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

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The ecoinvent Database: a success story

Rolf Frischknecht, ecoinvent manager

Swiss Centre for Life Cycle Inventories

frischknecht@ecoinvent.org

Contents

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

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… or in other words

- promotion
- information
- reflection

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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

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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

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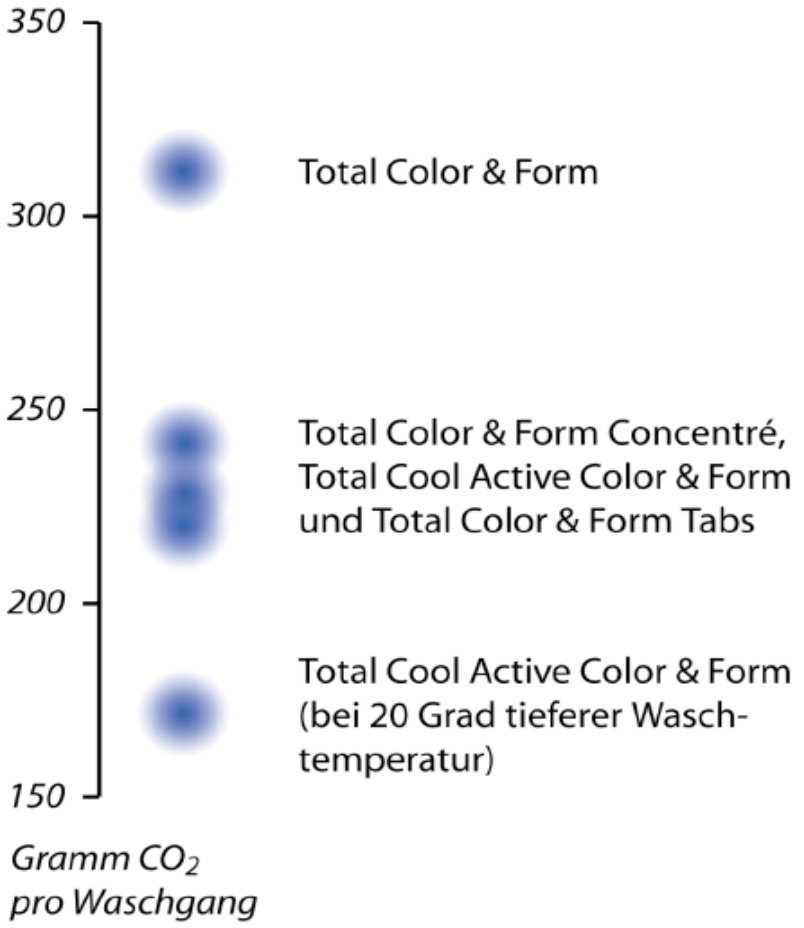
CO_2 labelling of consumer products

Total Cool Active Color & Form

Standard-Dosierung: 60g

Total Color & Form

Standard-Dosierung: 100g



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ecoinvent data used in EC research projects: The NEEDS project

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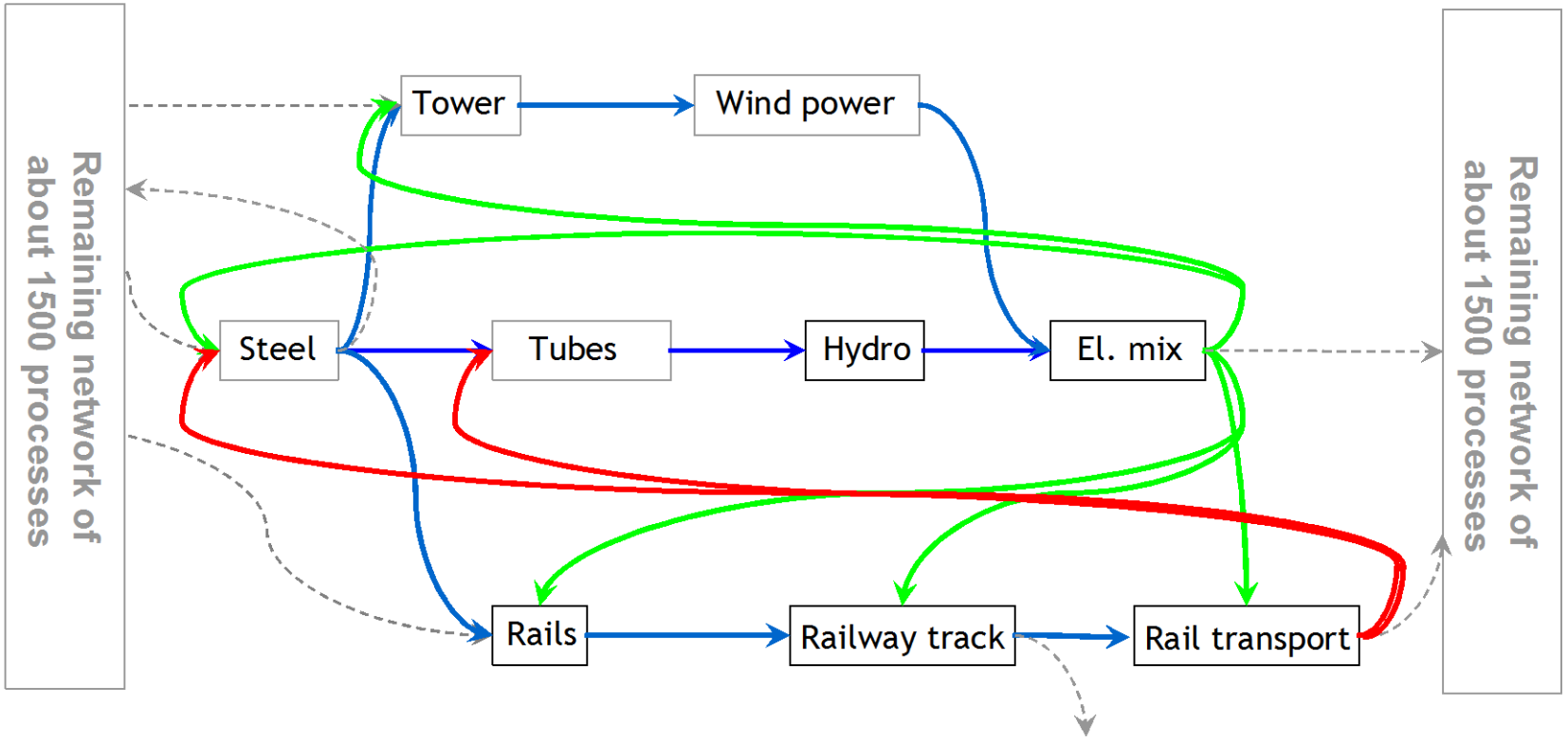
The advantage of unit process databases:
Interdependency & Feedback-Loops



