

Implementation of recycling systems: The delusive role of LCA

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1. About Carbotech
2. Primary vs. secondary production
3. Point of view
4. Which allocation approach to choose
5. Influence of credits
6. Discussing the role of LCA
7. Conclusions

- 25 years of experience in environmental consulting
- 30 specialists in the field of environmental science, chemistry, physics, toxicology, biology and economics
- Our clients are from the private industry, public authorities and NGOs
- Advisory activity all over the world, but with focus on Switzerland
- independent, neutral and objective
- Quality management: ISO 9001:2000 certified

Business units

Environmental consulting

- Environmental consulting
- LCA
- System modelling: Fuzzy Sets, Monte Carlo, ...
- Environmental audits
- Cleaner Production
- Teaching and coaching LCA

Pollutants/Contaminants

- Pollutants in buildings, like Asbestos, PCB/CP, organics, ...
- Diagnostics and project planning management
- Air pollution consultation (VOC, PM10 etc.)

International cooperation

To recycle or not to recycle?



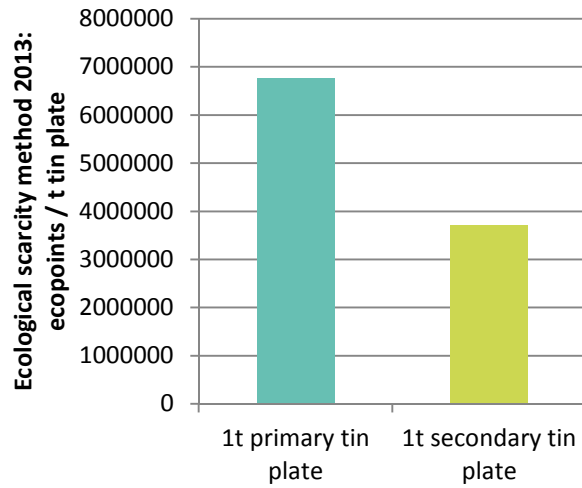
In the last years, we had many questions from the government and companies about the environmental impact and benefit of existing and planned recycling systems.

LCA played a crucial role in answering them.

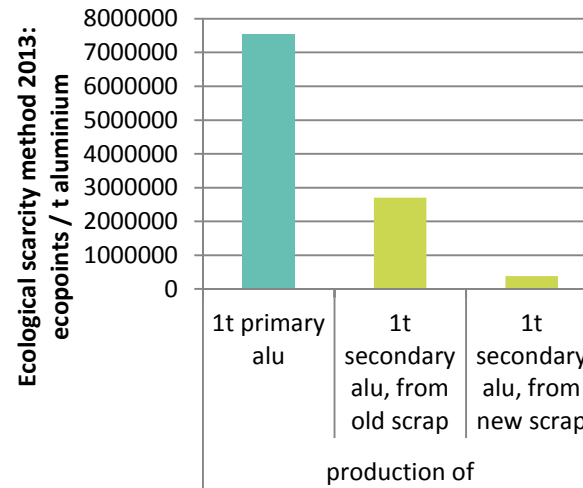
Production of primary vs secondary materials



