MIDAS includes the descriptions of models in use by the Commission in support to the policy cycle. MIDAS is developed and managed by the **Competence Centre on Modelling** of the European Commission.

Find out more at https://ec.europa.eu/knowledge4policy/modelling_en
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Factsheet

SWD/2022/82 final

Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC

Supporting model(s)

CONSUMPTION FOOTPRINT

Impact assessment
SWD/2022/82 final

Fact sheet on model contributions

Source: Commission modelling inventory and knowledge management system (MIDAS)

Date of Report Generation: 26/07/2023

Dissemination: Public

Contents

Overview of model contributions to the impact assessment SWD/2022/82 final

Title
Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC

Document ID
SWD/2022/82 final

Year of publication
2022

Led by
ENV

Model(s) used
CONSUMPTION FOOTPRINT

CONSUMPTION FOOTPRINT

Full title
Environmental impacts of the consumption of EU and EU countries

Run for this impact assessment by
European Commission

Contributed to
Problem definition

Description
The model has been used to analyse the current environmental impacts of the baseline and assess them against the Planetary Boundaries. The analysis included the 16 impact categories of the Environmental Footprint. Extensively used in Annex 7.

Overview of models

CONSUMPTION FOOTPRINT

Overview

Acronym CONSUMPTION FOOTPRINT
Full title Environmental impacts of the consumption of EU and EU countries

Main purpose
The Consumption Footprint is a set of 16 Life Cycle Assessment (LCA)-based indicators, aimed at quantifying the environmental impacts of an average EU citizen, based on the consumption of goods in 5 areas (food, mobility, housing, household goods, and appliances) (Sala & Sanyé Mengual, 2022).

Summary
As part of its commitment towards more sustainable production and consumption, the European Commission developed a LCA-based framework, which allows assessing the environmental impacts related to EU consumption and production including two indicators: the Consumption Footprint and the Domestic Footprint (Sanye Mengual & Sala, 2023). The **Consumption Footprint** assesses the environmental impacts of the consumption at EU and at Member States level (Note: The Consumption Footprint can be also applied to different geographical scales, such as city level as performed for the case of Turin (Italy) - Genta et al. 2022), including embodied impacts due to trade (consumption perspective) including the 16 impacts of the Environmental Footprint method (EC, 2021) (e.g. climate change, ecotoxicity, land use related impacts, water use related impacts, etc.). The Consumption Footprint includes around 165 representative products from five areas of consumption (Food, Mobility, Housing, Household goods and Appliances). The overall impacts of consumption combine data for each representative product regarding consumption intensity and cradle-to-grave environmental impacts based on LCA. The indicator offers a high level of granularity providing results from EU level to product level and within the life cycle of the product (e.g., manufacture processes, environmental emissions). This allows to use the indicator as model for specific scenarios from the micro- to the macro-scale. The assessment of consumption impacts can be complemented with the Domestic Footprint, which assesses the environmental impacts of domestic production and consumption activities taking place within the territory based on environmental statistics and modelling (Sanye Mengual et al., 2022).

The model to **assess the environmental impacts of consumption and production** may serve policies makers for three main aspects that can support the analysis of both existing and future policies:

- Monitoring of policies along time, including analyses from different perspectives (e.g., decoupling)
- Identification of hotspots at different levels (e.g., area of consumption, product, life cycle stage, environmental emission)

- Analysis of policy and green transition scenarios

Keywords

Sustainability; LCA; Life Cycle Assessment; Environmental Impact; Consumption

Model category (thematic)
Agriculture; Climate; Environment; Energy

Model home page
https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

Ownership & license

Ownership
EU ownership (European Commision)

Ownership details
The model has been developed in the context of the European Commission's European Platform of Life Cycle Assessment.

Licence type
Other: Not licensed yet

Details

CONSUMPTION FOOTPRINT structure and approach

The Consumption Footprint is a set of 16 LCA-based indicators, aimed at quantifying the environmental impacts of an average EU citizen, based on the consumption of goods in 5 areas (food, mobility, housing, household goods, and appliances) (Sala & Sanyé Mengual, 2022).