ecoinvent data used as LCA backbone

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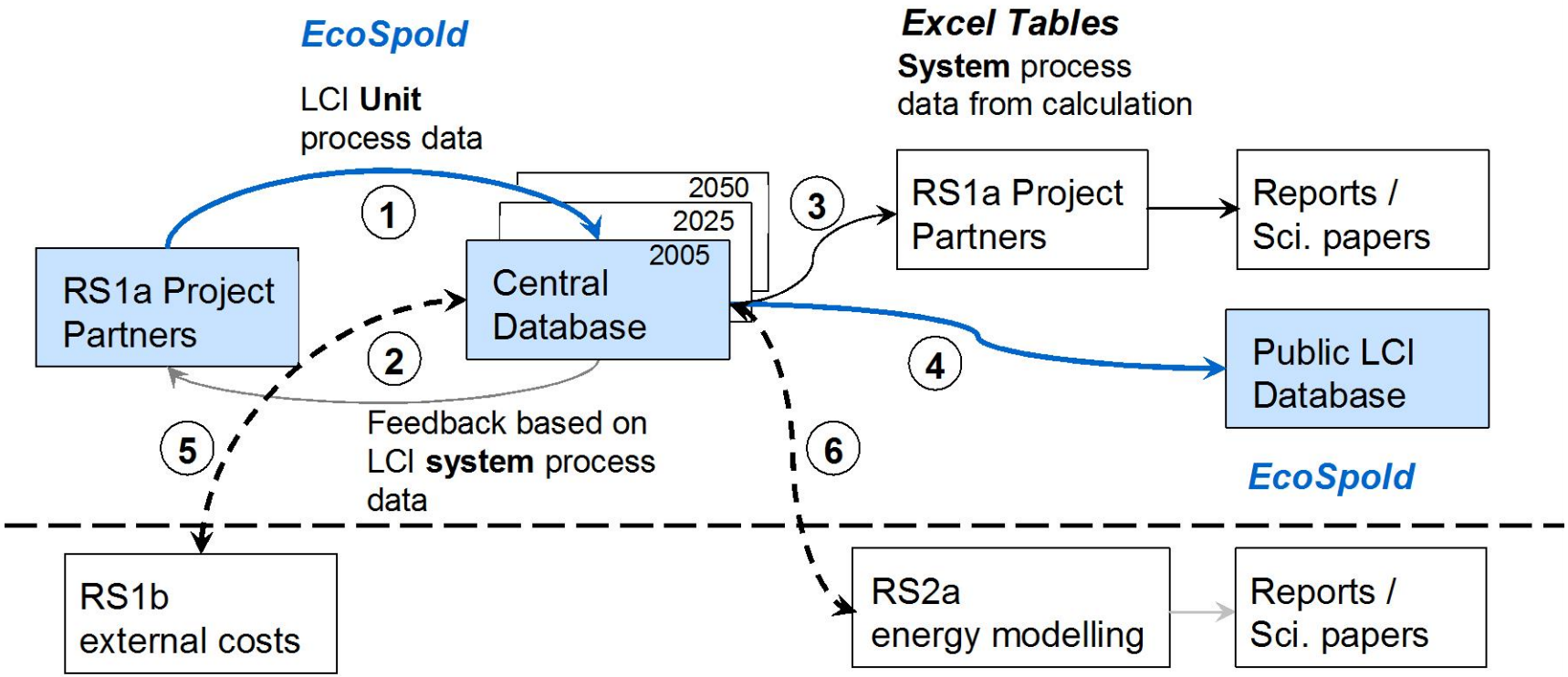
Work flow and products



