

# Laboratory for Applied Circular Economy (LACE)

Harald Desing<sup>1</sup>, Heinz Böni<sup>1</sup>, Roland Hischier<sup>1</sup>

<sup>1</sup> Technology & Society Laboratory, Empa St. Gallen, Lerchenfeldstrasse 5, 9014 St.Gallen, Switzerland

## Introduction

Circular Economy (CE) is the buzzword of today, promising an economy able to operate with limited resources by closing material cycles.

However:

- When are these CE strategies and initiatives environmentally sustainable?
- How can the legal framework promote and ensure environmentally and socially sustainable CE initiatives?
- How can companies design business plans to make CE economically possible and profitable?

Main goal of the project LACE is to demonstrate that circular business models can be applied to enterprises that are representative of the Swiss economic tissue. The project is part of the National Research Program "Sustainable Economy: resource-friendly, future-oriented, innovative" (NRP 73) of the Swiss National Science Foundation (SNSF).



Figure 1: Relations among the actors within LACE

## Project objectives

The main objective of the LACE project consists in introducing, consolidating and improving elements of a CE in companies, representative of the Swiss economic tissue. It aims to demonstrate under which circumstances circular business models can actually be implemented in an environmentally and economically beneficial way.

LACE seeks to find the boundary conditions within which a CE needs to operate in order to be in fact sustainable. The work shall lead to design-criteria for products, services and business models. Further, the project will develop in collaboration with the partner companies possible pathways towards an implementation.

LACE aims at consolidating practical knowledge for the transition towards a CE.



Figure 2: Project partners

## Project structure

**Inter- and transdisciplinary** approaches will be applied in close collaboration between science and industry. The scientific part of the work will be carried out in the following 3 PhD thesis:

- **Technical feasibility** (Empa)  
Environmental boundary conditions and derived design criteria; LCA/MFA based assessment methodology.
- **Legal complexity** (University of Lausanne):  
Barriers and necessary changes in the Swiss legal system for more CE.
- **Business profitability** (University of St.Gallen):  
Development of a toolbox to design circular business models.

All PhDs will work together with the eight partner companies along five different industrial sectors. The knowledge transfer partner Sanu Durabilitas ensures the link between science and application.

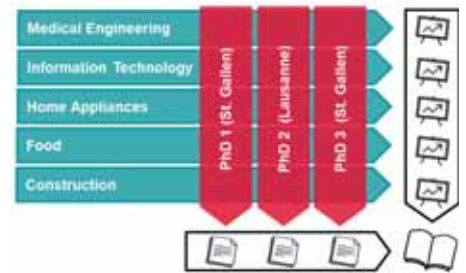


Figure 3: Project structure

## Our Definition of a CE

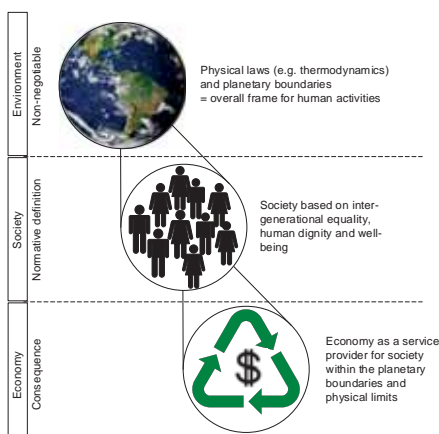


Figure 4: Systemic approach to CE

The **Circular Economy** is a model adopting a **systemic and holistic** view, aiming at taking into account all the variables of the system earth, in order to maintain its viability. It serves the society to achieve **human well-being** within the **physical and planetary limits**. It achieves that through technology and business model innovation, which provide the services required by society, which in turn leads to long term economic prosperity. The services are powered by renewable energy and rely on materials which are either renewable through biological processes or can be safely kept in the technosphere, requiring minimum raw material extraction and ensuring safe disposal of inevitable waste and dispersion in the environment.

## Environmental aspects

On a limited planet like ours, the total amount of any resource is limited – i.e. there is a need to have a sound understanding of the share of the earth's physical resources that are sustainably available for human appropriation.

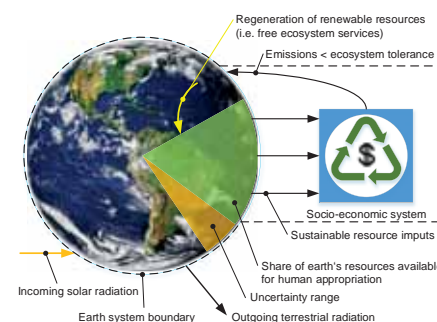


Figure 5: Physical system analysis for CE

1.) **How to quantify a sustainable resource base** and make sure, that despite all uncertainties, the earth system can sustain the socio-economic metabolism in the long run?

→ Sustainable resource budgets for renewable energy, renewable materials & finite resources

2.) **How to utilize these limited resources best** within the socio-economic system?

→ Minimize entropy production, efficient use of resources, design for durability ("slow cycle")

## Outlook

The project will explore aspects and consequences of this new definition together with the partner companies within the Swiss situation. The research results are expected as follows:

- **PhD "environmental issues"**  
*Conceptual:* MFA- & LCA-based frame to evaluate CE strategies on company level to ensure an improved (environmental) sustainability of company's activities;  
*Practical:* Application manual for company that would like to integrate such a frame.
- **PhD "legal and regulatory frame"**  
*Conceptual:* progress in the analysis of resource regimes in field of resources of the manufactured capital;  
*Practical:* conditions framing strategies of the five domains studied in the project.

- **PhD "business models"**  
*Conceptual:* contribution to the emerging literature on business models;  
*Practical:* insights into how to design sustainable business models and when and how they enhance firm performance.

## Contact:

**Harald Desing**  
Mail: [harald.desing@empa.ch](mailto:harald.desing@empa.ch)  
Tel. +41 58 765 75 13