



Quantis

CIRCULAR ECONOMY
AND LCA

EVALUATING CIRCULAR ECONOMY
PROJECTS WITH LCA

SCORE LCA

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CONTEXT



01 | 

Drivers for change...

Economic losses and structural waste

- In Europe, the average car is parked 92 percent of the time, 31 percent of food is wasted along the value chain, and the average office is used only 35–50 percent of the time.

Price and supply risks

- Many areas of the world possess few natural deposits of non renewable resources of their own and so must rely on imports.
- The European Union imports six times as much materials and natural resources as it exports

Natural system degradation

- Elements contributing to these environmental pressures include climate change, loss of biodiversity and natural capital, land degradation, and ocean pollution

Regulatory trends

- The number of climate change laws has increased 66% since 2009

...and a favourable alignment

Advances in technology

- New upcycling technologies have recently been developed, we can now recover materials we thought lost a couple of years ago (rare metals in electronics)

Acceptance

- Companies like *MUD Jeans* and *Philips&Turntoo* are getting more attention every day with their functional economy approach, while collaborative companies like Uber and AirBnB have become household names

Urbanisation

- With this steady increase in urbanisation, the associated costs of many of the asset-sharing services and the costs for collecting and treating end-of-use materials go down.

WHAT IS CIRCULAR ECONOMY?

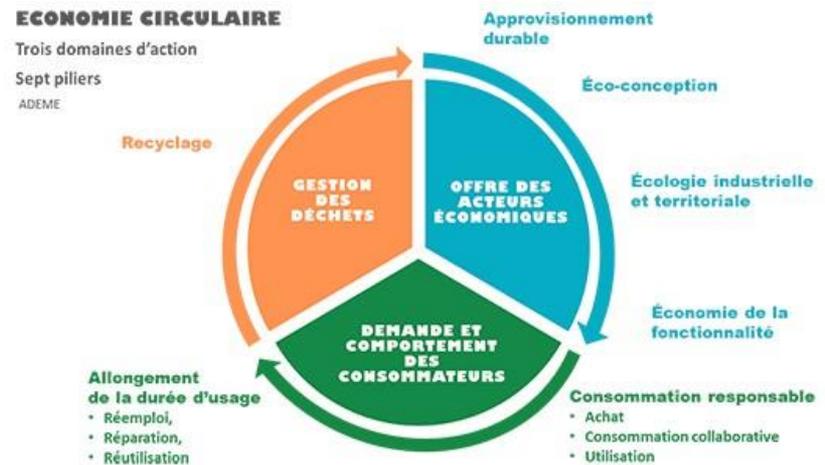


02 | 

Circular Economy does not have a precise definition

« A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles. »

