Can a carbon footprint give a good picture on environmental impacts?

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Outline of the presentation

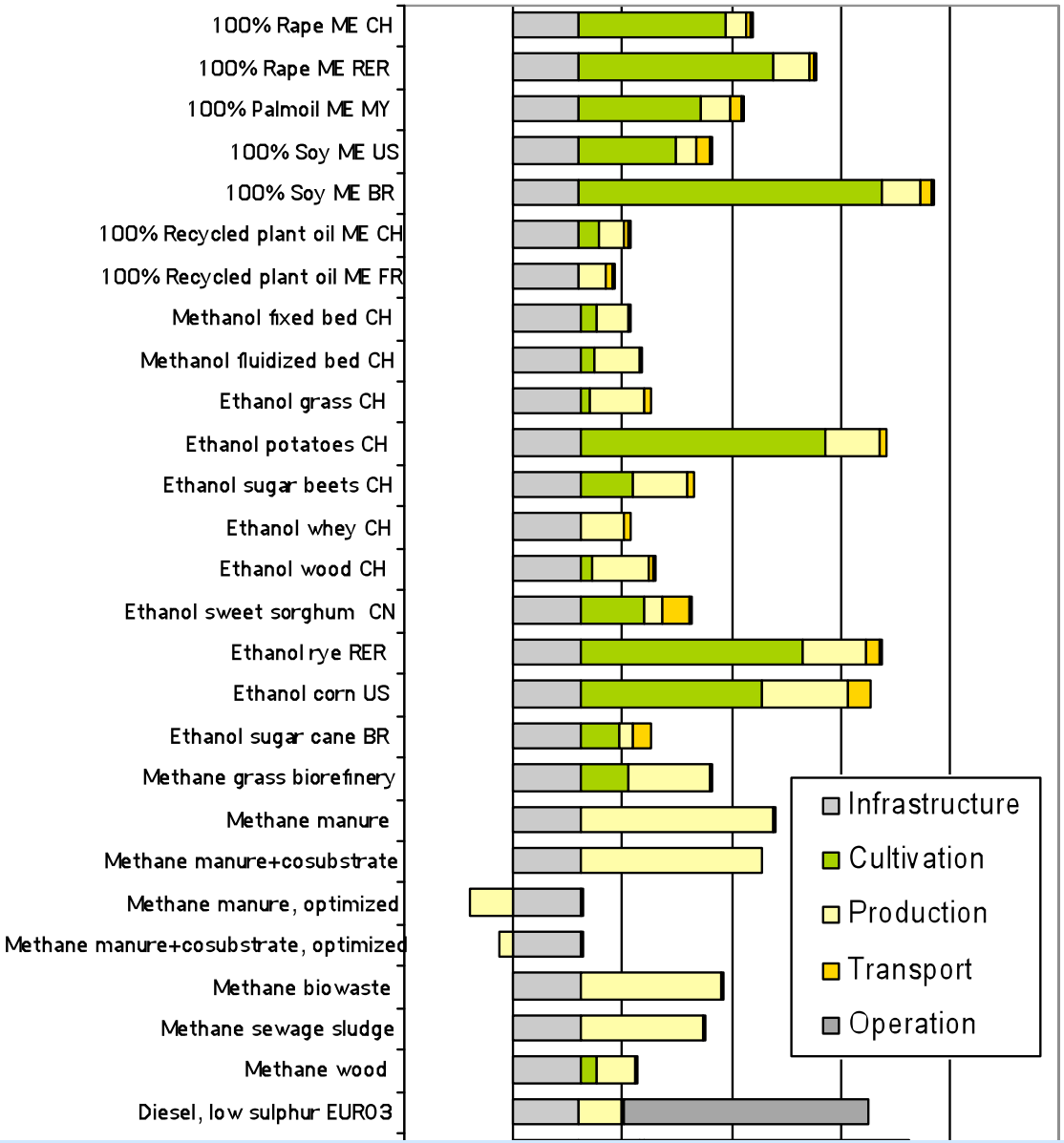
- Carbon footprint helps to start life cycle thinking
- Carbon footprint can lead to misleading conclusions concerning the environmental impacts
- Carbon footprint has to deal with the same and new methodological challenges as LCA

Biofuel example: The first view

- Biofuels save the climate, because they are carbon neutral
- Biomass absorbs as much CO_2 during plantation as is released during the combustion of the fuel