Technology assessment with ecoinvent

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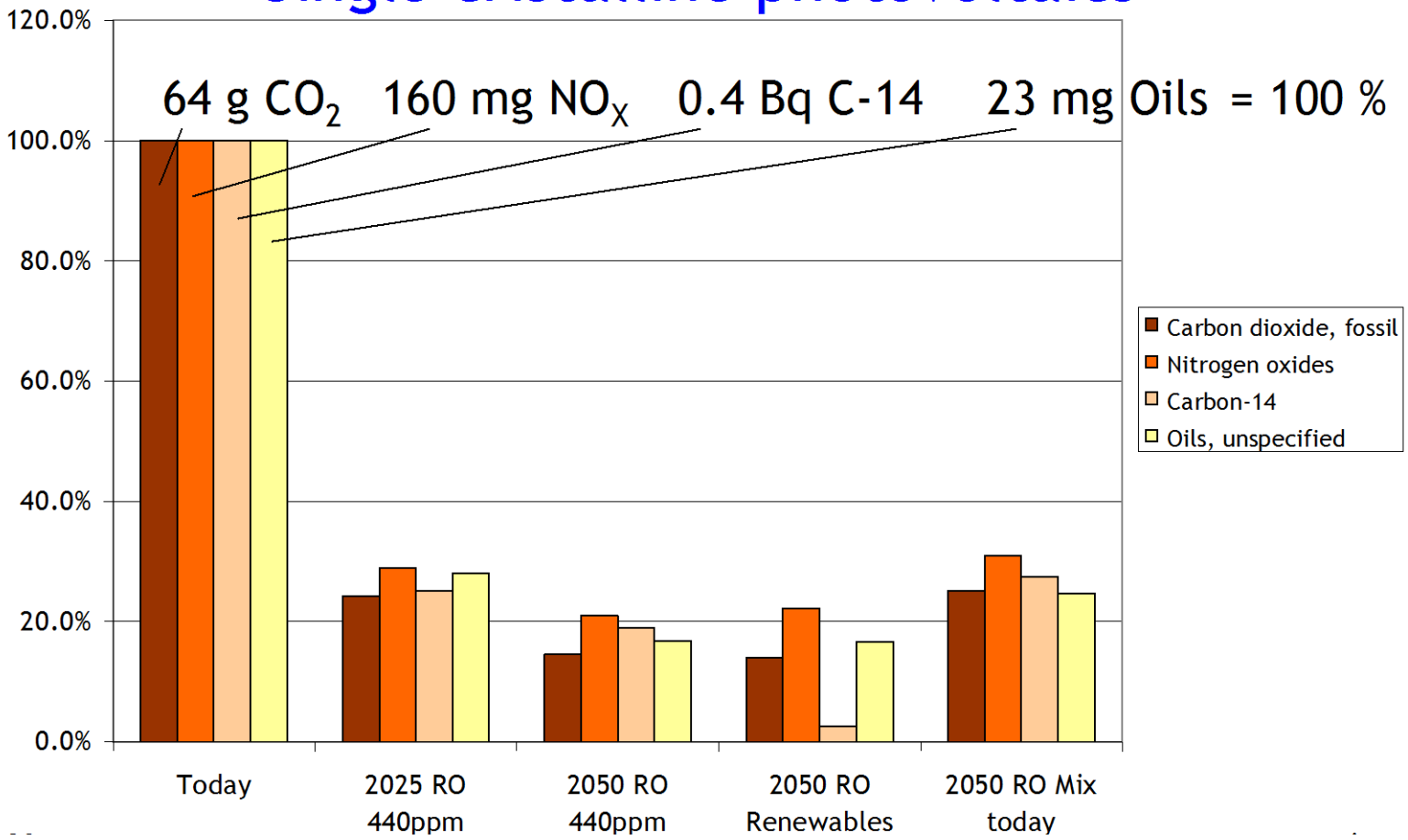
Single cristalline photovoltaics



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

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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

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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

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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

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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

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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

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New online access to LCI results

cumulative LCI results Expand all	electricity mix, SE, [kWh]
From Nature	electricity mix, SE, [kWh]

