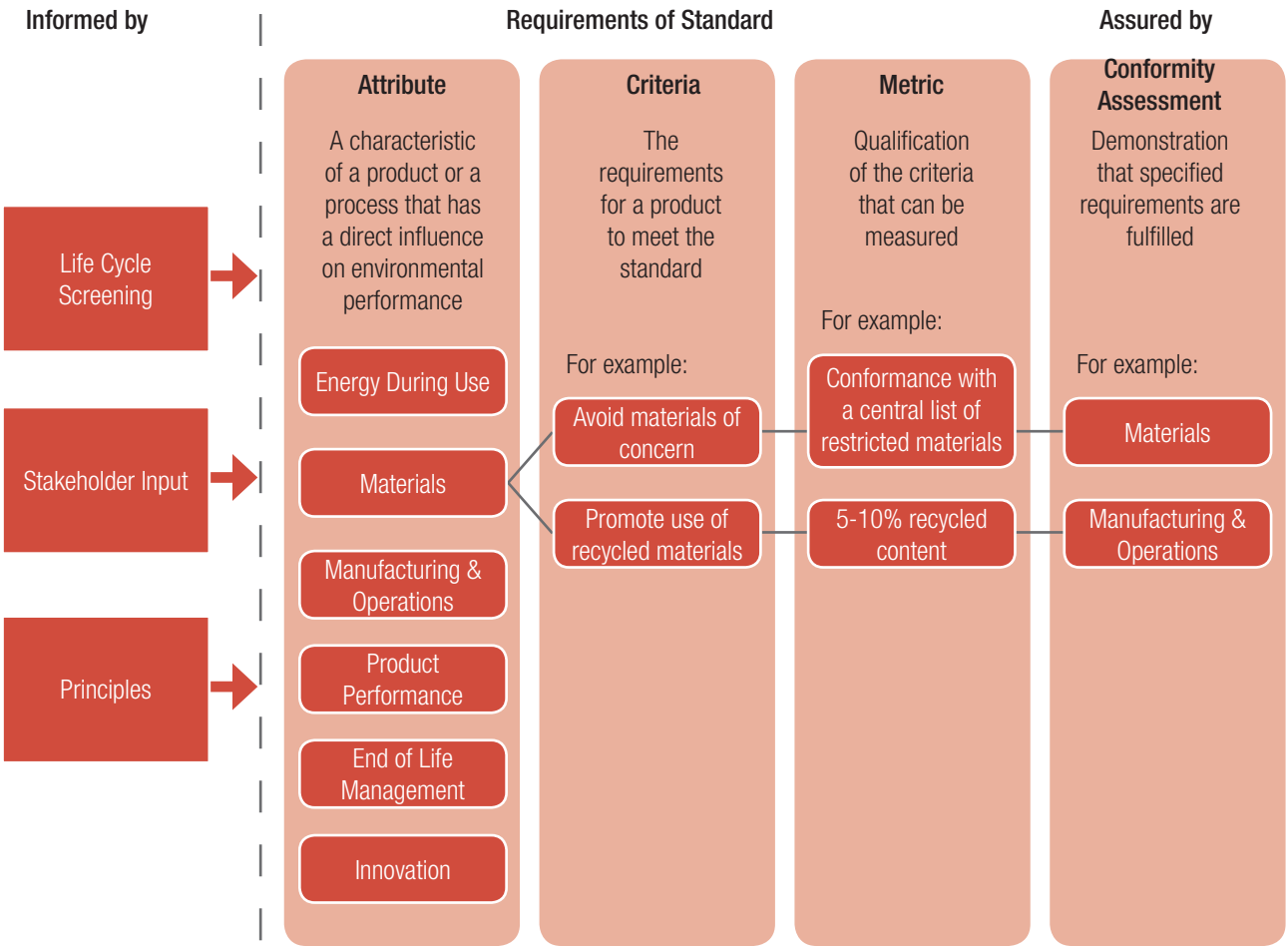


Figure 12: Translating results from life cycle screening, inputs from stakeholders and guiding principles into a standard

What?

Defining what should be measured and against which impact areas can be the most contentious and difficult step when developing a hotspots methodology. AHAM members produce appliances throughout the home including kitchen and laundry appliances, garment and beauty appliances, vacuums and air conditioners. Treating all these products as a single "sector" would have led to a cumbersome and confusing standard that would fail to be usable or inclusive. AHAM therefore decided to develop methodologies for its key sub-sectors. Currently four sustainability standards have been published covering refrigeration appliances, clothes washers, cooking appliances and portable and floor care appliances.

AHAM chose to develop the Sustainability Standard for Refrigeration Appliances first as this was one of its members' largest markets and appeared to be of significant interest to stakeholders with a large number of requests for information and data. Refrigeration was also considered by AHAM to be a relatively complex and challenging area allowing AHAM to stress test the development process and the outcomes from applying the methodology.

During this phase, it is also important to define the scope of the assessment, for AHAM, this meant including refrigerators, freezers and beverage/wine chillers, but excluding refrigerators for the commercial market. The scope for the assessment was cradle-to-grave with the life cycle of products divided into five stages: Raw Materials, Manufacturing, Packaging & Distribution, Use and End-of-Life.

To decide which impact areas should be included AHAM looked to gather together a list of the questions and requests for information various members had received about their refrigeration appliances, using this to gauge which issues were material to their stakeholders.

In doing this AHAM recognised that although members had received hundreds of different questions structured in different ways, these could be grouped into a relatively small set of key areas, termed "attributes" covering materials, energy during use, manufacturing and operations, product performance and end-of-life management. Within each of these areas, AHAM then defined the individual impacts or "criteria" that it would be seeking to measure against. For example, for materials the criteria were materials of concern, refrigerant and foam blowing agents, product recycled content, packaging recycled content and the efficient use of raw material resources. Each criteria was measured or quantified using a metric e.g., percentage recycled content. The key attributes and criteria were validated with industry and external stakeholders to ensure that these matched expectations and allowing for additional impacts to be proposed (including emerging or exploratory impacts).

At the start of the project, AHAM had decided that they wanted their sustainability methodologies to drive improvement in multiple impact areas, across the sector through the use of the standard. This had a strong influence on the identification of impact areas as it meant that AHAM was not interested in simply "rubber stamping" existing work on energy efficiency, which was already covered by the existing Energy Star or CEE programs.

How?

Setting out to drive sector-wide improvement as described above did create a challenge in building consensus between different industry players as to what "good" should look like and where the bar for progress should be set. On one side, industry leaders advocated cutting-edge targets, while on the other companies with less developed sustainability programs advocated a more compliance-based approach. AHAM tackled this problem in two ways:

- Defining prerequisites for criteria to establish a minimum requirement. For example, establishing that a product's refrigerant/blowing agent had to have a total GWP less than 1835 kgCO2e or demonstrating compliance with all regulatory requirements for water at manufacturing sites. Essentially these areas represented the minimum standard in key areas. Without these, it was felt that any claims or progress demonstrated in other areas would potentially be meaningless and the outputs of the analyses might not be credible
- Agreeing to allow different performance levels. This is a more unusual step in hotspots methodologies as it suggests comparison, which is not generally the goal of a hotspots

analysis. For AHAM, however, it allowed different groups to use the standard at different levels and ensured that manufacturers with less of a background in sustainability were still engaged in the process and were able to demonstrate their progress.

Metrics (the quantifiable indicators used to measure criteria or impacts) were informed by literature, stakeholder input and input from Five Winds, UL and CSA who were all experienced in the identification and use of sustainability metrics.

Where?

