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Life Cycle Methodologies for Regions

Good Practice Policy using LCA and LCM

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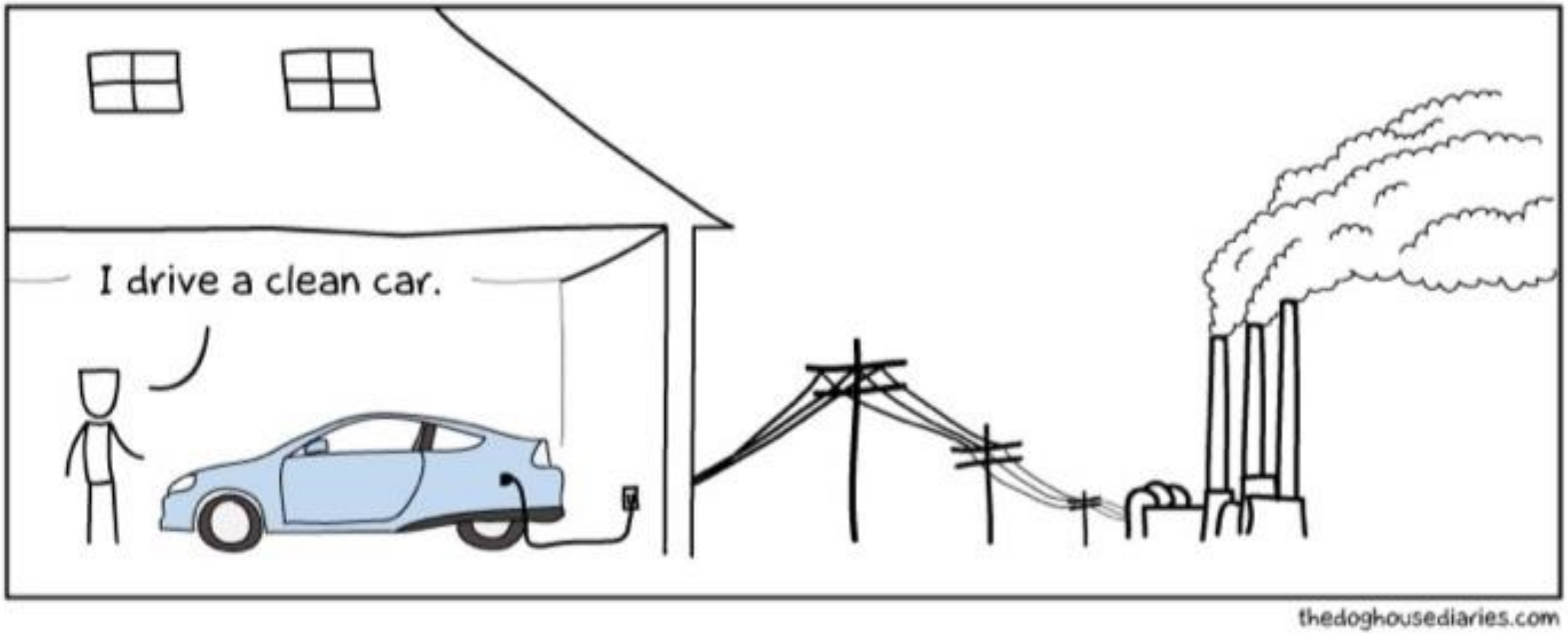
An everyday example

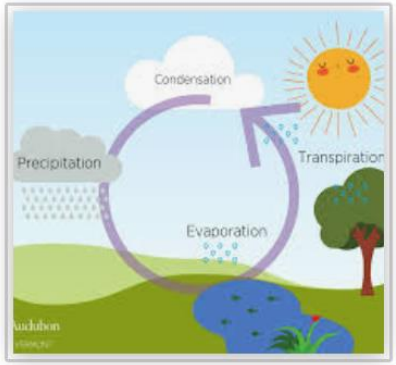
Real life is filled with contradictions



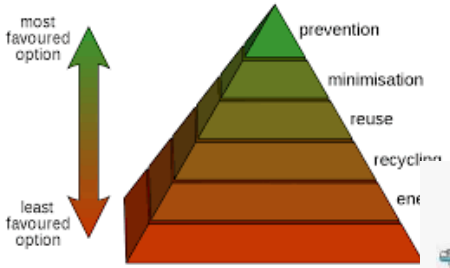
Why think life cycle ?

