



Using life cycle based environmental assessment in developing innovative multi-functional glass-polymer windows

**Karen Allacker*, Maria Calero*, Fabrice Mathieux*,
Catia Baldassarri*, Ya Roderick****



*European Commission, Joint Research Centre (JRC)
Institute for Environment and Sustainability
Sustainability Assessment Unit

** Integrated Environmental Solutions (IES) Ltd, United Kingdom



Background:

FP7 Project HarWin **«Harvesting solar energy with multifunctional glass- polymer windows»**

- NMP Call FP7
- Started September 1st, 2012.
- Budget of 499.975,2 Euro over 3 years (75% EU funded).
- Total of 10 partners (research and industry), 6 different countries.
- University of Bayreuth is the project leader.



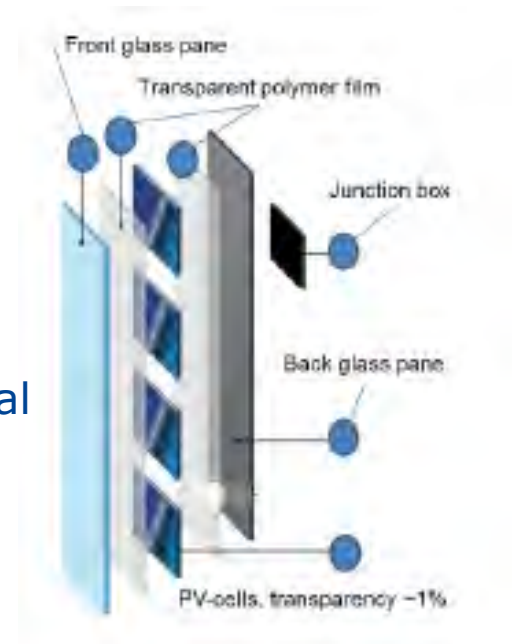


HarWin

«Harvesting solar energy with multifunctional glass-polymer windows»

Objectives

- development of new materials for frame and glazing of a future window
- increase energy efficiency of windows and buildings.
- extended functionalities: reduced weight, reduced thermal conductivity, integrated PV, wavelight management, heat and moisture control
- ... and developed based on Life Cycle Principles.





Approach for Life Cycle Environmental Assessment (LCEA) in HarWin

- Literature review: LCEA of windows and/or buildings
- +
- Existing LCEA methods are analysed



A proposal is made for a hybrid approach (LCEA_{HarWin}) combining various features and outcomes of existing assessment methods for implementation in HarWin



Existing LCEA methods, applicable for windows

- ISO 14040 and 14044 (international standards on LCA)
- CEN TC350: EN15804 (core guidelines for EPDs of construction products)
- PEF: Product Environmental Footprint [*COM(2013) 196 final*]
- MEErP: Methodology for Ecodesign of Energy-related Products [*DIRECTIVE 2009/125/EC*]
- REAPro: Resource Efficiency Assessment of Products [*COM(2011) 571 final*]

ISO 14040 and 14044



Appropriateness for HarWin

assesses the environmental impacts of products (windows) from a life cycle perspective, i.e. from raw material acquisition to final disposal



CEN/TC 350 – EN 15804:2012

This standard follows an LCA approach and “*provides a structure to ensure that all Environmental Product Declarations (EPD) of construction products, construction services and construction processes are derived, verified and presented in a harmonized way*”.

Strengths for LCEA_{HarWin}:

- **LCA based, multi-criteria**
- **Data quality: specific requirements for construction products**

Weaknesses for LCEA_{HarWin}:

- **Impact assessment not comprehensive, and not in line with ILCD recommendations**
- **Recycling at EoL not considered**



Product Environmental Footprint (PEF) has been developed by the Sustainability Assessment Unit of the JRC Institute for Environment and Sustainability (IES) in the context of one of the building blocks of the Flagship initiative of the Europe 2020 Strategy – “A Resource-Efficient Europe”.