AHAM's North American focus defined the geographical scope of the standard and meant that North American-specific methods and indicators were generally most relevant. AHAM explored methods outside of the North American to ensure that the best and most relevant approaches were included in the standard, with for example the EU's Restriction of Hazardous Substances Directive (RoHS) directive used when considering hazardous substances. AHAM also considered potential supply chain issues that could have occurred outside North America, particularly with regards to safe disassembly and responsible disposal of products at end-of-life.

When?

For AHAM timeframes for conducting a review of an analysis were strongly influenced by product design lifecycles and the timeframe for actions. New products influenced by improvement actions might only reach the market several years later depending on the product type, meaning that a total review on a yearly basis would not provide any information on the effectiveness of the actions taken. AHAM also considered that some actions or improvements might not occur within the first revision. This would particularly be the case for "binary" or absolute improvements such as the complete removal of a substance from products, whereas other areas would yield continuous improvement (e.g., reducing GHG emissions). A third aspect was considering the timeframes of regulations or standards linked into the methodology and how these might influence the hotspots and actions. Timeframes for update are also described in step 8.

STEP 2: GATHER DATA, SEEK EXPERT INSIGHT, KNOWLEDGE BUILDING AND ANALYSIS

The output of step 2 is agreement on how to collect, organize and analyse data in line with the goal and scope of the study. This will be an iterative process and may involve refinement to the goal and scope of the study.

AHAM's smaller manufacturers faced the greatest challenges in data collection, often lacking the systems and human resources possessed by the larger manufacturers. As described earlier, AHAM agreed to subsidise the participation of smaller companies to ensure inclusivity within the process. These manufacturers were also able to access centralised, independent resources provided by AHAM to aid them in gathering together the information required to conduct an analysis of their products.

Beyond this, AHAM also had to be mindful of data confidentiality, balancing the key principle of transparency with concerns about competition. These issues were mitigated by using indicators that could not be disaggregated e.g., Global Warming Potential (GWP) of refrigerant rather than reporting each individual chemical and by providing third-party support and verification through AHAM itself and Five Winds during the pilot phase and through UL and CSA for verification.

STEP 3: IDENTIFY AND VALIDATE HOTSPOTS

The output of step 3 shall be the identification of hotspots associated with the unit of analysis. The evidence collected in step 2 shall be used to build a picture of the likely issues and impact hotspots that will need to be addressed. Having identified and allocated impacts to each life cycle stage, there is then a need to either normalise the results or agree that each impact category will be assessed in isolation.

AHAM's identification and validation of hotspots for refrigeration appliances was an on-going process, which started during the goal and scope definition and carried on through drafting the standard and data gathering, reflecting the iterative nature of hotspots analysis.

The approach taken to identify and validate hotspots is described by the flow diagram shown

at right. The preliminary insights on hotspots were compiled in the goal and scope and provided the attributes (materials, energy consumption during use, manufacturing and operations, product performance and end-of-life management) and more specific criteria within each attribute. The next stage in the process was to validate and prioritize the hotspots using a combination of stakeholder input, expert judgement based on evidence and life cycle screening.

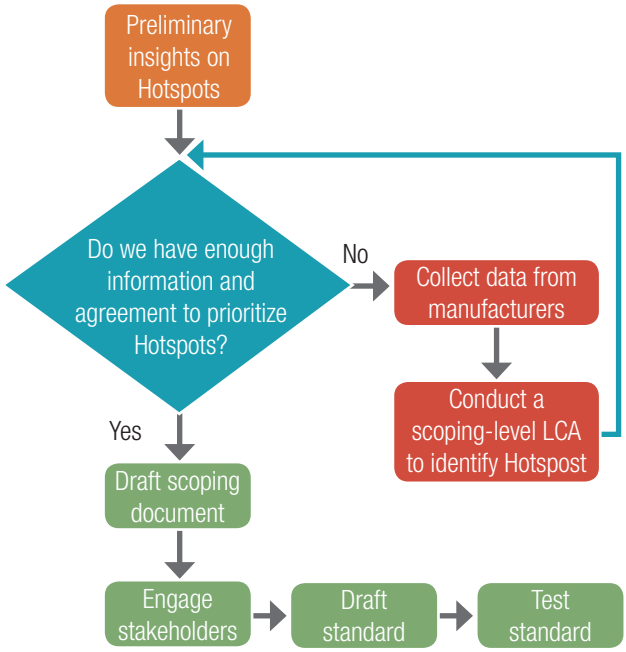


Figure 13: AHAM's process for the identification and validation of hotspots

Using this combined approach of scientific and stakeholder-based prioritisation provided AHAM with a balanced prioritisation of hotspots that had a solid scientific/evidence basis while also ensuring that stakeholder priorities and concerns were largely addressed.

AHAM felt that a more subjective prioritisation based solely on stakeholder input or expert judgement would be harder to defend and would be more easily skewed by individual interests or viewpoints. For example in the refrigeration standard GHG emissions from distribution were highlighted by multiple stakeholders as a concern, but were shown to be a cold spot through the life cycle screening allowing AHAM to demonstrate to stakeholders that their viewpoint had been considered, but also why ultimately it had been excluded. During prioritisation, AHAM defined "hot buttons", issues of high concern for consumers when thinking about sustainability and more specifically about the impact of product life cycles. Hot buttons were included as criteria by default as without these it was felt that without them consumers would be less engaged with the standard.

AHAM took the conscious decision to slightly "deprioritise" energy in use in the refrigeration standard as this was being comprehensively dealt with by the Energy Star and CEE programs. (45 points on offer rather than, for example, 80 as

Sustainability Impact Category	Raw Materials	Manufacturing	Packaging/ Distribution	Use	End of Life
Air	Refrigerant CDP	Releases during manufacturing		Noise	Transport to recycling?
Climate change	Refrigerant	Releases during manufacturing		Energy	Refrigerant
	Blowing agent				Foam
Living resources (flora & fauna)	Hazardous waste	Hazardous waste			
Non-living resources	Recycled content	Solid waste	Recyclability/ content of packaging		
Water (quality & quantity)	Releases in supply chain	Releases during manufacturing			
Human health	Materials of concern				
Socio-economic				Continued use of refrigerator	

Table 4: Validating and prioritizing hotspots

advocated by some stakeholders). This counter-intuitive approach meant that other hotspot areas where less action was being taken could be brought into focus through the standard. While this approach might not be appropriate in all cases, it is worth considering what actions are already being undertaken in hotspots areas and therefore what opportunities there may be to target improvement in other areas through hotspots analysis.

AHAM adopted a points-based system to prioritize and weight hotspots. Again, this approach might not be appropriate for all sectors, but for AHAM the points system directed manufacturers' improvement efforts to the key hotspots (more points available for bigger hotspots) and allowed for a staged approach where the standard could be used by groups with different starting levels of sustainability performance.

In any methodology, not all impacts or indicators proposed by stakeholders can be included. To help mitigate these concerns, AHAM allowed for an additional "innovation" attribute for manufacturers who could "…demonstrate innovation in product features and manufacturer programs and policies that demonstrate environmental performance improvement that is exceptional, measurable, and beyond the requirements and criteria covered within this Standard". These had to be validated through third party verification to ensure that they were defensible and in the spirit of the standard. Allowing a level of flexibility in a hotspots methodology can increase the usability of the methodology while still respecting its core aims and values.

STEP 4: RESPOND TO DATA AND STAKEHOLDER GAPS

The output of step 4 shall be a consideration of the impact of gaps in data and stakeholders, and recommendations of whether these should be tolerated or acted upon. Step 4 is part of an iterative process, reviewing steps 2 and 3. It is important to consider the significance of any data gaps, specifically whether hotspots have been misidentified due to a lack of data, or data of insufficient quality.

As with step 3, data and stakeholder gaps were dealt with on an on-going basis during the development process. Data gaps were tackled using a range of measures including the use of life cycle screening studies and by working collaboratively between AHAM, its members and stakeholders involved in the process such as retailers to help identify and collect data in new areas or from new organisations.