⊟ resource: 192

Name	Subcategory	Unit	Mean value
⊞ Aluminium, 24% in bauxite, 11% in crude ore, in ground	in ground	kg	7.3899E-06
⊞ Anhydrite, in ground	in ground	kg	2.2668E-10
⊞ Barite, 15% in crude ore, in ground	in ground	kg	2.2849E-05
⊞ Basalt, in ground	in ground	kg	9.3179E-07
⊞ Borax, in ground	in ground	kg	3.2844E-09
⊞ Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	in ground	kg	2.1809E-09
⊞ Calcite, in ground	in ground	kg	0.0020424
⊞ Carbon dioxide, in air	in air	kg	0.082758
⊞ Carbon, in organic matter, in soil	in ground	kg	7.775E-09
⊞ Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	in ground	kg	2.0954E-05
⊞ Chrysotile, in ground	in ground	kg	7.8754E-10
⊞ Cinnabar, in ground	in ground	kg	7.3661E-11
⊞ Clay, bentonite, in ground	in ground	kg	5.2256E-05
⊞ Clay, unspecified, in ground	in ground	kg	0.00053129

New online access to LCIA results

cumulative LCIA results Expand all | electricity mix, SE, [kWh]

⊞ CML 2001/acidification potential: 2

⊟ CML 2001/climate change: 5

Name	Location	Mean value	Unit
⊞ GWP 100a	GLO	0.085706	kg CO2-Eq
⊞ GWP 20a	GLO	0.093945	kg CO2-Eq
⊞ GWP 500a	GLO	0.081682	kg CO2-Eq
⊞ lower limit of net GWP	GLO	0.08676	kg CO2-Eq
⊞ upper limit of net GWP	GLO	0.086868	kg CO2-Eq

⊞ 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

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New online access to documents

[Startpage] [Database search] [Show download-basket] [Files] [Logout] [Help] [Deutsche Version]

User: **frischknecht** | Status: **ecoinvent administrator** | Data: **v2.01 (2007)** | Datasets in download-basket: **0**

Upload this file: Durchsuchen...

upload

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.

Name	Size	Last changes	Delete
01_OverviewAndMethodology.pdf	603 KB	18.12.2007, 08:21	DEL
03_LCIA-Implementation.pdf	4 MB	18.12.2007, 23:44	DEL
04_DatabaseSystem.pdf	1 MB	18.12.2007, 23:46	DEL
05_EnergySystemsSummary.pdf	1 MB	18.12.2007, 23:47	DEL
06_I-III_ZusammenfassungZielMethodik.pdf	244 KB	18.12.2007, 23:47	DEL
06_IV_Erdoel.pdf	11 MB	20.12.2007, 07:34	DEL
06_IX_Holzenergie.pdf	1 MB	18.12.2007, 23:52	DEL
06_VIII_Wasserkraft.pdf	837 KB	18.12.2007, 23:55	DEL
06_VII_Kernenergie.pdf	3 MB	18.12.2007, 23:55	DEL
06_VI_Kohle.pdf	2 MB	18.12.2007, 23:54	DEL
06_V_Erdgas.pdf	1 MB	18.12.2007, 23:53	DEL

methodological approaches kept

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- 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

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Main new methodological approaches

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- 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

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Renewable energy input
Problem setting and thesis

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- 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.

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Harvesting efficiencies

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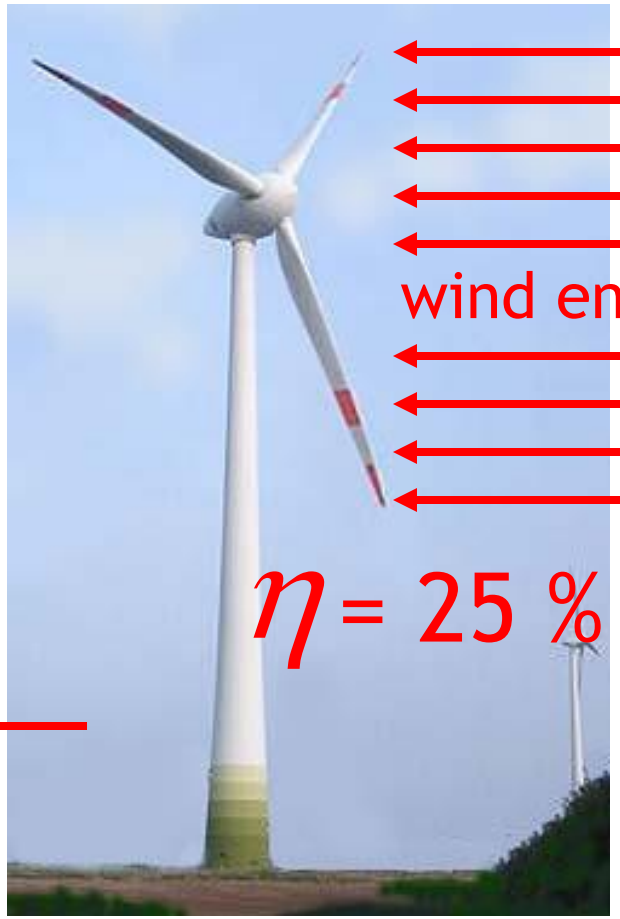
solar energy

η = 15 %



wind energy

η = 25 %

electricity

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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

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New consistent concept: energy harvested
Examples: non renewable resources

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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 %

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Examples: renewable resources

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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 %

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Scientific findings: Importance of capital equipment

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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

