

Decision support system (DSS)

Andreas Ciroth GreenDelta GCSM conference Berlin, 25 September 2013



Agenda

- ProSuite: Goals, introduction
- A new sustainability assessment framework
- Decision support tool
- Towards standardisation?



Project PROSUITE

Goals, introduction





Project PROSUITE

Development and application of a standardized methodology for the <u>PROspective SUstalnability assessment of</u> <u>TEchnologies</u>





In a nutshell...

- Tools that are applicable in a generic way to assess all aspects of sustainability of future technologies
- A new integrative framework addressing five major impact categories:
 - Human health
 - Social well-being
 - Prosperity
 - Natural Environment
 - Exhaustible resources
- Integration through normalisation and use of MCA-tools
- The PROSUITE open source decision support system



In a nutshell...

- Economic deliverables
 - Hybrid LCA model for modelling full scale adoption of a technology
 - Standardized Cost Estimation for New Technologies (SCENT)
- Environmental deliverables
 - PROSUITE methodology (midpoint and endpoint)
 - Improvement of selected characterisation models (metals, nanoparticle exposure) and assessment of uncertainties in existing models
- Social deliverables

Participatory approaches for selecting impacts and categorize them into

- Safety, security and tranquility;
- Autonomy;
- Participation and influence
- Equal opportunities



PROSUITE case studies

Four case studies for testing and demonstrating the methodology on emergent technologies

- Biorefineries and organic waste
- Nano technologies
- Carbon capture and Storage
- Multifunctional mobile devices

Consortium



1	Utrecht University (UU), Department of Science,	12					
	Technology and Society / Copernicus Institute						
2	Norwegian University of Science and Technology (NTNU)	13					
3	Technical University of Denmark (DTU)	14					
4	Dialogik	15					
5	Ecological Economics and Management Centre - Foundation of the Faculty of Sciences and Technology.	16					
	New University of Lisbon (UNL)	17					
6	Swiss Federal Institute of Technology Zurich (ETH)						
7	Institut Symlog (SYMLOG)						
8	Finnish Environment Institute (SYKE)						
10	Gent University (UG)						
10	International Institute for Applied Systems Analysis (IIASA) 2						
11	Hungarian Academy of Sciences Institute of Sociology						
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12	Universitat Autònoma de Barcelona (UAB)						
13	Pré Consultancy (PRE)						
14	GreenDelta (GD)						
15	FORTH						
16	Solvay						
17	Organic Waste Systems (OWS)						
18	Nokia						
19	HeiQ Materials AG (HeiQ)						
20	Paul Scherrer Institute (PSI)						
21	Sony Ericsson						
22	DSM						
23	Radboud University Nijmegen (RU)						
24	Hybrid Plastics [™]						



About us

GreenDelta is an independent capital company founded 2004 in Berlin by Andreas Ciroth; our work focusses on sustainability research, consulting, and software development for sustainability.

- Life Cycle Assessment
- Life Cycle Costing
- Social Life Cycle Assessment
 - Case studies
 - Method development (social LCA; uncertainties; aligning different LCA approaches)
 - Training
 - Reviews

- ...



About us

GreenDelta is an independent capital company founded 2004 in Berlin by Andreas Ciroth; our work focusses on sustainability research, consulting, and software development for sustainability.

- Web-based software & desktop software
- Enterprise solutions, SME, open source solutions
 - openLCA
 - E-DEA
 - BEST
 - Nexus
 - ...





Read about our four

project case studies

and findings



Home Project Team The Prosulte Framework Project case studies Decision Support System Library News

PROspective

SUstainability Assessment

of TEchnologies

Learn about the

PROSUITE

Sustainability

(PROSUITE)

A European project to develop a framework methodology, operational methods and tools for the sustainability assessment of current and futu technologies over their life cycle, applicable to different stages of mature mature of the sustainability and the sustainability and the sustainability assessment of the sustainability applicable to the sustainability and the sustainability assessment of Offering freeware, open source tools (beta versions available from 2013)

News Latest news on the project:

Links

Contact

Internal project webspace

25 April 2013: Paper on 5 impact categories

15 May 2013: Prosuite mini workshop at SETAC Europe Glasgow

18 April 2013: Tracking mobile phone recycling

16 April 2013: Nanosilver in textiles friend or foe?

8 Febr 2013: Experience curves for novel technologies (D1.3)

19 Dec 2012: Read our updated project summary

28-29 Nov 2012: Project team meeting in Copenhagen

5 Nov 2012: New deliverables: D3.2: Decision rule and statistical uncertainties in environmental impact methods D2.1: Economic indicators for SAT and model & methodology for scenarios



PROSUITE - PROspective SUstalnability assessment of TEchnologies - is now entering its final phase and in a few months from now, we will be delivering our project's final outcome, i.e. a new methodology, framework and software tool for you to conduct sustainable assessment of technologies within a life cycle approach.

While we are currently fine tuning our conceptual finding which has progressed to offer a new integrative sustainability assessment that goes beyond the traditional 3 pillars to identify 5 major impact categories, we are also preparing and scheduling our final dissemination activities in order to reach the widest possible range of interested parties and end-users. Learn where you can participate in workshops and case study demonstrations within the four emergent technologies chosen for our PROSUITE model development.