Stakeholder identification had taken place from early on in the development process, with additional potentially valuable stakeholders added during the process. Key additional stakeholders included later in the process included blowing agent and refrigerant manufacturers who were able to help AHAM and its members understand the technical aspects of these chemicals and the potential pathways for maintaining product performance while reducing impacts.

AHAM also accepted that the final methodology would still not be able to include everything and that some impacts might have to be considered for inclusion in future versions of the standard. For example, despite long and detailed discussions about social impacts, AHAM did not include any quantitative social impacts as they did not feel that the metrics/indicators were sufficiently well developed and there was no consensus across stakeholders as to what should be included and how it should be measured. Social impacts including human rights, labour practices and consumer health and safety were included through criteria related to corporate policies and governance, with the potential to expand these criteria in future versions.

AHAM's approach to identifying criteria for inclusion in the standard was characterised by three steps:

1. Seek consensus where possible on criteria;
2. "Agree to disagree" where no consensus is reached and communicate evidence/reasoning for proposed approach;
3. For areas where no approach can be found, communicate the exclusion transparently to stakeholders and record as a potential future inclusion.

STEP 5: IDENTIFY AND PRIORITIZE ACTIONS

The output of step 5 shall be a shortlist of prioritised actions based on their impact and feasibility. Having identified the hotspots and reviewed the

stakeholders required to address them, the next step is to identify and prioritise actions to eliminate or reduce the impact of the hotspots.

Actions based on the identified hotspots (characterised by attributes and criteria) were developed between AHAM, its members and key technical stakeholders. Prioritisation in the form of weighting was provided by the points system described previously. The structure of the standard was designed to encourage improvement in all the key attributes from one generation of products to the next. Actions and requirements included in the standard fell into two broad categories:

- Binary actions such as implementing a policy or providing proof of an existing program;
- Actions resulting in continuous improvements, such as demonstrating year-on-year progress on GHG emissions at manufacturing sites or improving energy efficiency of the product as recorded through the Energy Star program.

When identifying the potential actions and measures of progress AHAM sought detailed technical input from manufacturers and actors in the supply chain to understand the potential opportunities and limitations, ensuring that the actions proposed were ambitious, but remained feasible. This was particularly the case when targeting improvements in blowing agents and refrigerants or in manufacturing processes. Technical experts were also able to provide guidance on the timescales for potential improvements, which in turn informed the timescales for revision and review of the analysis.

STEP 6: REVIEW INITIAL FINDINGS

Having identified hotspots, potential actions, gaps in data and activity, the analysis and initial findings should be reviewed with experts and key stakeholders. The purpose of the review should be to ensure that the analysis is fit for purpose. This means that: it is consistent with the goal and scope; that the impact categories have been assessed appropriately; and that appropriate actions – and those that are able to undertake them - have been identified.

AHAM road tested the methodology across the refrigeration sector with analyses of several different product types being conducted by a range of manufacturers. This helped to identify common data gaps and helped to understand any practical challenges in applying the methodology. AHAM received valuable feedback on the actions suggested, ensuring that these could be understood and applied in the real world. AHAM circulated the document to a wide group of external stakeholders allowing for open and comprehensive feedback on the draft methodology. Webinars were organised with key stakeholders (such as those engaged at the start of the goal and scope phase) to describe the initial findings, answer questions and collect detailed feedback.

STEP 7: PRESENTATION AND COMMUNICATION

Presentation and communication of findings to a wider audience allows for validation of hotspots analysis (HSA) results, initiating actions and collaboration, designing pilots and reviewing progress over time.

AHAM wanted to create an action-oriented methodology the outputs of which could be used to communicate progress to its stakeholders across a diverse range of attributes. AHAM defined this aim during the goal and scope phase, meaning that the methodology was developed with a clear communications goal from the beginning.

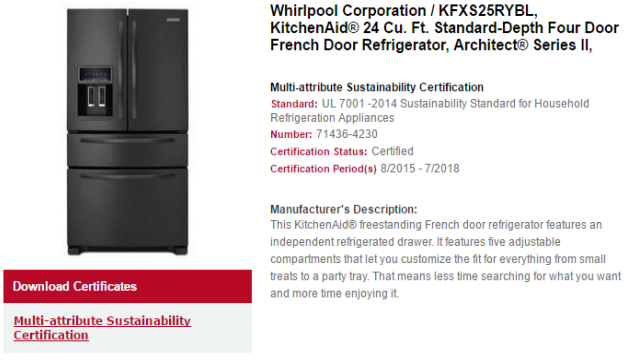


Figure 14 The multi-attribute sustainability certification available for download

AHAM's focus was on ensuring that the final output was relevant and understandable to retailers and consumers. AHAM decided not to use an Environmental Product Declaration (EPD)-style list of indicators, which was considered inaccessible to non-experts. Instead, AHAM favoured a certification approach, complemented

by communication of progress in individual areas appropriate to the target audience.

Manufacturers conducting assessments of their products using the methodology are awarded a multi-attribute sustainability certification through independent third-party verification. The verification process requires proof of documentation and an annual refresh of key elements of the assessment such as the numbers used in modelling and compliance documentation, with a full re-certification down to a factory level every three years. The verification process ensures that any claims of progress are robust and verifiable. AHAM has worked with UL to produce an environmentally preferred logo which is being trialled with freezers to communicate to consumers which products have been produced following the standard.


CERTIFICATE
OF COMPLIANCE

Whirlpool Corporation
KRFF305ESS, KitchenAid® 25 Cu. Ft. 36-Width Standard Depth French Door Refrigerator with Interior Dispense

UL 7001 -2014 Sustainability Standard for Household Refrigeration Appliances
Standard

Project Number | 70160-4230 Certificate Number | 08/12/2015 - 07/29/2018 Certificate Period

Environment

Figure 15: Example certificate of compliance

Beyond this, the detailed nature of the methodology allows manufacturers to communicate outputs from the analysis with a level of detail appropriate to the target audience. For example, when communicating to retailers with highly developed sustainability programs AHAM members can give detailed figures and show multi-attribute heat maps. Conversely, when communicating with groups less engaged in sustainability, AHAM members might choose to show percentage improvement in one or two key areas or an increase in the number of "points" from one generation to the next.

STEP 8: REVISIT HOTSPOTS AND ACTIONS IDENTIFIED

A method should be established to ensure that hotspots are revisited after a specified period or when certain trigger points occur (e.g., where the impact of a prioritised hotpot has been reduced to an acceptable level and resources become available to tackle the next hotspots on a rolling list). This is likely to depend on the goal, scope, objective and timeframe of the hotspots analysis; and the time required for agreed actions to be undertaken.

AHAM recognised that criteria would be improved at different rates, with some areas showing continuous improvement and others taking longer to improve. This was reflected in the requirements for verification with aspects such as model values for calculating GHG emissions refreshed annually, while factory-level data, which is more stable, re-submitted every three years.

Moving forward AHAM have put together an action plan outlining how the standard and methods of communication should respond to various scenarios (such as changing demands from retailers or regulatory changes). These "triggers to action" offer AHAM and its members a clear vision for the future of the standard and the communication of its outputs as the marketplace evolves.

3.4 Product level supplementary guidance

This module addresses issues which are specific to a hotspots analysis carried out at a product level. It covers points of differentiation which apply to Steps 1, 2 and 5, and should be used in conjunction with the overarching methodological framework. Other organisations may wish to provide guidance which is further tailored to the context for their products.

