Development of a System of Indicators for a Resource efficient Europe	SEVENTH FRAMEWORK PROGRAMME

DESIRE

Development of a System of Indicators for a Resource Efficient Europe

D9.4 Report with results of correlation analysis

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About DESIRE

DESIRE is a FP7 project that will develop and apply an optimal set of indicators to monitor European progress towards resource-efficiency. The project runs from September 2012 to February 2016. We propose a combination of time series of environmentally extended input output data (EE IO) and the DPSIR framework to construct the indicator set. Only this approach will use a single data set that allows for consistent construction of resource efficiency indicators capturing the EU, country, sector and product group level, and the production and consumption perspective including impacts outside the EU. The project will:

- Improve data availability, particularly by creating EE IO time series and now-casted data
- Improve calculation methods for indicators that currently still lack scientific robustness, most notably in the field of biodiversity/ecosystem services and critical materials. We further will develop novel reference indicators for economic success.
- Explicitly address the problem of indicator proliferation and limits in available data that have a 'statistical stamp'. Via scientific analysis we will select the smallest set of indicators giving mutually independent information, and show which shortcuts in (statistical) data inventory can be made without significant loss of quality.

The project comprises further Interactive policy analysis, indicator concept development via 'brokerage' activities, Management, and Conclusions and implementation including a hand over of data and indicators to the EU's Group of Four of EEA, Eurostat, DG ENV and DG JRC.

Partners are:

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Executive Summary

The potential for reducing the number of impact indicators required for environmental assessments was examined from two different starting points. Firstly, the ranked impacts of 135 indicators for 976 products from the Ecoinvent database were analysed and secondly 93 indicators of environmental impact were assessed for the consumption of 1 million euros worth of 7589 product-sector combinations from the EXIOBASE dataset. In both cases Principal Component Analysis (PCA) was applied and combined with multiple linear regression to come to an optimal set of indicators. The explained variance of the principal components was compared to the explained variance one would expect from randomly distributed rankings for the indicators.

Whether based on the life cycle impacts per kg of material or the impacts per million euros of consumption strong correlations between the different indicators of impact were found. This means that there is a large potential for reducing the number of indicators. For the Ecoinvent dataset, the first four principal components covered 92% of the variance in product rankings, showing the potential for indicator reduction. The same amount of variance (92%) could be covered by a minimal set of six indicators, related to climate change, ozone depletion, the combined effects of acidification & eutrophication, terrestrial ecotoxicity, marine ecotoxicity and land use. In comparison, four commonly used resource-based footprints (energy, water, land, materials) together accounted for 82% of the variance in material rankings.

For the EXIOBASE dataset seven indicators related to freshwater and marine ecotoxicity, photochemical oxidation, climate change, acidification & eutrophication, photochemical ozone formation and blue water withdrawal covered 90% of the variation. The four resource-based footprints together accounted for only 49% of the variance in product-sector rankings. Supplementing, however, the two best resource-based indicators (energy and land) with the best toxicity indicator (freshwater aquatic ecotoxicity potential, infinite time horizon) the explained variance is increased to 74.8%.

We conclude that the plethora of environmental indicators can indeed be reduced to a small key set, representing the major part of the variation in environmental life cycle impacts between materials and of the variation in product-sector combination in a Multiregional Input-Output model.

1 Introduction

Over the course of the last two decades a wide variety of methods for quantifying environmental impacts have been introduced, especially into the area of Life Cycle Impact Assessment (LCIA).[1] There are clear differences in coverage and complexity of the various LCIA methods available. Damage-based indicators, also called endpoint indicators, provide insight in the impact of emissions and resource use through the full cause-and-effect chain, which ultimately leads to ecosystem and/or human health damage.[2] Midpoint indicators provide a proxy of environmental damage by modeling only part of the cause-impact pathway. An example are the well-known global warming potentials to quantify the contribution of various greenhouse gas emissions to climate change in terms of integrated radiative forcing.[3] Finally, resource-based indicators directly apply the resources required in a life cycle without further impact or damage modeling. Cumulative energy demand is an example of such an indicator.[4] Additional variation in indicators results from the fact that there are several competing methods available that quantify the same type of effect, but with different models and data. For example, the TRACI method[5] and the EDIP method[6] both provide midpoint indicators for the impacts due to acidification.

A key question that this wide variety of available methods raises is whether the outcome of a Life Cycle Assessment (LCA) will be influenced by the choice of an indicator and methods. Furthermore, it is unpractical to base decisions for product optimization or environmental policy on dozens of indicators simultaneously. Therefore, there is a clear need to provide a limited set of indicators that is sufficiently small for efficient communication and decision-making, but at the same time representative of the overall environmental impact.

Several attempts have been made to find a representative subset of relevant indicators. In a study commissioned by the Joint Research Centre of the European Commission (JRC), various midpoint and endpoint indicators and methods were qualitatively compared in terms of scientific and stakeholder acceptance.[1] However, with 14 different recommended midpoint indicators, the set is still quite large and some of the methods have since then undergone quite significant changes. Moreover, the JRC study did not consider any redundancy among the recommended indicators caused by similarity in the underlying processes that cause the emissions and environmental impacts.

Others have suggested using only a "resource-based indicator family", which covers the cumulative demand of land, water, carbon (or fossil energy) and, potentially, materials.[7] While these resource-based indicators are easy to use and communicate[8], the full range of impact pathways employed in the damage-based methodologies may not be covered by this set. Finding a set of indicators that is optimal in both its size and coverage requires a more systematic and quantitative way of reducing the number of indicators.

A few studies have attempted to achieve this via Principal Component Analysis (PCA).[9-14] If correlations between indicators are high, substantial dimensionality reduction can be achieved by PCA. For example, only two indicators were needed to cover more than 95% of the total variance of the environmental impact for a set of 11 household electronic products.[14] However, while these studies give valuable insights for one method and/or product group, their coverage is too small to answer questions about which set of indicators is optimal in a more general sense. The search for an optimal set of indicators using PCA has, to the best of our knowledge, not yet been applied over a large range of products and impact assessment methods.

Here, we aim to find an optimal set of environmental indicators to cover the variance in the rankings of a large number of products. We selected 976 products and 135 environmental indicators from the Ecoinvent 3.1 database[15] and 93 impact indicators for 7589 product-sector combinations from the EXIOBASE database the as input for our analysis. We combined PCA with multiple regression to arrive at the minimum set of indicators explaining the variance in the product ranking. Apart from this minimum set, we also evaluated the extent to which the four commonly used resource-based indicators (fossil energy, water, land and materials) were representative of the total variation in product rankings.

2 Methods

2.1 Data sources

For the Ecoinvent dataset, 135 different impact indicators from different LCIA (Life Cycle Impact Assessment) methods were analysed (See Annex 1 for a full list of included indicators). For the EXIOBASE dataset 93 impact indicators were included (See Annex 2).

2.2 Data analysis

For both datasets we employed PCA combined with regression analysis to find the minimum set of indicators necessary to adequately describe the variance in product rankings among the full set of impact assessment methodologies. In PCA the total variation in a dataset is rewritten as a non-correlated linear combination of the original indicators called the principal components. The first principal component describes the maximum amount of variance and subsequent principal components explain decreasing amounts of variance. If there is a large correlation between indicators then the first couple of principal components will cover the majority of the variance in the dataset and these components can be used as a highly parsimonious summary of the total dataset.[16]

For 976 products from the Ecoinvent dataset, we performed our PCA on the rank correlation matrix of the 135 indicators to give equal weight to each product in the dataset and to each impact indicator. It is desirable to give equal weight to each product because the analysis of impact per kilogram of product is an arbitrary choice that does not reflect differences in production volumes or value to society. For the analysis of the EXIOBASE outcome, we have analyzed the ranked impacts based on 1 million euro of consumption from each sector-region combination. The consumptive footprints of the 7589 sector-region combinations with a final demand of more than 0.1 million euro were retained. 93 non-zero indicators of impact were calculated from these EXIOBASE output, 15 of which are direct outputs of EXIOBASE (such as water consumption and land and energy use for example).

