2nd International ecoinvent Meeting, March 14, 2008
ETH Lausanne / Plenary session

The ecoinvent Database: a success story

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Contents

- ecoinvent philosophy spreads out
- new contents in ecoinvent data v2.01
- new methodological aspects
- scientific findings: the importance of capital equipment
- personal notes
... or in other words

- promotion
- information
- reflection
ecoInvent data spreads out

- more than 1200 customers use ecoInvent data in more than 40 countries
- ecoInvent data are embedded or importable in all major LCA software tools
  - SimaPro
  - Umberto
  - Team
  - CMLCA
  - GaBi
  - KCL-Eco
  - Regis
  - Emis
  - Green-e
ecoinvent data at your fingertips

- Waste management policy in communities:
  Wrate
  Environment Agency, United Kingdom
- Environmental assessment of products:
  BilanProduit
  ADEME, France
- Environmental assessment of buildings
  LEGEP, Germany
  OGIP, Germany
  VITRUVIUS, Switzerland
CO₂ labelling of consumer products

Total Cool Active Color & Form
Standard-Dosierung: 60g

Total Color & Form
Standard-Dosierung: 100g

Total Color & Form
Total Color & Form Concentré,
Total Cool Active Color & Form
und Total Color & Form Tabs

Total Cool Active Color & Form
(bei 20 Grad tieferer Wasch-
temperatur)

Gramm CO₂ pro Waschgang
eco invent data used in EC research projects: The NEEDS project

The advantage of unit process databases: Interdependency & Feedback-Loops
Work flow and products

ecoinvent data used as LCA backbone
Technology assessment with ecoinvent

Single crystalline photovoltaics

- 64 g CO₂
- 160 mg NOₓ
- 0.4 Bq C-14
- 23 mg Oils

Today, 2025 RO 440ppm, 2050 RO 440ppm, 2050 RO Renewables, 2050 RO Mix today

Legend:
- Carbon dioxide, fossil
- Nitrogen oxides
- Carbon-14
- Oils, unspecified

Swiss Centre
For Life Cycle Inventories
A joint initiative of the ETH domain and Swiss Federal Offices

NEEDS
Swiss Centre
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New contents in ecoinvent data v2.0

- new economic sectors
- updated inventory data
- new elementary flows
- new impact assessment methods
- new features in online access to database
New economic sectors

- electronics
- precious and rare earth metals
- petrochemical solvents and specialty chemicals
- energy supply US, BR, JP, CN, new member states
- ventilation systems and small scale energy generation
- mechanical engineering and compressed air supply
- fuels and fibres from renewable sources
- agricultural products in US and EU countries
Updated inventory data

- Plastics and cardboard
- Agricultural processes
- EU countries’ electricity mixes
- Power plant performance Eastern European countries
- Photovoltaics (including additional technologies)
- Road and railway transport
Data maintenance

- errors cannot be avoided
- quarterly update of the list of discovered errors
- download in the “Files” section of the online database
- yearly update of the current version 2.01
- First list expected later this month
New elementary flows

- land occupation/transformation, tropical rain forest
- Carbon, in organic matter, in soil
- Carbon dioxide, land transformation
- quite a few new pesticide emissions
- a few new metals resources and chemical pollutants
New impact assessment methods

- EDIP 2003
- EDP (Ecological damage potential; land use)
- Ecological footprint
- Cumulative Exergy Demand
- TRACI

- Available in EcoSpold and SimaPro format: ecological scarcity 2006
## New online access to LCI results