STEP 1 DEFINE, CLARIFY AND SOLICIT AGREEMENT OF THE GOAL AND SCOPE

When defining the goal and scope, the product to be assessed shall be defined and clearly communicated. Key considerations in determining the product hotspots will include the time period considered and how this is defined. For energy using and energy related products, this would affect the significance of the use phase relative to other life cycle stages. For example, the life of an item of clothing could be expressed in years or number of washes.

STEP 2 GATHER DATA, SEEK EXPERT INSIGHT, KNOWLEDGE BUILDING AND ANALYSIS

Consideration should be given to the product life cycle stages most likely to contribute to impacts and these stages prioritised for data gathering. The role of capital equipment should be considered in the context of the functional unit. This may indicate the effort required to understand the impact of capital items. For products, a range of databases are available which could provide useful secondary information, such as the international life cycle database.

STEP 5 IDENTIFY AND PRIORITIZE ACTIONS

Product hotspots analysis is likely to identify hotspots which are shared by different stakeholders along value chains. In considering actions, the impact of collaborative and stand-alone actions should be considered. For example, it may be that a hotspot occurs during the use phase of a product. This may be outside of the control of organisations involved in the hotspots analysis, but could be within their influence. A range of means of influence should be considered. These could include options around design, instructions, public communications campaigns and managing product waste at end of life.

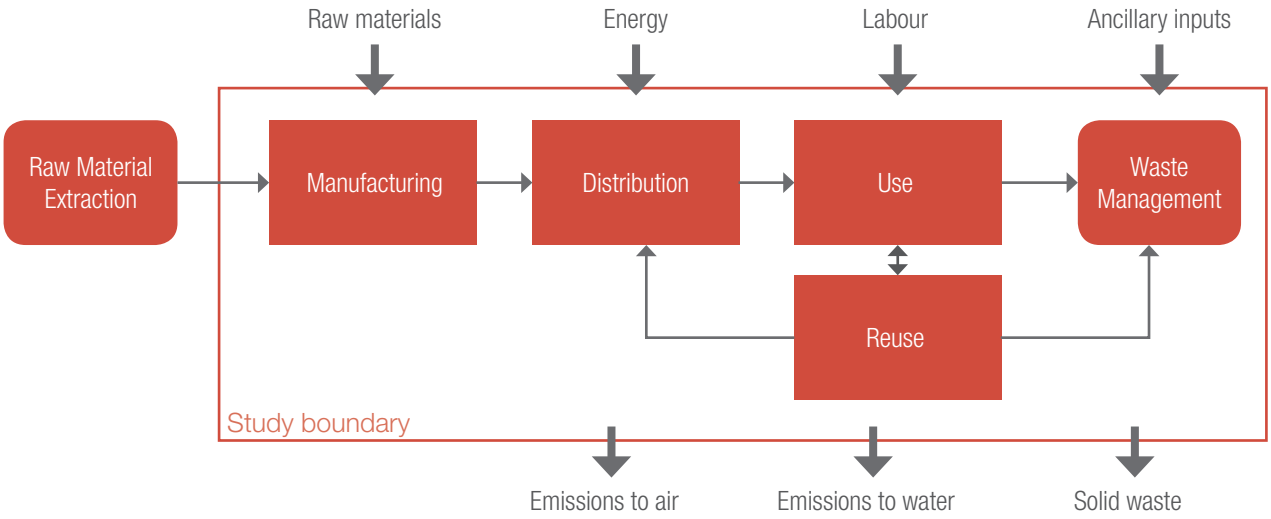


Figure 16: Example study boundary diagram – product category level

3.5 The Sustainability Consortium: product case study

The Sustainability Consortium's Product Sustainability Toolkits (Toolkits) stem from the idea that innovation in consumer goods sustainability can be driven throughout the supply chain when key decision makers ask the right questions of their partners and collectively act on what they learn. The Sustainability Consortium (TSC) has developed a rigorous methodology to evaluate available scientific knowledge, identify sustainability issues and opportunities for different types of consumer products, and create key performance indicators (KPIs) for measuring and reporting product category-level performance.

These are used to manage the sustainability performance of consumer products worth over $100 billion in annual retail sales. This helps businesses identify and implement sustainability improvements right across the value chain, and also generates large amounts of new data to help improve the process over time. More information and sample results can be found here: https://www.sustainabilityconsortium.org/product-categories/ .

The process is summarized in nine steps as shown in Figure 17. These align closely with the 8-step process described in the Life Cycle Initiative's Methodological Framework:

1. DEFINE THE PRODUCT CATEGORY (HOTSPOTS METHODOLOGY STEP 1)

Each Toolkit addresses a unique product category, e.g., computers, tomatoes, or plush toys. In this sense TSC's work is different from other initiatives that may focus at an organizational or individual product level sustainability. This level of specificity allows the methodology to be replicable and

Life Cycle Perspective
Toolkits reveal social and environmental hotspots from throughout the product category life cycle.

Multi-Stakeholder Process
TSC members and invited participants are stakeholders from business, civil society, government, and academia who collaboratively develop the Product Sustainability Toolkits.

Stakeholders initiate a development cycle with one or more scoping meetings which are followed by at least two draft rounds with further meetings and online commenting.

Figure 17: Overview of TSC's development process

Data Type	Review Type			
	Independent Reviewed by a third party of three or more people not involved in the execution of the study and without a conflict of interest resulting from their position. (ISO 14025-2006)	Editorial One or two independent reviewers have assessed the work.	Internal One or more non-independent reviewers have assessed the work.	None Review type is not independent, editorial, or internal.
Primary Collected by the researcher or group that also analyzes the data.	High	Medium	Medium	Low
Secondary Collected by one party and then analyzed by a different party.	High	Medium	Medium	Low
None No primary or secondary data are used.	Medium	Low	Low	Low

Table 5: TSC Source Quality Matrix is used to assign each publication a quality value for use in later decisions

scalable across a large portion of the consumer goods industry and produce useful and meaningful metrics. The scope of a particular product category is determined by industry norms, the similarity of supply chains, and feedback from stakeholders.

2. REVIEW SCIENTIFIC SOURCES (HOTSPOTS METHODOLOGY STEP 2)

After a product category is defined, information on its sustainability throughout its life cycle is collected from scientific publications and other sources through staff research and consultation with members and other experts. Only sources that are transparent (i.e., available to all at reasonable cost and effort) can be used to support the Toolkits. Life cycle assessments (LCAs) are particularly sought after because they can directly compare impacts across the product category life cycle.

Each individual source is assessed for its source quality based on how its review process and the type of data (primary, secondary) is used to draw its conclusions. TSC uses its custom-built Research Database to organize all of the information captured or created in the research process starting with the scientific sources being referenced.

3. RESEARCH HOTSPOTS AND 5. EVALUATE THE EVIDENCE (HOTSPOTS METHODOLOGY STEP 3 & 4)

A hotspot is a discrete activity within a single life cycle stage of a product category that creates relatively high impacts compared to other life cycle stages. Where high quality LCAs are available, TSC begins by identifying life cycle activities that are responsible for at least 10% of the impact in an impact category (as defined by the LCA study). TSC also considers impact categories that may not be addressed by an LCA but are by studies in other scientific literature (particularly social impacts). Any impact identified by these studies must have at least three high quality sources supporting it to be considered in the hotspots analysis. This helps ensure that evidence which may be at the product level is applicable at the product category level. Impacts with lower levels of support may be designated as an additional issue and included in later documentation.