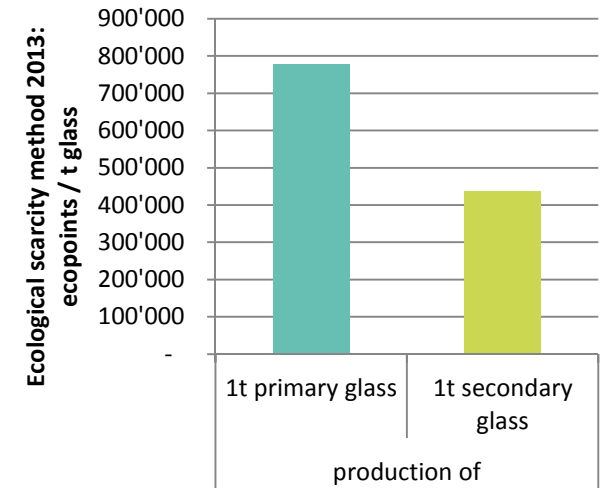
Tin plate



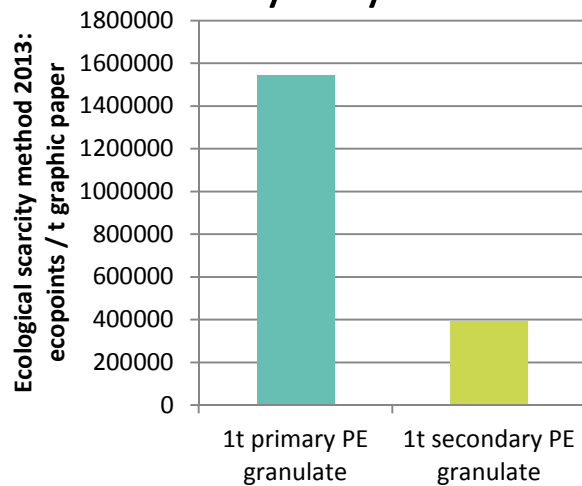
Aluminium



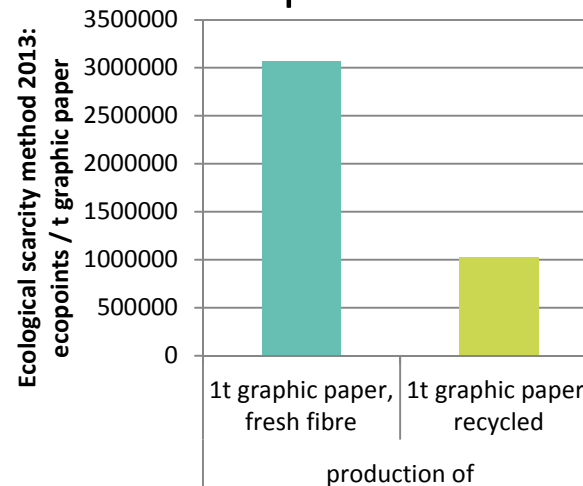
Glass



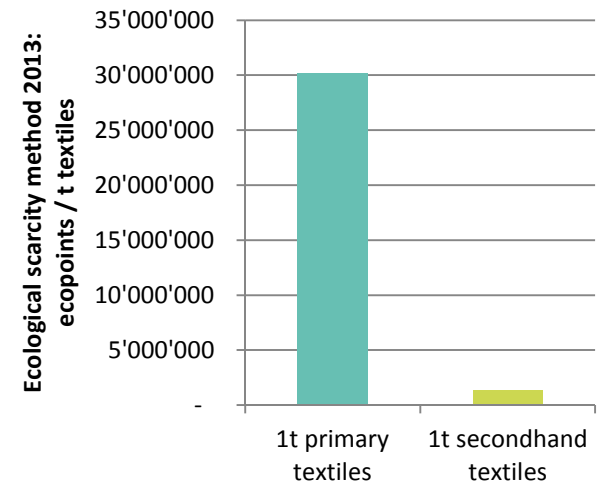
Polyethylene



Paper



Textiles



Benefit of Recycling



what about thermal utilisation?

- For materials that have a heating value, the answer is not that simple.
- Plastics, paper etc. can be thermally utilised
 - in an incineration plant producing electricity and heat which replaces fossil fuels indirectly or
 - in the cement industry replacing directly fossil fuels.
- If we recycle, the benefit of thermal utilisation is reduced - or maybe not?

It depends on the point of view



Resource point of view:

how to use a certain amount of raw material as efficiently as possible (e.g. 1 ton of PE or 1 ton of paper)?

-> it appears that to recycle the material as often as possible is the best solution. In the end, it can be thermally utilised anyway.

Demand point of view:

how to fulfil the different demands in terms of material and energy?

-> If we recycle as much as possible, we need other energy carriers to meet our energy demand. If we do not recycle, we need less energy carriers but more materials to fulfil our material demands.

-> the answer is now less clear.