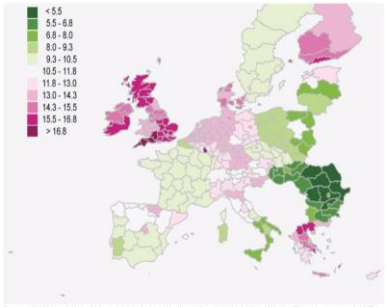
- Avoids impacts, not remediates them (at a cost)
- Reduces the ‘burden shifting’ problem (no spill-over effects)
- Achieves greater system efficiency (reduces wastage)
- Lower total cost
- Addresses upstream and downstream issues we care about
- Addresses the time-shift problem (deal with it now!)
- Takes into account intergenerational responsibilities

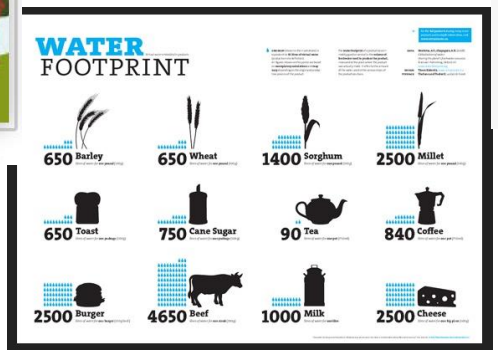
Some regional life cycles

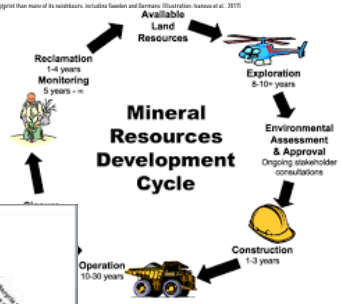


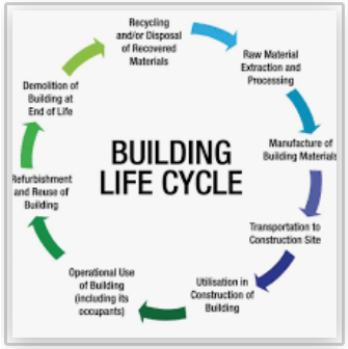
The Water Cycle Revisited! | Aud...