The remaining impacts were calculated manually by multiplying the appropriate emissions/resource and material extractions by their corresponding characterization factors. To obtain the impacts per million euro, we divided the total consumption footprints of each of these sector-region combinations by its total final demand. 10 indicators could be removed *a priori* because they were perfectly correlated (rank correlation coefficient = 1) to another indicator in the dataset. Perfectly correlated are undistinguishable from each other, therefore only one (the first one, based on alphabetical order) of indicators was retained (83 in total).

Second, we determined the number of non-trivial components and associated explained variance with the Avg-Pa (Average parallel analysis) stopping rule as described by Peres-Neto et al.[17] This stopping rule is a criterion which tells whether a component describes more or less variance than one would expect if it was based on purely randomized data. Because we work with product rankings rather than impact scores, we adjusted the procedure to work with randomized product rankings rather than normally distributed random data. All integers from 1 to 976 were randomly sampled to create a dataset with the same number of rows (976) and columns (135) as the original data for the Ecoinvent data and 7589 rows and 83 columns for the EXIOBASE data. A PCA was then performed on 1,000 randomized runs on this dataset and the average variance explained by each component was calculated. If the explained variance of the original data exceeded that of the randomized data, the component was considered non-trivial.

Third, to interpret the non-trivial components the loading of each indicator the loading of each indicator on that particular component was examined. The more extreme (high or low) the loading the more representative the indicator is of that component.

Fourth, to find a small subset of the original indicators that describe these principal components, we calculated the amount of variance in principal components scores that could be explained by subsets of the original indicators. Subsets of any number of indicators can be tested, whereby a set comprised of all indicators would cover 100% of the variance and smaller subsets cover less. The best set, in terms of explained variance, for each size of indicators was found by using the "improve" algorithm from the package "subselect"[18] in the statistical program R.[19] The improve algorithm uses multiple linear correlation to determine the amount of explained variance.

Fifth, we defined the optimal size of the indicator set by using the explained variance of the so called non-trivial principal components as a benchmark. The indicator set with the lowest number of indicators and an explained variance equal or higher than the explained variance of the non-trivial components was considered to be preferred set of indicators.
Finally we tested to what extent a set of four resource-based indicators (fossil energy, land, water and material use)[7] covers the dimensions of the data in our dataset by using the multiple linear correlation analysis on all principal component scores, as mentioned above. For the Ecoinvent dataset these four resource-based indicators were not part of the set of 135 indicators. For the EXIOBASE dataset the four resource-based indicators were already part of the 83 indicators.

3 Results

3.1 Ecoinvent products

The number of non-trivial components was four, which together covered 92.0% of the total variance in the dataset. The majority of the variance (83.3%) was covered by the first component, with 3.9%, 3.1% and 1.9% covered by the three consecutive components (Figure 1). Since all correlations in the database were positive, the first component can be seen as an overall indicator of environmental impact. Indicators that are most similar to other indicators (i.e. have the highest correlation) have the highest absolute loadings on this component. For the first component these were the indicators related to freshwater and marine ecotoxicity. However, most other indicators showed very similar loadings (See Table A1 for the loadings of all indicators on the first four principal components).

Indicators with the lowest absolute loadings on the first component were related to land use, which means that these are the ones that are least correlated to all other indicators. The second principal component separated indicators related to land use and terrestrial ecotoxicity (high loadings) from indicators related to fossil energy use and global warming (low loadings). Indicators related to ionizing radiation (i.e. from the use of nuclear energy) and indicators of ozone depletion are further distinguished from the rest in components 3 and 4.

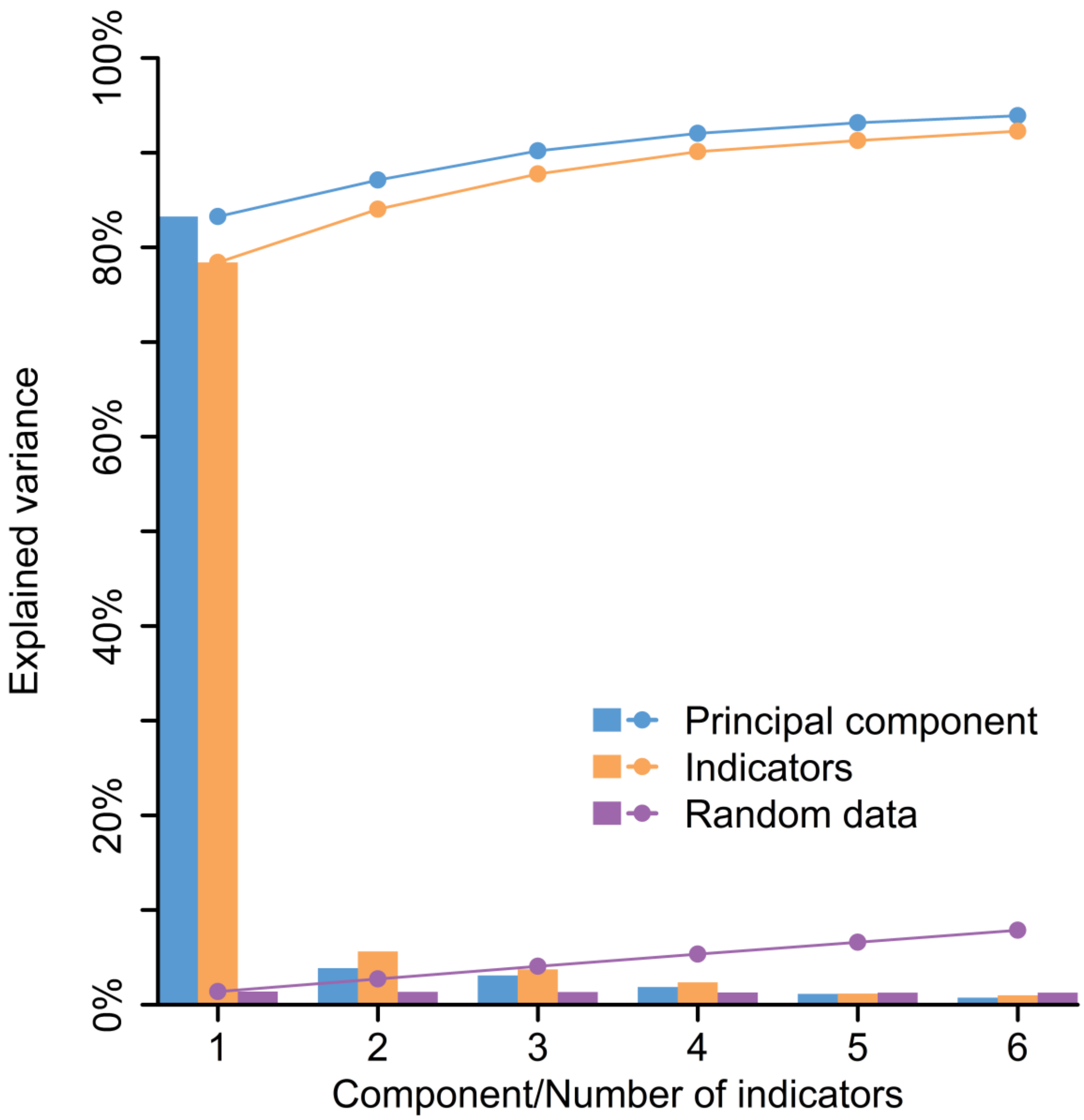

Figure 1. Bars show the explained variance per principal component based on the Ecoinvent dataset (blue), based on random data (purple) and for the best set of indicators (orange). Solid lines with dots indicate the cumulative explained variances.