Because the Product Sustainability Toolkits are designed to be practical business tools, TSC has set a limit of 15 hotspots per product category. This requires additional decision-making if there is

Impact group	Resources	Climate	Ecosystems and biodiversity	Health and safety	Social well-being
Domain	Water Mineral Fossil Land	Global	Terrestrial Freshwater Marine	Worker Consumer Community	Worker Consumer Community Animal
Impact categories	**Water** Surface water depletion Ground water depletion Ground water degradation **Mineral** Mineral depletion **Fossil** Fossil resource depletion **Land** Soil erosion Soil degradation Land transformation and use Resource impact, other	Greenhouse gas emissions Soil carbon loss Black carbon emissions Climate change, other	Ecotoxicity Acidification Eutrophication Biological resource depletion Invasive species and genes Light pollution Noise pollution Ecosystem services loss Ecosystem process change Habitat loss and fragmentation Turbidity Biodiversity loss, other Water quality, other	Toxicity, carcinogens Toxicity, mutagens Toxicity, neurotoxicants Toxicity, endocrine disruptors Toxicity, sensitizers Toxicity, irritants Toxicity, reproductive toxicants Toxicity, other specific organ Toxicity, unspecified Ionizing radiation Ozone depletion Smog formation Particulate matter Pathogens Accidents and injuries Health and safety, other	Access to immaterial resources Access to material resources Animal welfare Child labor Community engagement Consumer privacy Corruption Cultural heritage Delocalization and migration Education and training End-of-life responsibility Equal opportunities / discrimination Fair salary Feedback mechanism Forced labor Freedom of association and collective bargaining Gender equality Labor laws and conventions Local employment Management system Poverty Respect of indigenous rights Secure living conditions Social benefits / social security Transparency Working hours Social well-being, other

Table 6: TSC's Impact Classification
The impact classification is based on a number of sources including the Life Cycle Initiative's Guidelines for Social Life Cycle Assessment of Products

evidence for more than 15 potential hotspots. TSC uses the concept of actionability to address this challenge: how likely a typical brand manufacturer in the product category is to have visibility into the supply chain to gather information and sufficient influence to effect a change.

The most basic requirement of actionability is that there are one or more improvement opportunities documented in published literature (Step 4 in Figure 17) that demonstrate brand manufacturers can take meaningful action on the hotspot. Actionability is further assessed through stakeholder input. In an iterative process with the creation of the Key Performance Indicators, potential hotspots that are highly correlated or would be addressed through a single action or metric can be combined.

4. RESEARCH IMPROVEMENT OPPORTUNITIES (HOTSPOTS METHODOLOGY STEP 5)

Improvement opportunities are specific actions that manufacturers can take to address the hotspots. These are identified from the same scientific literature as the hotspots.

5. KEY PERFORMANCE INDICATORS (KPIS)

The creation of KPIs is the primary driver for TSC's hotspots analysis. Each of the 15 KPIs in a Toolkit allows manufacturers to report their performance against one or more of the life cycle hotspots. A variety of metric types are used, including some direct impact metrics such as greenhouse gas emissions intensity, the percentage of certified materials purchased, and occasionally qualitative response option scales.

6. MULTI-STAKEHOLDER REVIEW (HOTSPOTS METHODOLOGY STEP 6)

Members of The Sustainability Consortium are stakeholders from business, civil society, government, and academia who collaboratively develop the Product Sustainability Toolkits. The process for developing high quality Toolkits relies heavily on regular workshops, discussions, and commenting in which all TSC members and a wide selection of other external stakeholders can participate.

7. PUBLISH THE TOOLKIT (HOTSPOTS METHODOLOGY STEP 7)

The Toolkit is published and the Key Performance Indicators are available for manufacturer to customer reporting

8. UPDATE AND REVISE THE TOOLKIT (HOTSPOTS METHODOLOGY STEP 8)

At least every two years, each Toolkit undergoes a review by TSC researchers and members to assess whether an update is required. New information often becomes available from new research, feedback from users, or analysis of reported results. TSC aims to balance the need for continual improvement with the value of having static questions and consistent reporting over time.

More information and sample results can be found here: https://www.sustainabilityconsortium.org/product-categories/

4. Annexes

ANNEX 1: Background and context to Hotspots Analysis

A1.1 About Hotspots Analysis:

Hotspots analysis allows for the rapid assimilation and analysis of a range of information sources, including life cycle based studies, market, and scientific research, expert opinion and stakeholder concerns. The outputs from this analysis can then be used to identify potential solutions and prioritize actions around the most significant economic, environmental, governance, ethical and social sustainability impacts or benefits associated with a specific country, industry sector, organization, product portfolio, product category or individual product or service. Hotspots analysis is often used as a pre-cursor to developing more detailed sustainability information.

A1.2 Distinctions between Hotspots Analysis and Life Cycle Assessment:

A key aspect is that hotspots analysis is action-oriented. Unlike Life Cycle Assessment, it may not require detailed understanding of all life cycle stages. Hotspots Analysis is not a tool for comparison of products, sectors, cities or other issues. Rather, it is designed to help identify and prioritise actions based on their potential impact. Communications are likely to focus on how issues are being addressed rather than the magnitude of an environmental footprint.

Hotspots Analysis can incorporate qualitative as well as quantitative information to identify issues and prioritise action, therefore allowing

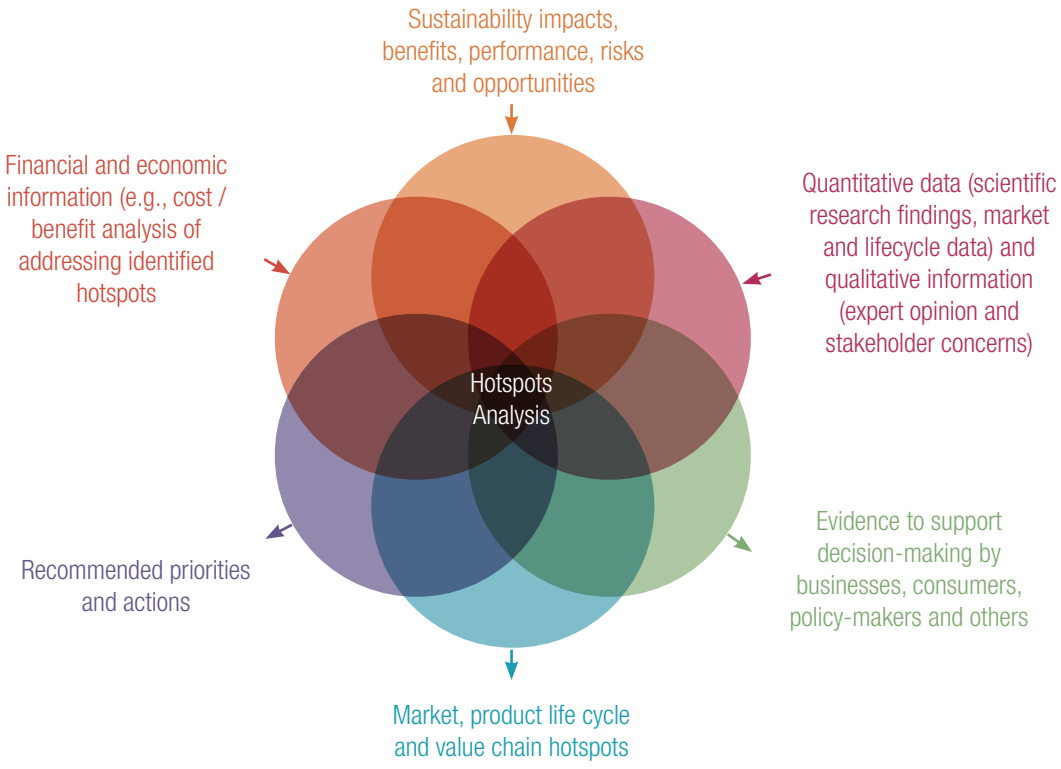


Figure 18: Application of Hotspots Analysis: different data sources and example study outputs

it to be used for issues which cannot readily be incorporated into current Life Cycle Assessment tools (e.g., noise, biodiversity, ethical issues).