- Helen McArthur Foundation



Source : ADEME

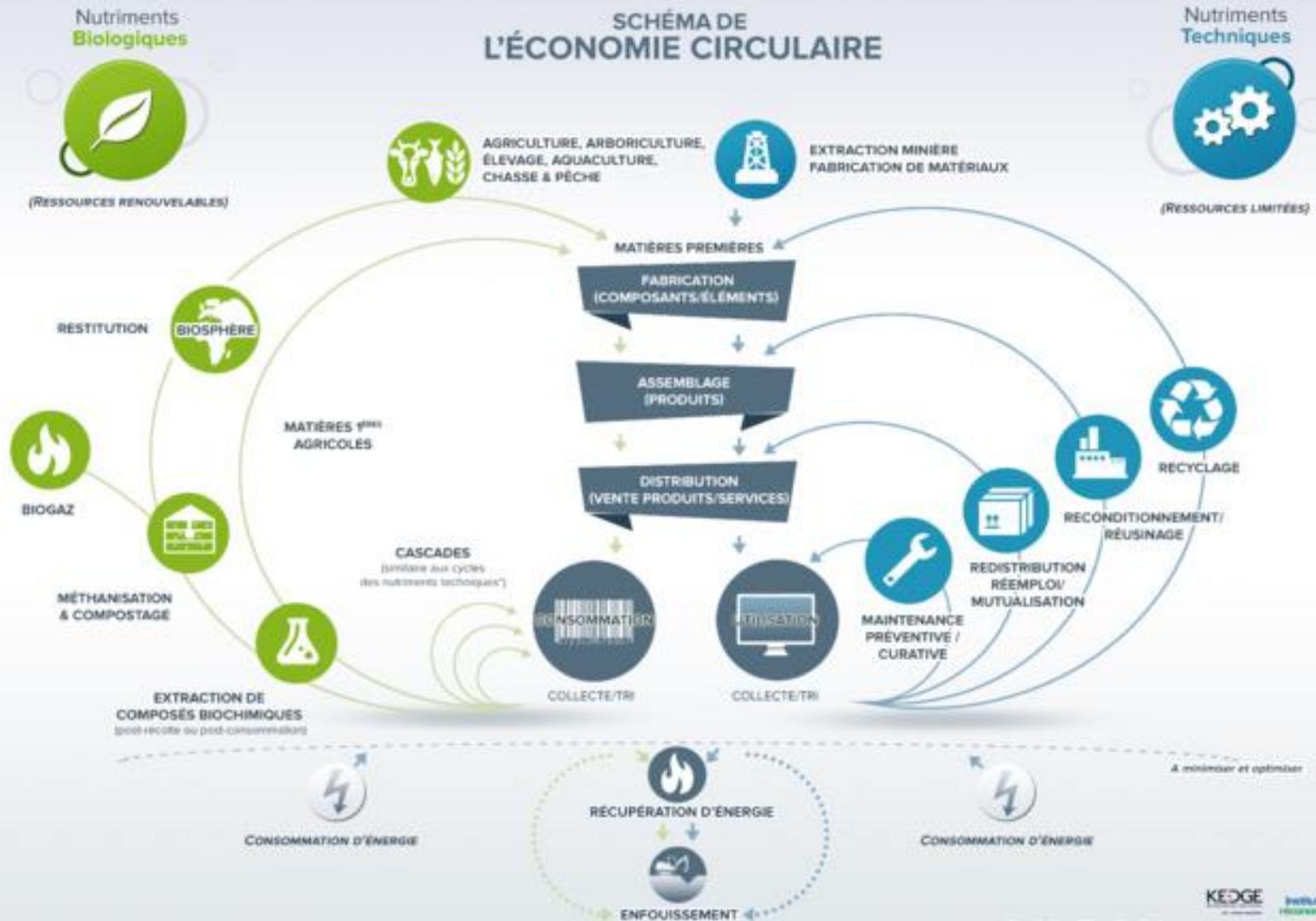
« In essence, a circular economy represents a fundamental alternative to the linear take-make-consume-dispose economic model that currently predominates. This linear model is based on the assumption that natural resources are available, abundant, easy to source and cheap to dispose of, but it is not sustainable, as the world is moving towards, and is in some cases exceeding, planetary boundaries »

-EEA

What is circular economy?

- Circular Economy is a very large subject with several imbedded notions :
 - Waste Management (**Recycling**, Energy recovery ...)
 - Consumer attitude (**Reuse, reemploy, repair**, responsible buyers, ...)
 - Industrial responsibility (Eco-innovation, **Industrial ecology**, sustainable sourcing...)
 - Decarbonation
- However, Circular Economy is **NOT a concrete methodology**, there is no ISO standard associated to it and there are no rules.
- Circular economy is a **vision** : how can we transform a linear model into a more sustainable use of resources ensuring the **decoupling of economic growth and resource consumption**? How can we make a product *good*, instead of just *less bad*?