A set of six indicators was needed to cover slightly more variance than the first four principal components (i.e. 92.3% and 92.0% respectively; Figure 1). The best sets of one up to six indicators and the variance explained by each set are shown in Table 1. The best set of six indicators relate to climate change, ozone depletion, terrestrial ecotoxicity, the combined ecosystem effects of acidification & eutrophication, marine ecotoxicity and land use.

The four resource-based indicators together give an explained variance of 82.0%. The results suggest that it is best to use the fossil energy indicator if just one of the simple resource-based indicators has to be selected. With an explained variance of 72.9% this seems to be a reasonably good indicator of overall impact. The explained variance can be raised to 76.8% by adding material use. Adding land use raised the explained variance to 80.1%, while a set of all four resource-based indicators, including water use, covers 82.0% of the total variance in our dataset. The water footprint appeared to be less important than the other footprints for our dataset; this is due to the fact that water consumption is related to both the energy-intensive process of electricity generation and the land-intensive process of crop production.

Table 1. Best sets of impact indicators and the variance explained per set, for all combinations and the explained variance of the resource-based sets

#	Impact indicator	Method: Full name of indicator	Explained variance
1	Marine ecotoxicity	ReCiPe: METP100a (I)	78.4%
2	Climate change Marine ecotoxicity	CML2001: upper limit of net GWP100a* ReCiPe: METPinf (H)	84.0%
3	Land use Human toxicity Climate change	Impact2002: land occupation ReCiPe: HTPinf (E) ReCiPe: GWP100a (H)	87.8%
4	Climate change Ozone depletion Land use Marine ecotoxicity	CML2001: upper limit of net GWP100a CML2001: ODP40a Impact2002: land occupation ReCiPe: METPinf (E)	90.1%
5	Climate change Ozone depletion Terrestrial ecotoxicity Acidification & eutrofication Marine ecotoxicity	CML2001: GWP20a CML2001: ODP40a CML2001: TAETP20a Impact2002: terrestrial acidification & eutrofication ReCiPe: METPinf (E)	91.3%
6	Climate change Land use Ozone depletion Acidification & eutrofication Marine ecotoxicity Terrestrial ecotoxicity	CML2001: GWP20a CML2001: Land use: competition** CML2001: ODP40a Impact2002 ReCiPe Midpoint E: METPinf ReCiPe Midpoint I: TETP100a	92.3%
Resource-based sets			
1	Fossil energy Land Water Material		72.9% 37.9% 58.1% 54.3%
2	Fossil Energy, Material		76.8%
3	Fossil Energy, Land, Material		80.1%
4	Fossil Energy, Land, Material and Water		82.0%

Abbreviations:
METP: Marine EcoToxicity Potential
GWP: Global Warming Potential
HTP: Human Toxicity Potential
ODP: Ozone Depletion Potential
T(A)ETP: TerrestriAl EcoToxicity Potential
inf/100a/40a/20a: Time Horizons of infinite duration and 100, 200 and 40 years respectively
(I): Individualist perspective, (E): Egalitarian perspective, (H): Hierarchist perspective

* Upper limit of GWP100a: a method where the upper values of several uncertain GHGs are used rather than the most likely value
** Like the land footprint this consists of an unweighted summation of different land uses, however not all types are included

3.2 EXIOBASE sector outputs

Six non-trivial components were found for the 93 included indicators in the EXIOBASE dataset, the first six components cover 91.5% of the total variance in the set (Figure 2). Again all correlations were positive, meaning that in general sectors that are intensive in one type of emission or resource use are intensive in all. Because all correlations are positive all the indicator loadings of the first component have the same sign (negative in this case). The lowest (i.e. most extreme) loadings on the first component were found for different indicators of ecotoxicity while the indicators for eutrophication and land use score highest on the second component (Table A2).

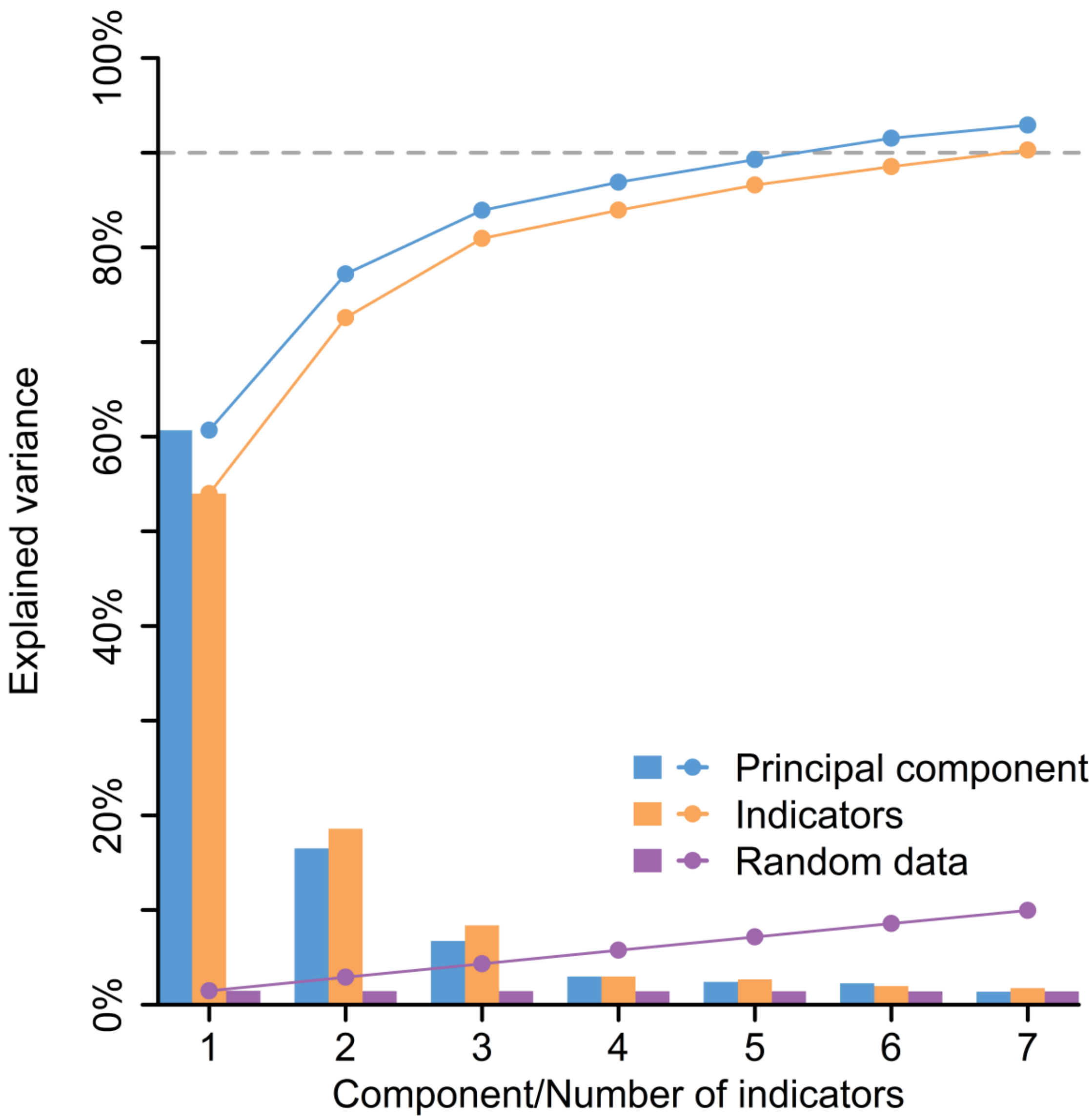

Figure 2. Bars show the explained variance per principal component based on the EXIOBASE dataset (blue), based on random data (purple) and for the best set of indicators (orange). Solid lines with dots indicate the cumulative explained variances. The grey dotted line indicates 90% explained variance.