Strengths for LCEA_{HarWin}:

- **Two-step procedure** (screening PEF + final PEF)
- **strict data quality requirements**
- **Comprehensive multi-criteria assessment** (14 environmental impact categories)
- **in line with ILCD recommendations**



Methodology for Ecodesign of Energy-related Products

(MEErP) has been developed by COWI Belgium in association with Van Holsteijn en Kemna (VHK) on behalf of the European Commission, DG Enterprise and Industry. It supports the policy proposes defined in the Ecodesign Directive 2009/125/EC.

The MEErP methodology proposes a structured approach to analyze environmental, economic and technical performances of Energy-related Products (ErP) alternatives

Strengths for LCEA_{HarWin}:

- windows are typical **ErP** belonging to the **SCOPE** of the Ecodesign Directive
- **BaseCase** as comparative base both at the product level and product group level

Weaknesses for LCEA_{HarWin}:

- **simplified** environmental impact assessment method



Resource Efficiency Assessment of Products (REAPro) has been developed by the Sustainability Assessment Unit of the JRC Institute for Environment and Sustainability (IES), to be used in the framework of various product policies, including the EcoDesign Directive (Directive 2009/125/EC 2009), EU Ecolabel (Regulation EC 2010) and Green Public Procurement (EC 2008).

Strengths for LCEA_{HarWin}:

- Specific focus on **resource efficiency**
- **Recyclability and Durability indices**
- **in line with ILCD recommendations**

Weaknesses for LCEA_{HarWin}:

- **No data quality requirements**
- **Not prescriptive**



LCEA_{HarWin} method

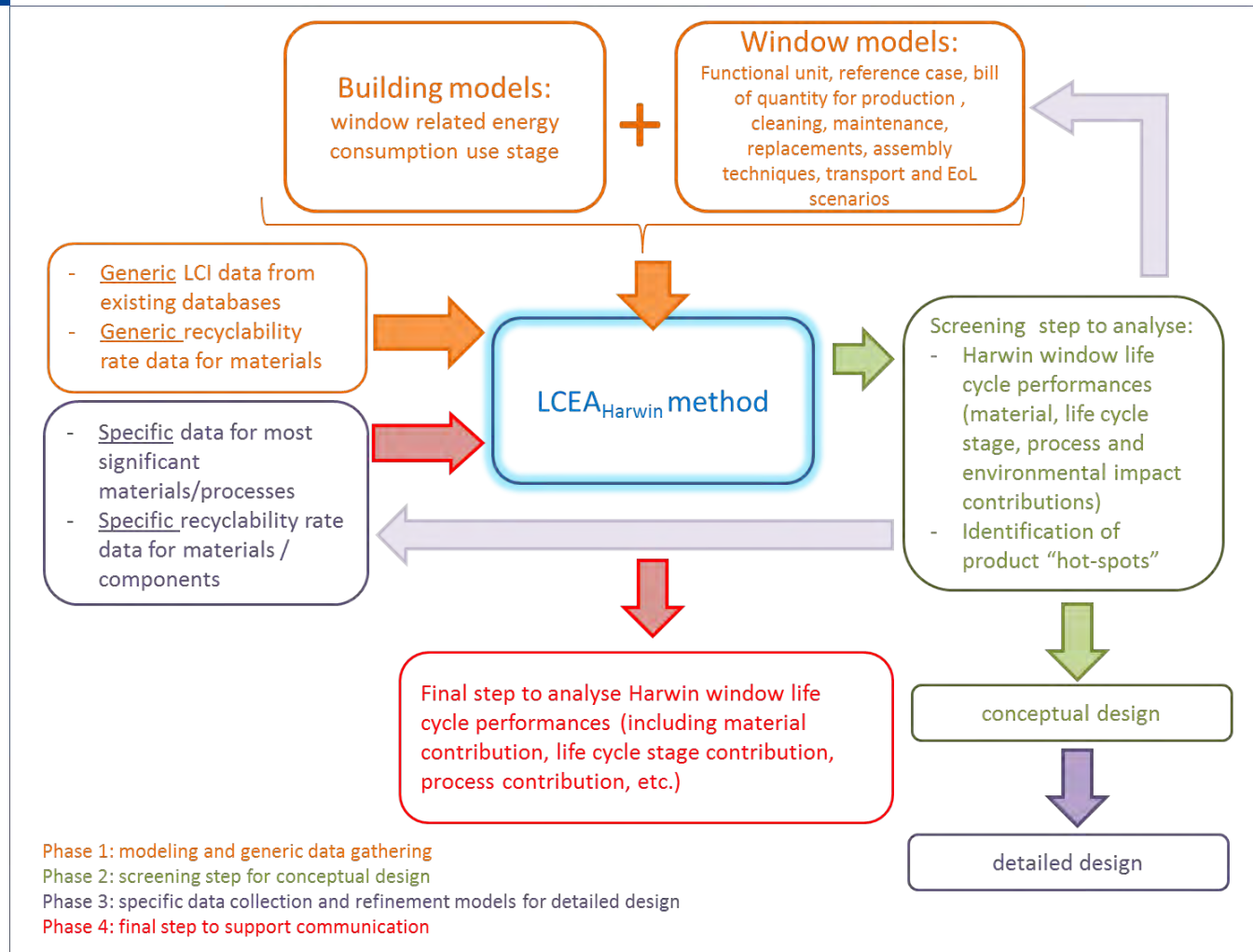
- life cycle based [ISO 14040 and ISO 14044]
- multi-criteria (14 + 4) life cycle impact assessment [PEF + EN 15804]
- indicators of material efficiency, namely RRR, RRR_{Benefits}, Durability, Recycled Content, Recycled Content Benefit [REAPro]
- allows to draw conclusions on the macro-scale (i.e. for the whole European continent) [MEErP]
- follows an iterative assessment process [PEF]:
 - a *screening assessment* (based on generic data)
 - a *detailed assessment* (based on specific data and revised/refined building and window models)
 - a *final assessment* (based on final specific data and final building and window models)