→Governmental targets on general biofuel support

→No differentiation between fuels

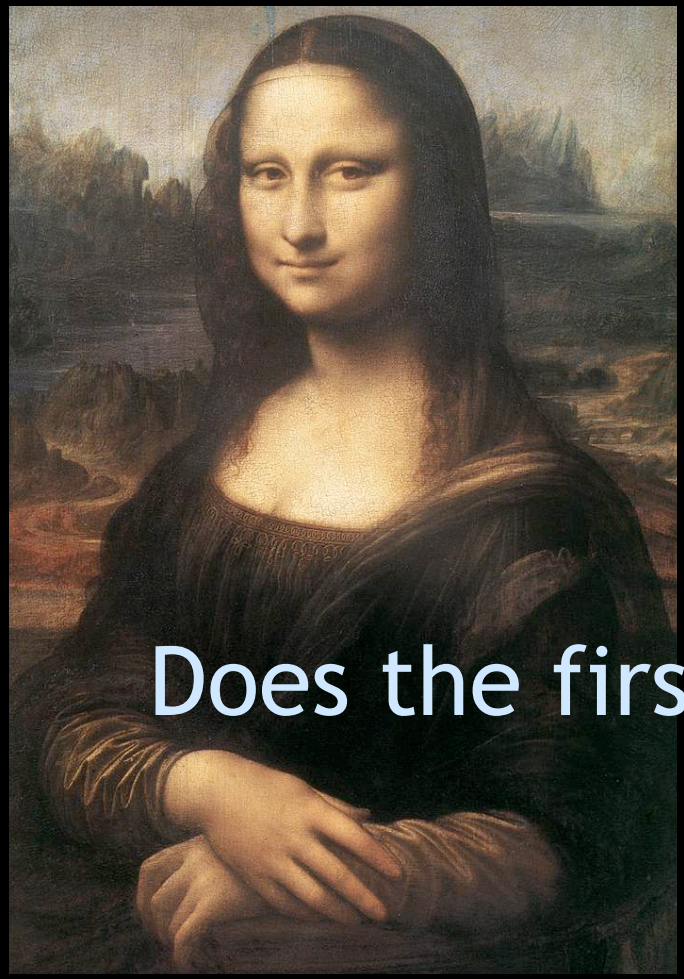


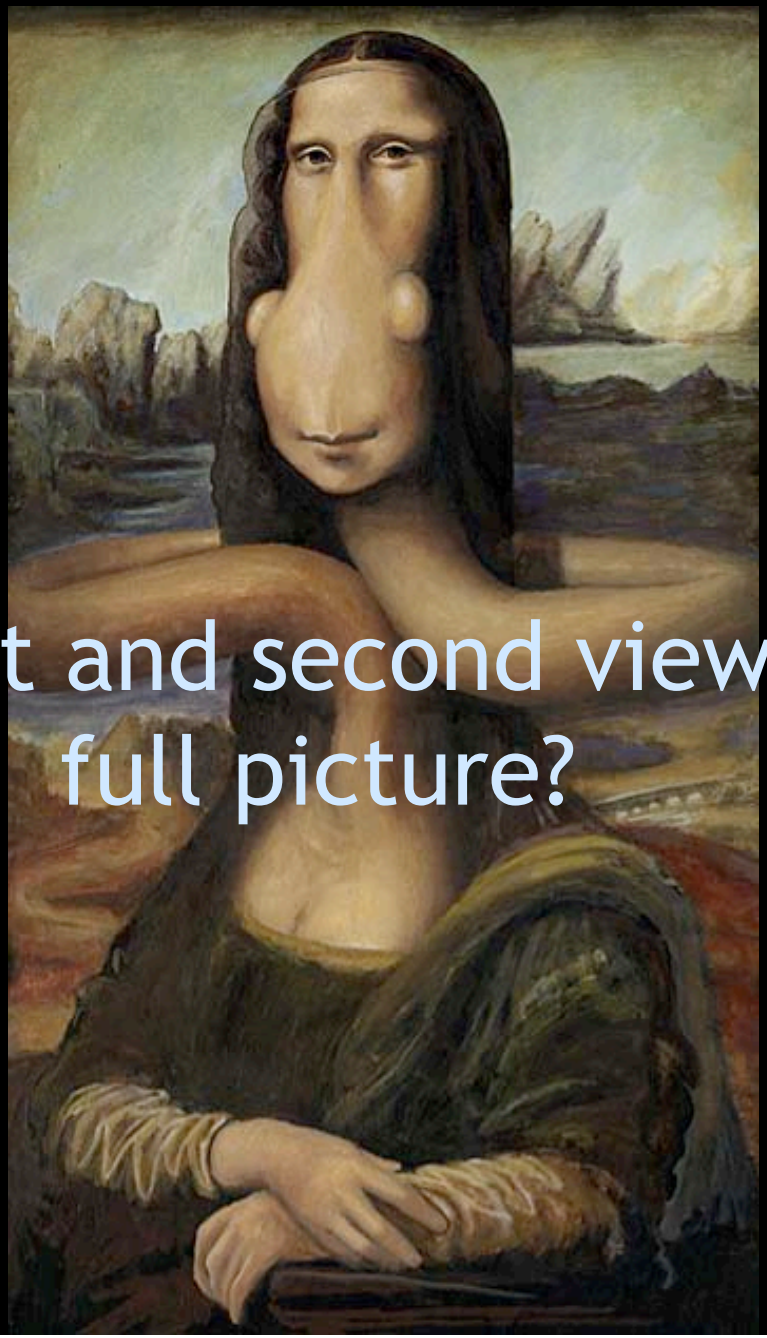
2nd view: Carbon footprint

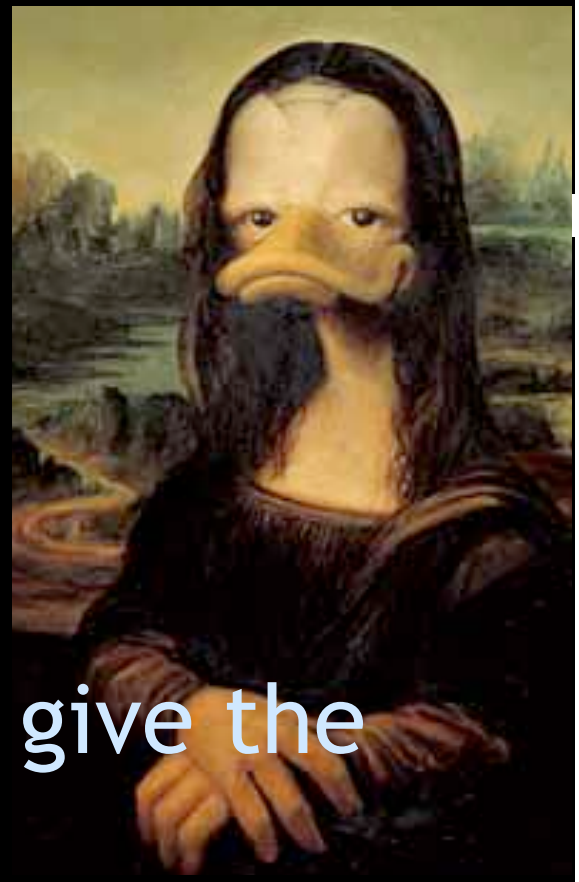
Conclusions:

- Fossil CO_2, N_2O and methane are emitted during production and cultivation
- Biofuels have a carbon footprint
- 13 of 26 investigated fuels reduce the GWP significant (>50%)
- Some fuels are worse than petrol: Brazilian soya oil with more GWP than fossil reference (transformation of rainforest into agriculture)

- ➢ Large support for biofuel use
- ➢ Understanding of necessary differentiation







Does the first and second view give the full picture?

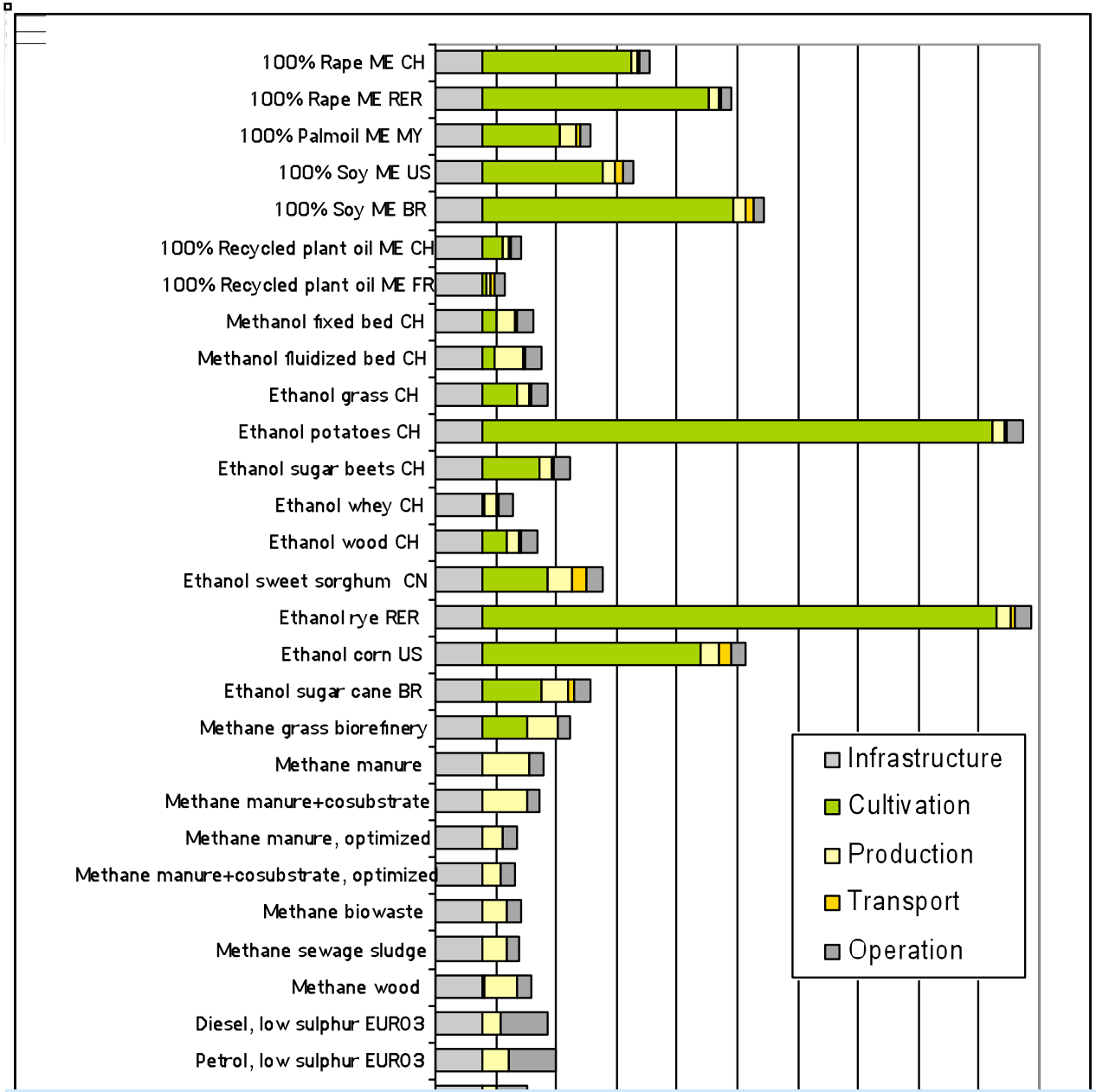
GWP is one environmental effect…

… others serious effects are:

- photochemical oxidation
- acidification
- eutrophication
- ozone layer depletion
- human and eco toxicity
- land competition
- abiotic depletion
- radioactive wastes and emissions

All effects can be aggregated:

- Eco-indicator 99
- Ecological Scarcity 2006 or **U**mwelt**B**elastungs**P**unkte