The indicator with the most extreme loading on the first component (freshwater aquatic ecotoxicity) explains the most variance in the total dataset of all indicators (54.0%), 72.7% of the variance can be explained if acidification (which is among the indicators with the most extreme values on the second component) is added. Three of the original indicators (Freshwater aquatic ecotoxicity, Climate change and Marine eutrophication) are needed to cover 80.9% of the variance. For other sets of indicators, up to 7 indicators (explaining >90% of the variance), see Table 2. Similar to the analysis on the Ecoinvent dataset, the performance of the resource based sets as indicator sets was also tested. A difference is that for the EXIOBASE dataset the resource based sets of Energy, Water, Land and Material were already part of the original set of 83 indicators. Results demonstrate that sets of 1 to 4 resource indicators cannot cover the same amount of variance that can be explained by one toxicity indicator. Combined, the energy, land and material footprints cover 48.1% of the variance.. There is not much benefit in adding the fourth resource-based indicator (blue water consumption), because it is strongly correlated (r = 0.84) with the amount of land used.

Table 2. Best sets of impact indicators, the methods via which these indicators are calculated and the variance explained per set

#	Impact indicators	Method	Explained variance
1	Freshwater aquatic ecotoxicity (FAETP inf)	CML	54.0%
2	Freshwater aquatic ecotoxicity (FAETP inf) Acidification (fate not included)	CML CML	72.6%
3	Freshwater aquatic ecotoxicity (FAETP inf) Climate change endpoint, human health Eutrophication marine midpoint	CML ILCD recommended ILCD recommended	80.9%
4	Freshwater aquatic ecotoxicity (FAETP inf) Damages to human health caused by climate change (H.A) Eutrophication marine midpoint Photochemical ozone formation endpoint, human health	CML Ecoindicator 99 ILCD recommended ILCD recommended	83.9%
5	Freshwater aquatic ecotoxicity (FAETP inf) Global warming net (GWP100 max) Eutrophication marine midpoint Photochemical ozone formation endpoint, human health Water Withdrawal Blue – Total	CML CML ILCD recommended ILCD recommended EXIOBASE output	86.6%
6	Freshwater sedimental ecotoxicity (FSETP 20) Damages to human health caused by climate change (I.I) Eutrophication marine midpoint Photochemical ozone formation endpoint, human health Water Withdrawal Blue – Total Marine aquatic ecotoxicity (MAETP 500)	CML Ecoindicator 99 ILCD recommended ILCD recommended EXIOBASE output CML	88.5%
7	Freshwater sedimental ecotoxicity (FSETP 100) Damages to human health caused by climate change (H.A) Damage to Ecosystem Quality caused by the combined effect of acidification and eutrophication (I.I) Photochemical ozone formation midpoint, human health Water Withdrawal Blue – Total Marine aquatic ecotoxicity (MAETP 500) photochemical oxidation (MOIR; high NOx)	CML Ecoindicator 99 Ecoindicator 99 ILCD recommended EXIOBASE output CML CML	90.3%

Abbreviations of the methods: FAETP: Freshwater Aquatic Ecotoxicity Potential, GWP: Global Warming Potential, FSETP: Freshwater Sediment Ecotoxicity Potential, MAETP: Marine Aquatic Ecotoxicity Potential, MOIR: Maximum Ozone Incremental Activity

inf/500a/100a/20a: Time Horizons of Infinite, 500, 100 and 20 years respectively
(I): Individualist perspective, (E): Egalitarian perspective, (H): Hierarchist perspective, (A) Average weighting set

Table 2. (continued)

#	Impact indicators	Method	Explained variance
Resource-based sets			
1	Total Energy Use	EXIOBASE output	29.2%
2	Total Energy Use Land use	All: EXIOBASE output	44.7%
3	Total Energy Use Land use Domestic material extraction	All: EXIOBASE output	48.1%
4	Total Energy Use Land use Domestic material extraction Water Consumption Blue – Total	All: EXIOBASE output	49.3%

4 Discussion

We have successfully applied our methodology for reducing the number of impact indicators on two fundamentally different datasets. In the EXIOBASE database, 93 indicators of impact could be reduced to just seven indicators while retaining 90% of the variation in the rankings of the region-sector combinations. For the Ecoinvent dataset an even larger reduction in indicators could be achieved, with more than 90% of the variance in product rankings covered by just 4 out of 135 original indicators.

While the optimal sets maximize the amount of covered variance, the recommended indicators are not necessarily the most preferable using additional criteria, such as the RACER (Relevant, Accepted, Credible, Easy and Robust) criteria.[20] As the loadings of the indicators (Annex A1 and A2) on the first component show for both datasets there are several indicators with approximately the same amount of explanatory power. This means that alternative sets of indicators can be defined which are only marginally worse in terms of explained variance compared to the statistically preferred set of four and seven indicators proposed here. Some of the selected indicators may not fulfill all these criteria, for example the problem of ozone depletion is becoming less relevant due to successful emission reduction policies[21] and the indicators of toxicity are not always robust, due to the large uncertainties involved in their calculations.[22]

The resource-based indicators are relatively easy and robust to calculate. Being indicators of resource use rather than indicators of environmental impact it was not clear whether they can be used as a proxy for environmental impacts. Our results for the Ecoinvent dataset indicate that they also cover the variance in impact indicators relatively well (82% explained variance with four indicators), which suggests that these indicators are relevant for use in the area of LCIA. For the EXIOBASE dataset the difference between the resource-based sets and the statistically optimal sets of the same size was relatively large. These toxic emissions are not explained well by the resource-based footprints.

In both cases, only three out of the four resource-based indicators seem to be of real added value. For the both datasets these were the indicators of energy, land and material. This is due to the fact that the (agricultural) water consumption is strongly correlated to the land footprint, especially in the EXIOBASE dataset (rank correlation coefficient, r = 0.84), making one of the two indicators redundant. Using two or three simple resource based indicators would eliminate the need for the complicated mid- and endpoint damage models, but has limited coverage of the impacts associated with toxic emissions, especially for the EXIOBASE dataset. Supplementing the two best resource indicators (energy and land) with the best toxicity indicator (freshwater aquatic ecotoxicity potential, infinite time horizon) increases the explained variance to 74.8%.

5 Conclusion

Strong correlations between the included indicators were found, this makes reduction of the number of indicators for both the Ecoinvent as well as the EXIOBASE dataset feasible. For the Ecoinvent dataset, a minimal set of six indicators cover 92% of the variation. The indicators refer to climate change, ozone depletion, the combined effects of acidification & eutrophication, terrestrial ecotoxicity, marine ecotoxicity and land use. For the EXIOBASE data seven indicators related to freshwater and marine ecotoxicity, photochemical oxidation, climate change acidification & eutrophication, photochemical ozone formation and blue water withdrawal covered 90% of the variation.