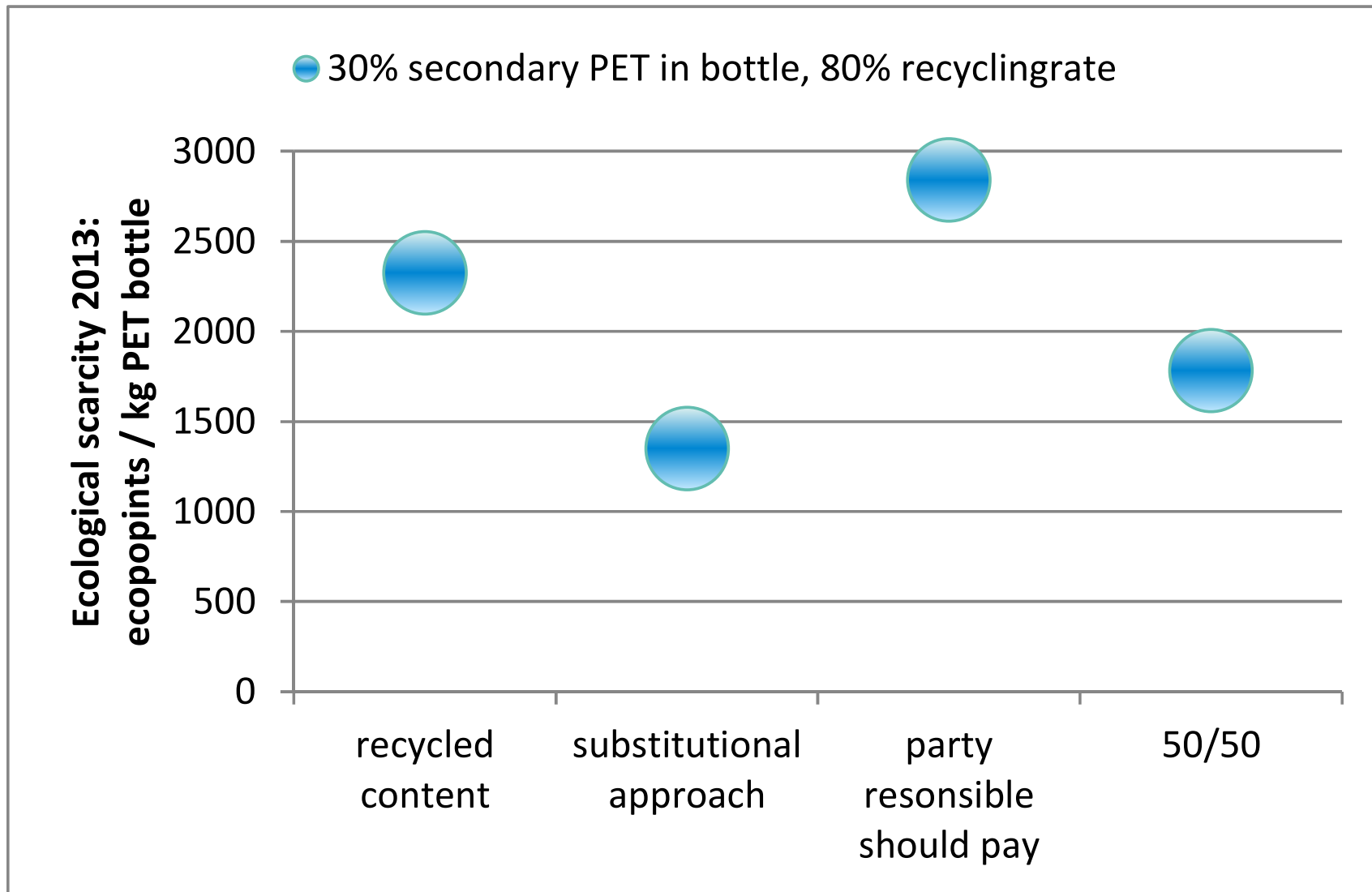


From the demand point of view the question arises:

Which allocation approach to choose?

- Recycled content?
- Substitutional approach?
- 50/50?
- Party responsible should pay?

