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ENVIRONMENTAL IMPACT OF PHOTOVOLTAIC POWER BY LIFE CYCLE ASSESSMENT

LGC CHEMICAL ENGINEERING

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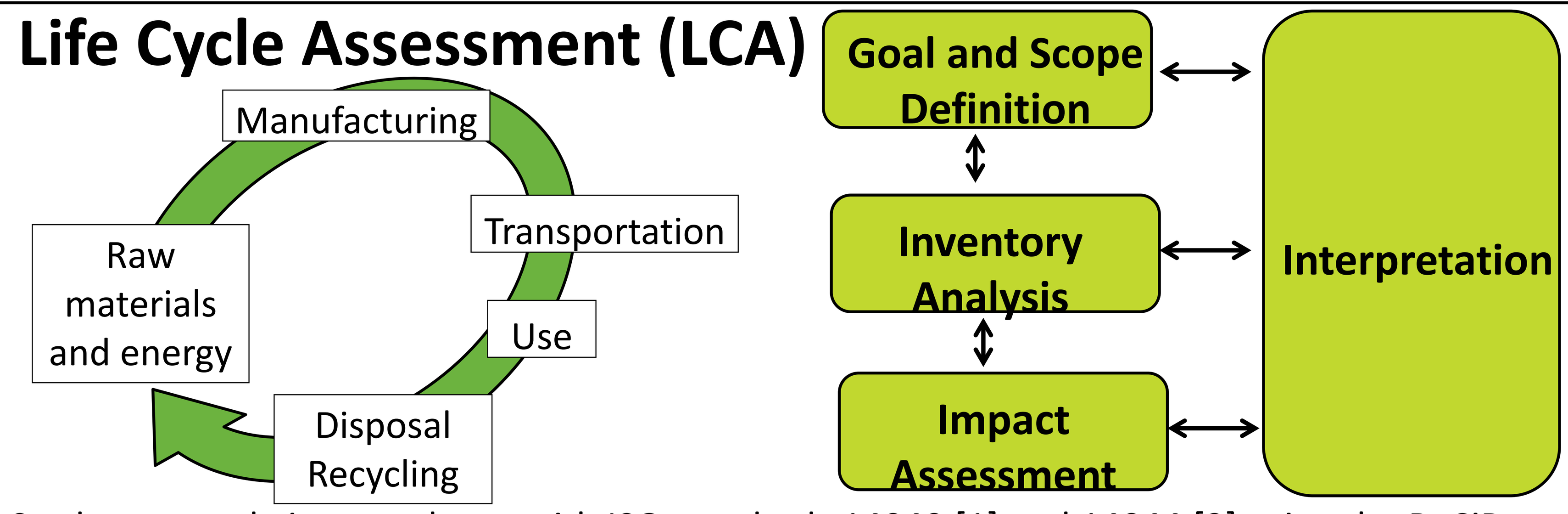
Life Cycle Assessment (LCA)



Study was made in accordance with ISO standards 14040 [1] and 14044 [2] using the ReCiPe methodology [3] to evaluate environmental impacts. Technical data were provided ecoinvent databases [4] and scientific literature [5] [6] [7] were also used to get all necessary data.

Multicrystalline silicon photovoltaic panel, Technosun

Studied panel:

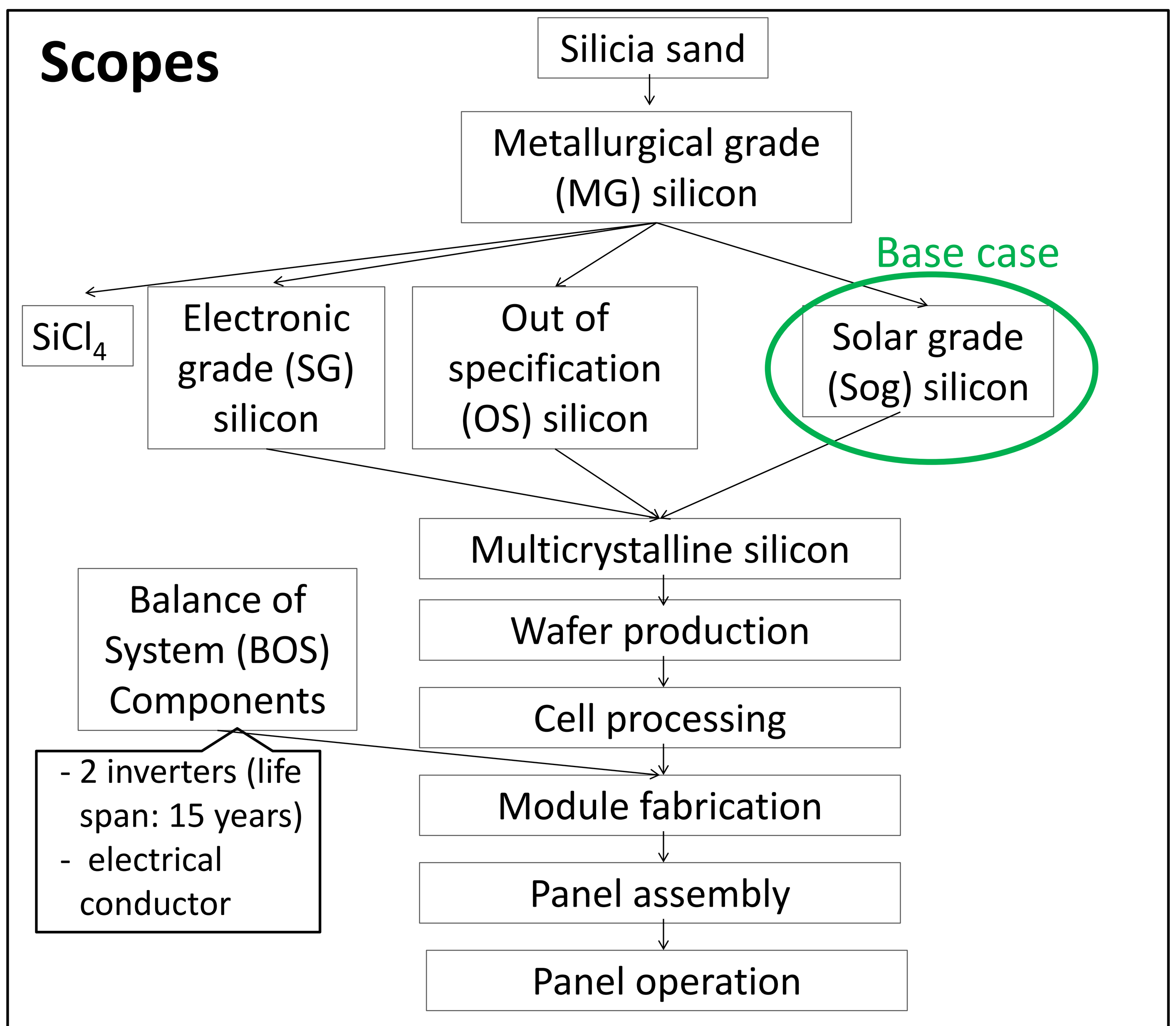
- Multicrystalline silicon
- Efficiency : 14 %
- Performance ratio : 75 %
- Life span: 30 years
- Installed in Belgium: 102.6 kWh/year/m^2

Functional Unit:

Production of yearly electrical power for an average Belgian household: 3650 kWh

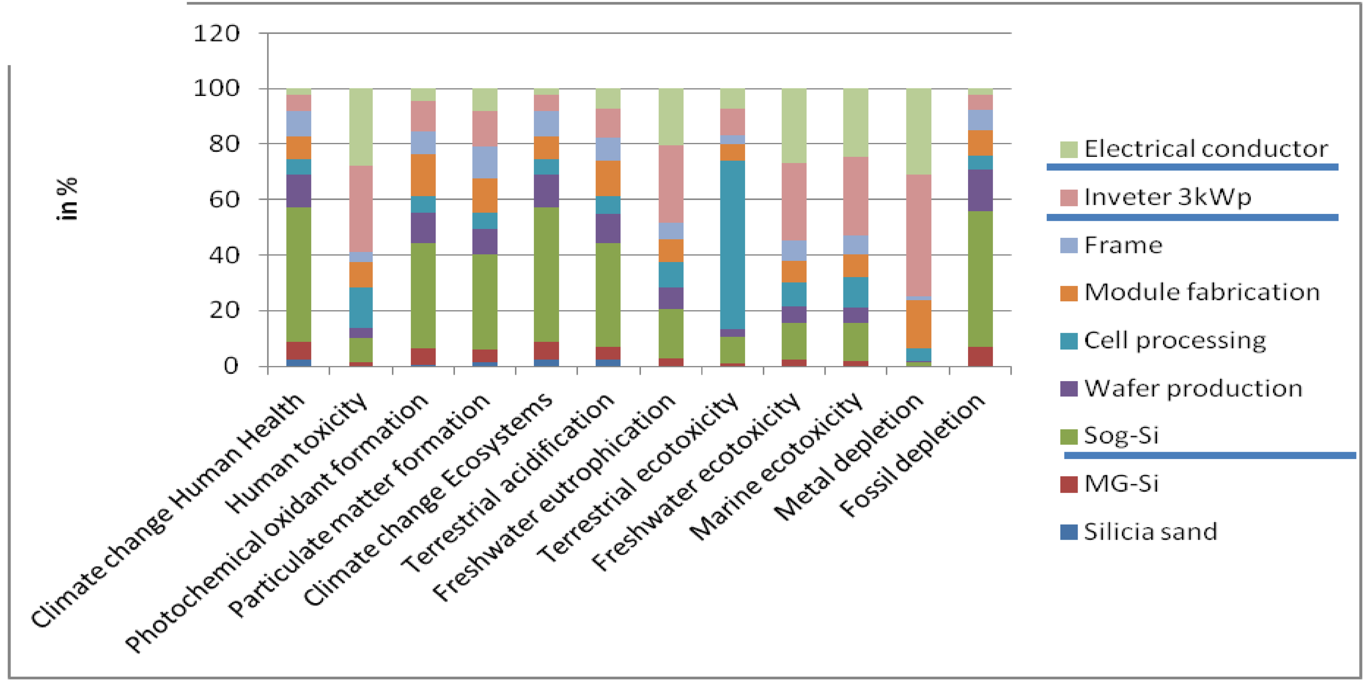
➔ Covered area: 35,5m^2

Scopes



Results - EndPoint using the ReCiPe method

○ **Characterization**



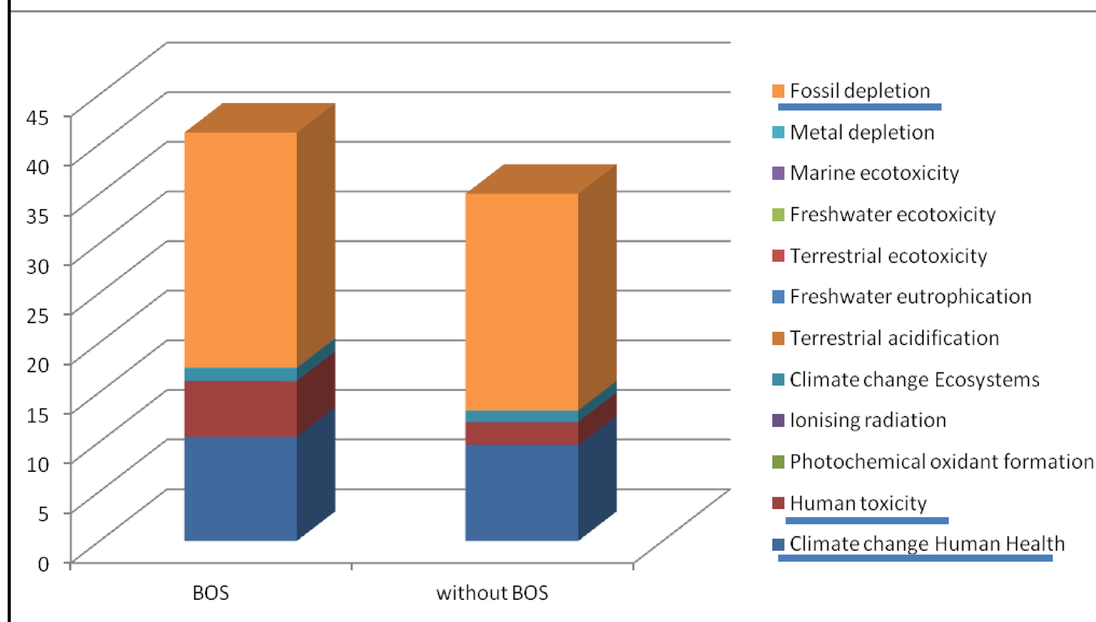
○ **Energy Payback Time**

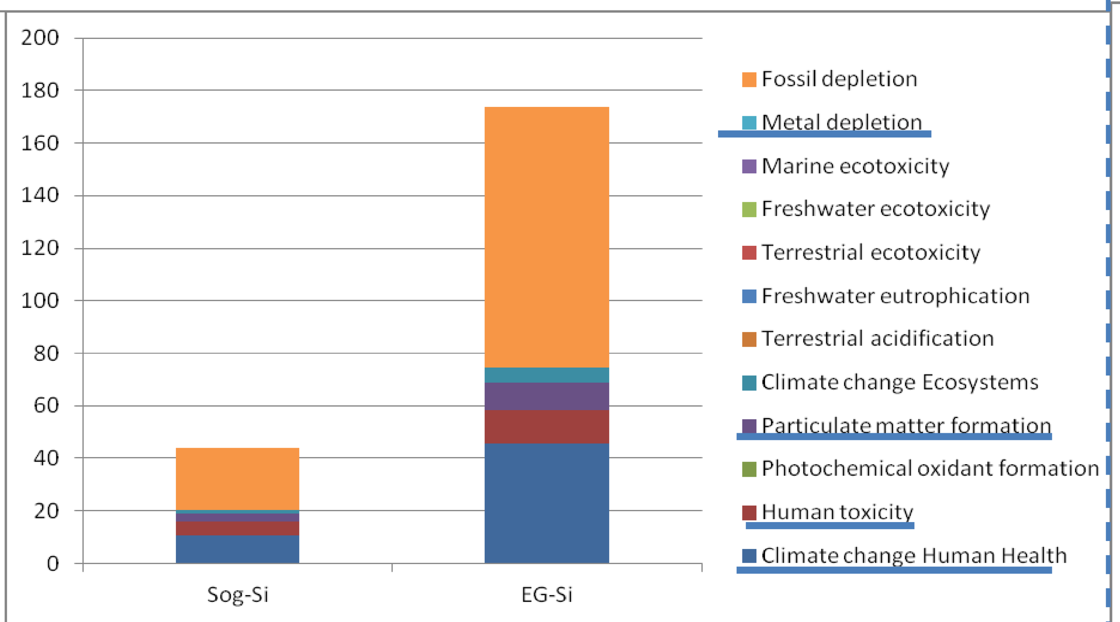