However, the optimal sets found in our study are sets that are optimal from a statistical point of view only. A combination of our statistical approach and other criteria such as the RACER (Relevant, Accepted, Credible, Easy and Robust) criteria is needed to come to a final set of recommended indicators. A first attempt to include alternative criteria was made by testing the statistical coverage of a footprint family set, consisting of the: the fossil-energy, material, land and water footprints. These footprints covered only marginally less variation than statistically optimal sets of indicators of the same size for the Ecoinvent dataset. For the EXIOBASE dataset it is recommended to supplement the resource based indicators with an indicator of ecotoxicity to increase the statistical coverage of the set.

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Annex 1

Table A1. Included indicators used for the Ecoinvent dataset and their loadings on the first four components, ranked from highest to lowest absolute score on component 1.

#	Indicator category	Method: full name of indicator	Loadings per component			
			1	2	3	4
1	Marine ecotoxicity	ReCiPe: METP100a (I)	-0.091	0.006	0.071	0.085
2	Freshwater ecotoxicity	ReCiPe: FETPinft (E)	-0.091	0.042	0.016	0.066
3	Marine ecotoxicity	ReCiPe: METPinft (H)	-0.091	0.012	0.076	0.087
4	Freshwater ecotoxicity	ReCiPe: FETPinft (H)	-0.091	0.042	0.016	0.066
5	Marine ecotoxicity	ReCiPe: METPinft (E)	-0.091	-0.007	0.084	0.099
6	Respiratory effects & PM	Impact2002: human health:respiratory effects (inorganics)	-0.091	-0.029	-0.038	0.060
7	Marine ecotoxicity	CML2001: MAETP 100a	-0.091	-0.002	0.086	0.100
8	Marine ecotoxicity	CML2001: MAETP 20a	-0.091	-0.004	0.088	0.094
9	Marine ecotoxicity	CML2001: MSETP 100a	-0.091	0.001	0.087	0.098
10	Marine ecotoxicity	CML2001: MAETP 500a	-0.091	-0.002	0.085	0.101
11	Marine ecotoxicity	CML2001: MSETP 500a	-0.091	0.001	0.086	0.100
12	Freshwater eutrophication	ReCiPe: FEPt (H)	-0.091	0.034	0.041	0.060
13	Marine ecotoxicity	CML2001: MSETP 20a	-0.091	-0.001	0.088	0.092
14	Eutrophication	EDIP2003: eutrophication:separate P potential	-0.091	0.032	0.042	0.061
15	Freshwater ecotoxicity	CML2001: FSETP infinite	-0.091	0.036	0.063	0.096
16	Freshwater ecotoxicity	CML2001: FAETP infinite	-0.091	0.041	0.055	0.092
17	Freshwater ecotoxicity	CML2001: FSETP 500a	-0.091	0.034	0.063	0.096
18	Freshwater ecotoxicity	CML2001: FAETP 500a	-0.091	0.039	0.056	0.093
19	Freshwater ecotoxicity	CML2001: FSETP 100a	-0.091	0.034	0.063	0.095
20	Endpoint: single score	ReCiPeend: ReCiPeend(E,A)	-0.091	-0.030	-0.022	0.064
21	Freshwater ecotoxicity	CML2001: FAETP 100a	-0.091	0.039	0.056	0.093
22	Freshwater ecotoxicity	CML2001: FSETP 20a	-0.091	0.034	0.062	0.095
23	Freshwater ecotoxicity	CML2001: FAETP 20a	-0.091	0.039	0.055	0.092
24	Marine ecotoxicity	CML2001: MSETP infinite	-0.091	-0.016	0.090	0.086
25	Aquatic ecotoxicity	EDIP2003: ecotoxicity:chronic, in water	-0.091	-0.001	0.091	0.031
26	Human Toxicity	ReCiPe: HTPinft (E)	-0.091	-0.011	0.102	0.063
27	Acidification	EDIP2003: acidification:acidification	-0.091	-0.046	-0.035	0.048
28	Respiratory effects and PM	TRACI: human health:respiratory effects, average	-0.091	-0.063	-0.002	0.054
29	Marine ecotoxicity	CML2001: MAETP infinite	-0.090	-0.017	0.086	0.083
30	Photochemical ozone formation	TRACI: environmental impact:photochemical oxidation	-0.090	-0.059	-0.084	0.033
31	Acidification	CML2001: acidification:average European	-0.090	-0.045	-0.041	0.047
32	Acidification	TRACI: environmental impact:acidification	-0.090	-0.037	-0.051	0.052

33	Human Toxicity	ReCiPe: HTPinft (H)	-0.090	0.026	0.080	0.067
34	Acidification	Impact2002: ecosystem quality:aquatic acidification	-0.090	-0.036	-0.049	0.051
35	Acidification	CML2001: acidification:generic	-0.090	-0.036	-0.048	0.051
36	Respiratory effects and PM	ReCiPe: PMFPt (I)	-0.090	-0.035	-0.045	0.075
37	Freshwater ecotoxicity	ReCiPe: FETP100a (I)	-0.090	0.051	-0.009	0.061
38	Acidification	ReCiPe: TAP20a (I)	-0.090	-0.032	-0.052	0.048
39	Acidification	ReCiPe: TAP100a (H)	-0.090	-0.025	-0.058	0.049
40	Ecotoxicity	EDIP2003: ecotoxicity:in sewage treatment plants	-0.090	-0.002	0.063	0.033
41	Acidification	ReCiPe: TAP500a (E)	-0.090	-0.020	-0.063	0.050
42	Endpoint: Human health	Impact2002end: Impact2002humanhealth	-0.090	0.001	-0.005	0.055
43	Human toxicity	CML2001: HTP infinite	-0.089	0.009	0.051	0.049
44	Aquatic ecotoxicity	EDIP2003: ecotoxicity:acute, in water	-0.089	-0.016	0.088	0.010
45	Climate change	Impact2002: climate change:total	-0.089	-0.090	-0.091	0.004
46	Climate change	CML2001: GWP 500a	-0.089	-0.090	-0.091	0.004
47	Climate change	ReCiPe: GWP500a (E)	-0.089	-0.091	-0.090	0.003
48	Climate change	CML2001: upper limit of net GWP	-0.089	-0.087	-0.101	0.004
49	Photochemical ozone formation	ReCiPe: POFPt (H)	-0.089	-0.088	-0.084	0.022
50	Climate change	CML2001: GWP 100a	-0.089	-0.088	-0.102	0.002
51	Climate change	ReCiPe: GWP100a (H)	-0.089	-0.088	-0.102	0.001
52	Eutrophication	EDIP2003: eutrophication:combined potential	-0.089	0.088	-0.056	0.039
53	Human toxicity	EDIP2003: human toxicity:via surface water	-0.089	-0.029	0.059	0.005
54	Climate change	EDIP2003: global warming:GWP 500a	-0.089	-0.111	-0.068	0.015
55	Climate change	TRACI: environmental impact:global warming	-0.089	-0.106	-0.081	0.013
56	Climate change	EDIP2003: global warming:GWP 100a	-0.089	-0.106	-0.081	0.012
57	Climate change	CML2001: lower limit of net GWP	-0.089	-0.087	-0.104	0.008
58	Photochemical ozone formation	EDIP2003: photochemical ozone formation:impacts on vegetation	-0.089	-0.095	-0.095	0.026
59	Human toxicity	TRACI: human health:carcinogenics	-0.089	0.013	0.072	0.042
60	Climate change	ReCiPe: GWP20a (I)	-0.088	-0.099	-0.106	0.000
61	Climate change	CML2001: GWP 20a	-0.088	-0.099	-0.106	0.001
62	Photochemical ozone formation	CML2001: Summer smog: high NOx POCP	-0.088	-0.085	-0.049	-0.030
63	Photochemical ozone formation	EDIP2003: photochemical ozone formation:impacts on human health	-0.088	-0.098	-0.098	0.022
64	Eutrophication	CML2001:	-0.088	0.090	-0.063	0.012