A1.3 Benefits of Hotspots Analysis:

The benefits of hotspots analysis include ensuring:

- Focus on priority issues (e.g., waste, water, materials of concern)
- Focus on the right life cycle stage (e.g., material acquisition, manufacturing, use, end of life)
- Focus on the right actors (e.g., producers, manufacturers, suppliers, retailers, customers) to evaluate, influence and implement solutions
- Implications of trade-offs are understood
- Resources (e.g., time, money) can be effectively allocated to actions.

A1.4 Hotspots Analysis and the Sustainable Development Goals

At the United Nations Sustainable Development Summit on 25th September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs), with 169 supporting targets to end poverty, fight inequality and injustice, and tackle climate change by 2030. These are shown in Figure 19. Hotspots Analysis can be used to identify and prioritise actions for each of these goals at a product category / sector / city / nation or other level.

For example, Goal 5 is to achieve gender equality and empower all women and girls. The Social Hotspots Database project aims to foster greater collaboration in improving social conditions worldwide by providing the data and tools necessary for improved visibility of social hotspots in product supply chains[15]. The database was used in a hotspots analysis by the EU in 2013 Social sustainability in trade and development policy: A life cycle approach to understanding and managing social risk attributable to production and consumption in the EU-27[16].

Goal 11 on sustainable cities and communities is implicitly linked to identifying poverty hotspots and addressing these in an inclusive and participatory manner. Goal 12, in particular target 12.8 aimed at ensuring that people everywhere

15 http://socialhotspot.org/
16 http://bookshop.europa.eu/en/social-sustainability-in-trade-and-development-policy-pbLBNA26483/

Figure 19: UN Sustainable Development Goals

have the relevant information and awareness for sustainable development and lifestyles; as well as actions under Goal 13 on climate action that could be prioritized based on hotspots for greenhouse gas emissions, but also adaptation to a changing climate.

A1.5 Related techniques and tools for assessment

A1.5.1 Life Cycle Thinking

The Life Cycle Initiative identifies Life Cycle Thinking as going beyond a site or process based approach to consider the environmental, social and economic impacts of a product (or sector) over its entire life cycle.

The main goals of Life Cycle Thinking are to reduce a sector's or product's resource use and emissions to the environment as well as improve its socio-economic performance through its life cycle. This may facilitate links between the economic, social and environmental dimensions within a sector, an organization and through its entire value chain.

Life Cycle Thinking is a principle rather than a detailed methodological framework, and Hotspots Analysis aligns with the principles of Life Cycle Thinking to consider impacts at a number of different scales (e.g., product, sector, city and nation) and identify where the greatest impacts and opportunities exist.

For further information

- UNEP/SETAC Life Cycle Initiative (2012) Greening The Economy Through Life Cycle Thinking[17]

A1.5.2 Life cycle approaches (e.g., LCA, LCM, Footprinting, Life Cycle Costing)

Life Cycle approaches encompass a wide range of methodologies and tools for the evaluation of various stages of the life of a product or organization, from raw material acquisition to final disposal. This covers simplified methodologies from qualitative screening tools via footprint analysis (ISO 14046 and 14067), hotspots analysis; and finally detailed life cycle assessment (LCA), such as environment or social LCA or life cycle costing, based on the ISO standards of the ISO 14040 series and ISO 14072.

Life Cycle approaches can cover one or more impact categories (e.g., water use, climate change and land use). The information may be used to support a range of activities, such as Sustainable Public Procurement, Eco or Sustainable Design and Eco-labels (based on the ISO 14020 series of Standards).

Hotspots Analysis is a life cycle approach that can be used to identify the most significant impacts at different scales of application (e.g., product category, sector, national levels, etc.). The findings from hotspots analysis are used to identify impact improvement opportunities and to prioritize impact reduction actions.

For further information

- ISO standards on life cycle assessment http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54854
- ISO standards on environmental labelling http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54836

A1.5.3 Input Output Analysis

Input-output analysis allows for an understanding of the interconnection between different sectors of an economy. The framework for modern input-output analysis was developed by Wassily Leontief in the 1950s. Traditionally, input-output tables are constructed for national economies to show the flow of money between sectors, from primary extraction to final consumption. This is represented in a table that shows how the product of one industry is consumed by a range of sectors (e.g., another industry, final consumption by households). Very quickly, this approach was applied to environmental issues (Leontief 1970).

The international nature of production and consumption means that multi-regional input-output tables (MRIO) have become increasingly relevant in understanding the economic impacts of production and consumption patterns. MRIO analysis is also used to analyse and allocate environmental pressures caused by economic activities; an approach called Environmentally

17 http://www.lifecycleinitiative.org/wp-content/uploads/2013/03/2012_LCI_10_years_28.3.13.pdf

Extended multi-regional input-output analysis (EE-MRIO) and can also be applied to social issues.

EE-MRIO can be used to identify hotspots in production and consumption of specific products at a national, regional, or multi-regional level. The phases in an EE-MRIO align well with life cycle based approaches and as they cover an entire economy, they ensure that all environmental pressures are allocated (i.e., there is no double counting or omission of shared impacts).

For further information

- The Environmental Footprints Explorer (http://www.environmentalfootprints.org/) an open access forum for multi-regional input-output (MRIO) data, focussing on environmental footprints.
- The One Planet Economy Network (OPEN:EU) (http://www.oneplaneteconomynetwork.org/), a two year EU funded project to develop a set of EU consumption indicators and interactive software tool
- Leontief, W. 1970. Environmental Repercussions and the Economic Structure: An Input-Output Approach. The Review of Economics and Statistics 52(3): 262-271. http://www.jstor.org/stable/1926294

ANNEX 2: Workshops and webinars organized by the Project Group

Two, one-day interactive workshops were undertaken in Paris on the 16th and 17th of June 2016, for each of the product and sector levels of hotspots analysis, to review, discuss and receive stakeholder input and feedback on the draft methodological framework, as well as the draft guidelines on the appropriate use and communication of sustainability information derived from hotspots analysis. 20 participants attended on the 16th and 21 on the 17th June.

Following on from the workshops three, three-hour webinars were held in July (14, 18 and 21 July 2016) to solicit additional input and feedback from key experts and stakeholders unable to attend the Paris workshops:

Attendance for the webinars was as follows:

- 14 July: 20 sign-ups
- 18 July: 18 sign-ups
- 21 July: 19 sign-ups

ANNEX 3: Methodology used for the Phase 1 study

Phase 1 of the project, which occurred between May and December 2014, involved the identification and mapping of existing hotspots studies, initiatives and methodologies from around the world in order to better understand the following aspects:

- Range and diversity of approaches to hotspots analysis in existence and how they are being applied;
- Suitability of different hotspots analysis methodologies for use at different scales or levels of granularity (e.g., at the national-, sector- or product category-level);
- Commonalities and differences among these different methodologies and the reasons behind them, including key methodological components and process steps;
- Body of best practice that already exists around methodology development and application;
- Who is developing and using these methodologies and the business models behind them;
- Topics, sectors of the economy and product categories they are being applied to;
- The range of outputs, findings, outcomes and impacts that result from these studies, initiatives and methodologies – and their impact; and
- Opportunities to develop a common global approach to hotspots analysis that is flexible enough to be applied at a range of different scales and levels of granularity and accuracy based on user needs and budget.

In order to achieve these objectives the following research methodology and process has been used to identify, short-list and analyse hotspots analysis methodologies:

Step 1: Shortlisting and screening of existing hotspots analysis methodologies for preliminary selection

This included the development of selection criteria, desktop research and an online survey of methodology developers and users to help identify, validate and shortlist existing hotspots analysis methodologies.