### Cumulative LCI results

#### From Nature

<table>
<thead>
<tr>
<th>Resource: 192</th>
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<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Aluminium, 24% in bauxite, 11% in crude ore, in ground</td>
</tr>
<tr>
<td>Anhydrite, in ground</td>
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<tr>
<td>Barite, 15% in crude ore, in ground</td>
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<tr>
<td>Basalt, in ground</td>
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<tr>
<td>Borax, in ground</td>
</tr>
<tr>
<td>Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground</td>
</tr>
<tr>
<td>Calcite, in ground</td>
</tr>
<tr>
<td>Carbon dioxide, in air</td>
</tr>
<tr>
<td>Carbon, in organic matter, in soil</td>
</tr>
<tr>
<td>Chromium, 25.5% in chromite, 11.6% in crude ore, in ground</td>
</tr>
<tr>
<td>Chrysotile, in ground</td>
</tr>
<tr>
<td>Cinnabar, in ground</td>
</tr>
<tr>
<td>Clay, bentonite, in ground</td>
</tr>
<tr>
<td>Clay, unspecified, in ground</td>
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</table>
New online access to LCIA results

<table>
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<tr>
<th>Name</th>
<th>Location</th>
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<th>Unit</th>
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<tr>
<td>GWP 100a</td>
<td>GLO</td>
<td>0.085706</td>
<td>kg CO2-Eq</td>
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<tr>
<td>GWP 20a</td>
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<td>kg CO2-Eq</td>
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<tr>
<td>GWP 500a</td>
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<td>kg CO2-Eq</td>
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<tr>
<td>lower limit of net GWP</td>
<td>GLO</td>
<td>0.08676</td>
<td>kg CO2-Eq</td>
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<tr>
<td>upper limit of net GWP</td>
<td>GLO</td>
<td>0.086868</td>
<td>kg CO2-Eq</td>
</tr>
</tbody>
</table>

- CML 2001/ acidification potential: 2
- CML 2001/ climate change: 5
- CML 2001/ eutrophication potential: 2
- CML 2001/ freshwater aquatic ecotoxicity: 4
- CML 2001/ freshwater sediment ecotoxicity: 4
- CML 2001/ human toxicity: 4
- CML 2001/ ionising radiation: 1
- CML 2001/ land use: 1
- CML 2001/ malodours air: 1
- CML 2001/ marine aquatic ecotoxicity: 4
New online access to documents

Here you find the ecoinvent reports of all v2.01 datasets, and if necessary the xml-files and pdf documentations of corrected ecoinvent v2.01 datasets.

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<td>1 MB</td>
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<td>DEL</td>
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</table>
methodological approaches kept

- transparent unit process modelling
- no system expansion
- attributional modelling
  - unit process level facilitates
    - consequential or decisional modelling, and/or
    - system expansion
- land use modelling
- categorisation of emissions (e.g. high/low pop density)
- default distances and waste management paths
- LCI data format EcoSpold
Main new methodological approaches

- CO$_2$ emissions from land transformation - effects of clear cutting primary forest

- Renewable energy resource input change in concept of inventory:  
  - from energy offered by nature  
  - to energy harvested

- refinement of heavy metals and nitrate emission models in agriculture
Renewable energy input
Problem setting and thesis

• Cumulative Energy Demand (CED) lacks sound and consistent foundation. Different concepts exist:
  - resource conservation: only non renewable energy
  - climate change oriented: only fossil energy
  - proxy indicator: non renewable plus hydro energy
  - "total energy demand": all energy sources
• CED sometimes even considered as part of LCI!
• How to account for renewable energy sources?

Thesis:

Renewable energy *harvested* is the key information from a total energy demand perspective leading to best achievable consistency.
Harvesting efficiencies

- Solar energy: $\eta = 15\%$
- Wind energy: $\eta = 25\%$
- Electricity
Harvesting efficiencies

- Conversion efficiency were applied inconsistently:
  - solar energy to electricity via photovoltaics
  - kinetic energy in wind to electricity from wind power
  - oil extracted from the ground
- consistency with photovoltaics would imply:
  - solar energy required to "produce" kinetic energy
  - solar energy to produce fossil fuels
- neither sensible
  from a resource protection perspective
  (sun energy is unlimited in a human time scale)
- nor practical
New consistent concept: energy harvested
Examples: non renewable resources

Lignite

IN: energy in lignite extracted
OUT: lignite fuel
Harvesting efficiency: 100 %

Uranium

IN: energy in Uranium extracted and finally burnt-up in LWR
OUT: nuclear fuel
Harvesting efficiency: 100 %
Examples: renewable resources

Wood

IN: energy in wood felled
OUT: round, industrial and residual wood
Harvesting efficiency: 100 %

Wind

IN: rotation energy transmitted to gearbox
OUT: electricity
Harvesting efficiency: 93 %
Scientific findings: Importance of capital equipment

Inclusion or exclusion of capital goods in LCA is disputed:

• Capital equipment shall be part of any LCA in any case!
  But, this makes my product system explode!