		eutrophication:generic				
65	Climate change	EDIP2003: global warming:GWP 20a	-0.088	-0.114	-0.085	0.010
66	Acidification& eutrification	Impact2002: ecosystem quality:terrestrial acidification & eutrification	-0.088	0.012	-0.104	0.057
67	Human toxicity	CML2001: HTP 500a	-0.088	0.023	0.043	0.018
68	Human toxicity	EDIP2003: human toxicity:via air	-0.088	0.039	-0.006	0.012
69	Human toxicity	CML2001: HTP 100a	-0.088	0.023	0.044	0.018
70	Human toxicity	CML2001: HTP 20a	-0.088	0.023	0.044	0.017
71	Land fill	EDIP2003: land filling:slag and ashes	-0.088	0.020	0.093	-0.024
72	Endpoint: Single score	EPS2000end: EPS2000Total	-0.088	-0.075	0.015	0.095
73	Endpoint: Single score	ReCiPeend: ReCiPeend(H,A)	-0.087	-0.020	-0.110	0.019
74	Land fill	EDIP2003: land filling:bulk waste	-0.087	0.034	0.014	0.075
75	Endpoint: Single score	ecological scarcity 2013: EcoscarcityTotal	-0.087	0.019	-0.081	0.048
76	Endpoint: Single score	ReCiPeend: ReCiPeend(I,A)	-0.087	-0.032	-0.107	0.031
77	Human Toxicity	TRACI: human health:non-carcinogenics	-0.087	0.060	0.035	0.062
78	Land use	ReCiPe: ULOPt (E)	-0.087	0.081	0.039	0.027
79	Human Toxicity	EDIP2003: human toxicity:via soil	-0.087	0.020	-0.018	-0.065
80	Human Toxicity	Impact2002: human health:human toxicity	-0.086	0.040	0.071	0.029
81	Ionizing radiation/radio-active waste	ReCiPe: IRP_It (I)	-0.086	0.004	0.127	-0.055
82	Aquatic ecotoxicity	Impact2002: ecosystem quality:aquatic ecotoxicity	-0.086	0.011	0.109	0.019
83	Ionizing radiation/radio-active waste	ReCiPe: IRP_HEt (H)	-0.086	-0.007	0.133	-0.093
84	Ionizing radiation/radio-active waste	Impact2002: human health:ionising radiation	-0.086	-0.007	0.133	-0.094
85	Ionizing radiation/radio-active waste	CML2001: ionising radiation	-0.086	-0.007	0.133	-0.094
86	Endpoint: single score	EI99end: EI99(H,A)	-0.086	0.011	-0.130	-0.001
87	Eutrophication	CML2001: eutrophication:average European	-0.085	0.039	-0.132	0.051
88	Eutrophication	ReCiPe: MEPt (I)	-0.085	0.094	-0.111	-0.030
89	Eutrophication	EDIP2003: eutrophication:terrestrial eutrophication	-0.085	0.044	-0.133	0.050
90	Water/resource depletion	Impact2002: resources:mineral extraction	-0.085	0.028	0.117	0.095
91	Terrestrial ecotoxicity	ReCiPe: TETPinft (E)	-0.085	0.127	-0.039	-0.011
92	Ozone depletion	CML2001: ODP steady state	-0.084	-0.045	0.117	-0.180
93	Eutrophication	EDIP2003:	-0.084	0.102	-0.128	-0.017

		eutrophication:separate N potential				
94	Endpoint: single score	EI99end: EI99(I,I)	-0.084	0.046	0.011	0.101
95	Ozone depletion	ReCiPe: ODPinft (H)	-0.084	-0.053	0.101	-0.167
96	Water/resource depletion	ReCiPe: MDPt (H)	-0.084	0.027	0.110	0.090
97	Ozone depletion	CML2001: ODP 5a	-0.084	-0.044	0.133	-0.195
98	Ozone depletion	CML2001: ODP 10a	-0.084	-0.043	0.133	-0.198
99	Ozone depletion	CML2001: ODP 15a	-0.084	-0.043	0.133	-0.200
100	Land fill	EDIP2003: land filling:hazardous waste	-0.084	0.004	0.112	-0.046
101	Water/resource depletion	CML2001: depletion of abiotic resources	-0.084	-0.168	-0.053	-0.046
102	Ozone depletion	CML2001: ODP 20a	-0.084	-0.043	0.133	-0.202
103	Ozone depletion	CML2001: ODP 25a	-0.083	-0.042	0.134	-0.203
104	Ozone depletion	CML2001: ODP 30a	-0.083	-0.042	0.133	-0.204
105	Ozone depletion	TRACI: environmental impact:ozone depletion	-0.083	-0.045	0.117	-0.189
106	Ozone depletion	CML2001: ODP 40a	-0.083	-0.042	0.133	-0.206
107	Ionizing radiation/radio-active waste	EDIP2003: land filling:radioactive waste	-0.083	-0.018	0.124	-0.151
108	Endpoint: resources	Impact2002end: Impact2002resources	-0.083	-0.169	-0.053	-0.053
109	Endpoint: single score	EI99end: EI99(E,E)	-0.082	0.028	-0.066	-0.010
110	Photochemical ozone formation	CML2001: Summer smog: low NOx POCP	-0.082	-0.086	-0.096	-0.090
111	Water/resource depletion	Impact2002: resources:non-renewable energy	-0.082	-0.174	-0.056	-0.066
112	Respiratory effects and PM	CML2001: malodours air	-0.082	0.041	-0.012	-0.080
113	Ecotoxicity	TRACI: environmental impact:ecotoxicity	-0.082	0.049	0.089	0.098
114	Water/resource depletion	ReCiPe: FDPt (E)	-0.082	-0.181	-0.065	-0.074
115	Terrestrial ecotoxicity	CML2001: TAETP infinite	-0.081	0.138	-0.041	-0.021
116	Photochemical ozone formation	CML2001: Summer smog: EBIR	-0.081	-0.081	-0.104	-0.104
117	Terrestrial ecotoxicity	CML2001: TAETP 500a	-0.081	0.146	-0.055	-0.026
118	Land use	ReCiPe: NLTPt (I)	-0.080	-0.014	0.109	-0.139
119	Photochemical ozone formation	CML2001: Summer smog: MOIR	-0.080	-0.077	-0.110	-0.120
120	Endpoint: ecosystems	Impact2002end: Impact2002ecosystemquality	-0.080	0.176	-0.012	0.003
121	Photochemical ozone formation	CML2001: Summer smog: MIR	-0.080	-0.072	-0.107	-0.126
122	Terrestrial ecotoxicity	Impact2002: ecosystem quality:terrestrial ecotoxicity	-0.079	0.061	0.093	0.042
123	Photochemical ozone formation	Impact2002: human health:photochemical oxidation	-0.079	-0.146	-0.120	-0.072
124	Eutrophication	TRACI: environmental impact:eutrophication	-0.079	0.013	-0.140	-0.131