Electricity grid chosen for the production of the panels	European	Belgium	Swiss	German
Energy Payback Time (in years)	10	8	5	11

➔ Smaller than the life span of the panels (30 years)

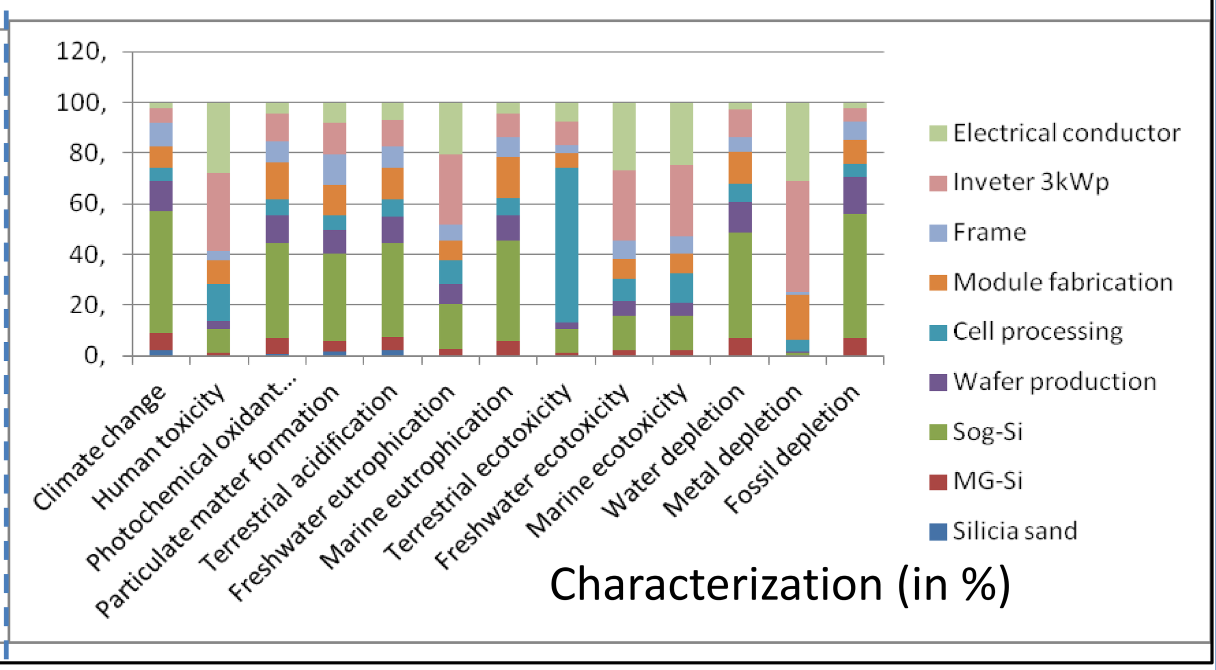
Sensitivity checks

Scenarios (in MidPoint with ReCipe) : Unique Score (in point)