The 3rd view: environmental impacts

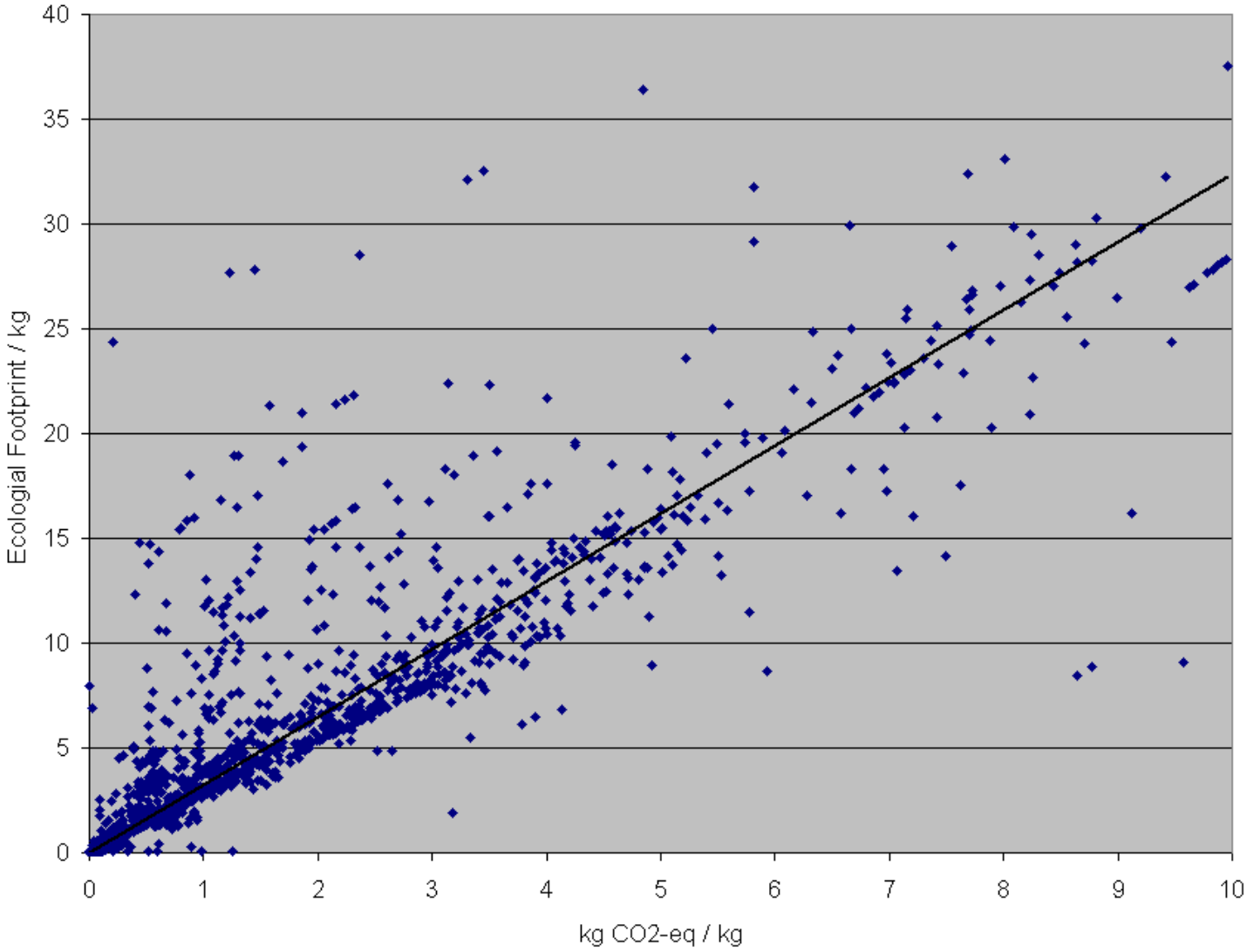
Conclusion:

- Land occupation, fertilizer use and pesticides cause environmental damages
- Only view fuels are better than the fossil fuel
- Ranking between fuels is different from ranking by carbon footprint

➢ The 1st and 2nd view on biofuels lead to wrong conclusions which have to be corrected after doing a full environmental LCA