Step 2: Further review of selected methodologies for secondary selection

This step included the application of the selection criteria to the preliminary list of hotspots analysis to shortlist the 44 methodologies identified to meet the project sponsors quota to include 3 national, 5 sector level and 10 product category-level methodologies for more detailed analysis. Further, a review of the popularity of different hotspots analysis approaches was conducted using Amazon's on-line Alexa[18] website tracking tool. The project team then reached out to stakeholders including methodology developers, owners and users and also gained access to privileged information and data for in-depth analysis. This led to the selection of 21 shortlisted methodologies that included four national, five sector-level and 12 product category-level hotspots analysis methodologies.

Step 3: In-depth assessment and segmentation of selected methodologies

The authors then conducted an assessment of these 21 methodologies to obtain information on key commonalities and differences among the shortlisted methodologies using the following parameters:

- Approach: is the methodology based on a quantitative or qualitative approach, or a combination of the two – i.e., a 'beyond LCA[19]' approach?

18 Alexa.com is an online tool that allows users to do a basic analysis of the "popularity" of different websites. See: http://www.alexa.com/. More information on the caveats and limitations of Alexa data and interpretation of Alexa rankings: http://counsellingresource.com/lib/practice/intel/alexa/.

19 In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via Life Cycle Assessment (as encompassed by Environmental Life Cycle Assessment, Social Life Cycle Assessment and Life Cycle Costing). "Beyond LCA" should not be interpreted as better than or superior to Life Cycle Assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

- Single or multi-impact category or issues addressed?
- Breadth of impacts / hotspots covered: environmental, social, ethical, economic, governance
- Level of stakeholder engagement*: in the development, piloting and broader use of the methodology (using three broad classification of the level of engagement achieved: full engagement with pilot testing; moderate engagement throughout the process; limited phases of engagement).
- Availability of supporting tools: does the methodology provide supporting tools or explicitly include measures or approaches to support stakeholder efforts to address hotspots or impacts (e.g., identifying hotspots, supporting tools, data or knowledge bases, supporting piloting of a range of solutions to identified hotspots, etc.)?
- Outreach: is the methodology well-known, widely disseminated or applied?
- Target audience: ability to cater for different user needs and potential for flexibility in application across relevant sectors or product categories
- Business model: how was / is the development and use of the methodology funded?

Scale of Application	Methodology	Stakeholder engagement	Impact coverage	Applicability to SMEs	Applicability to Emerging Economies	Ease of Use	Business Model		Approach	
							Public	Private	Quality	Quantity
National	EU EIPRO[1]	■	O	✔	✔	+	$	$		
	Getting the Numbers Right[2]	■■■	O	✔	✔	++		$		
	Global Protocol for Community Scale GHG emissions	■■■	O	✔	✔	+	$	$		
	US GSA Supply Chain Hotspots Project	■	O			+	$			
Sector	GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard	■■■	O	✔	✔	+	$	$		
	National Cattlemen's Beef Association Hotspots Analysis[3]	■■■	OO	✔	✔	++		$	💬	
	Public Gardens Sustainability Index Hotspots Analysis	■■■	OOOO	✔	✔	++		$	💬	
	Sustainability Accounting Standards Board Materiality Map™	■■■	OOOO	✔		++	$	$	💬	
	Sustainability Assessment of Food and Agriculture systems	■■■	OOOO	✔	✔	++	$		💬	

Table 7: Summary of findings of the shortlisted HSA Methodologies (continues on next page)

Scale of Application	Methodology	Stakeholder engagement	Impact coverage	Applicability to SMEs	Applicability to Emerging Economies	Ease of Use	Business Model		Approach	
							Public	Private	Quality	Quantity
Product	Association of Home Appliance Manufacturers Hotspots Analysis	■■■	○○○	✔	✔	+		$		
	French Grenelle I and II BPX 30-323-0 Product Lifecycle Environmental Impact Quantification Guidance Standard	■■■	○	✔	✔	+	$	$		
	GHG Protocol Product Life Cycle Standard	■■■	○	✔	✔	+	$	$		
	ISO/TS 14067: 2013 - Carbon footprint of products	■■■	○	✔	✔	+	$	$		
	Japanese Carbon Footprint Program	■■■	○	✔		+	$	$		
	Japanese EcoLeaf Program	■■■	○	✔		+	$	$		
	WRAP's Product Sustainability Forum[4]	■■■	○○	✔	✔	+	$	$		
	Social LCA	■■	○○	✔		++	$	$		
	Sustainability Hot Spots Analysis (SHSA) tool[5]	■	○○	✔		++	$	$		
	The Sustainability Consortium	■■■	○○	✔	✔	+		$		
	Water Quality Association (WQA) Hotspots Analysis	■■■	○○○	✔	✔	+	$	$		
	Water Footprint Assessment Methodology	■■■	○○○○	✔	✔	++	$	$		

Notes

1 Also applicable to product and sector scales of application
2 Also applicable to product and sector scales of application
3 Also applicable to products
4 Also applicable to sectors
5 Also applicable to sectors

Key Insights from the study

National-level methodologies all utilize a quantitative approach, are generally based on input / output analysis or materials flows analysis; and focus solely on environmental impacts. All involve multiple stakeholders in their development.

Sector-level methodologies (with one exception) cover environmental and social impacts; with the majority including both quantitative and qualitative inputs. Some include a broader range of impacts, including economic and governance impacts. All involve multiple stakeholders in their development and provide some form of support tools for their users.

Product category-level methodologies all use a quantitative approach as a minimum with the majority combining this with qualitative inputs. The predominant scope of product category-level methodologies is environmental impacts, with roughly half the methodologies identified focusing on a broader range of impacts and issues, such as economic impact (e.g., WRAP's Product Sustainability Forum); and social and ethical impacts (e.g., The Sustainability Consortium, and the Wuppertal Institute's Sustainability Hot Spots Analysis methodology). All involve multiple stakeholders in their development and use. With two exceptions (AHAM and WQA) all methodologies are applied across multiple product categories and therefore have broad target audiences.

Key stakeholder feedback

Feedback from survey respondents, telephone interviews and e-mail exchanges with methodology developers / owners and users has highlighted some key learning points and observations from their experience of existing hotspots methodologies that should be considered in the development of global guidance:

'Beyond LCA[20]': Most stakeholders were in favour of hotspots analysis methodologies that utilize a mix of quantitative and qualitative analysis to make the analysis more well-rounded, market relevant and able to overcome some of the limitations of traditional LCA approaches

Goal and scope clarity: was considered to be critically important to the successful application of any hotspots analysis methodology, including early engagement with key stakeholders.

Stakeholder credibility and a phased approach: to the development and application of any hotspots analysis methodology is seen as another important factor; building internal capability, engaging critical friends to review the approach and highlighting quick wins and successes all help to achieve a successful outcome.

Keep it actionable and manageable: Stakeholders suggested that it is really important to identify how many hotspots can be practically dealt with at one time. This has implications for how thresholds or materiality criteria are set – i.e., when does an aspect or impact become a hotspot? Clarity of actions required to address the hotspot is also seen as an important component in the development of any methodology.

Prioritization and the 'addressability' of hotspots: Many stakeholders called for clarity around the nature, scale and location of the hotspot in the sector, product lifecycle or value chain; and how 'addressable' they are in the current infrastructure, market, operational or economic context (e.g., ability of the company to influence the hotspot, ease and cost of implementation of solutions to address the hotspot, complexity of the sector or value chain, etc.). In some cases, stakeholders mentioned that it is likely that some form of pre-competitive collaboration would be required to tackle a hotspot – i.e., to share the cost of implementation; agree a common targeted approach; or build and share expertise and capacity and capability to respond..