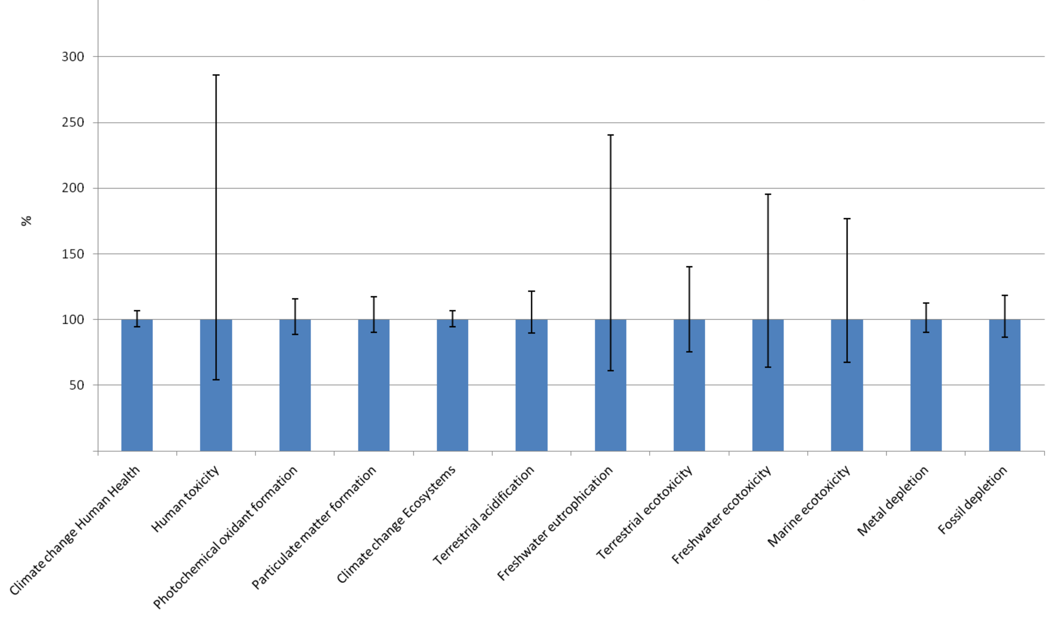
Methods: in MidPoint with ReCipe



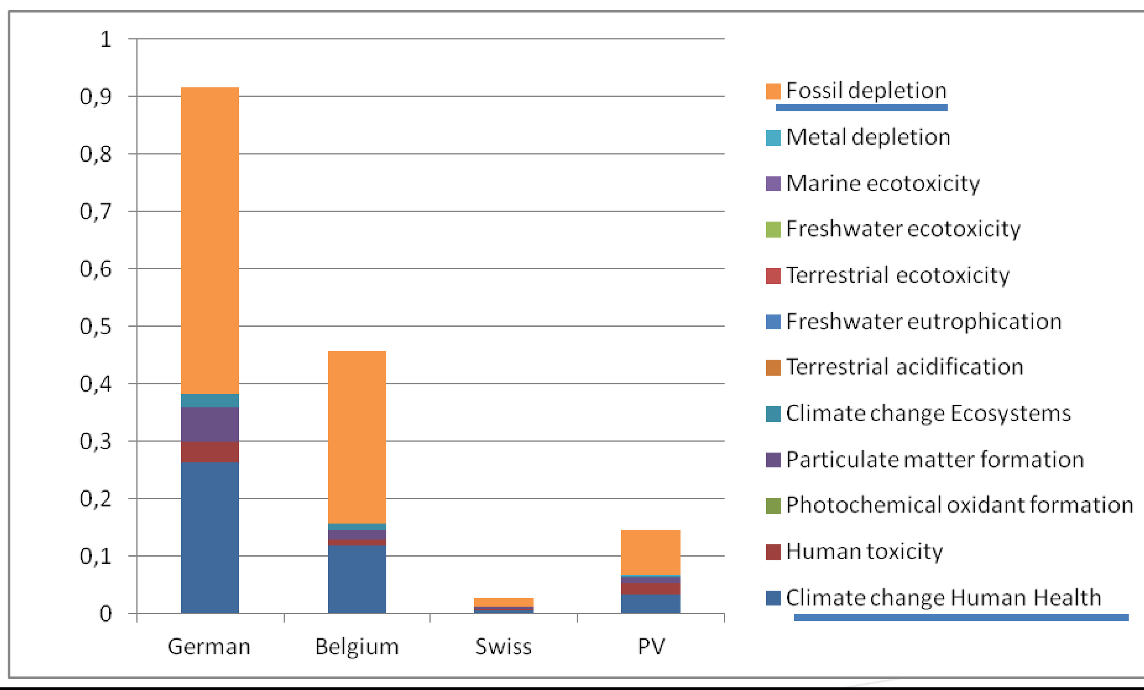
Characterization (in %)

