

# Methods review to support the PAS for the calculation of the embodied greenhouse gas emissions of goods and services

## Executive Summary

A research report for the Department for Environment, Food and Rural Affairs by the Stockholm Environment Institute and the University of Minnesota

# **METHODS REVIEW TO SUPPORT THE PAS PROCESS FOR THE CALCULATION OF THE GREENHOUSE GAS EMISSIONS EMBODIED IN GOODS AND SERVICES**

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Views expressed in this report are those of the authors and do not necessarily reflect those of Defra.

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1. Recently the calculation of the greenhouse gas (GHG) emissions embodied in goods and services has prominently featured in the public debate and on the policy level. For example, Tesco, the biggest retailer in the UK, has announced to put carbon labels on every one of its 70,000 products. DEFRA and the Carbon Trust have teamed-up with the British Standards Institution (BSI) to fast-track the standardisation of a robust methodology for calculating the greenhouse gas emissions embodied in goods and services by developing a Publicly Available Specification (PAS)<sup>1</sup>. Several requirements for the PAS development have been specified in this context. The PAS should:
  - Be applicable to all goods and services with consideration given to how and whether it may need customizing for specific product groups, e.g. food, buildings, energy use products;
  - Consider all life cycle stages along the supply/value chain of a good or service, i.e. from raw materials to end of life;
  - Consider all GHGs;
  - Be usable by all sizes and types of organizations;
  - Provide a common basis for measurement that allows comparability between different goods and services, and allow for the results to be communicated.
2. A team for the development of the PAS has been formed and a first draft specification has been provided in August 2007. At the same time DEFRA initiated an independent review of available methodologies for calculating the GHG emissions embodied in goods and services to further inform the PAS process. This report describes the work and results from this project called 'Methods review to support the PAS process for the calculation of the greenhouse gas emissions embodied in goods and services', undertaken by Stockholm Environment Institute York and the University of Minnesota.
3. The project aim was to identify relevant methods for the measurement of the GHG emissions embodied in goods and services, review the identified methods

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<sup>1</sup> A PAS is a consultative document based on the British Standard model. Any organisation, association or group who wish to document standardised best practice on a specific subject, both for the benefit of their industry and to help promote their expertise, can commission a PAS, subject to the BSI acceptance process. (<http://www.bsi-global.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/What-is-a-PAS-Publicly-Available-Specification>).

in a fitness-for-purpose review and recommend which methods can be used or built upon to meet the PAS requirements.

4. Three methods were identified to be of relevance: process life cycle assessment, input-output life cycle assessment and hybrid life cycle assessment. For these three methods a SWOT analysis was undertaken to identify the strength, weaknesses, opportunities and threats associated with their application for estimating the GHG emissions embodied in goods and services in the context of the PAS. This assessment was informed by a literature review, the expertise of the project team members and an expert survey, which was carried out during the first three weeks of the project.
5. 17 international experts in process life cycle assessment, input-output life cycle assessment, hybrid life cycle assessment and the compilation of GHG inventories participated in the survey. The survey comprised 19 questions regarding the expertise of the experts, the adequacy of the literature list and a series of PAS specific questions. Even though some experts had problems with answering some of the questions due to their particular expertise, the survey results greatly contributed to a transparent and informed assessment.
6. The report concludes that a PAS methodology can be established in the foreseeable future, which is able to provide sufficiently comparable and robust estimates - at least for some of the intended PAS applications. However, significant changes to the current draft methodology are recommended to achieve highest levels of robustness and comparability as well as cost effectiveness.
7. The method most suited to meet the needs of the PAS various applications is a fully integrated, ISO-consistent Hybrid-LCA approach, which combines the detail of process LCA with the complete supply chain coverage of input-output LCA. Ultimately, it should aim to include GHG emissions from the input of capital goods and (intermediate) services in production processes, company overheads as well as use phase emissions. We believe that the development of a hybrid-LCA approach is crucial for applications, where the robustness of the final estimate is of great importance such as Type 3 eco-labelling, carbon trading or product comparisons. For other applications we perceive hybrid-LCA as preferable for matters of cost efficiency even though a process-LCA approach could be used as well.
8. The PAS should endorse one particular hybrid life cycle inventory (LCI) database to maximise the comparability of embodied GHG estimates across studies. This database should pull together best available process information from a variety of existing LCI databases and link it with available input-output and GHG emissions data from the environmental accounts. As such a database does not exist currently for the UK, its construction should be

initiated. A set of best practise GHG emission factors for non-combustion processes should be compiled based on a review. National and international experts should oversee the development and maintenance of such a database. The inclusion of multi-national input-output data should be considered.

9. A PAS working group should review and appraise existing software tools in relation to their PAS compliance. Suitable Hybrid-LCA software should be listed. A public or private organisation should support the development of existing or new software tools.
10. Applications of the PAS depend on the quality and comprehensiveness of available data. Therefore, PAS applications should be reviewed annually together with the database in use. It seems that a variety of applications can already be achieved today such as process improvement or supply chain management. However, applications requiring high levels of robustness and comparability of the final estimates such as Type 3 eco labelling or carbon trading seem not achievable in the immediate future. Further distinctions in applications considering different levels of uncertainties associated with products in different product groups (e.g. food) should be considered.
11. Our recommendation to base the PAS on an ISO-consistent hybrid LCA approach will require a work programme, which could be completed once the new, more detailed input-output tables are published by the Office for National Statistics post 2010 and the multi-national input-output and environmental account data is available from the EXIOPOL project. Such a work programme should be initiated. Less ambitious tiered Hybrid-LCA applications should be encouraged by the PAS from the beginning. We have proposed timelines and development stages in Section 6 of the report.
12. If a process-LCA approach is pursued in the PAS, applications of the PAS need to be restricted. We perceive that process-LCA – given the PAS requirements (see Section 1) - will not deliver sufficiently robust and comparable results in the foreseeable future for applications such as Type 3 eco-labelling, carbon trading or product comparisons. In such a case, shortcomings of the PAS draft reviewed in the course of this project should be addressed - most importantly the shifting from a process flow diagram towards a matrix-based process-LCA approach, the inclusion of use-phase emissions as well as GHG emissions from the use of capital goods, intermediate services and company overheads. Relevant aspects of recommendations 2,3,4,5,7 and 8 in Section 5 of the full report should be taken into account as well.