THE USE OF LCA IN THE EUROPEAN IPP
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Abstract
The objective of this study is to evaluate potential environmental impacts (physical impacts and monetary quantification) linked to the various product that make European economy. It also to give an overview of the distribution of these impacts across the various stages of the life cycle. The method used was especially developed for this study and is based on a life cycle approach. The results showed that transport and building occupancy generate most environmental impacts linked to resource consumption and air emissions. ‘Food products’ production generates most of the water emissions contributing to eutrophication. The main categories contributing toxicity and ecotoxicity risks are different according to the type of toxicity considered. The range in which the external cost varies is large: the minimum is likely to be near 220 and the maximum is higher than 960 Euros / capita per yr. More than 50% can be allocated to greenhouse effect and another significant proportion to human health effects caused by dusts.

Keywords

1 CONTEXT AND OBJECTIVES OF THE STUDY
In the past decade, environmental policymakers around the world have increasingly been looking at ways to improve the environmental performance of products across their life cycle. In February 2001, the European Commission launched a debate on these issues by means of the Green Paper on Integrated Product Policy IPP.

In that context, the European Commission, DG Environment, has commissioned the present study on external environmental effects related to the life cycle of products and services. The purpose of the study is to give a good overview of the environmental impacts (both physical impacts and monetary quantification as far as possible) related to the various product groups which together make our economy and to identify clear patterns. The study also gives an overview of the distribution of these impacts across the various stages of the life cycle of these product groups and includes case studies on specific products and/or product-service systems.

2 A SPECIFIC METHODOLOGY DEVELOPED
This study has to be seen as a pioneer work in the field of IPP, combining for the first time and based on the current state of the scientific knowledge, several dimensions: environmental impacts, external cost, life cycles and entire economy.

• All the major potential environmental impacts associated to products and services.

In this study, an attempt is made to derive a simplified Life Cycle Assessment addressing product systems on a macro-economic level (i.e. integrating consumption patterns in the European Union), which can be called ‘market-oriented LCA’.

The LCAs performed follow to a very large extent the ISO 14040 standards and are based on various existing life cycle inventory (LCI) database.

The functional unit considered is the quantity of products / services consumed to fulfil the demand of European consumers per year (time reference: 1999).

• The external costs of these environmental impacts.

Environmental impacts assessed from LC Inventory inputs and outputs were monetarised. No ready-for-use database about external cost factors exist today in such a macro-economic and LCA-context. External cost factors used in this study were predominantly derived from existing cost factors resulting from ‘impact pathway’ approaches.

• The different stages constituting the life cycle of products and services.

The use of a life cycle-oriented approach in the framework of the IPP is justified by the fact that product and service categories present contrasted life cycle patterns.

• The main product and service categories constituting the entire European economy.

34 categories of final products and services were selected in order to cover most of the entire economy with a view to presenting homogenous product groups for the purpose of policy making and to minimising double counting. They were classified according to a new classification of products and services defined for the purpose of the study, constituted of 13 families (‘food and beverage’, ‘clothing and footwear’, ‘housing’, ‘transport’, ‘communication, recreation and culture’...).

Between 60% and 75% of all expenditures made by individuals are represented by the various categories included in the analysis (‘economic representativeness’). As for ‘environmental representativeness’, e.g. the global warming impacts related to the product groups covered by the study and calculated by adding the contribution of all categories considered (bottom-up approach) represents between 80 to 95% of the overall global warming effects assessed by the Environmental European Agency (top-down approach).

3 KEY RESULTS OF THE ANALYSIS OF THE ENTIRE ECONOMY THROUGH CATEGORIES

Updated results will be presented for LCE 2006
3.1 Environmental Impacts Generated in the EU

Most of the environmental impacts linked to resources consumption and air emissions are generated by two main categories, for which the use stage is predominant:

- transport (goods transport and private transport of passengers by car).
- building occupancy (mainly due to the energy used to heat domestic and commercial buildings).

‘Food products’ production generates most of the water emissions contributing to eutrophication (mainly from ‘vegetables’ due to the use of fertilisers) and photochemical oxidation (mainly from ‘animal food’ due to enteric fermentation and manure management).

As for toxicity and ecotoxicity risks as well as solid waste, LCA data being of relatively poor quality and heterogeneous according to products, results are less robust. However, one can mention that the main categories contributing toxicity and ecotoxicity risks are different according to the type of toxicity considered and, from data available, appear to be the following for human toxicity risk:

- ‘Water supply’ explains toxicity risks on human health (mainly due to the AOX content of sewage sludge (end of life step) associated with ‘waste water treatment’),
- As for the ‘years of life lost’ indicator, the main burden comes from ‘transport’ and ‘building occupancy’ (due to several air emissions: dusts, NOx, SOx, VOC).

### Table 1: Contribution of Categories to Environmental Impacts at the EU Level

<table>
<thead>
<tr>
<th>Category</th>
<th>Depletion of non renewable resources</th>
<th>Greenhouse effect</th>
<th>Ozone Depletion</th>
<th>Photochemical oxidation</th>
<th>Eutrophication</th>
<th>Human Toxicity</th>
<th>Years of Life Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total EU impacts (all the categories together) = 100%</td>
<td>10-20%</td>
<td>20-40%</td>
<td>60-80%</td>
<td>40-60%</td>
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</tbody>
</table>

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<tr>
<td>Transport</td>
<td>EEE</td>
<td>Building occupancy</td>
<td>Transport</td>
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<td>Transport</td>
<td>Transport</td>
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<tr>
<td>Building occupancy</td>
<td>EEE</td>
<td>Building occupancy</td>
<td>Transport</td>
<td>Transport</td>
<td>Transport</td>
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<tr>
<td>Primary energy</td>
<td>EEE</td>
<td>Transport</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
</tr>
<tr>
<td>Ducts</td>
<td>EEE</td>
<td>Transport</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
</tr>
<tr>
<td>Metals into air</td>
<td>EEE</td>
<td>Transport</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
</tr>
<tr>
<td>Metals into water</td>
<td>EEE</td>
<td>Transport</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
<td>Building occupancy</td>
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</tr>
<tr>
<td>Metals into soil</td>
<td>EEE</td>
<td>Transports</td>
<td>Water supply</td>
<td>MSW management</td>
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</tr>
</tbody>
</table>

Table 1: Contribution of Categories to Environmental Impacts at the EU Level
3.2 External Cost of the Environmental Impacts Generated in the EU

Considering the current state of the art of environmental impacts monetarisation applied to LCA, the range in which the external cost varies is large: the minimum is likely to be near 220 and the maximum is higher than 960 Euros / capita per yr (higher because several environmental impacts are not monetarised).

More than 50% can be allocated to greenhouse effect and another significant proportion to human health effects caused by dusts. The use stage of the products / services consumed in the EU is likely to be at the origin of more than 60% of the overall external cost: transport (goods transport and personal cars) and building occupancy (mainly space heating of domestic and commercial building) are the main contributing categories.

4 FURTHER RESEARCH WORK

Further research work will be necessary in the future:

- a standardisation work to classify products and services consumed in the EU within a life cycle perspective,
- a concerted European effort to establish a whole easily accessible LCA database of good quality,
- the development of a database of external cost factors applicable to LCI data (inputs and outputs occurring all along the life cycle of products and services),
- further thought given to the prospective dimension which is necessary to be included when elaborating a policy (in particular IPP).

Figure 2: Contribution of Categories to the Overall External Cost at the EU Level (in % of the total generated by all the categories studied).