Uncertainty analysis

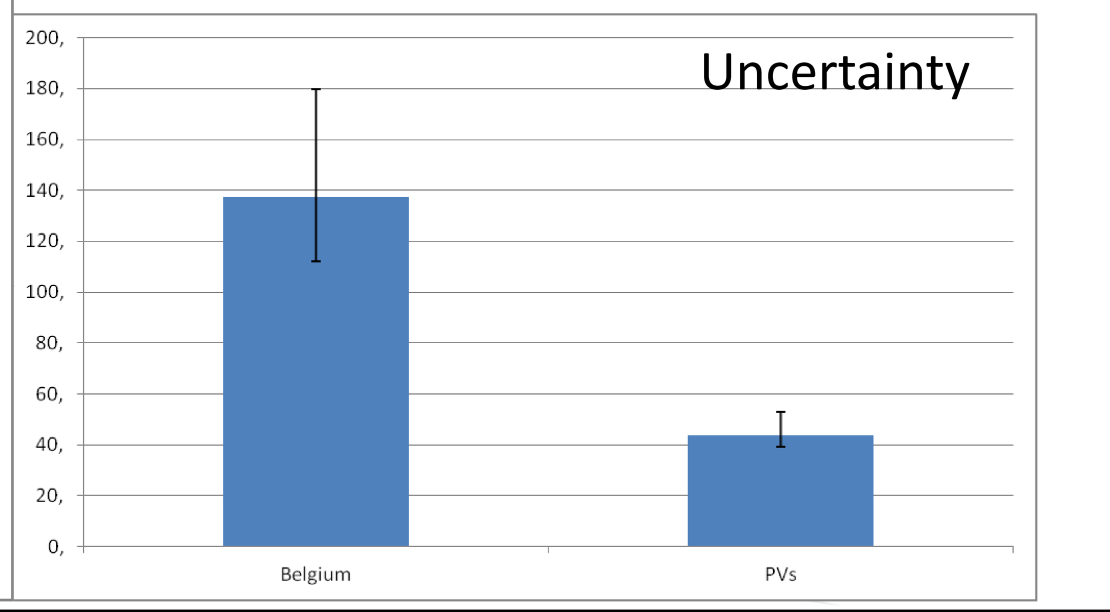
Characterization (in %)



Comparison with the electricity from the grid



MidPoint with ReCiPe : Unique Score (in Point)



Conclusions

- Environnemental benefit of using PVs
- Importance of sog-Si Production
- Importance of BOS components

Perspectives

- High uncertainty: need for more reliable data
- Take into account end of life
- Improvement in photovoltaic panels

References:

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2. ISO, *ISO 14044 : Management environnemental - Analyse du cycle de vie - Exigences et lignes directrices*, ISO, Editor. 2006.
3. Goedkoop, M., et al., *ReCiPe 2008 : A life cycle impact assessment method which comprises harmonised category indicators at the midpoint and the endpoint level* R.O.e.M. Ministerie van Volkshuisvesting, Editor. 2009, Ruimte en Milei. p. 132.
4. ecoinvent Centre (2010). The life cycle inventory data version 2.2. , Swiss Center for Life Cycle Inventories.
5. Phylispen, G.J.M. and E.A. Alsema (1995) *Environmental life-cycle assesment of multicrystalline silicon solar cell modules*.
6. Jungbluth, N., et al., *Life Cycle Assessment for Emerging Technologies: Case Studies for Photovoltaic and Wind Power.* International Journal of Life Cycle Assessment, 2005. **10**.
7. Stoppato, A., *Life Cycle Assesment of photovoltaic electricity generation.* Energy, 2008. **33**.