Relevance of recycling allocation approach for PET bottles in CH

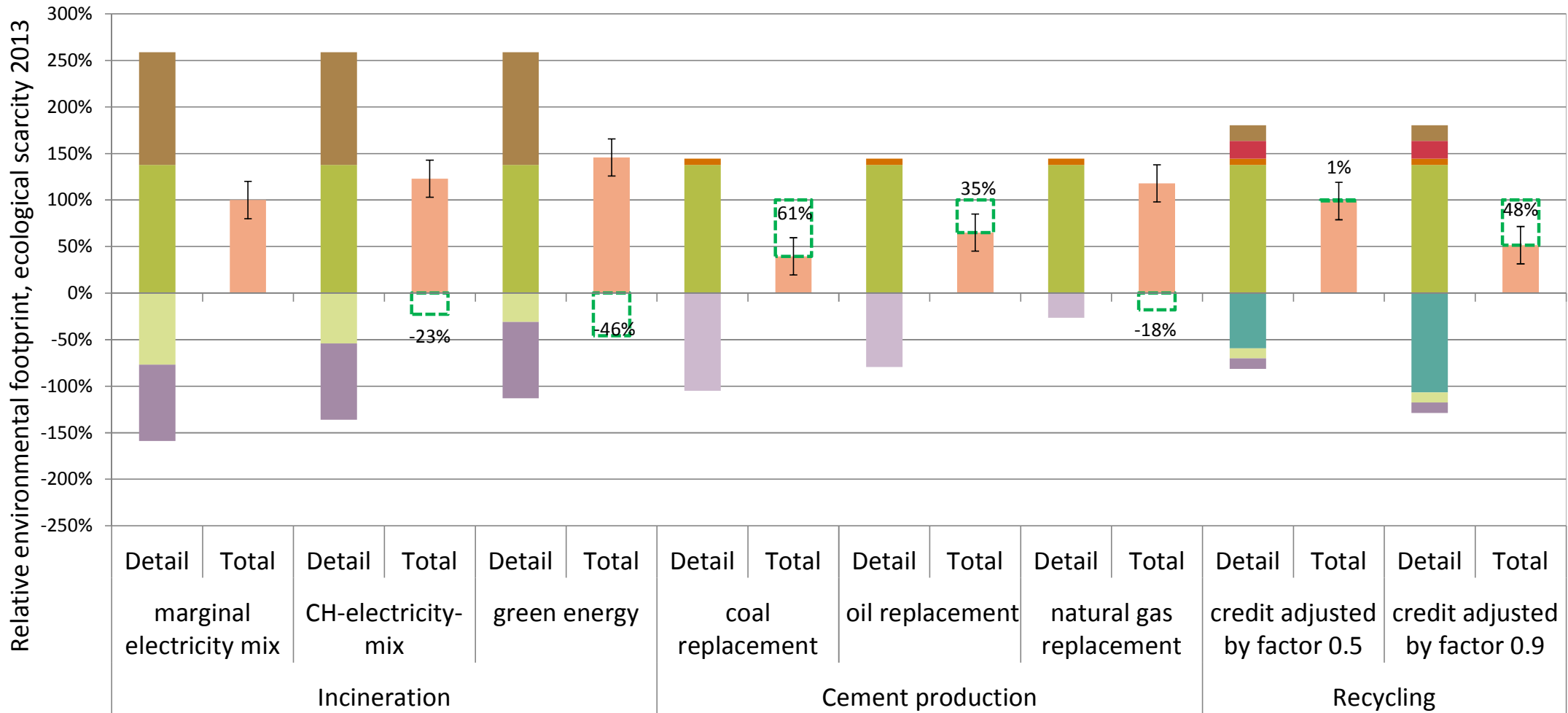


For the substitutional approach, the following question arises: What is really replaced?