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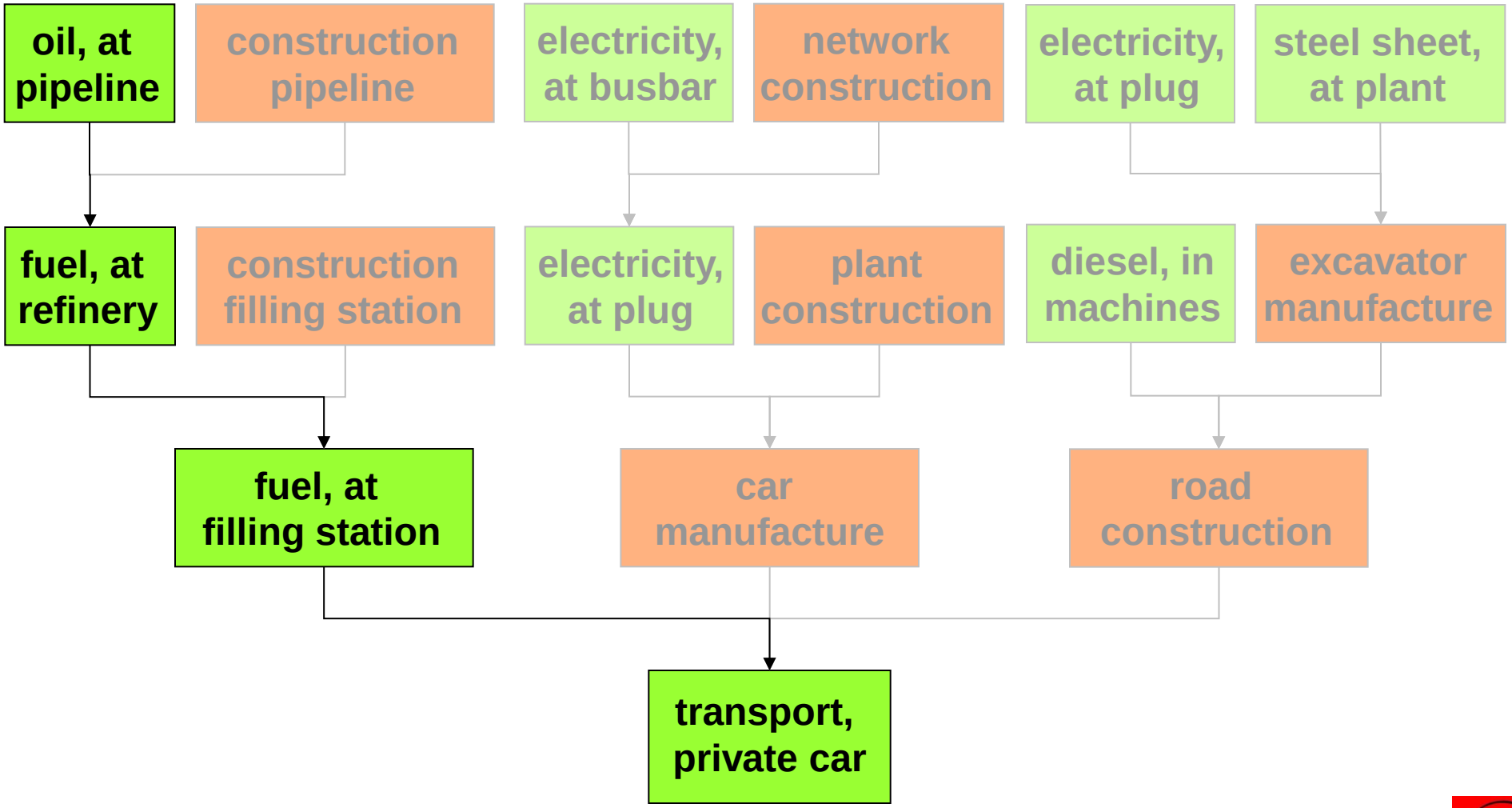
Operation versus capital goods manufacture



Synthesis

	land use	mineral resources	non renewable CED	climate change	acidification / eutrophication	toxicity and ecotoxicity
fossil energy	major	major	minor	minor	minor	substantial
nuclear energy	major	substantial	minor	substantial	substantial	substantial
biomass energy	minor	major	substantial	substantial	minor	substantial
renewable energy, nec	major	major	major	major	major	major
metals	substantial	minor	minor	minor	minor	minor
mineral construction materials	substantial	major	minor	minor	minor	substantial
wood products	minor	major	substantial	minor	minor	substantial
agricultural products	minor	major	substantial	minor	minor	substantial
transport services	major	major	substantial	substantial	substantial	substantial
waste incineration	substantial	major	substantial	minor	minor	minor
land filling	substantial	major	substantial	substantial	substantial	minor
waste water treatment	major	major	major	major	substantial	substantial

Personal notes

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Managing an LCA database is ...