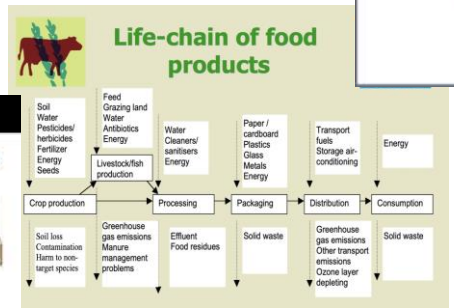




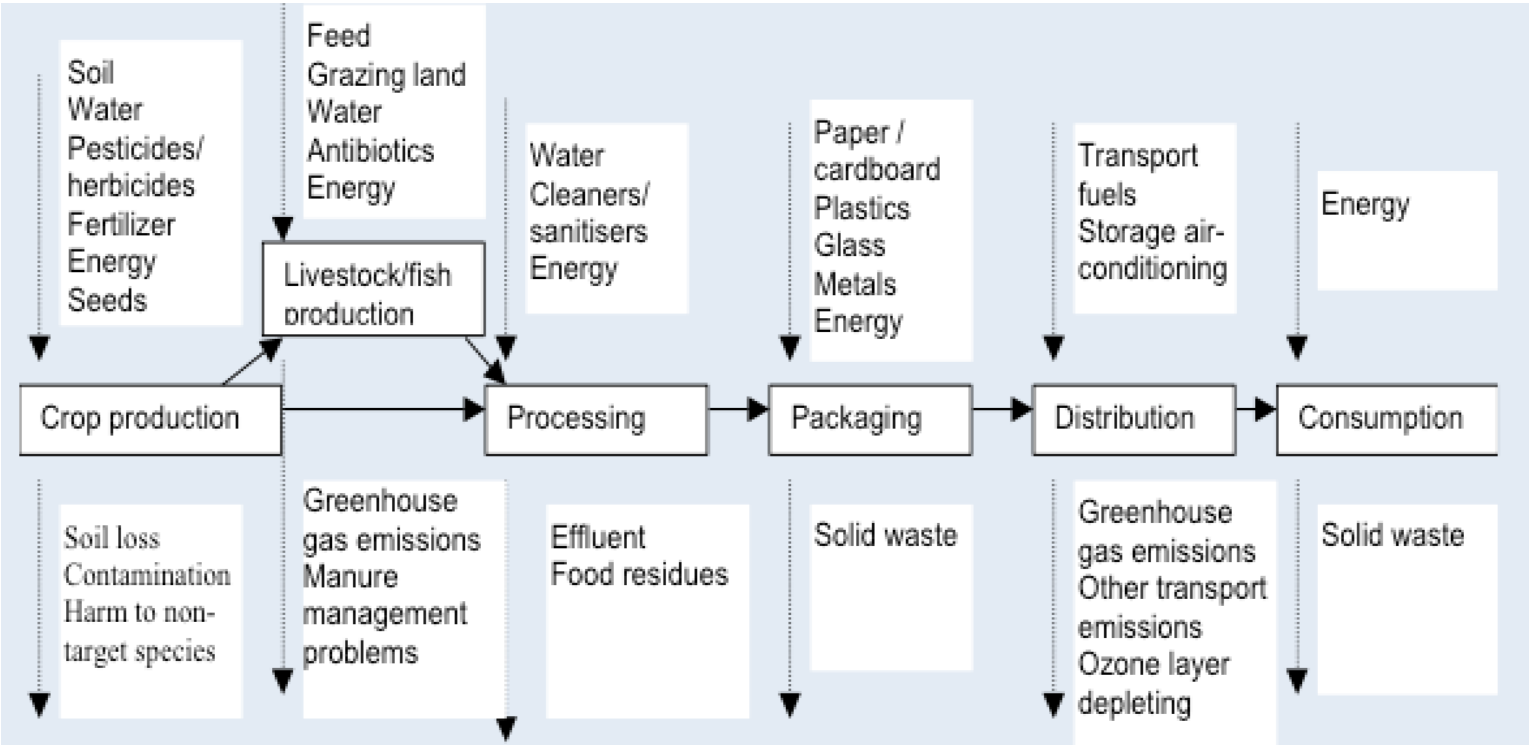








Life chains have multiple inputs and outputs



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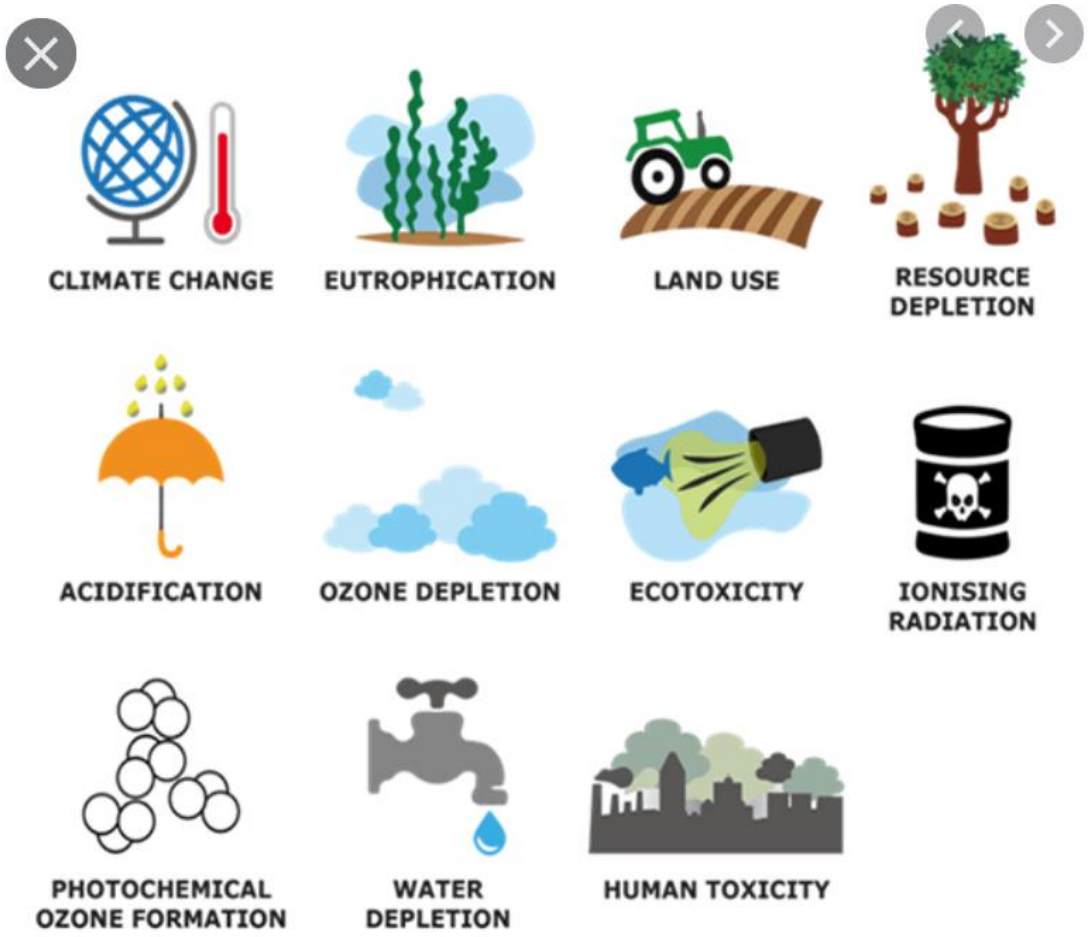
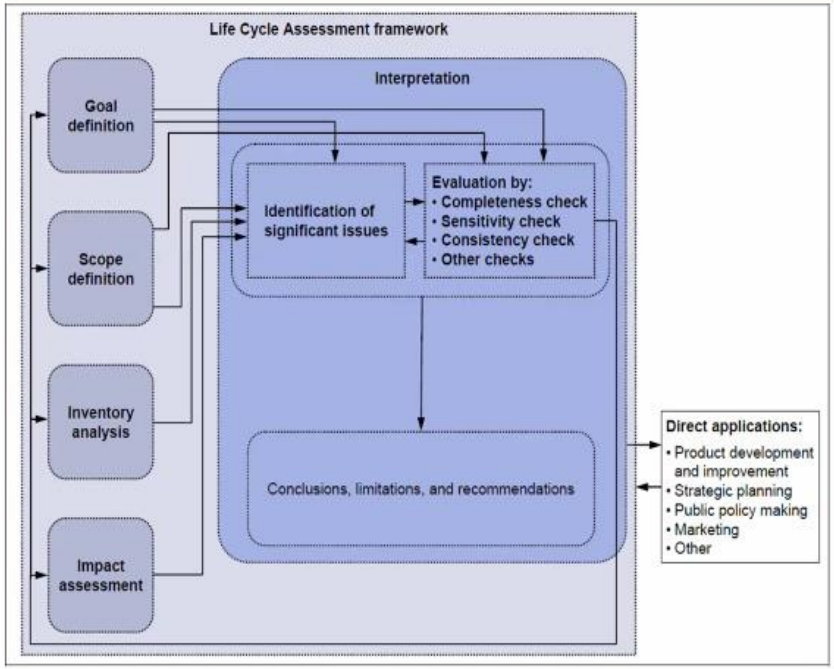
Multiple environmental impacts