• Capital equipment shall be excluded per se!
  But then we risk to miss significant parts of the environmental impacts!

Thesis:

• Capital equipment must be included in cases where relevant!
  Criteria need to be defined!

Published in Int J LCA, Vol. 12, Special Issue 1, pp 7-17
Operation versus capital goods manufacture

- oil, at pipeline
  - construction pipeline
  - electricity, at busbar
  - network construction
  - electricity, at plug
  - steel sheet, at plant

- fuel, at refinery
  - construction filling station
  - electricity, at plug
  - plant construction
  - diesel, in machines
  - excavator manufacture

- fuel, at filling station
- car manufacture
- road construction

- transport, private car
<table>
<thead>
<tr>
<th>Synthesis</th>
<th>land use</th>
<th>mineral resources</th>
<th>non renewable CED</th>
<th>climate change</th>
<th>acidification / eutrophication</th>
<th>toxicity and ecotoxicity</th>
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</thead>
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<td>minor</td>
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<td>minor</td>
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<tr>
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<tr>
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<td>waste incineration</td>
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<td>major</td>
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<td>minor</td>
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<td>land filling</td>
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<td>waste water treatment</td>
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<td>major</td>
<td>substantial</td>
<td>substantial</td>
</tr>
</tbody>
</table>
Personal notes

Managing an LCA database is …

… like driving a tramway
You have to decide on the appropriate course
... and on an appropriate design
you cannot always avoid conflicts...
... even within your organisation
you face competition with private transportation ...
... and with other public transport organisations
you have to counter nasty conditions ...
and you can join forces
Tram tickets in Göteborg

- With Swedish coins or Swedish mobile phone: Buy single ticket on tram (SEK 20)
- With Swedish notes: Buy 100-card (six rides+) at Chalmers kiosk
- With credit card or Euro notes: Buy 100-card at kiosk inside coop konsum
- With ruthless guts: Go without ticket

To use 100-card:
- Put it in green machine on bus or tram
- Press "2"
... much easier with ecoinvent data

Country*: Scotland
☑ One address for mailing and billing (members only).

Telephone: 
Telefax: 

E-Mail*: hermione.granger@hogwarts.edu
☑ Please add me to the mailing list of the ecoinvent newsletter.

Register as
• Guest
• New user for V2.0

If you wish to order the ecoinvent data V1.3 only, please contact Annette Köhler.

☑ Please send me the ecoinvent CD-ROM (members only).

☑ I agree with the terms of use.

Username*: Hermione
Password*: ●●●●●●●●
Confirm password*: ●●●●●●●●

Register  Reset
from the early beginnings ...
... to the most powerful equipment ...
... the mission is still the same: help people to reach their goal ...
with easy access, comfort, and ...
My apologies to all of you, who

- did not always feel comfortable on board
- did not always arrive where expected
- did not always arrive in time
- were not always happy with the course chosen
My deep thanks to all of you, who

- made and make use of the services offered
- provided professional equipment and support
- contributed your brain power and passion
- cared for marketing and “ticket” sales
- organised and provided funding
- performed successful national and international political lobbying
- contributed good spirit and fun
One small step for a professor …

• In 1990, a mechanical engineering’s professor dared to employ a civil engineer to work on environmental Life Cycle Assessment

• It turned out to be the flutter of a butterfly wing creating a marvellous personal opportunity and a happy life

• Thank you so much, Peter Suter!
Thank you very much for your attention!

Rolf Frischknecht