SCHÉMA DE L'ÉCONOMIE CIRCULAIRE



(*) ces cascades se retrouvent à toutes les étapes de la vie du produit

Graphique adapté de la **Fondation Ellen MacArthur** par l'**Institut de l'économie circulaire** et la chaire "business as unusual" de **KEDGE Business School** - Version 1.2 Novembre 2013

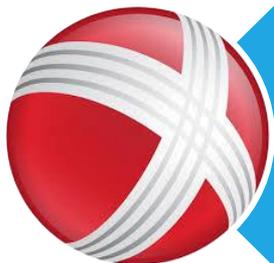
Is Circular Economy a new idea?



Schweppes started recycling its bottles in the UK in the 1800's



Craigslist a virtual C2C classified advertisement company was created in 1995



More than ten years ago, Xerox started selling copies instead of selling photocopiers

Some examples of Circular Economy Projects/Models

Examples		
REgenerate 	<ul style="list-style-type: none"> Shift to renewable energy and materials Reclaim, retain, and restore health of ecosystems Return recovered biological resources to the biosphere 	    
Share 	<ul style="list-style-type: none"> Share assets (e.g. cars, rooms, appliances) Reuse/secondhand Prolong life through maintenance, design for durability, upgradability, etc. 	   
Optimise 	<ul style="list-style-type: none"> Increase performance/efficiency of product Remove waste in production and supply chain Leverage big data, automation, remote sensing and steering 	     
Loop 	<ul style="list-style-type: none"> Remanufacture products or components Recycle materials Digest anaerobic Extract biochemicals from organic waste 	       
Virtualise 	<ul style="list-style-type: none"> Books, music, travel, online shopping, autonomous vehicles etc. 	      
Exchange 	<ul style="list-style-type: none"> Replace old with advanced non-renewable materials Apply new technologies (e.g. 3D printing) Choose new product/service (e.g. multimodal transport) 	    

Circular Economy at the national level

- Several countries have decided to encourage, develop and structure circular economy



The United States Materials Marketplace is a project from the US Business Council for Sustainable Development to scale up business-to-business materials reuse across the US.



In France, Circular Economy has become one of the main topics for ADEME, with the development of guides and projects on recycling, industrial ecology and ecodesign



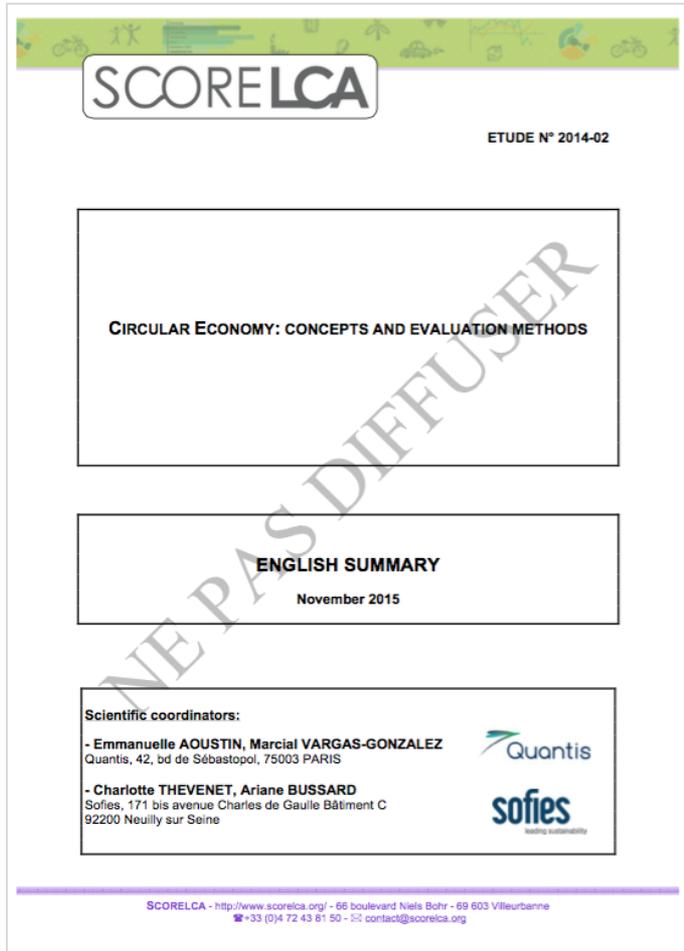
In 2002, China accepted the circular economy development strategy. Since, they have gone from a tight recycling policy to a reduction of waste at every life-cycle stage



HOW ARE CIRCULAR ECONOMY AND LCA RELATED?