Source JRC

LCA method overview

ISO 14040: 2006 LCA - Principles and framework



(Source: ILCD Handbook, 2010)

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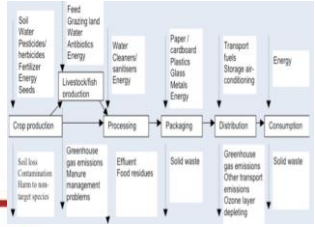
LCA scope definition

System Boundaries



- System boundaries are need to be defined in accordance with the intent and goal of the study
- All processes that contribute to deliver the function of the product being studied need to be included
- System boundaries influence results of LCA and hence shall be defined in accordance with the best practice in LCA
- There are foreground and background processes
- Technical system boundary, geographical system boundary and temporal system boundary

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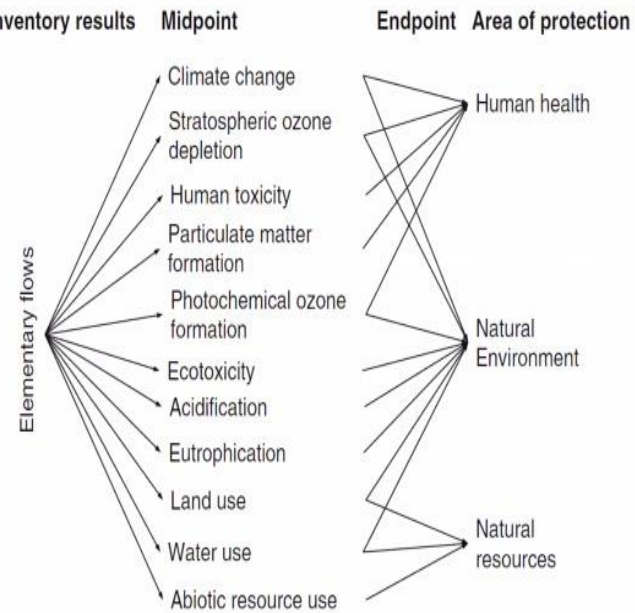
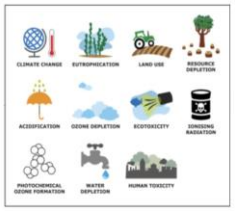
LCA ‘endpoints’

Midpoint Versus Endpoint Indicators





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(Source: Hauschild, M. Z., & Huijbregts, M. A. (Eds.). (2015). *Life Cycle Impact Assessment.* Springer)

