



Eco- and Cost- sustainability of large area SSL

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GAIKER – ik4

GAIKER is a Technological Centre with the mission of contributing to sustainable technological development and the improvement of competitiveness. The means for this goal are the Applied Research and the generation of Innovative Technological Solutions that add value to companies within a framework of social responsibility and cooperation with other agents.



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9 Technology Centres
1 Common Project
> **scientific and technological excellence** for our clients

Concentration of knowledge
1.274 people
111,2 €M R&D (2015)

Sustainability in LASSIE-FP7 Project

- Environmental Life Cycle Assessment
- Recyclability Assessment
- Cost Assessment

Recyclability assessment

- Legal recovery and recycling targets:

75% recovery

55% re-use and recycling

- Target materials:

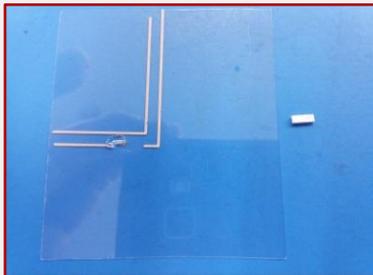
- LEDs: focus on undamaged package separation for rare earth recovery
- Plastic films: PET / PC
- Printed circuit boards + electronics
- Frame

Recyclability assessment

2 step approach: delamination



NaOH 1M, 1h, T=20°C



HAc 100%, 67', T=20°C

Polymer layers



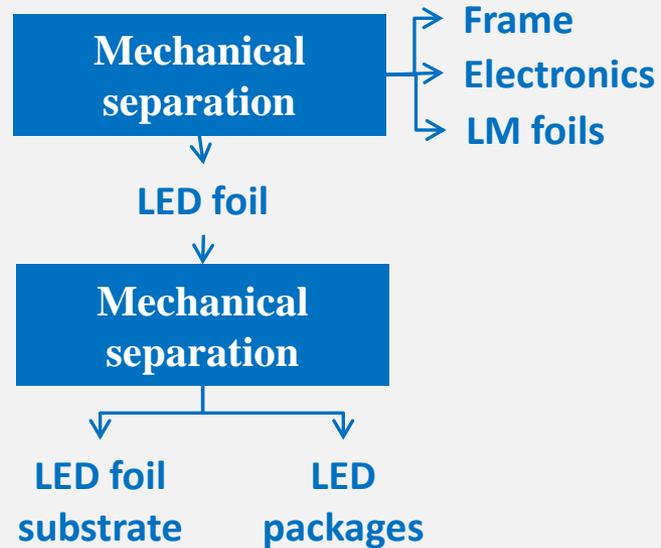
LEDs



Module

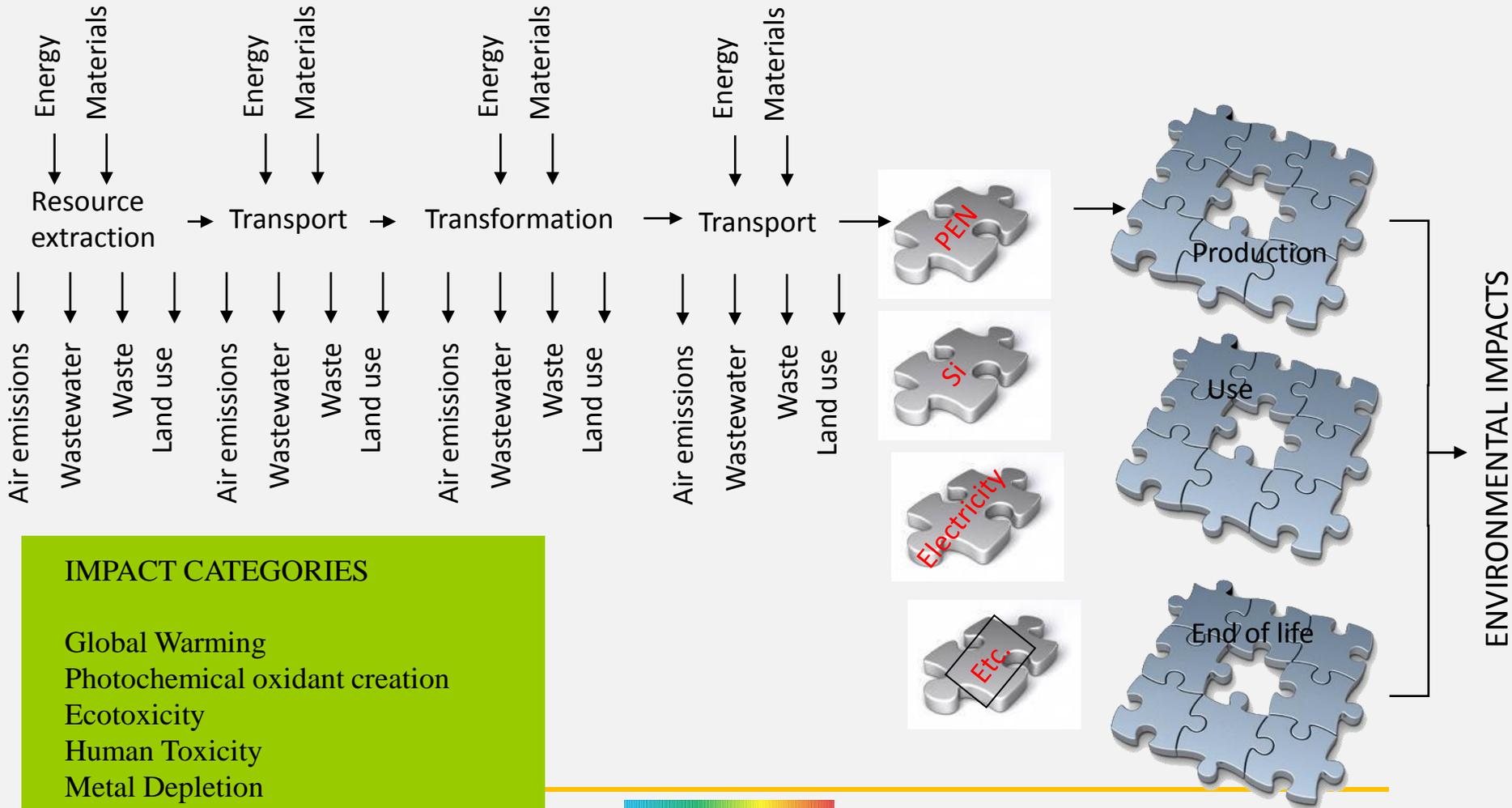


Intelligence



Life Cycle Assessment

Life Cycle Assessment



IMPACT CATEGORIES

Global Warming
 Photochemical oxidant creation
 Ecotoxicity
 Human Toxicity
 Metal Depletion
 Fossil depletion
 ...

Sustainability in LASSIE-FP7 Project

Strong points of evaluating the sustainability over the life cycle at early stage of design:

- 80% of the environmental load of a product is determined by in the design.
- In order to avoid a potential shift of burdens (among different regions, different time-frames, different impact categories, etc) Life Cycle Thinking has been recognized in the EU as the most suitable methodological framework for most product and process related sustainability discussions (EU Research for the Environment 2007-2013 - 2010 Revision)

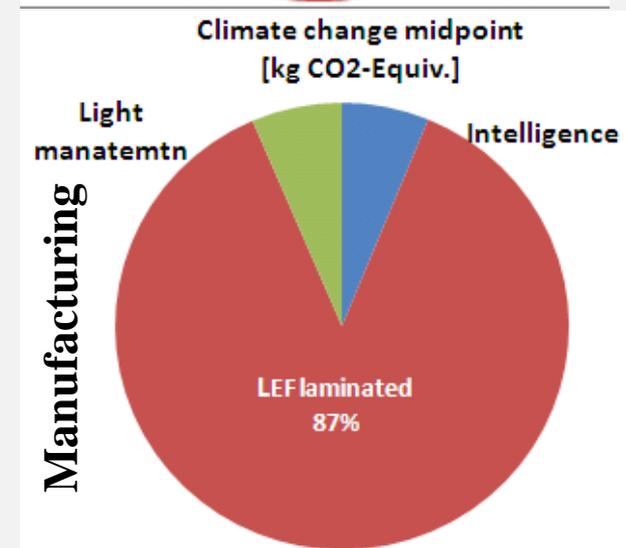
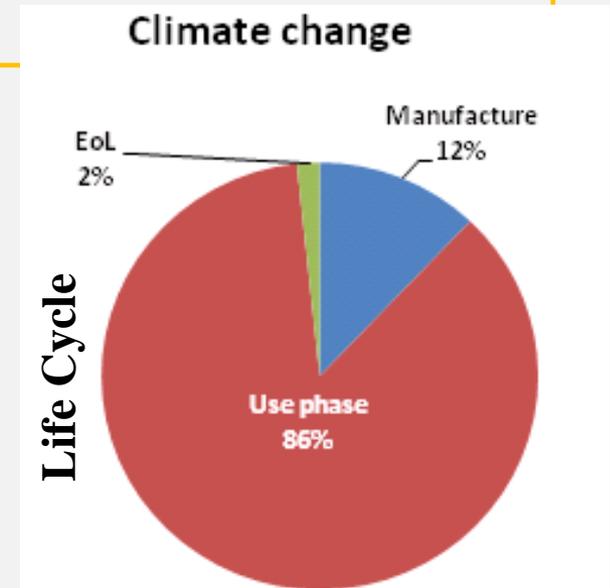
Some potential limitations for evaluating the sustainability over the cycle at early design:

- Changing nature of new products (composition, efficiency...)
- Information gaps:
 - Confidentiality
 - New materials (limited information on potential impacts)
 - Estimations needed to model scaled up processes
 - New process vs established processes: unfair comparisons?

Life Cycle Assessment

Environmental assessment

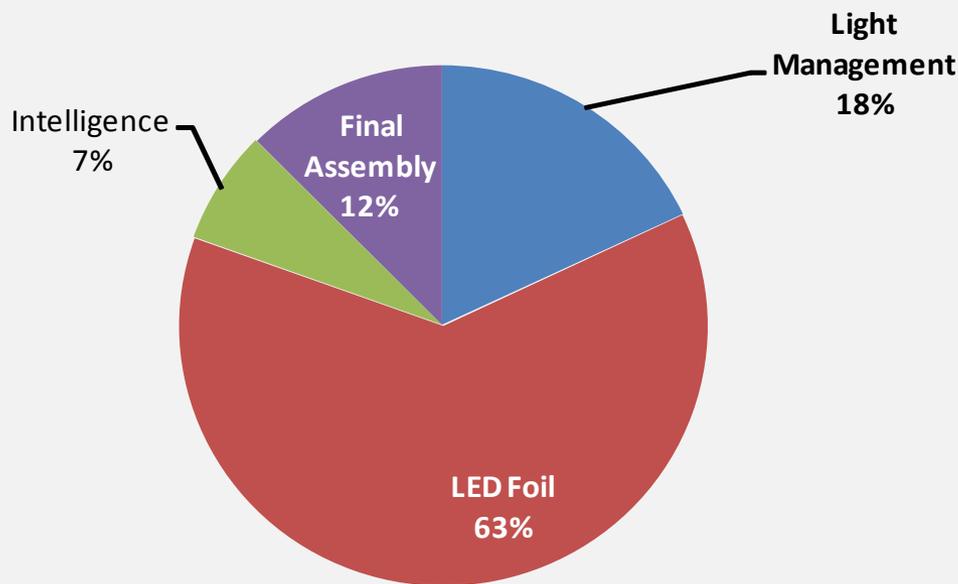
- **Efficacy is the key parameter:**
85% of CO2 emissions in the use phase
- **Impacts in Production phase:**
 - Significance of the LED foil
 - LED number has high influence associated to:
 - LEDs
 - Bonding material
 - Heat management structures
 - Impact reduction strategies have been identified



Cost Assessment

- Potential market applications strongly influences cost: Market size

Cost of large market applications up to 65% of cost of small market applications



Number of LEDs is a very relevant cost element:

- Material cost
- Processing cost
- Associated heat management cost

Highlights and conclusions

- Evaluating economic and environmental aspects in early design phases enables decision making for higher sustainability.
- Limitations:
 - Available information for the environmental evaluation: new materials/processes...
LCA databases and resources
 - Evolving definition of the product: several iterations
 - Scaling up approximations are necessary
- Conclusions Lassie-FP7:
 - Efficacy improvement will lead to improved sustainability.
 - High potential recyclability, providing suitable treatment processes.
 - Economic and environmental evaluation point similar priorities.
 - The project is seeking the balance among technical requirements and LED number, for improving sustainability.
 - The simplification in the design adopted within the project is leading to both, cost reduction and higher recyclability.