

Teaching of Life Cycle Assessment methodology to sensitize future engineers to sustainable development

S. Belboom & A. Léonard

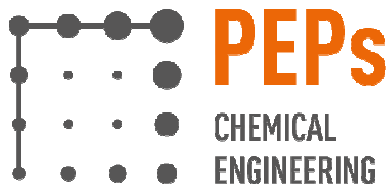
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Products, Environment, and Processes (PEPs)

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Introduction

- What are the required skills to become an effective engineer?
 - Being able to solve technical problems, taking into account societal challenges

- Is SD part of the required skills ?

Introduction

Source = S. Valdivia

Major global challenges of today

the guardian

News Sport Comment Culture Business Money Life & style Travel Environment

Environment Environment blog

ENVIRONMENT BLOG

THE WORLD'S LEADING GREEN JOURNALISTS ON CLIMATE, ENERGY AND WILDLIFE

Previous Blog home Next

The six natural resources most drained by our 7 billion people

For how long can we realistically expect to have oil? And which dividing element is essential to plant growth?

Rare metals
Phosphorus
Oil
Gas
Coal
Water

Posted by
Carmila Ruiz
Monday 31 October 2011
11:01 GMT
theguardian.com



iPoint | Conflict Minerals Platform



TIME

The Clean Energy Myth

as business grows
Politicians and Big Business are pushing biofuels like corn-based ethanol as alternative to oil. All they're really doing is driving up food prices and making global warming worse—and you're paying for it.



TIME

GLOBAL WARMING

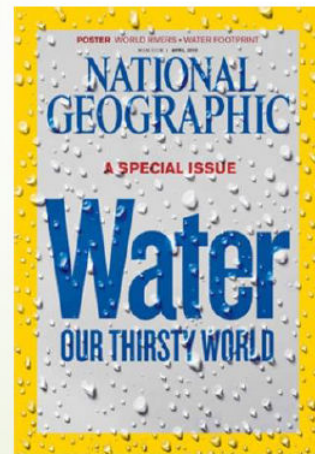
Choking temperatures. Melting glaciers. Rising seas. All over the earth we're feeling the heat. Why isn't Washington?



The Economist

The shape of things to come

Gerwyn's Dean
America's Taliban test
The future of flight
A SURVEY OF FOOD



NATIONAL GEOGRAPHIC

A SPECIAL ISSUE

Water

OUR THIRSTY WORLD



Economist Intelligence Unit

Global food security index 2012

An assessment of food affordability, availability and quality



The Economist

The rich and the rest

A 14-page special report on the global elite

Introduction

- Global warming
- Local air pollution
 - Acidic rains, smog, particulate matters, ...
- Natural resources depletion
 - Oil shocks, rare earths, 'critical raw materials'
- Accidental pollutions
 - Tchernobyl, Seveso, Bhopal, etc.

Impacts to take into account for Environment and Humans

Introduction

- Increasing importance of environment
 - Pressure of industries
 - Everyday life problems
- How to deal with environment and how to solve problems?

Environment and engineers at ULg

- Bachelor level
 - Mandatory course 'introduction to environmental engineering'
 - Sustainable energy

- Master level (Chemical engineering)
 - Lectures relative to
 - Downstream processes
 - Treatment of air and water pollution
 - Until three years ago
 - ~~Green chemistry~~
 - ~~Ecodesign~~
 - ~~LCA~~

Standard definition of LCA

- General frame given by International Standards ISO 14040 et ISO 14044
 - « studies environmental aspects and potential impacts through the whole life of a product, from raw materials extraction to its production, its use, and its final disposal»
 - Product = product, activity, system or process



http://3.bp.blogspot.com/-ZcKjWhyEMew/VVcKBSjfiFI/AAAAAAAAANQ/kqCx0pkCnDg/s1600/LCA_new.png

Introduction of LCA courses at ULg

- Since 2006
 - 2 hours given to bachelors in engineering
- Since 2013
 - Elective courses « LCA and ecodesign »
 - Proposed to student in second master of chemical or mechanical engineers
 - Mandatory course for industriel engineers (HELMO-Gramme)
 - Based on LCA research for more than 15 years at ULg
 - Not so well considered at first: « LCA is just a 'push button', putting data in software, not reliable, no interest, ... »

LCA and Ecodesign course in Liège

- Integrated course based on
 - Previously acquired knowledge ('pre-requisites')
 - Mass and energy balances
 - Treatment of air pollution
 - Wastewater treatment
 - + Physical unit operations, reactor engineering, process modelling ...

LCA and Ecodesign course in Liège

- Divided in three parts
 - Learning
 - Practising
 - Acting and opening their mind

LCA and Ecodesign course in Liège

■ Learning

- Goal: to highlight main environmental challenges
 - For their generation
 - For the next ones
- Actions:
 - Discussions with students about environmental challenges
 - Explanations of current regulations and environmental context

LCA course in Liège

■ Practising

□ Learning of LCA through ISO standards

■ Exercices

- Comparison of PS and popcorn to fill a box (Jolliet et al. 2010)

■ Published studies

■ Illustrations of green washing

- Importance of LCA to avoid trade off in steps or pollution

□ Actions:

■ Homework with the critical review of a published article

- Environmental relevance

LCA course in Liège

■ Practising

□ Actions:

- To model scenarios with a LCA software
- To show the only interface function of the tool
 - Trash in, trash out...
- To train their critical mind
- Same exercises for all students with the help of the teachers

LCA course in Liège

- Acting and opening their mind
 - Group project
 - One scientific paper to analyse and model per group (different from one another)
 - Work together
 - Criticise the paper
 - Environmental relevance and accordance or not with ISO standards
 - Remodel/rebuilt scenarios
 - Comparison of their results with the published ones
 - Differences
 - Interpretation

Conclusions and perspectives

- LCA course
 - First attempt to add
 - Sustainability competences
 - Upstream method linked to environment
 - Improvement each year
 - Feedback of students
 - Feeling of teachers
 - Reduction of time dedicated to the modelling work
 - Increase of time dedicated to interpretation

Conclusions and perspectives

- LCA course
 - Main goal
 - To act against greenwashing
 - To increase transparency
 - Main drawback
 - Lack of social and economic inputs
 - Perspective
 - Add social and economic fields with the help of colleagues from other faculties
 - Association with integrated/interdisciplinary project of 1st master
 - Now proposed to some bioengineers

Thanks for your attention!

Any question?

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