LCEA_{HarWin} during different design steps

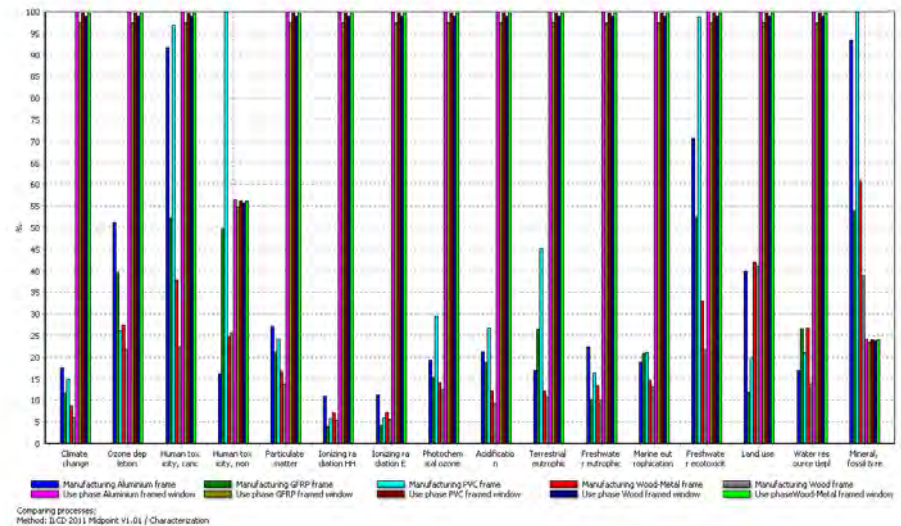
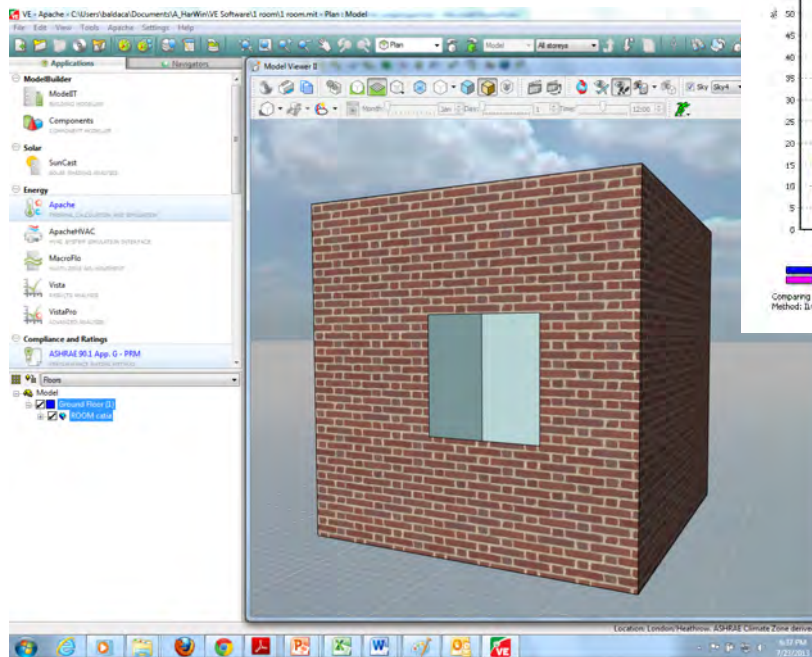
- During **planning phase** (e.g. month 1 - 8): to identify the key environmental performances
- During **conceptual design phase** (e.g. month 6 - 24): to analyse design concepts alternatives
- During **detailed design phase / Testing/Prototyping** (e.g. month 18 - 30): to analyse technical design alternatives
- During the **closure of the project**: to analyse global performances to be communicated and to identify further developments