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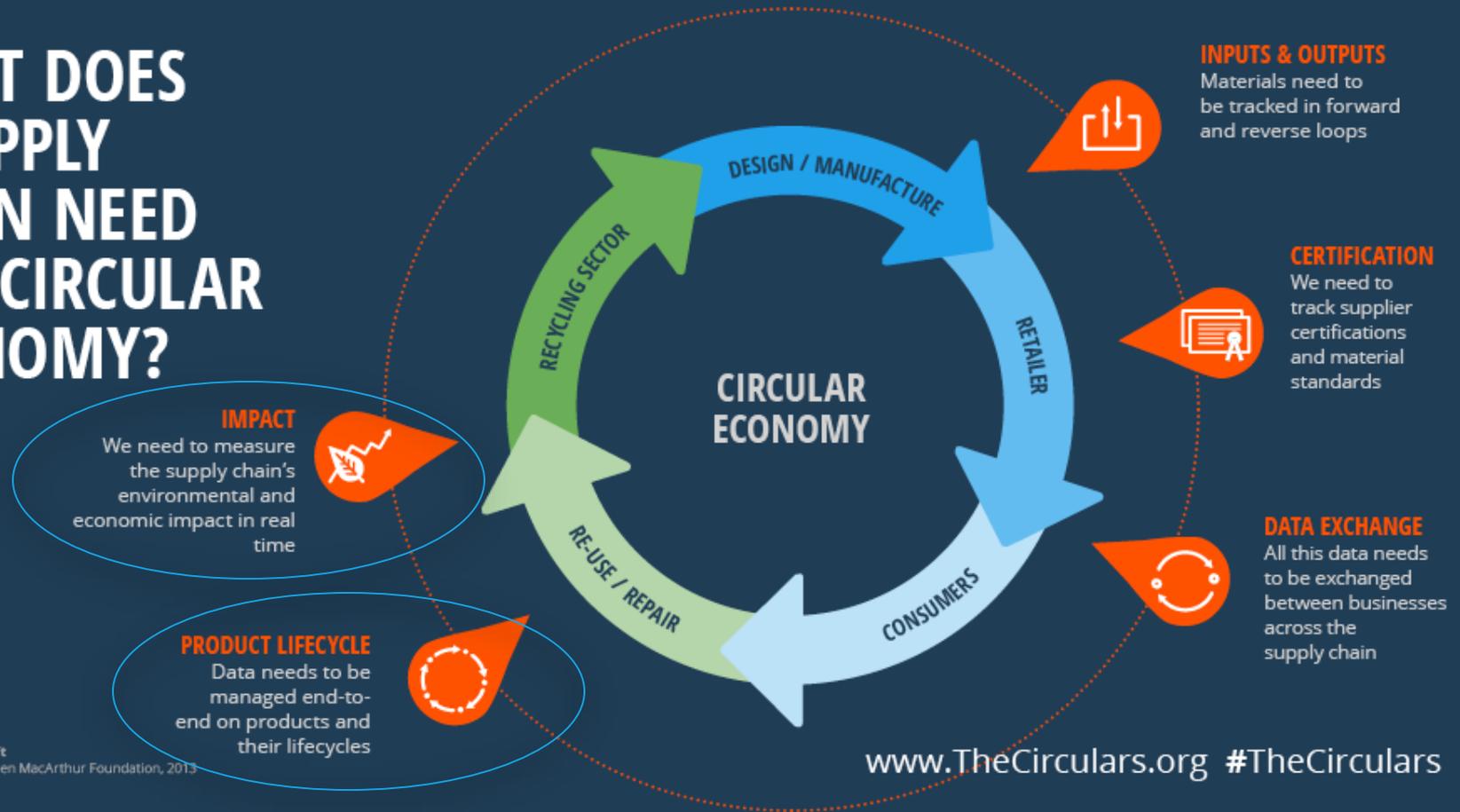
SCORELCA Report