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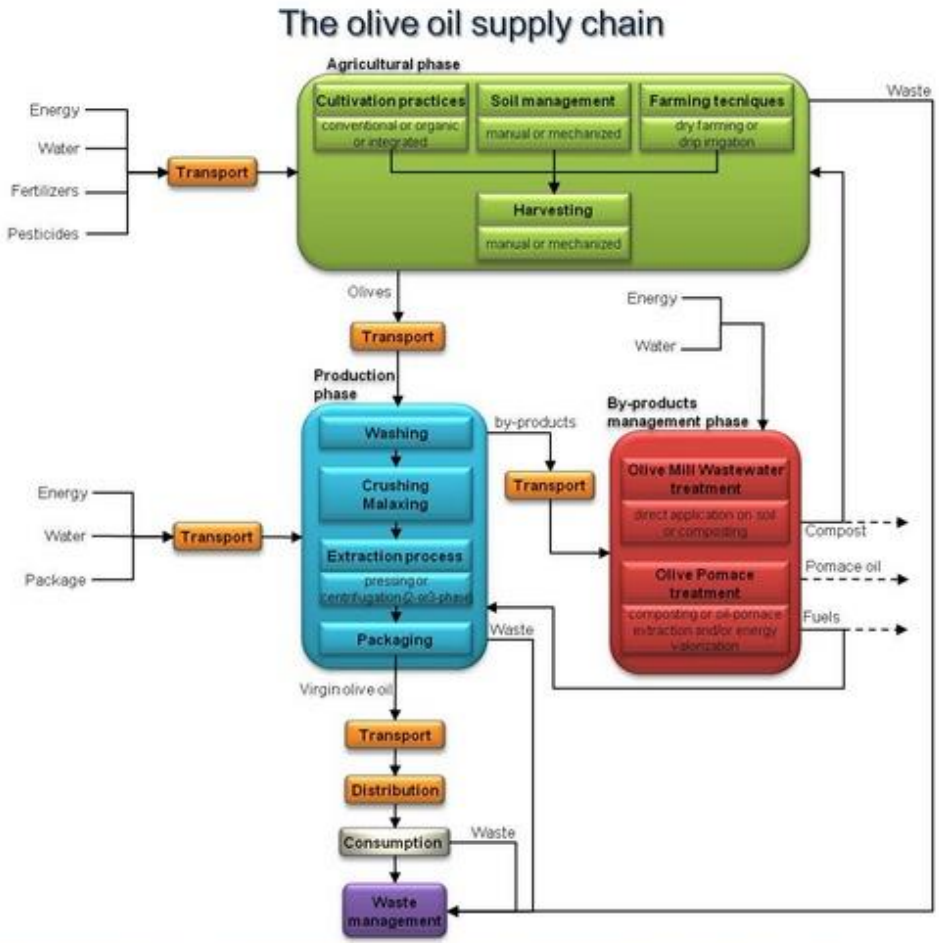
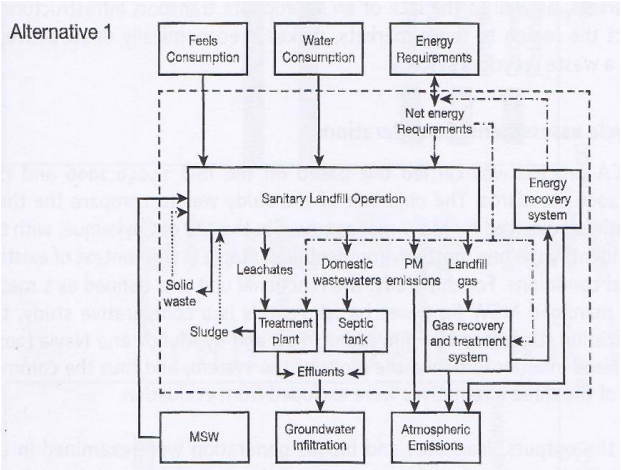
Typical LCA of a product (note the waste flows)

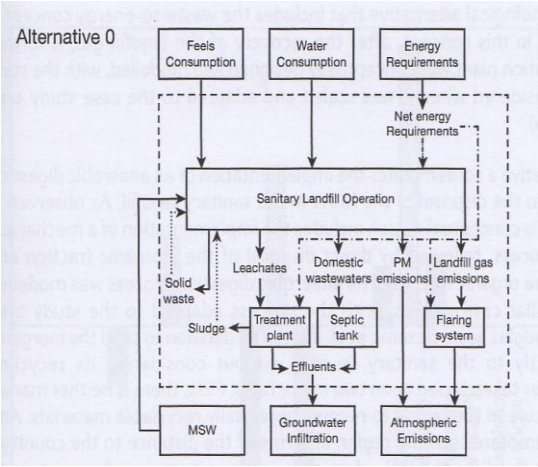


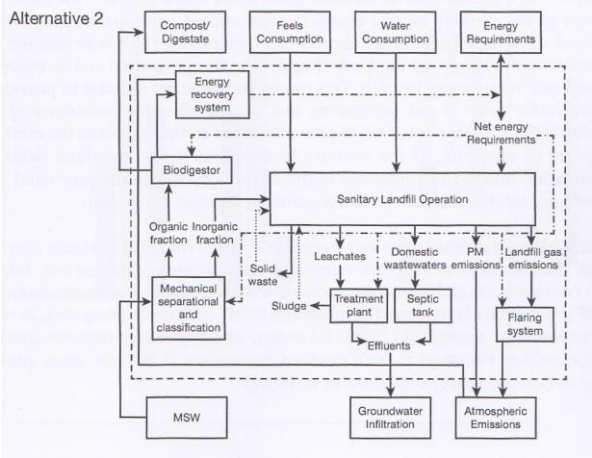
Please note that only the main processes and the main inputs/outputs of the supply chain are indicated