Find our methodological reports and indicator derivations in the PROSUITE Library.

Meet us! Find out where to participate in workshops and case study demonstrations.



PROSUITE 7th Framework research project Grant agreement no.: 227078 - PROSUITE

Web page www.prosuite.org

Updated regularly





PROSUITE Final conference

Brussels, 30 October 2013

- Sign up to receive an invitation



A new sustainability assessment framework





Problem definition

- Conventional methodologies for sustainability assessment:
 - Often too specific for certain products
 - Not applicable to wide range of technologies
 - No clear aggregation of various impacts
- There is a need for sustainability assessment method that:
 - Covers all dimensions of sustainability in a comprehensive way
 - Is applicable to a wide range of technologies
 - Pursues a rigorous assessment along the cause-effect chain to ultimate scores

Impact assessment in environmental LCA







Initial approach in Prosuite





Problems with initial approach

There are overlaps:

- Social impacts (quality of life) could include health (env) and income (econ)
- If an external cost approach were applied, all impacts are economic
- Health impacts from environmental interventions considered part of environmental pillar, but occupational health part of social pillar

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New approach within Prosuite

- 5 Endpoints:
 - Impact on human health
 - Impact on social well-being
 - Impact on prosperity
 - Impact on natural environment
 - Impact on exhaustible resources

Mostly present generation

Mostly future generations

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Impact on human health



endpoint

inventory data

Toxic exposures

Non-fatal accidents at work

Fatal accidents at work

Occupational diseases

Accidents ending with death/inability to work

midpoints

Impact on consumption related human health

Impact on occup<mark>ational</mark> human health

environmental flows

Elementary

Climate change Ozone depletion Human toxicity Respiratory organics Ionising radiation Photochemical ozone formation

Impact on environmental human health Impact on human health (DALYs)



Impact on social well-being





Social indicators

<u>Safety</u>, security and tranquility

- Knowledge-intensive jobs
- Total employment
- Risk perception
- Possibility of misuse

<u>Autonomy</u>

- Child labour
- Forced labour

Participation and influence

- Trust in risk information
- Stakeholder involvement
- Long-term control functions

Equal opportunities

- Regional income inequalities
- Global income inequalities

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Impact on natural environment

inventory data

midpoints

endpoint

Climate change

- Ozone depletion
 - Photochemical ozone formation
 - Eutrophication
 - Acidification
- → Ecotoxicity
- → Land use
 - → Water use

Impact on ecosystem – health

Impact on natural environment (PDF)



Impact on exhaustible resources inventory data midpoints endpoint Impact on fossil Elementary flows resource depletion Impact on exhaustible resources Impact on mineral (€) resource depletion





Overall sustainability assessment

- Assessment across all impact categories is needed.
- Various approaches available:
 - No aggregation, leave as it is
 - Multicriteria analysis, results shown as hierarchy
 - Aggregate into one single score



Conclusions

- A framework is proposed that covers all dimensions of sustainability
- For all impact categories, an assessment is possible on a life-cycle basis and across the full cause-effect chain
- The impact categories follow the McKinsey 'MECE' principle: Mutually Exclusive, Collectively Exhaustive (Friga, 2008)



Main challenges for LCSA (1)

- Development of indicators for the social assessment
- Define a quantitative metric for these indicators
- Determine how to aggregate them into one value for the end-point indicator 'social well-being'



Main challenges for LCSA (2)

- How to integrate/interpret the endpoint indicators across the environmental, economic and social domain?
 - Aggregation into one value (yes/no)?
 - Multi-criteria analysis
 - Other...?



Decision Support Tool





Decision Support System

- Modular software consisting of a framework and set of tools for scenario analyses and technology assessment
- Implementation of PROSUITE methods in openLCA
 - Specific plugins
 - Improvement of the overall architecture of openLCA
- Freely available, as open source software

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openLCA as a basis: a professional, open source LCA software

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- Process creation

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– Results analysis



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Impact categories	Preshwater eutrophication	*	

Location	Amount	Unit	PA I
Global	858.70261		
Switzerland	20.58040		
Germany	0.69875		
Poland	0.53926		
Europe	0.48670		
Greece	0.22678		~
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General information LCI - Total LCIA - Total Process contribut... Process results Flow contributions Locations Sun burst Localised LCIA (b... Sankey diagram "2



PROSUITE plugin

 A plugin-architecture and "framework" has been implemented in the DSS

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prosuite



Sustainability assessment

- Input: results from the other modules
- Output
 — Multi-Criteria tool:

 Graphical display of alternatives performance

for endpoint indicators







Multi-criteria tool

- Ranking of alternatives applying Condorcet decision rule
 - following a strong sustainability idea, the integration module will not compute a single score but keep the sustainability dimensions separate
- Sensitivity analysis results



Project PROSUITE

Towards standardisation?





Towards standardisation

- Candidates:
 - Sustainability framework..
 - .. or parts of it
 - Indicator sets
 - Approaches for data collection

(in the context of life cycle sustainability assessment)

• Approaches for data quality assurance (in the context of life cycle sustainability assessment)

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Comments and feedback welcome!

Thank you for your attention

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