125	Terrestrial ecotoxicity	CML2001: TAETP 100a	-0.078	0.184	-0.070	-0.056
126	Human toxicity	ReCiPe: HTP100a (I)	-0.078	0.121	-0.120	-0.053
127	Terrestrial ecotoxicity	ReCiPe: TETPinft (H)	-0.076	0.190	-0.066	-0.101
128	Terrestrial ecotoxicity	ReCiPe: TETP100a (I)	-0.076	0.190	-0.066	-0.101
129	Terrestrial ecotoxicity	CML2001: TAETP 20a	-0.074	0.214	-0.071	-0.082
130	Ecotoxicity	EDIP2003: ecotoxicity:chronic, in soil	-0.073	0.166	-0.095	-0.069
131	Water/resource depletion	ReCiPe: WDPt (I)	-0.071	0.192	-0.053	-0.051
132	Eutrophication	Impact2002: ecosystem quality:aquatic eutrophication	-0.070	0.033	-0.135	-0.224
133	Land use	CML2001: land use:competition	-0.063	0.260	-0.086	-0.109
134	Land use	ReCiPe: ALOPt (E)	-0.059	0.270	-0.095	-0.131
135	Land use	Impact2002: ecosystem quality:land occupation	-0.059	0.284	-0.100	-0.096

Abbreviations of the methods: METP: Marine EcoToxicity Potential, FETP: Freshwater EcoToxicity Potential, MAETP: Marine Aquatic Ecotoxicity Potential, MSETP: Marine Sediment Ecotoxicity Potential, FEP: Freshwater EutroPhication, FSETP: Freshwater Sediment Ecotoxicity Potential, FAETP: Freshwater Aquatic Ecotoxicity Potential, HTP: Human Toxicity Potential, PMFP: Particulate Matter Formation Potential, FETP: Freshwater Ecotoxicity Potential, TAP: Terrestrial Acidification Potential, GWP: Global Warming Potential, POFP: Photochemical Ozone Formation Potential, POCP: Photochemical Ozone Creation Potential ,ULOP: Urban Land Occupation Potential, IRP: Ionizing Radiation Potential, MEP: Marine Eutrophication Potential, TAETP/TETP: TerrestriAl Ecotoxicity Potential, ODP: Ozone Depletion Potential, MDP: Mineral/Metal Depletion Potential, MOIR: Maximum Ozone Incremental Activity, FDP: Fossil Depletion Potential, EBIR: Equal Benefit Incremential Reactivity, NLTP: Natural Land Transformation Potential, MIR: Maximum Incremental Reactivity, WDP: Water depletion potential, ALOP: Agricultural Land Occupation Potential.

500a/100a/20a: Time Horizons of 500, 100 and 20 years respectively
(I): Individualist perspective, (E): Egalitarian perspective, (H): Hierarchist perspective

Annex 2

Table A2. Included indicators used for the EXIOBASE dataset and their loadings on the first six components, ranked from highest to lowest absolute score on component 1.

	Indicator names	Method	Loadings per component					
			1	2	3	4	5	6
1	Freshwater aquatic ecotoxicity FAETP 500	CML	-0.131	0.074	0.023	0.006	-0.010	-0.034
2	Freshwater sedimental ecotoxicity FSETP 500	CML	-0.130	0.076	0.024	0.006	0.009	-0.052
3	Freshwater aquatic ecotoxicity FAETP inf.	CML	-0.130	0.097	0.019	-0.002	0.013	-0.012
4	Freshwater sedimental ecotoxicity FSETP inf.	CML	-0.130	0.094	0.024	-0.021	0.003	0.007
5	Marine aquatic ecotoxicity MAETP 20	CML	-0.129	0.088	0.029	-0.007	0.012	-0.036
6	Freshwater aquatic ecotoxicity FAETP 100	CML	-0.129	0.051	0.020	0.046	0.008	-0.108
7	Marine sedimental ecotoxicity MSETP inf.	CML	-0.129	0.090	0.014	-0.003	-0.052	0.072
8	Marine aquatic ecotoxicity MAETP inf	CML	-0.129	0.074	0.010	0.028	-0.076	0.063
9	Marine sedimental ecotoxicity MSETP 100	CML	-0.128	0.100	0.031	-0.027	0.002	0.007
10	Marine sedimental ecotoxicity MSETP 20	CML	-0.128	0.079	0.027	0.017	0.027	-0.080
11	Freshwater sedimental ecotoxicity FSETP 100	CML	-0.128	0.054	0.022	0.048	0.029	-0.128
12	Marine aquatic ecotoxicity MAETP 100	CML	-0.127	0.105	0.032	-0.044	-0.014	0.050
13	Marine sedimental ecotoxicity MSETP 500	CML	-0.126	0.109	0.035	-0.053	-0.016	0.067
14	Freshwater aquatic ecotoxicity FAETP 20	CML	-0.126	0.040	0.023	0.060	0.037	-0.156
15	Carcinogenic effects on humans (I.I)	Ecoindicator 99	-0.126	0.111	0.019	-0.023	0.004	0.061
16	Respiratory effects on humans caused by organic substances (E.E)	Ecoindicator 99	-0.125	0.003	-0.022	0.059	0.007	-0.112
17	Marine aquatic ecotoxicity MAETP 500	CML	-0.125	0.109	0.036	-0.057	-0.027	0.087
18	Human toxicity	USEtox	-0.125	0.112	0.040	-0.008	0.004	0.014
19	Human toxicity midpoint, non-cancer effects	ILCD recommended method	-0.125	0.112	0.040	-0.008	0.004	0.014
20	Human toxicity endpoint, non-cancer effects	ILCD recommended method	-0.125	0.112	0.040	-0.008	0.004	0.014
21	Damage to Ecosystem Quality caused by ecotoxic emissions (I.I)	Ecoindicator 99	-0.125	0.093	0.021	0.029	0.058	-0.052
22	Terrestrial ecotoxicity TETP 20	CML	-0.125	0.110	0.045	-0.032	-0.055	0.066
23	Ecotoxicity freshwater midpoint	ILCD recommended method	-0.124	0.109	0.038	-0.021	0.028	0.013
24	Carcinogenic effects on humans (E.E)	Ecoindicator 99	-0.124	0.112	0.047	-0.060	-0.020	0.089
25	Freshwater sedimental ecotoxicity FSETP 20	CML	-0.124	0.041	0.023	0.068	0.051	-0.172
26	Terrestrial ecotoxicity TETP 100	CML	-0.124	0.111	0.047	-0.035	-0.055	0.072
27	Terrestrial ecotoxicity	CML	-0.124	0.113	0.048	-0.036	-0.050	0.070
28	Fresh water Ecotoxicity	USEtox	-0.124	0.114	0.045	-0.040	0.011	0.046
29	Terrestrial ecotoxicity TETP inf	CML	-0.124	0.114	0.044	-0.004	0.014	0.000