LCA - Comparative impact assessment

3 waste management options compared – landfill, incineration, recycling

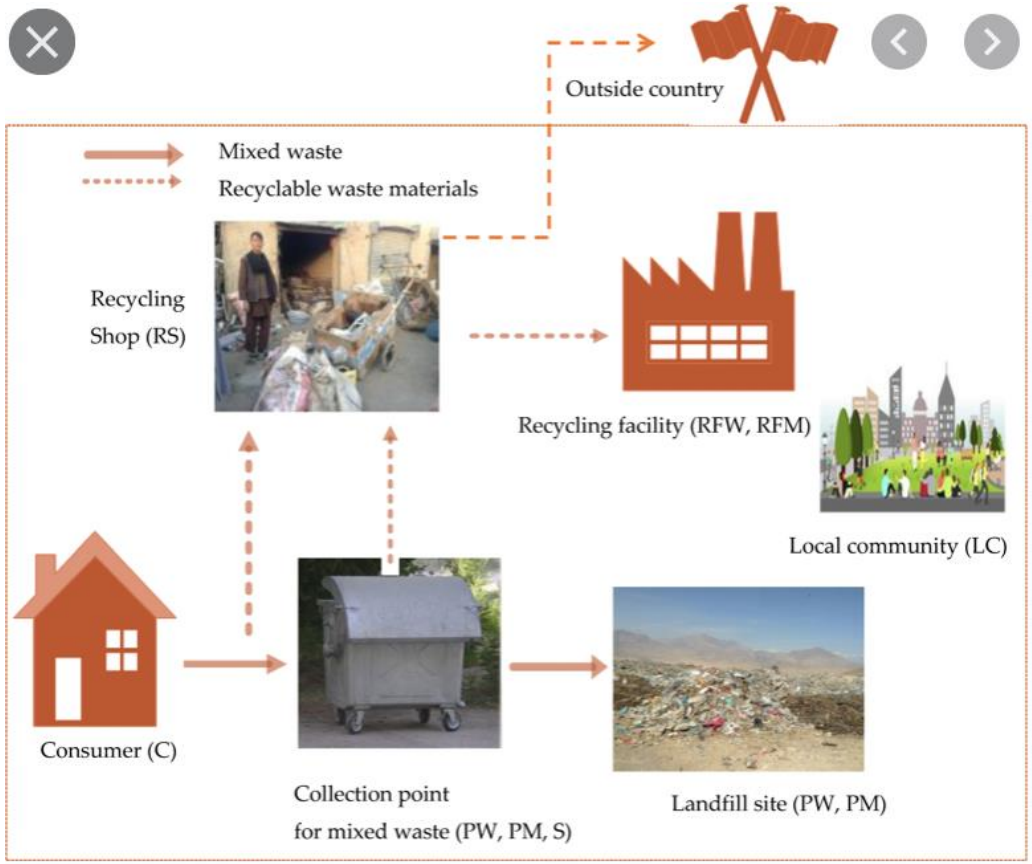


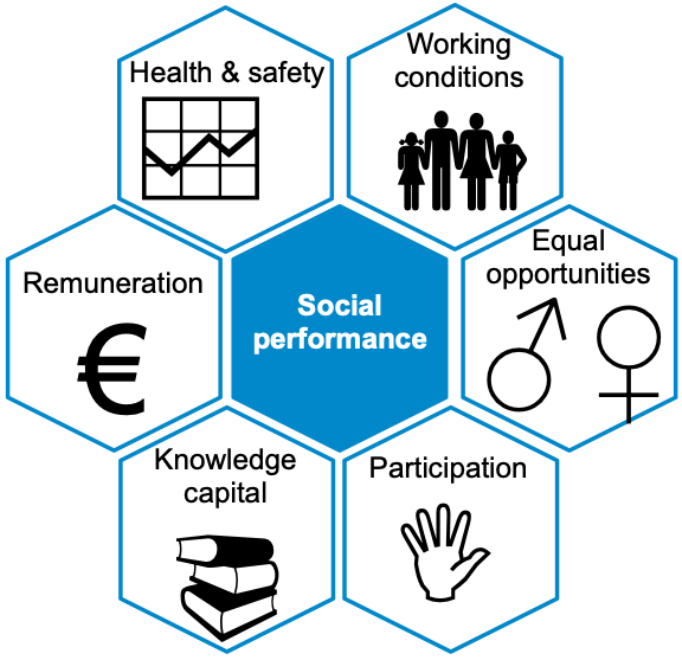




sLCA – Social Impact Assessment

of a waste recycling system

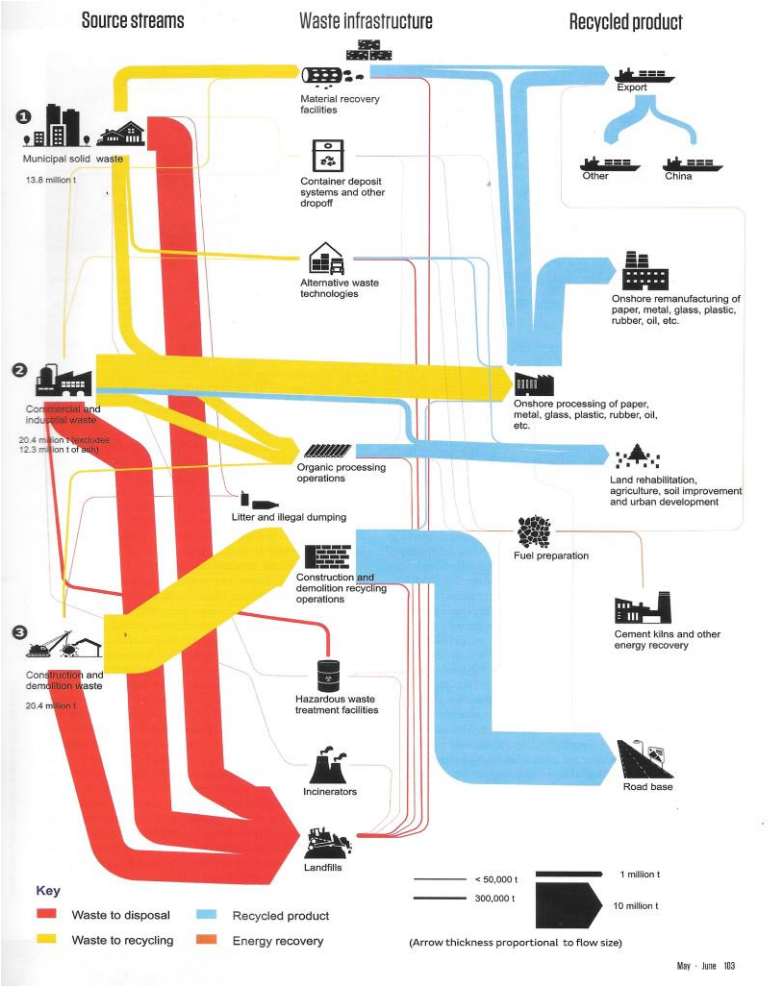




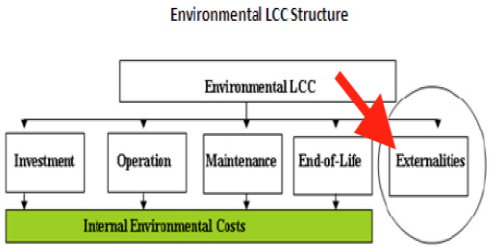
Aspects of social performance

Materials Flow Analysis (MFA)

example of
regional waste flows



Environmental Life Cycle Costing (LCC)



- Traditional costing – consider only initial purchase price
- Internal life cycle costing – account for internal cost flows
- Full life cycle costing – internal + external public costs

Simple example:

Cost of a printer + ink cartridges & electricity + eol disposal

Option: consider social issues at point of manufacture and of recycling

Selected Life Cycle Tools, Procedures and Concepts useful for efficient and effective implementation of SDGs

Life cycle systems and concepts

Circular economy
Industrial ecology
Product-service system
Cradle to grave/cradle to cradle
Environmental/sustainability footprints

Life cycle assessment tools and methods

Life cycle assessment LCA* (materials, energy)
Materials flow assessment (MFA)
Input-Output tables
Social LCA (SLCA)
Sustainability LCA
Organisational LCA (O-LCA)
Life cycle Costing (LCC)
Chemicals assessment*
Risk assessment
Evolving assessment tools for biodiversity, LULUC, landscape etc.

Action tools based on LCA

Eco-labels*
Environmental Product Declarations (EPD)*
Product environmental footprint (PEF)*
Eco-design

Life cycle Management Tools

Sustainable supply-chain management (SSCM)