Substitutional approach means for

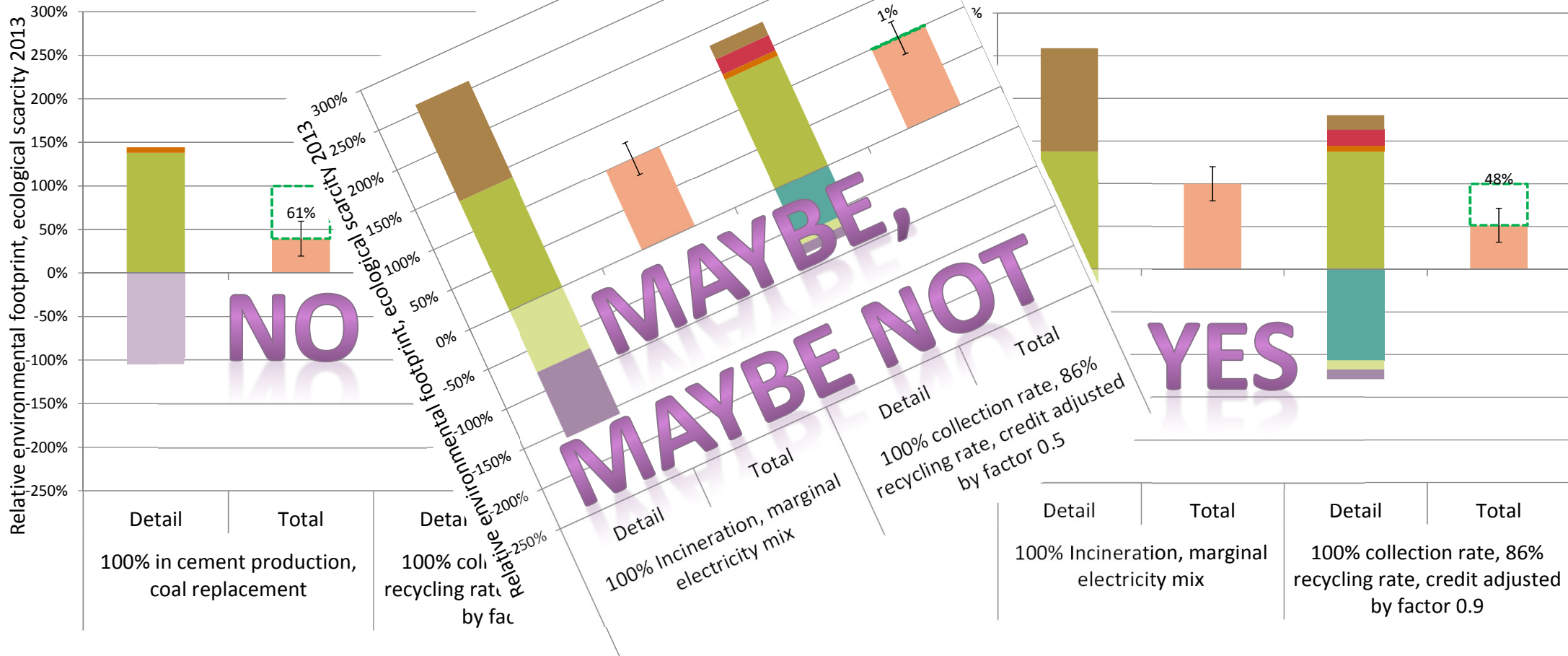
- recycling path: credits for replacing primary materials
 - If the secondary materials do not have the same quality as primary materials: How much primary materials are really replaced?
- incineration path: credits for replacing otherwise produced electricity and heat
 - Which electricity and heat will be replaced: country mix, marginal mix, future mix (green electricity)?
- usage in cement production: credits for replacing fossil fuels
 - Which fossil fuels will be replaced: most expensive ones (gas, oil), most often used / cheapest ones (coal), marginal mix, future mix?

Influence of replaced energies and material quality



- Primary PE production
- Collecting and sorting
- Secondary PE production
- Credit for primary PE replacement
- Emissions of incineration
- Credit for electricity replacement
- Credit for heat replacement
- Credit for fuel replacement
- Total
- Difference to incineration marginal electricity mix

What to do with PE bottles: Shall we now recycle or not?



The delusive certainty of LCA



- LCA results seem to be “true”, especially if the LCA fulfils ISO conformity and transparent reporting.
- But LCA results, however scientific they may be, are very delusive, because they never tell the truth!
- They simply answer certain questions.
- And the answered questions can be slightly different, even if the same goal and scope is considered (see previous slide).

- Often the chosen energy strategies are decisive for the results. And in this case the discussion is about energy mixes and not about recycling.
- The better the energy mix being replaced, the more favourable the recycling system.
- It has to be taken into account, that LCA only answers a certain question. And the trick is to ask the right question.
- There are no simple answers for complex systems (e. g. circular economies).
- Although LCA is nowadays the most comprehensive method to evaluate environmental impacts and consequences, it is important to be careful interpreting the results. In this context transparency is crucial.
- LCA is very helpful to better understand the origins of the environmental impacts and the consequences of decisions. But the more complex a system becomes, the more reasonable it is not only to rely on LCA results but to go a step further and to combine it with e. g. dynamic system modelling.



Thank you
for your attention!