... like driving a tramway

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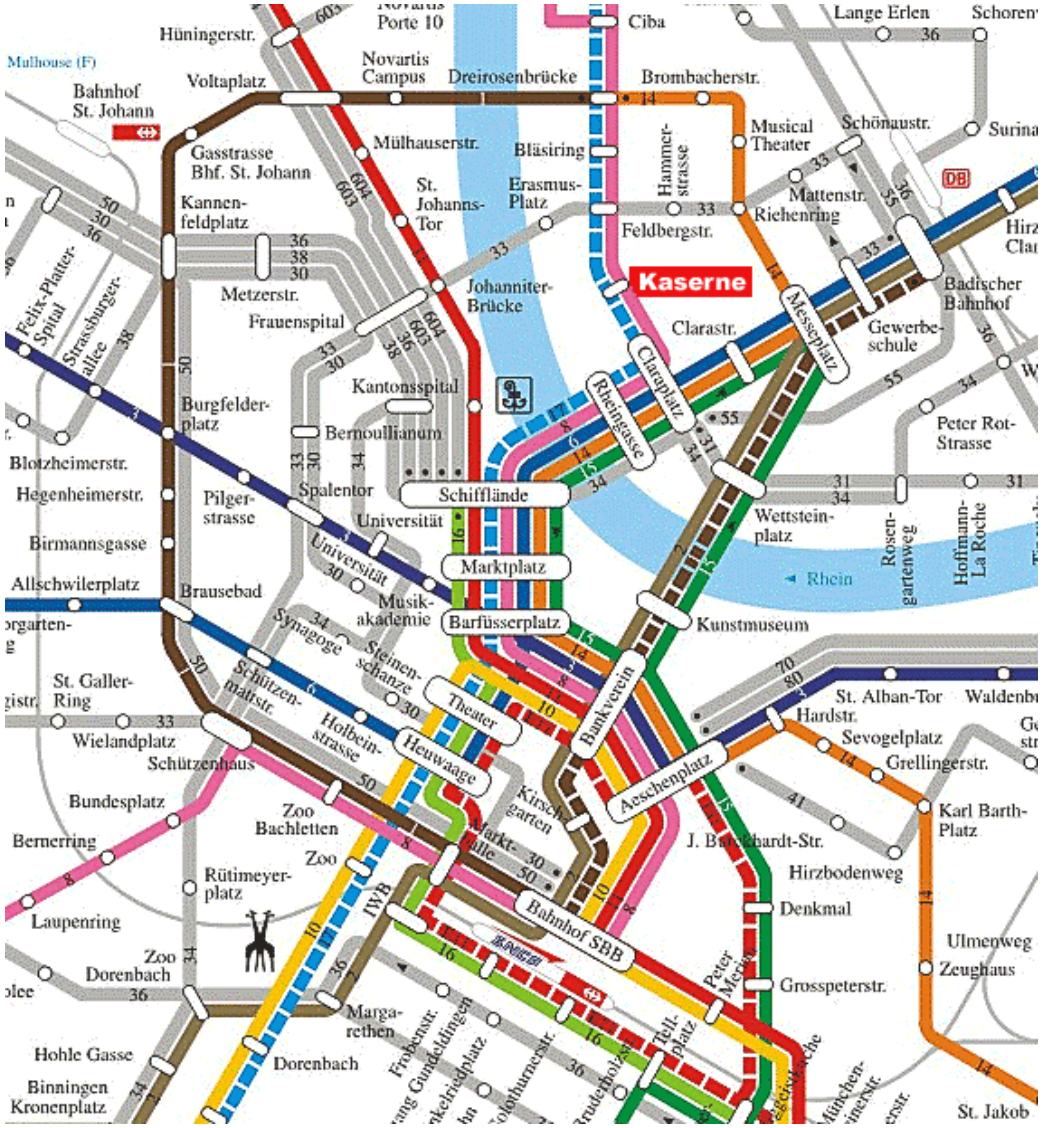
You have to decide on the appropriate course



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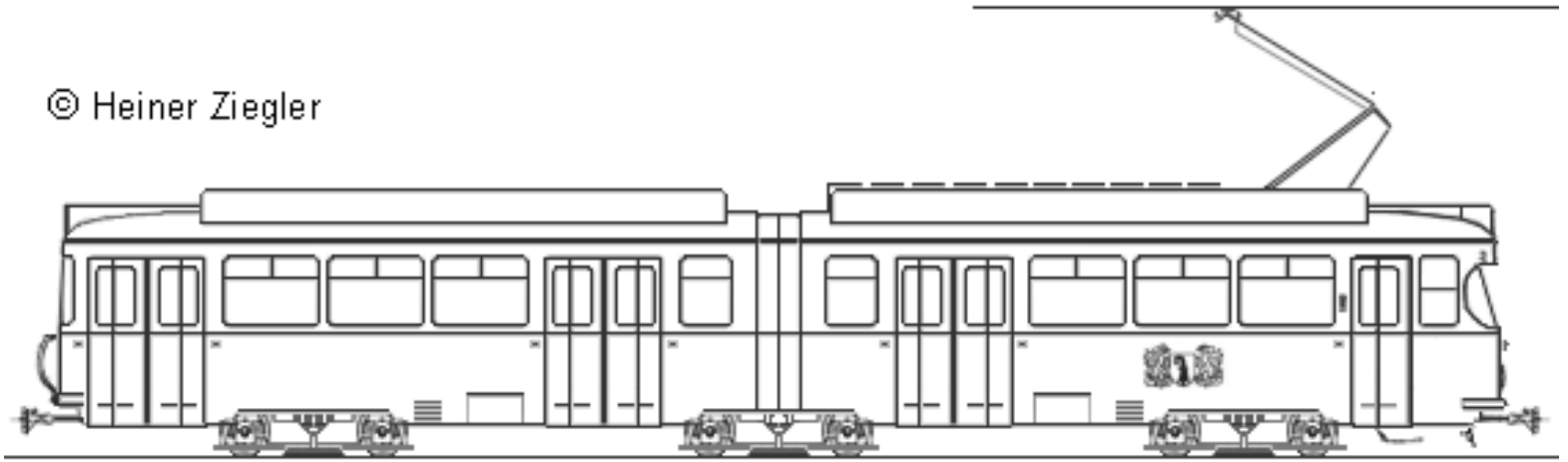
… and on an appropriate design



