



Life Cycle Assessment of Energy

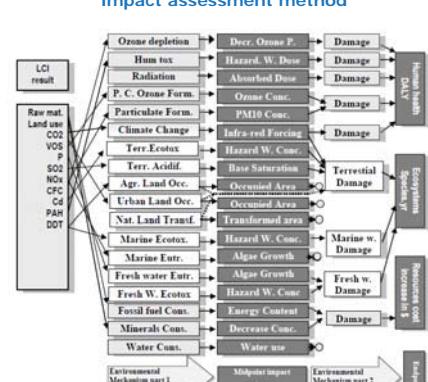
Mariska de Wild-Scholten
21ST OSCE Economic and Environmental Forum
Prague, 12 September 2013



Life Cycle Assessment (LCA)

- **LCA:** Determination of environmental impact of a product from cradle to grave/cradle
- A *fair comparison* can only be made by taking all steps of the life-cycle into account:
mining – refining – manufacturing – installation - use – recycling & transport

**ReCiPe 2008
impact assessment method**

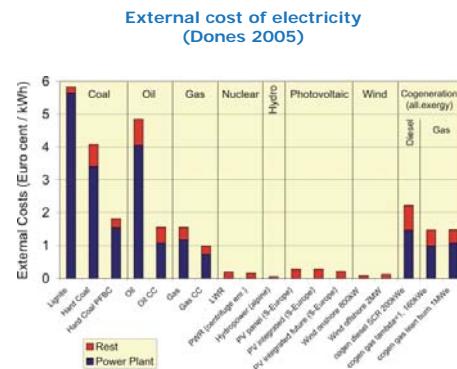


The flowchart illustrates the ReCiPe 2008 impact assessment method. It starts with an 'LCI result' box containing 'Raw mat.', 'Land use', 'CO2', 'VOCs', 'P', 'SO2', 'NOx', 'CFC', 'C6', 'PAH', and 'DDT'. Arrows point from these to various intermediate factors: 'Ozone depletion', 'Hum tox', 'Radiation', 'P. C. Ozone Form.', 'Particulate Form.', 'Climate Change', 'Terr. Ectox', 'Terr. Acidif.', 'Agr. Land Occ.', 'Urban Land Occ.', 'Nat. Land Transf.', 'Marine Ectox.', 'Marine Eutr.', 'Fresh water Extr.', 'Fresh w. Ectox', 'Fossil fuel Cons.', 'Mineral Cons.', and 'Water Cont.'. These factors then lead to specific environmental impacts: 'Decre. Ozone P.', 'Hazard. W. Dose', 'Absorbed Dose', 'Ozone Conc.', 'PM10 Conc.', 'Infra-red Forcing', 'Hazard W. Conc.', 'Base Saturation', 'Occupied Area', 'Transformed area', 'Hazard W. Conc.', 'Algae Growth', 'Algal Growth', 'Energy Content', 'Decrease Conc.', 'Water use', 'Midpoint impact target', 'Environmental Mechanism part 1', 'Environmental Mechanism part 2', and 'Final Impact'.

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LCA → Environmental / External costs

LCA → Life-cycle
 emission data
 (kg / kWh)
 x damage of emission
 (€ / kg)
 = Environmental costs
 (€ / kWh)



http://gabe.web.psi.ch/projects/externe_pol/index.html

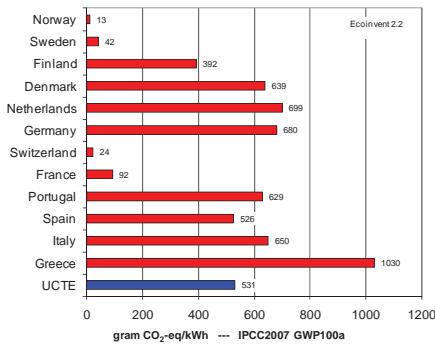
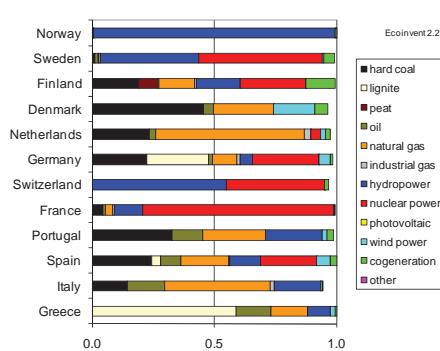