Make it visual: A number of stakeholders commented on the fact that the clear and intuitive visualisation of hotspots analysis findings is really important to them and particularly to their non-technical colleagues who are faced with making a decision on the actions that they need to take or mandate to address a hotspot. Sector heat maps and product hotspot matrices, synthesized findings in slide deck form, short digestible action

20 In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via Life Cycle Assessment (as encompassed by Environmental Life Cycle Assessment, Social Life Cycle Assessment and Life Cycle Costing). "Beyond LCA" should not be interpreted as better than or superior to Life Cycle Assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

plans and searchable libraries of solutions are all considered helpful.

Periodic review and revision of hotspots: Stakeholders suggested that hotspots analysis should be revisited and updated periodically to capture any changes that take place over time, which could affect the applicability, usability or purpose of the hotspots analysis.

Clear communication of uncertainty: A number of stakeholders called for clearer statements of uncertainty in the findings from hotspots analysis; and for the inclusion within hotspots analysis methodology of clear guidance and tools to support the development of data quality, management and analysis protocols, methods for uncertainty testing; clear rules for the communication of assumptions, proxy products or processes and any models used in the analysis.

Case studies: Several stakeholders stated that case studies and examples that showed how to apply a methodology were incredibly helpful, particularly when applying the methodology for the first time. One specific example was given for the GHG Protocol Product Standard, which is peppered with case studies from road-testing companies to support users of the Standard.

Versatility and flexibility of hotspots analysis

The findings from Phase 1 of this project suggest that hotspots analysis is highly adaptable and flexible, and can be used at a number of different scales or levels (e.g., countries, cities, industry sectors, product portfolios, product categories or individual products) to overcome some of the challenges around managing and applying 'big data' and the ever increasing volumes of research findings available to decision-makers. The findings suggest that existing sector-level hotspots analysis have the potential to be applied across multiple sectors of an economy. Similarly, product category-level hotspots analysis methodologies also exhibit the potential to be applied across a range of different product categories. Examples of the sectors that existing hotspots analysis methodologies cover include: food and grocery products, DIY (home improvement) products, textiles and clothing, electrical and electronic products, household appliances, toys and leisure (public gardens).

Some hotspots methodologies have been deliberately developed to be iterative in nature, starting by conducting an analysis of the hotspots in a national economy, then selecting priority sectors or cross-cutting hotspots for further analysis; and then identifying and taking action on the priority products and hotspots in product categories (e.g., bakery products) or for groups of similar products within a broader product category (e.g., white bread). Other methodologies can accommodate or be adapted to operate at more than one scale or level of detail. Examples of this approach can be found in the methodologies from WRAPs Product Sustainability Forum (PSF), EU Environmental Impact of Products (EIPRO), Getting the Numbers Right, Social LCA and the Water Footprint Network.

Similarly, existing hotspots analysis methodologies are being developed with a number of audiences and sustainability-based applications in mind. Some studies are being used to help government policy-makers to focus voluntary agreements or action plans with industry in areas where sustainability hotspots have been identified. For example, as is the case with WRAP's Product Sustainability Forum's work in the UK food chain; the French Government's work to provide more sustainability information to consumers; or the Water Footprint Network's analysis of water scarcity hotspots in major river catchments.

Businesses are using hotspots analysis to focus their resources, drawing up action plans and practical programmes of work to eliminate, reduce or mitigate hotspots in their global value chains; and tackling major societal and commercial issues like food waste, food and resource security (future supply risk and resilience issues); and water use in agriculture. For example, the work of UK grocery retailer, Tesco, to tackle the food losses and food waste associated with the international sourcing of its products and their use by consumers; and the

work of The Sustainability Consortium in building consensus around the key sustainability hotspots to address in consumer goods value chains.

In some cases, the scope of hotspots analysis methodologies and studies are broadening beyond consideration of one or more environmental impact categories and including 'beyond LCA[21]' approaches and wider sustainability topics like biodiversity management, animal welfare, fair trading arrangements, land use and land use change and governance issues around raw materials (e.g., conflict minerals) or water resources. This development would suggest that both methodology developers and users see the value in securing a more holistic view of hotspots, allowing them to identify where trade-offs may need to be considered (e.g., between traditional intensive agricultural practices and the potential impact on the agri-ecosystems that support them).

21 In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via Life Cycle Assessment (as encompassed by Environmental Life Cycle Assessment, Social Life Cycle Assessment and Life Cycle Costing). "Beyond LCA" should not be interpreted as better than or superior to Life Cycle Assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

About the Global Life Cycle Initiative

The Global Life Cycle Initiative was established by UN Environment and SETAC. Among other things, the Life Cycle Initiative builds upon and provides support to the on-going work of UN Environment on sustainable consumption and production, such as Industry Outreach, Industrial Pollution Management, Sustainable Consumption, Cleaner and Safer Production, Global Reporting Initiative (GRI), Global Compact, UN Consumer Guidelines, Tourism, Advertising, Eco-design and Product Service Systems.

The Initiative's efforts are complemented by SETAC's international infrastructure and its publishing efforts in support of the LCA community.

The Life Cycle Initiative is a response to the call from governments for a life cycle economy in the Malmö Declaration (2000). It contributes to the 10-year framework of programmes to promote sustainable consumption and production patterns, as requested at the World Summit on Sustainable Development (WSSD) in Johannesburg (2002).

The Life Cycle Initiative's vision is a world where life cycle approaches are mainstreamed and its mission is to enable the global use of credible life cycle knowledge for more sustainable societies.

Our current work is building on the Life Cycle Initiative's continual strength to maintain and enhance life cycle assessment and management methodologies and build capacity globally. As we look to the future, Life Cycle Assessment (LCA) and Life Cycle Management (LCM) knowledge is the Life Cycle Initiative's anchor, but we will advance activities on LCA and LCM to make a difference within the real world. Therefore, the renewed objectives are the following:

Objective 1: Enhance the global consensus and relevance of existing and emerging life cycle methodologies and data management;

Objective 2: Expand capability worldwide to apply and to improve life cycle approaches; making them operational for organisations;

Objective 3: Communicate current life cycle knowledge and be the global voice of the Life Cycle community to influence and partner with stakeholders.

For more information,
www.lifecycleinitiative.org

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About the Society of Environmental Toxicology and Chemistry (SETAC)

The Society of Environmental Toxicology and Chemistry (SETAC) is a professional society in the form of a not-for-profit association, established to promote the use of a multidisciplinary approach to solving problems of the impact of chemicals and technology on the environment. Environmental problems often require a combination of expertise from chemistry, toxicology, and a range of other disciplines to develop effective solutions. SETAC provides a neutral meeting ground for scientists working in universities, governments, and industry who meet, as private persons not bound to defend positions, but simply to use the best science available.

Among other things, SETAC has taken a leading role in the development of Life Cycle Management (LCM) and Life Cycle Assessment (LCA).

The organization is often quoted as a reference on LCA matters.

For more information,
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Hotspots analysis is being used around the world to address significant sustainability challenges by helping to provide focus in an era of information overload. However, there is not currently a common global approach to hotspots analysis; nor has there been any effort to bring together or share best practice amongst those organisations or initiatives currently developing and using these methods. Nor is there any accepted guidance on how to translate and apply the results of hotspots analysis into meaningful sustainability information and insight for use by industry, governments and other stakeholders.

In response to the gaps cited above, the Life Cycle Initiative, through its Flagship Project, is publishing this document as a common methodological framework and global guidance for sustainability hotspots analysis. As a framework, rather than a standard, it provides a degree of flexibility to enable hotspots analysis to be used in differing circumstances at the product or sector level. Case studies provide further elaboration on the proposed framework.

A protocol for the appropriate use and communication of sustainability information derived from hotspots analysis is available in a companion publication: "*Communicating hotspots: The effective use of sustainability information to drive action and improve performance*" available on the Life Cycle Initiative website.

For more information about this publication, contact:

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