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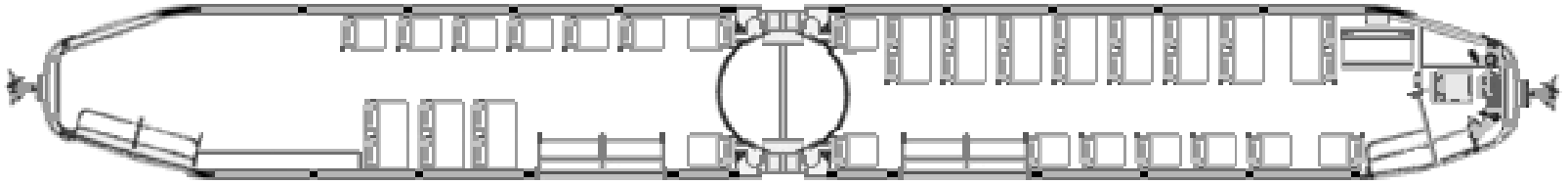

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you cannot always avoid conflicts...

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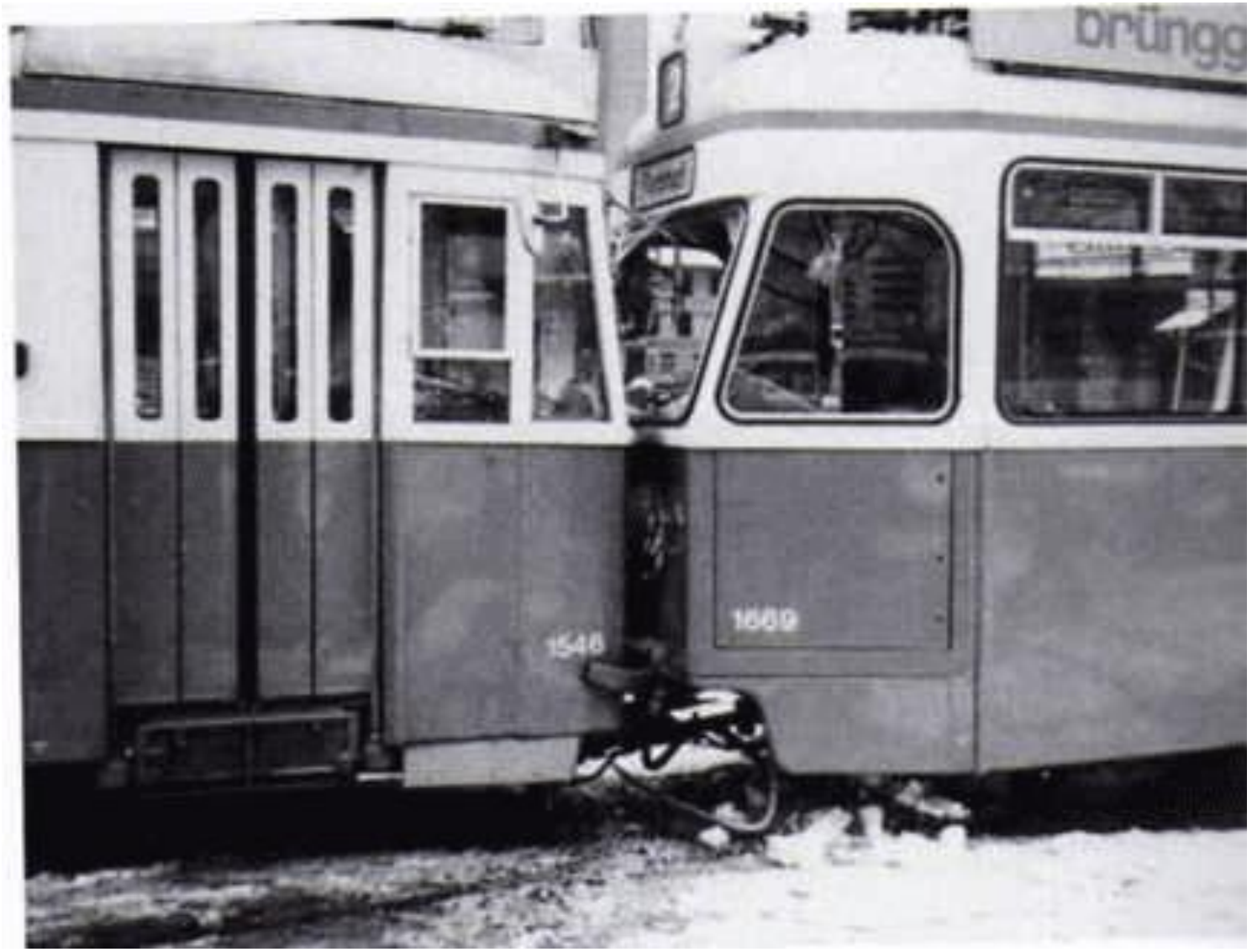
... even within your organisation