Circular materials management
Sustainable and/or circular public procurement (SSP, CPP)
Green purchasing (GP)
Extended Producer Responsibility (EPR)
Environmental Management Systems* (EMS, EMAS)
Sustainability reporting* (e.g. GRI)

*1. Some of the above have been standardized procedures under international agreements or practices**
2. Other concepts such as sustainable production, resource efficiency, etc. also provide useful frameworks for implementing selected SDGs

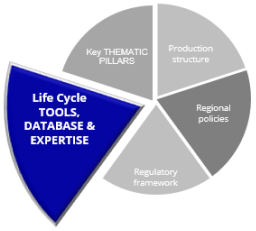
Two main interest areas -

* Assessment and analysis (LCA)
* Management action (LCM)

Regional life cycle relevance

- policies, programmes, products

- SDGs and policy goals
- Sustainability systems – CE, IE, bio-economy
- Sustainable products from the region (EPD, PEF, AOP)
- Sustainable industry (IPP, RE)
- Regional infrastructure, and eol (LCA, RE, LCC)
- Resource management and planning (MFA, EIA and LCA)
- Water resources, land and agriculture (Footprint, LCA)
- Natural capital (LCC)
- Environmental approvals and permitting (XMP, LCA)
- Waste management planning and execution (LCA, MFA, LCC)



Examples of partner use of LCA

LCA of municipal waste strategies in Lithuania

LCA of bio-digestion options of waste materials in Finland

LCC for methods to reduce energy use on construction sites in Italy

LCA for building insulation in Poland

GHG footprint for public services in Pamplona

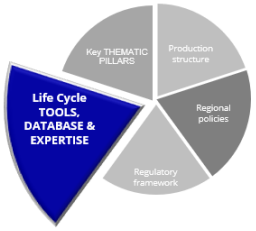
LCA for packaging in Slovenia

LCA/EPD for wind energy in Navarra

LCA of land restoration in Finland

Some applications of regional life cycle management (or how to act on LCA results)