Proposed method



Implementation ongoing

. Window and building modeling



Implementation ongoing

. Data gathering



Legal Notice Privacy Statement Log In

JOINT RESEARCH CENTRE
Life Cycle Thinking and Assessment
European Commission >> JRC >> IES >> LCT

Welcome to Life Cycle website.

Thinking Assessment

Home LCT | Sectors | Approaches | Glossary | News archive | LCT forum | Terminology |

Our thinking - life cycle thinking



Life Cycle Thinking (LCT) seeks to identify possible improvements to goods and services in the form of lower environmental impacts and reduced use of resources across all life cycle stages. This begins with raw material extraction and conversion, then manufacture and distribution, through to use and/or consumption. It ends with re-use, recycling of materials, energy recovery and ultimate disposal.

The key aim of Life Cycle Thinking is to avoid burden shifting. This means minimising impacts at one stage of the life cycle, or in a geographic region, or in a particular impact category, while helping to avoid increases elsewhere. For example, saving energy during the use phase of a product, while not increasing the amount of material needed to provide it.

[Read more...](#)

Our common goal - sustainable consumption and production

The products we buy and use every day contribute to our comfort and well-being. However, awareness of the unsustainable levels of resource consumption and the significant impacts of these products on the environment is growing among consumers, policy makers and business.

Life Cycle Thinking seeks to identify possible improvements to goods and services in the form of lower environmental impacts and reduced use of the resources across all life cycle stages.

[Read more...](#)

Shortcuts

News

New ELCD Released
[20.02.2013]

Final Report EcoDesign Project
[19.12.2012]

EXPERT WORKSHOP: Security of Supply and Scarcity of Raw Materials
[13.11.2012]

Life cycle indicators framework and reports
[19.10.2012]

JRC Reference Report on ILCD Handbook online
[11.05.2012]

LCTA Characterisation Factors
[01.03.2012]

ILCD recommended LCTA methods - final version released in November 2011
[20.12.2011]

Thank you for your attention! Questions?

Further links and contact:

JRC website:

<http://ec.europa.eu/dgs/jrc/index.cfm>

IES website:

<http://ies.jrc.ec.europa.eu/>

Sustainability Unit (H08) website:

<http://ies.jrc.ec.europa.eu/the-institute/units/sustainability-assessment-unit.html>

LCA/LCT website:

<http://lct.jrc.ec.europa.eu/>

HarWin:

www.harwin-fp7.eu

Email: LCA@jrc.ec.europa.eu

Acknowledgments:

The funding of the European Union Seventh Framework Programme (FP7/2007-2013) within the project HarWin under grant agreement No 314653 is gratefully acknowledged.