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Carbon footprint Electricity from Europe

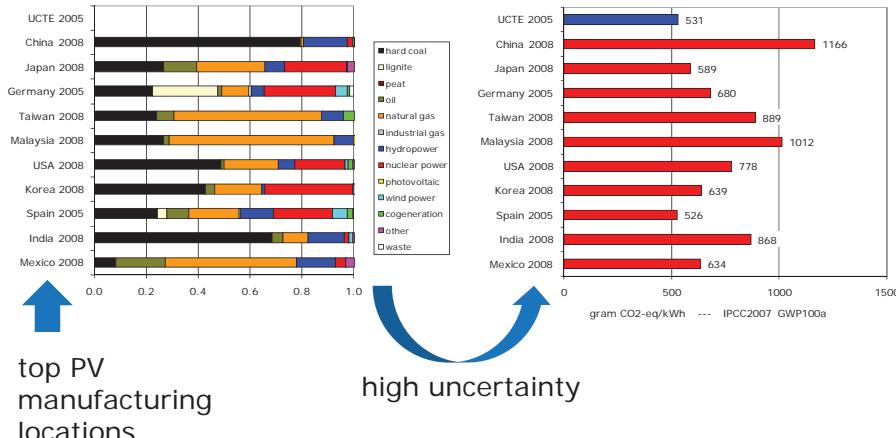


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Carbon footprint Electricity from various countries



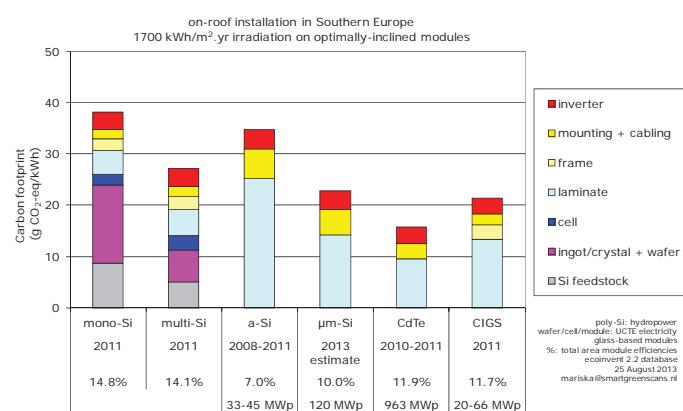
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Carbon footprint of photovoltaics

Impacts depend on technology used



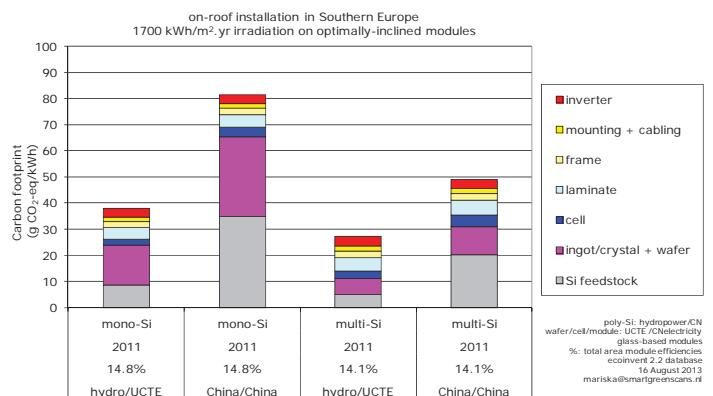
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Carbon footprint of photovoltaics

Impacts depend on production location (electricity mix)



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Research directions to improve the environmental footprint

- ✓ Save resources
- ✓ Reduce environmental impacts

- !! Reduce use of scarce materials & reuse/recycle
- !! Reduce material and energy consumption
- !! Reduce waste and emissions to the environment
- !! Increase performance
- !! Increase lifetime



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Recommendations for the OSCE

- Collect LCA data on all life-cycle phases of energy production so decision makers use reliable info
- Evaluate environmental costs associated with energy production (external cost) which are not included (yet) in the cost paid by consumers



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