Correlation between indicators

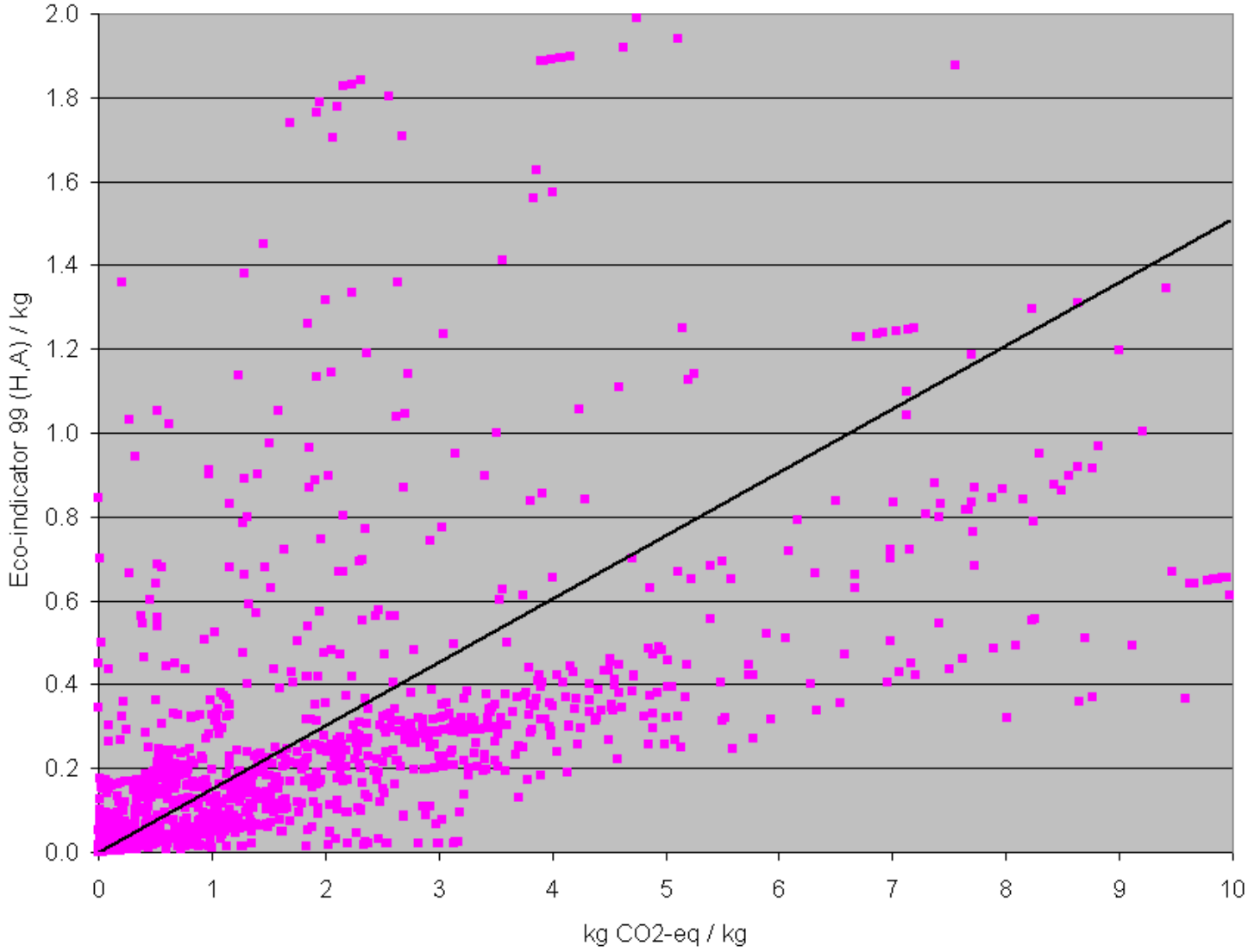
environmental footprint (GWP, nuclear, land use)