- In 2014, SCORELCA launched the *Circular Economy : Concepts and Evaluation Methods* project.
- The goal was to present the main circular economy concepts to LCA practitioners and to identify the best evaluation methods for material-loops

Life Cycle Thinking and Circular Economy

WHAT DOES A SUPPLY CHAIN NEED IN A CIRCULAR ECONOMY?



Created by Tradeshift
Source: Tradeshift / Ellen MacArthur Foundation, 2013

Life Cycle Thinking and Circular Economy

- *Life Cycle Thinking* and *Circular Economy* interact and feed off each other!
 - Circular Economy can be used for Eco-design
 - LCA can be used to evaluate Circular Economy Projects
- **However**, in some cases, *Circular Economy* and *Life Cycle Thinking* can have opposing views
 - Ex. Circular Economy encourages recycling (no questions asked), in LCA energy recovery is sometimes more beneficial



A few methodological questions...



Are the methods used to evaluate *Resource Depletion* relevant in the context of Circular Economy?

What are the methodological considerations when **modelling** material-loops?

How should **loss of quality** after recycling be taken into account?

Should impacts be **prioritized** and how?

How can **other evaluation methods** help LCA practitioners improve their studies?

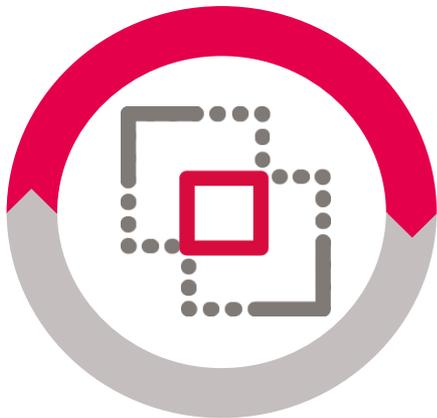
... and some concrete recommendations



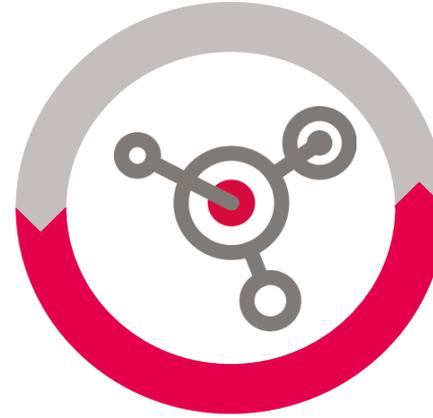
When should
Waste LCA be
used



How are
different EoL
approaches
relevant in
different
contexts



When should
the quality
factor be
applied



Which issues
should be
considered in
order to create
consistent
methodologies

Using LCA to evaluate *Circular Economy*

- LCA is a great tool to evaluate circular economy, the philosophy between both concepts being quite similar. Circular economy encourages Life Cycle Thinking
- LCA does NOT have all the answers when dealing with Circular Economy projects. Most notably :
 - Dissipative losses of raw materials are hardly taken into account by standard *Resource Depletion indicators*
 - The usual **EoL approaches** are not always the ideal solution to encourage circular economy
 - *Downcycling and Upcycling* are difficult to evaluate
 - Impact weighting or *absolute environmental sustainability indicators* seem necessary in a circular economy context.

If people stand in a circle long enough, they'll eventually begin to dance.

GEORGE CARLIN