- Design/re-design and promote regional (sustainable) products
- Adopt sustainable infrastructure (buses, water, energy, tourism)
- Green procurement for regional institutions
- Integrated waste management
- Assign producer responsibility for damage (EPR)
- Require environmental/sustainability information for products
- Product regulation – bans, quality, circularity
- Factory approvals & permits
- Sustainability reporting, eg GRI



Example of regional use of the LC toolbox (Navarra):

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LC Assessment tools

Calculation of Carbon emissions in services of the Commonwealth of the Region of Pamplona: analysis of services and facilities to calculate greenhouse gas emissions (water cycle, urban waste, urban transport). Registry of carbon offset and CO2 absorption projects. 15 organizations in Navarra have registered their carbon footprint.

Carbon footprint
- Navarra asparagus and the cured sheep cheese Latxa de Lezaun
- Oil production - oleohealth 2013- calculation of GHG emissions

MFA (Materials Flow Analysis) - Inventory of GHG emissions in Navarra**:** evaluation of GHG emissions taking into account both the **sectors** that originate them and the **type** of GHG

LCA for organic extra virgin olive oil 2008-2010: LCA, SLCA, and LCC to assess environmental, economic and social impacts.

Footprint calculation models
UMBERTO; SIMAPRO; SIMUR; EURENERS; ENECO

Indicators: See section 4.5 on the regional analysis

LC Management tools

Eco-design ISO 14006
- LCA for designing healthy and sustainable food menus in municipal schools

Eco-label: Register of Navarra Products with European Ecological label:
- tissue paper napkins of SCA Hygiene Spain S. Com. P.A
- quilt and mattress protector from Textiles Inducam SL
- Hotel Rural Aribe
- lubricating greases from Verkol, S.A.U

EPD (Environmental Product Declarations) - use of LCA to support certification
- EGGNOVO, has 3 EPD for different products derived from eggshells
- COMPOSITES GUREA had in its day 1 registered EPDN (removed)
- ACCIONA and SIEMENS GAMESA have 6 and 9 registered EPDs each for installed wind farms.

Ecological Footprint – regional environmental footprint considering material resources and waste generated for the maintenance of the production and consumption model of the community.

Carbon footprint reductions
- Carbon offset scheme for municipal energy consumption
- Purchase of green energy by municipality
- Energy efficient public transport (buses)

Management Systems ISO 14001 (427 certified organizations) and **ISO 50001** (9)

Circular and sustainable materials management:
- Reusing drinking glasses at parties and events for public services
- "Nights without plastics" in Informal Room of Tafalla to reduce footprint of events
- Olite, ecological municipality to eliminate plastic material, and decrease footprint
- ECOCIRPLAS Project - life cycle analysis approach to waste management in the Foral Community, promoting waste reduction and its reuse and recycling as key management principles.
- Lourdes Renove

Green Procurement:
- LCA and calculation of Carbon Footprint for road cleaning tenders of Pamplona

Summary

Life cycle thinking improves sustainability of regional actions.

The sustainability agenda is broad (17 UN SDGs). Regions engage in many activities, and with so many SDGs and impacts to take into account, there is a search to simplify solutions. But simplicity comes at a high price.
To simplify regional policies it is common to address only a few issues (*'cherry-picking'*), leaving the others aside. This often just moves the impact elsewhere (*the 'spill-over effect'*) rather than actually solving the problem. (EVs are a good example of this – see slide 2)

A system-based life-cycle framework for decision-making is a better approach.
There is a life cycle toolbox from which regions can choose the most appropriate approach.

Life cycle assessment tools (LCA) can assist regions in evaluating their sustainability impact (*footprint*), and also that of possible sustainability responses (the *'solutions'*). Many assessment tools are sufficiently mature for use by regions. Some tools still need to evolve further.

Life cycle management frameworks embrace multiple stakeholders in a collective solution. They are often sector- or materials-specific (e.g. for construction), or embrace a more general approach across all areas (e.g. procurement).

Measurement of the outcome is important for quality assurance and communication.

10-step life cycle filter for your GP

1. Clarify the purpose of your GP; which problem are you trying to solve?
2. Map out the key life chain stages considered by your GP activity.
3. Identify potential impacts of your GP activity – environment, social, economic.
4. Note the sustainability objectives of your region (which SDGs?)
5. Choose appropriate LCA tools to assess the potential impacts and costs of the problem, and of your GP solutions.
6. Undertake a quantitative analysis, using appropriate data bases and calculation models. Summarise the results.
7. Propose appropriate LCM tools to mitigate potential impacts.
8. Identify stakeholders and partners (and also opponents) in the LCM exercise.
9. Implement the LCM procedures, and measure the results
10. Report results to the stakeholders. Share your experiences.

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Thank you!

Questions welcome

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Postscript

This presentation is necessarily brief.

If you or your stakeholders are interested in a more comprehensive “orientation” workshop at a future time to perfect your understandings and skills, please let Sandra know of your interest.