ecoinvent data v2.0
Materials with unit kg

Correlation between indicators

Eco-indicator 99 (H,A) with several damage categories

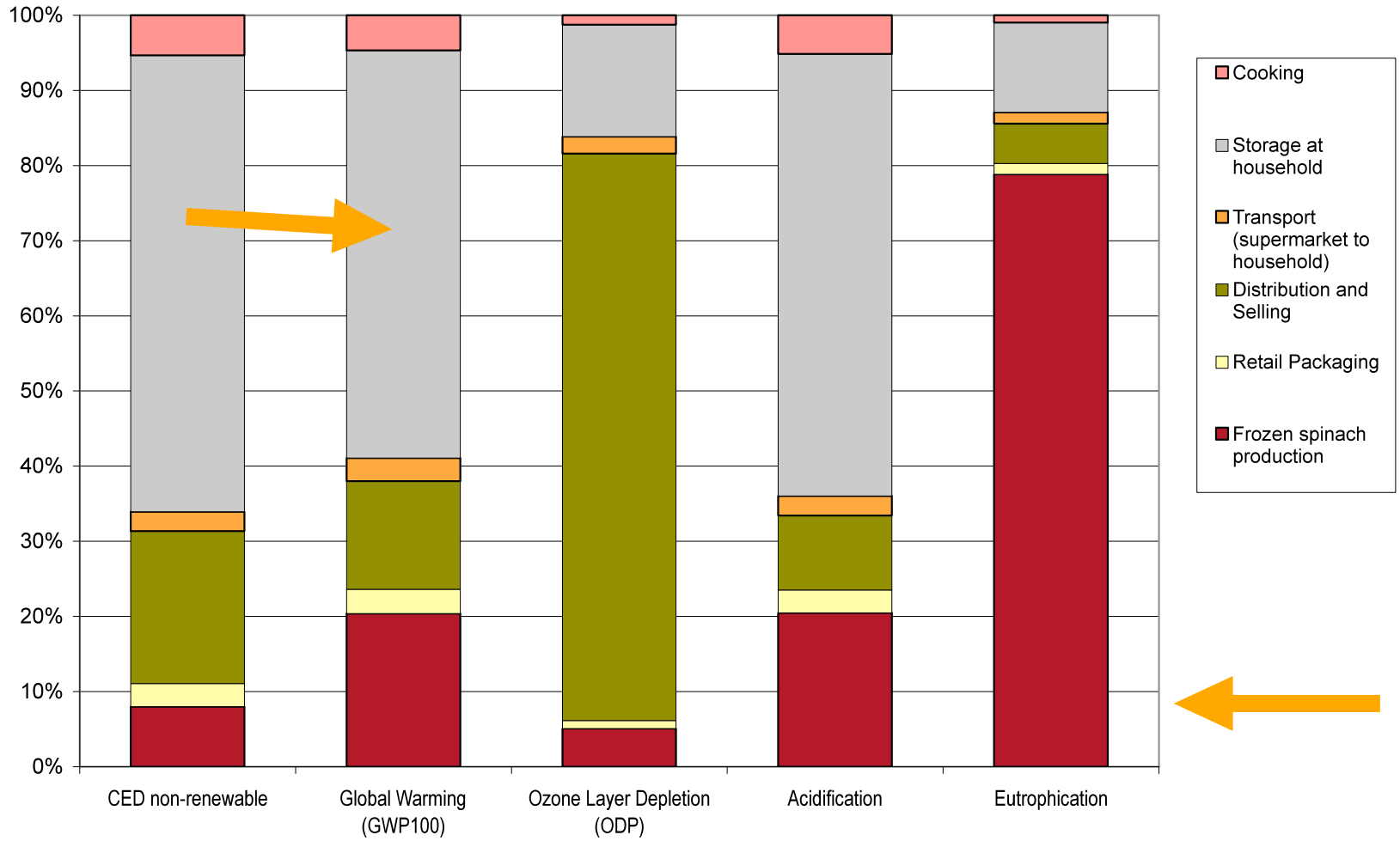


Correlation does not seem to justify a simplification by using carbon footprint

Some recommendations

- No full correlation between GWP and environmental impacts
- All important environmental impacts should be considered
  - Air emissions like particles and NOx
  - Water emissions as nitrate and phosphorus
  - Land occupation
  - Water use

The spinach example



Different conclusions on responsibility

- Carbon footprint: Storage in household is most important → type of conservation important → consumers are responsible
- Eutrophication: Spinach production is important → Producer and retailer are responsible
- This also leads to the question: Were to set the system boundaries of a carbon footprint?

What should be labelled?

Consumers want to know what they buy

Retailer know what they produce

Life cycle thinking includes consumer behaviour

System boundaries

- At Supermarket
  - Show the carbon footprint that is really known
  - Shows what the distribution chain has achieved
  - Influence of the buying decision
  - Consistent with e.g. organic or fair trade label
- Full life cycle
  - Post purchase are important → life cycle thinking
  - Functional unit must be clear
  - Consumer behaviour might be variable and thus label is not valid
  - Product design or clear description must ensure forecasted benefits

➢ Label should clearly distinguish between the footprint in the shop and the influence of the consumer behaviour

Further methodological challenges similar in CF and LCA

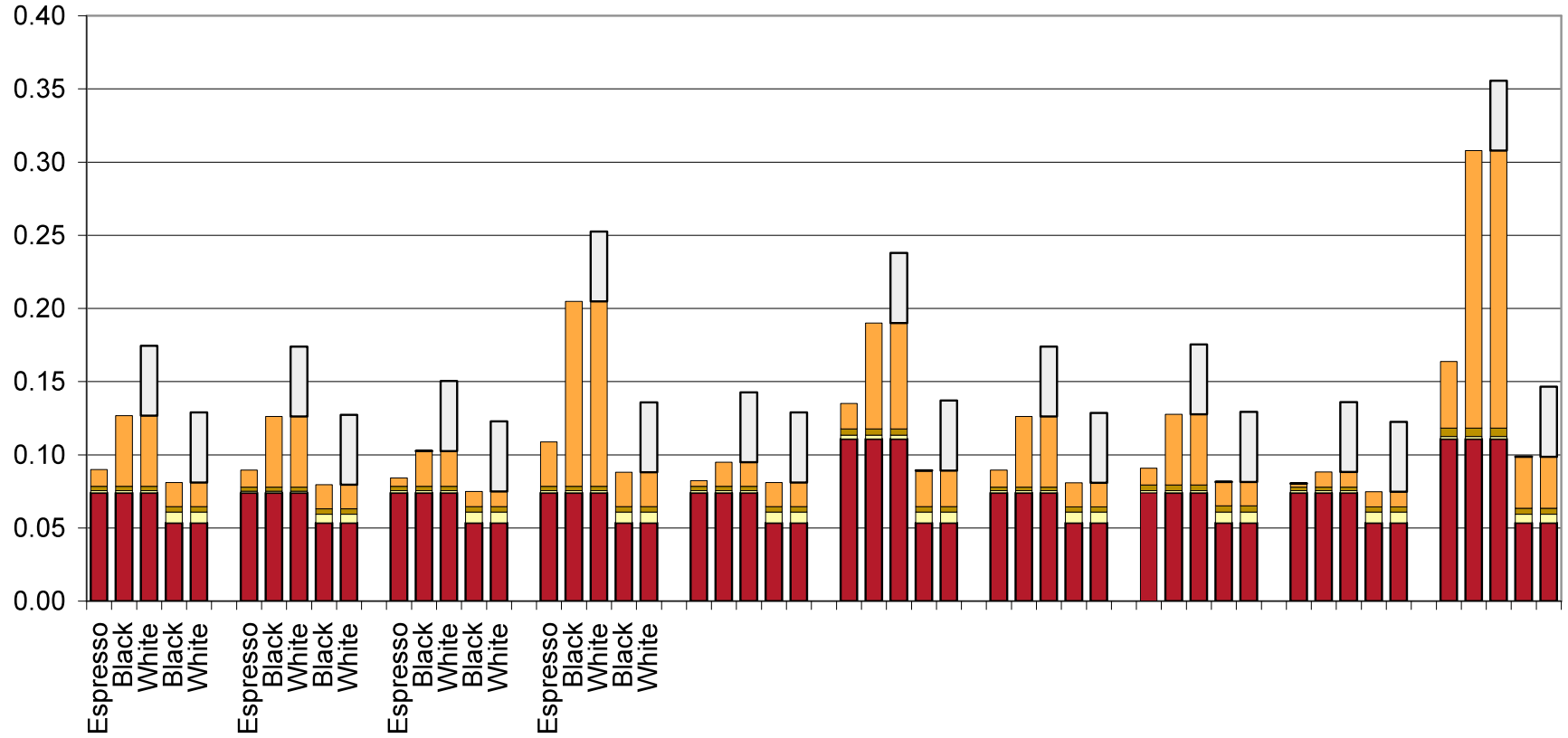
- Definition of functional unit
- Background data quality
- Accuracy of foreground data
- Multi-output processes and allocation
- Cut-off criteria
- Modelling of non-fossil GWP, e.g. land use change or N_2O emissions
- Accuracy of results in view of uncertainties