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you face competition with private transportation ...

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... and with other public transport organisations

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you have to counter nasty conditions …

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and you can join forces

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One main difference: getting access …

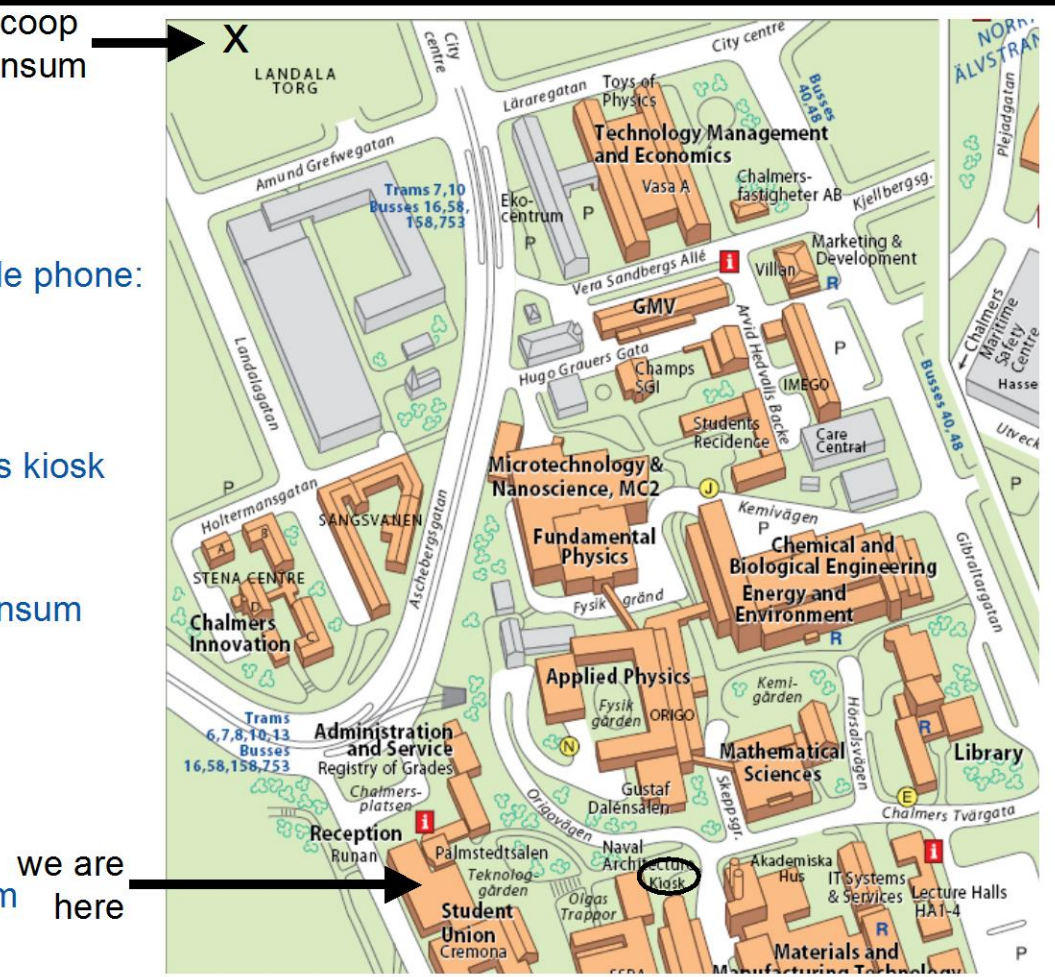
CHALMERS

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"



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IVL Swedish Environmental Research Institute

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… much easier with ecoinvent data

Country*: Scotland Country*:

☑ One adress 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

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from the early beginnings ...

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... to the most powerful equipment ...

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... the mission is still the same: help people to reach their goal ...

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with easy access, comfort, and ...

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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

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My deep thanks to all of you, who

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- 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

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One small step for a professor ...

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- 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!

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Thank you very much for your attention!

Rolf Frischknecht

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