The Consumption Footprint implements the Life Cycle Assessment (LCA) methodology, which entails four main steps:

1. *Definition of goal and scope*. This step includes the overall design of the study, e.g. the definition of the specific objectives of the study, the description of the modelling assumptions, the identification of the intended audience etc.

2. *Definition of the life cycle inventory (LCI)*. In this step, data on inputs, i.e. resources, and outputs, i.e. emissions in the environmental compartments (air, water, soil), entering and leaving the system under study should be collected.

3. *Assessment of the environmental impacts*. In this step, the environmental impacts due to resources use and emissions reported in the inventory are calculated through the use of impact models. Sixteen indicators referred to different impacts are considered, such as climate change, eutrophication of water bodies, use of fossil, mineral and metal resources. Furthermore, endpoint assessment models can be applied to assess effects of these 16 impacts on 3 areas of protection, i.e. human health, ecosystem health, and natural resources. These 16 indicators may be normalised by global impacts and weighted to be summarised in one "single score" indicator. Compared to the 16 indicators, the single score indicator has the advantage of being more effective for communication and for supporting the selection of alternatives, but at the same time "hides" part of the complexity of the different environmental impacts, and introduce a subjective element, i.e. weighting, which may affect the results.

4. *Interpretation of the results*. This step is aimed at fulfilling the goal and scope of the study. Typical questions which may be answered at this stage are "which are the most impacting stages of the supply chain?", "which are the effects on the environment of a certain policy?". LCA results are characterised by different sources of uncertainty which should be considered in the interpretation of the results. The definition of the life cycle inventory is subject to the availability of average information describing the system. In addition, impact assessment models are characterised by uncertainties, which to different extent influence the robustness of the 16 indicators

The Consumption Footprint encompasses the five most impacting areas of consumption, i.e. Food, Housing, Mobility, Household Goods, and Appliances. For each of them a "Basket of representative Products" has been defined and the environmental impacts of each basket has been calculated through LCA. Currently, the Consumption Footprint includes around 165 representative products. Environmental impacts of each representative product are multiplied with their consumption intensity based on apparent consumption approach (apparent consumption = production – export + import) or modelling the entire stock (e.g., mobility and housing).

Input and parametrization
The Consumption Footprint is based on the combination of:

1. the emissions to air, soil and water as well as the resources used along the life cycle of circa 165 representative products, belonging to 5 areas of consumption (food, mobility, housing, household goods, and appliances);

2. the consumption intensities of those products based on apparent consumption (= production – export + import);

3. the Environmental Footprint (EF) impact assessment method, which translates emissions and resource consumption into potential environmental impacts.

The Consumption Footprint results from aggregating the environmental impacts of consuming representative products. For each representative product, the consumption intensity is calculated for the year under analysis and multiplied by the environmental impact of the life cycle of the product (allocated to 1 year in case of a longer lifespan, e.g. durable goods).

Life cycle inventory databases are employed to obtain data for background processes (e.g., electricity production, transportation, waste treatment): ecoinvent 3.6 (Wernet et al., 2016) and Agrifootprint (Blonk Consultants, 2019).

Main output
The Consumption Footprint results can be reported at different scales:

- At EU level
- At Member States level
- Per areas of consumption (Food, Housing, Mobility, Household Goods, and Appliances)
- Per single products (around 165 products divided among food products, appliances, household goods, housing and mobility)
- Per life cycle stage
- Per environmental pressure (resource use, environmental emission)
- Per environmental impact category (Climate change, Ozone depletion, Particulate matter, Ionising radiation, Photochemical ozone formation, Acidification, Terrestrial Eutrophication, Freshwater Eutrophication, Marine Eutrophication, Freshwater ecotoxicity, Human toxicity (non-cancer), Human toxicity (cancer), Land use, Water use, Resource use (fossils), Resource use (minerals and metals)
- As a single headline indicator (consumption footprint)

Spatial - temporal extent

The output has the following spatial-temporal resolution and extent:

Parameter	Description
Spatial Extent / Country Coverage	EU Member states 27
Spatial resolution	World-regions (supranational) , National
Temporal extent	Medium-term (5 to 15 years)
Temporal resolution	Years , Multiple years

Quality & transparency

Quality

Question	Answer	Details
Models are by definition affected by uncertainties (in input data, input parameters, scenario definitions, etc.). Have the model uncertainties been quantified? Are uncertainties accounted for in your simulations?	No	The Consumption Footprint has many layers of input parameters that could lead to uncertainty of the overall result: - Consumption intensity data from official statistics - Modelling of the environmental impact of the life cycle of individual products - Impact assessment models of the Environmental Footprint method So far, uncertainties have not been quantified. However, ranges could be tested. Regarding the Environmental Footprint impact assessment method (EF 3.1) recommendations (Andreasi Bassi et al., 2023), model robustness for each of the 16 indicator has been evaluated (EC, 2021).
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	Yes	The Consumption Footprint can deal with sensitivity analysis for many parameters, including consumption intensity data and environmental impact data. No formal sensitivity analysis has been performed to check all parameters as this would be very time demanding. However, the model has been used to test more than 50 green transition scenarios which provide information on the sensitivity of the model to certain parameters.
Have model results been published in peer-reviewed articles?	Yes	
Has the model formally undergone scientific review by a panel of external experts? (Please note that this does not refer to the cases when model results were validated by stakeholders)	No	
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	Yes	Validation has been performed with other models, but observed data are not available.

Transparency

Question	Answer	Details
To what extent do input data come from publicly available sources? (Note: this may include sources accessible upon subscription and/or payment)	Based on both publicly available and restricted-access sources	

Is the full model database as such available to external users? (The answer 'yes' comprises the cases when access to the database implies a specific procedure or a fee)	No	Only the model results are publicly available at the website https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html
Have model results been presented in publicly available reports?	Yes	
Have output datasets been made publicly available? (Note: this could also imply a specific procedure or a fee)	Yes	https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html
Is there any user-friendly interface presenting model results – such as dashboards or interactive interfaces – that is accessible to the public?	Yes	https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html
Is the model code open source?	No	
Can the code be accessed upon request?	No	
Has the model been documented in a publicly available dedicated report or a manual? (Note: this excludes IA reports)	Yes	
Is there a dedicated public website where information about the model is provided?	Yes	https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

The model's policy relevance and intended role in the policy cycle

The model is designed to contribute to the following policy areas

- Agriculture and rural development
- Business and industry
- Climate action
- Consumers
- Energy
- Environment
- Maritime affairs and fisheries
- Public health
- Trade
- Transport

The model is designed to contribute to the following phases of the policy cycle

- Anticipation
- Formulation
- Implementation
- Evaluation

The model's potential

The Consumption Footprint has been designed aiming at supporting policy-making in:

- Identifying **environmental hotspots**: the granularity of the indicators can provide information at different levels (environmental issues with the highest relevance, areas of consumption, product groups and products, life cycle stages of products, and of most relevant resource used or emissions to the environment). The indicators could be presented as 16 different environmental impact categories or as a single score. Biodiversity footprint could be presented as well.

- **Monitoring**: yearly updates of the indicators allow tracking the evolution of impacts associated with changes in production and consumption patterns. This may be strategic for monitoring e.g. how much EU is decoupling environmental impacts from economic growth, the benefits of transition towards circular economy, the ability of EU to remain within planetary boundaries as well as progress related to the SDGs (especially SDG12 on responsible consumption and production).

- Setting a baseline against which **testing policy options and green transitions scenarios**: the modularity of the indicators can formulate scenarios affecting not only lifestyles but all the stages along the supply-chain (from raw material extraction to end of life) as well as technological changes in the life cycle of products.

- **Evaluating lifestyles and consumption patterns**, which can be compared to EU and Member State average lifestyles.
- Identifying **transboundary and spillovers effects**, since the indicators could unveil the trade footprint, namely the amount of impacts embodied in imported goods.