Conclusions

- Carbon footprint helps to introduce first life cycle thinking
- CF alone can be misleading, all environmental impacts should be taken into account
- Differentiation between responsibilities of distributor and consumer is necessary → clear definition of the functional unit necessary
- Methodological challenges e.g. on allocation are the same as for an LCA
- → Not clear if carbon footprint really helps at this point of time and development for reducing environmental impacts
- Full LCA case studies help better to identify priorities for product improvement

Annexe

Sensitivity analyses on coffee consumption



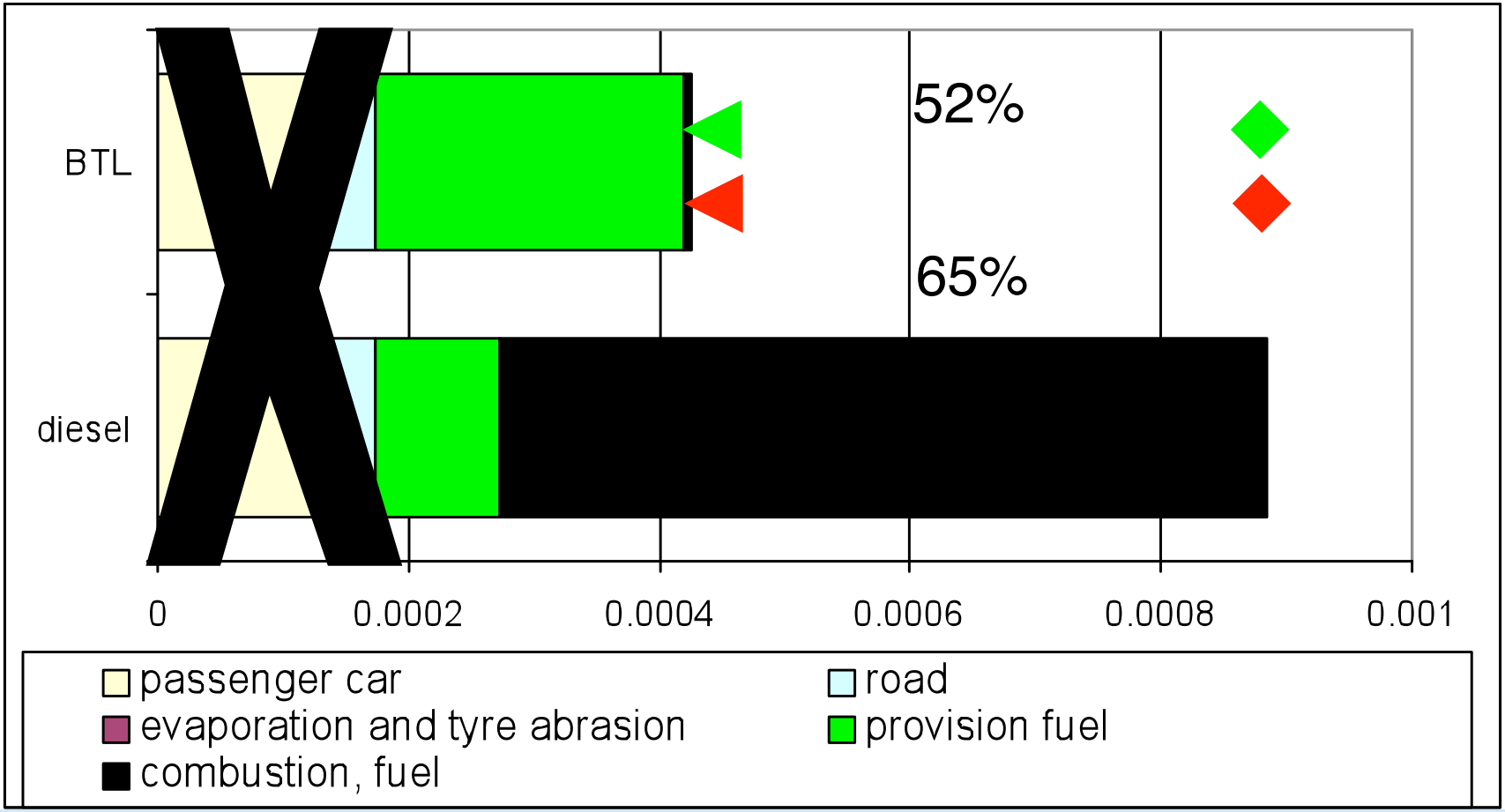
Conclusions coffee case study

- Most relevant factors for coffee purchased
  - Agricultural coffee production
- Consumers' behaviour influences the environmental impacts of coffee consumption more than the packaging
  - brewing of the coffee
  - milk production in case of white coffee

Questions to be answered

- Using BTL reduces the GWP by X% compared to fossil fuel
- Using a specific amount (e.g. 1 MJ or 1 kg) of BTL reduces the GWP by Y kg (or another appropriate unit) compared to fossil fuel

GWP reduction of agrofuels



- Neglecting parts of the life cycle leads to different conclusions concerning reduction potentials expressed as a percentage

And again: How much better are biofuels?