30	Respiratory effects on humans caused by inorganic substances (H.A)	Ecoindicator 99	-0.123	0.095	0.018	0.044	0.055	-0.055
31	Damage to Ecosystem Quality caused by ecotoxic emissions (E.E))	Ecoindicator 99	-0.123	0.095	0.018	0.044	0.055	-0.055
32	Particulate matter/Respiratory inorganics endpoint	ILCD recommended method	-0.123	-0.069	0.028	-0.015	-0.039	-0.149
33	Human toxicity endpoint, cancer effects	ILCD recommended method	-0.123	0.112	0.052	-0.053	-0.050	0.093
34	Human toxicity midpoint, cancer effects	ILCD recommended method	-0.123	0.112	0.052	-0.053	-0.051	0.093
35	human toxicity HTP inf.	CML	-0.122	0.118	0.043	0.007	0.012	-0.009
36	Respiratory effects on humans caused by inorganic substances (I.I)	Ecoindicator 99	-0.121	-0.085	0.039	-0.048	-0.027	-0.128
37	EPS (Steen, 1999))	EPS	-0.121	0.023	-0.028	0.073	0.027	-0.217
38	human toxicity HTP 500	CML	-0.118	0.110	0.056	-0.083	-0.056	0.147
39	human toxicity HTP 100	CML	-0.118	0.110	0.056	-0.083	-0.056	0.147
40	human toxicity HTP 20	CML	-0.118	0.110	0.056	-0.083	-0.056	0.147
41	photochemical oxidation (high NOx)	CML	-0.116	-0.044	-0.155	-0.024	0.208	-0.057
42	photochemical oxidation (low NOx)	CML	-0.116	-0.046	-0.069	-0.023	0.075	-0.290
43	photochemical oxidation (MOIR; high NOx)	CML	-0.115	-0.055	-0.076	-0.033	0.082	-0.281
44	photochemical oxidation (EBIR; low NOx)	CML	-0.115	-0.055	-0.076	-0.033	0.082	-0.280
45	photochemical oxidation (MIR; very high NOx)	CML	-0.115	-0.056	-0.077	-0.034	0.083	-0.279
46	global warming GWP500	CML	-0.108	-0.107	-0.161	-0.029	-0.193	0.021
47	global warming net GWP100 max	CML	-0.106	-0.132	-0.145	-0.069	-0.152	-0.004
48	Total Emission relevant energy use	Direct EXIOBASE output	-0.106	-0.048	-0.167	0.080	-0.133	0.148
49	Damages to human health caused by climate change (H.A)	Ecoindicator 99	-0.106	-0.134	-0.145	-0.066	-0.155	0.015
50	global warming net GWP100 min	CML	-0.106	-0.134	-0.145	-0.070	-0.155	0.004
51	Damages to human health caused by climate change (I.I)	Ecoindicator 99	-0.106	-0.135	-0.145	-0.067	-0.153	0.015
52	Climate change endpoint, ecosystems	ILCD recommended method	-0.106	-0.133	-0.149	-0.068	-0.148	0.015
53	Climate change endpoint, human health	ILCD recommended method	-0.106	-0.133	-0.149	-0.068	-0.148	0.015
54	Climate change midpoint	ILCD recommended method	-0.106	-0.133	-0.149	-0.068	-0.148	0.015
55	global warming GWP100	CML	-0.105	-0.132	-0.151	-0.068	-0.154	0.007
56	Photochemical ozone formation midpoint, human health	ILCD recommended method	-0.104	-0.051	-0.181	-0.018	0.306	0.060
57	Photochemical ozone formation endpoint, human health	ILCD recommended method	-0.104	-0.052	-0.181	-0.018	0.306	0.060
58	acidification (incl. fate, average Europe total, A&B)	CML	-0.104	-0.149	0.092	-0.107	-0.018	-0.001
59	global warming GWP20	CML	-0.101	-0.140	-0.152	-0.088	-0.091	0.009

60	Respiratory effects on humans caused by inorganic substances (E.E)	Ecoindicator 99	-0.101	-0.155	0.090	-0.123	-0.027	0.021
61	acidification (fate not incl.)	CML	-0.101	-0.156	0.102	-0.115	-0.020	0.010
62	Acidification midpoint	ILCD recommended method	-0.098	-0.156	0.124	-0.089	-0.002	-0.007
63	Acidification endpoint	ILCD recommended method	-0.097	-0.157	0.127	-0.089	-0.001	-0.005
64	Total Energy Use	Direct EXIOBASE output	-0.094	-0.019	-0.205	0.092	0.103	0.231
65	Damage to Ecosystem Quality caused by the combined effect of acidification and eutrophication (I.I)	Ecoindicator 99	-0.088	-0.176	0.130	-0.123	-0.026	0.049
66	Water Withdrawal Blue - Total	Direct EXIOBASE output	-0.085	-0.064	-0.018	0.413	-0.118	0.089
67	Unused Domestic Extraction	Direct EXIOBASE output	-0.085	-0.065	0.013	0.194	0.027	-0.111
68	Water Consumption Blue - Manufacturing	Direct EXIOBASE output	-0.083	-0.058	0.118	0.341	0.017	-0.071
69	eutrophication (incl. fate, average Europe total, A&B)	CML	-0.082	-0.182	0.141	-0.116	-0.027	0.062
70	Respiratory effects on humans caused by organic substances (I.I)	Ecoindicator 99	-0.082	-0.092	-0.186	-0.035	0.342	0.181
71	ozone layer depletion ODP steady state	CML	-0.081	-0.067	-0.168	0.003	0.370	0.237
72	Water Withdrawal Blue - Manufacturing	Direct EXIOBASE output	-0.080	-0.067	0.116	0.351	0.022	-0.059
73	Water Consumption Blue - Electricity	Direct EXIOBASE output	-0.079	-0.052	-0.065	0.387	-0.194	0.093
74	Water Withdrawal Blue - Electricity	Direct EXIOBASE output	-0.076	-0.048	-0.074	0.367	-0.173	0.141
75	Total Energy supply	Direct EXIOBASE output	-0.076	-0.021	-0.194	0.137	0.214	0.218
76	Domestic Extraction	Direct EXIOBASE output	-0.074	-0.123	0.048	0.119	0.088	-0.098
77	eutrophication (fate not incl.)	CML	-0.065	-0.168	0.192	0.002	0.056	0.056
78	Eutrophication marine midpoint	ILCD recommended method	-0.063	-0.186	0.205	-0.033	0.029	0.049
79	Water Consumption Blue - Livestock	Direct EXIOBASE output	-0.062	-0.164	0.202	0.011	0.078	0.078
80	Water Consumption Blue - Total	Direct EXIOBASE output	-0.058	-0.170	0.217	0.058	0.056	0.096
81	Water Consumption Green - Agriculture	Direct EXIOBASE output	-0.058	-0.175	0.221	0.019	0.103	0.108

82	Land use	Direct EXIOBASE output	-0.056	-0.177	0.207	0.044	0.107	0.045
83	Water Consumption Blue - Agriculture	Direct EXIOBASE output	-0.053	-0.168	0.226	0.027	0.073	0.111
84	odour	CML	**These indicators were left out of the calculation procedure because of perfect correlation with one (or more) of the other indicators.**					
85	Carcinogenic effects on humans (H.A)	Ecoindicator 99						
86	Respiratory effects on humans caused by organic substances (H.A)	Ecoindicator 99						
87	Damage to Ecosystem Quality caused by ecotoxic emissions (H.A)	Ecoindicator 99						
88	Damage to Ecosystem Quality caused by the combined effect of acidification and eutrophication (H.A)	Ecoindicator 99						
89	Damages to human health caused by climate change (E.E)	Ecoindicator 99						
90	Damage to Ecosystem Quality caused by the combined effect of acidification and eutrophication (E.E)	Ecoindicator 99						
91	Particulate matter/Respiratory inorganics midpoint	ILCD recommended method						
92	Eutrophication terrestrial midpoint	ILCD recommended method						
93	Ecotoxicity freshwater endpoint	ILCD recommended method						