- If we want an answer like „the use of biofuel has ???% lower GWP than fossil fuels“ than we have to include the all parts of the life cycle, e.g. for transports also cars and streets
- Neglecting certain parts of the life cycle, even if the same for both options, will bias the results
- System boundaries must be stated correctly if comparing reduction figures, e.g. well-to-wheel should include the wheel
- See www.esu-services.ch/btl/ for background paper

How much CO_2 can be compensated?

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Catchwords

- Our company is CO_2 neutral
- We did carbon compensation
- You can be climate neutral

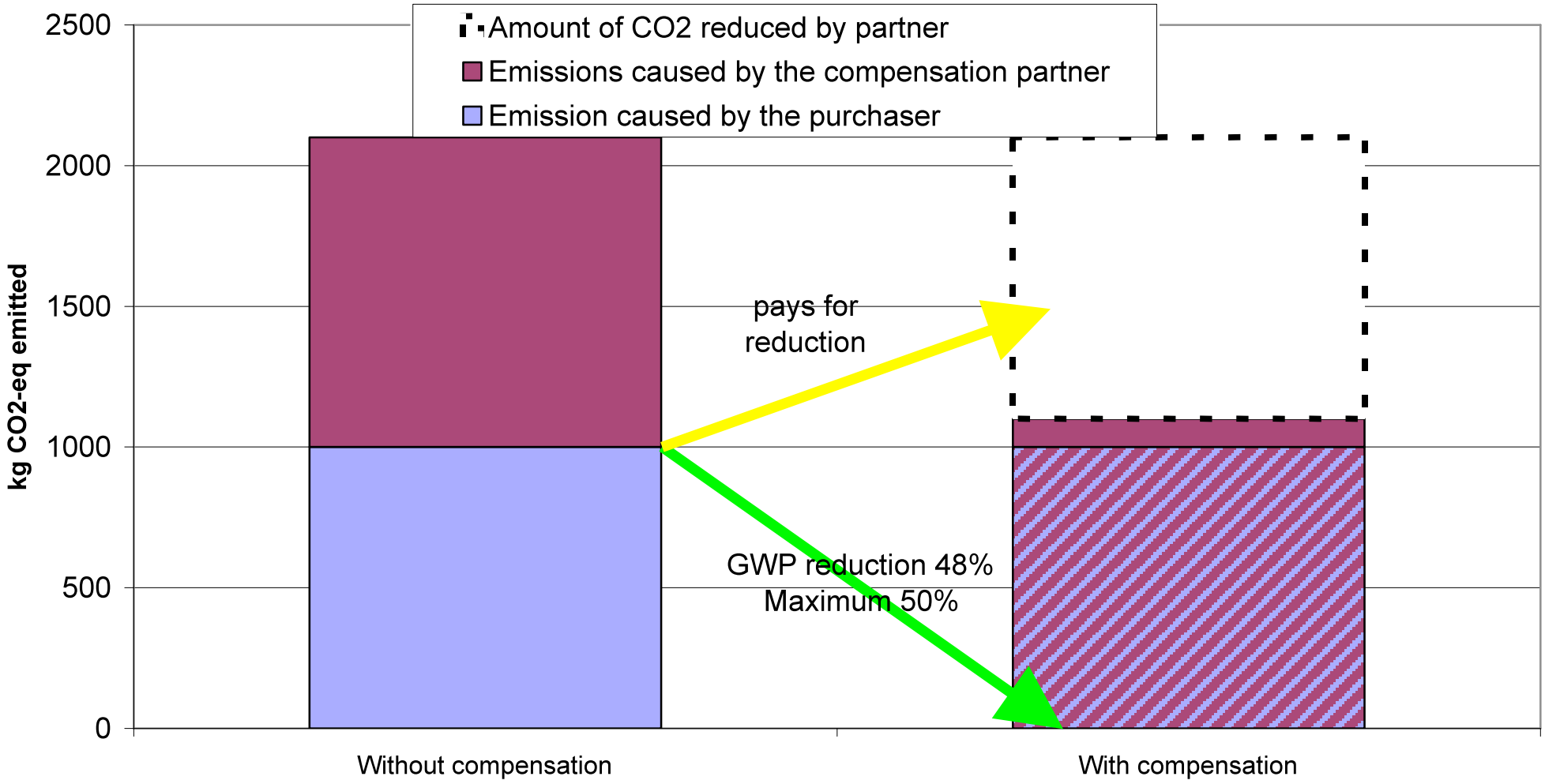
➢ By means of Climate Protection Projects

- How much can CO_2 emissions be reduced in reality by such claims?

The Idea

- Reduction of greenhouse gas emissions by replacing fossil energy uses with renewable energy
- Support for energy efficient technologies and energy saving
- The polluter pays in order to compensate the own CO2 emissions with external projects

The impact


Amount of CO2 reduced by partner
Emissions caused by the compensation partner
Emission caused by the purchaser
kg CO2-eq emitted
2500
2000
1500
1000
500
0
pays for reduction
GWP reduction 48%
Maximum 50%
Without compensation
With compensation

Conclusion

- Maximum reduction of GWP is 50%
- CO_2 neutrality is not possible by means of compensation
- In reality many reductions will only be achieved in future and not today. Today emissions might even be the same
- Personal backpacks are just shifted but not removed from the atmosphere
- Double counting is possible if products from the compensation side are sold

➢ Such projects should be claimed as a green investment or donation rather than a neutralization or compensation