Components and operationalization of a framework for sustainability assessment

Serenella Sala

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Joint Research Centre

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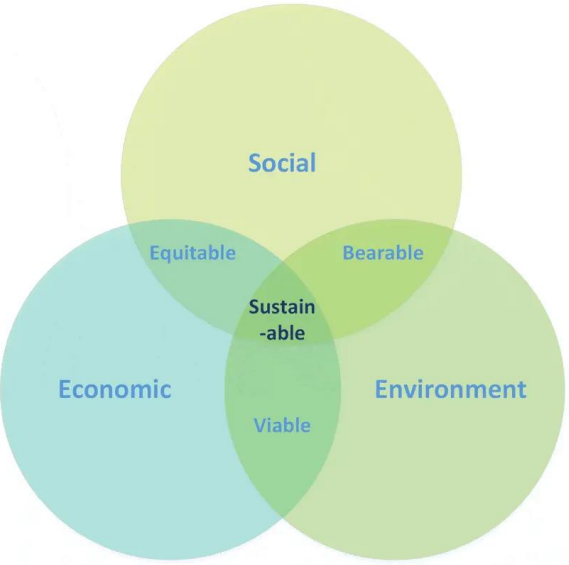
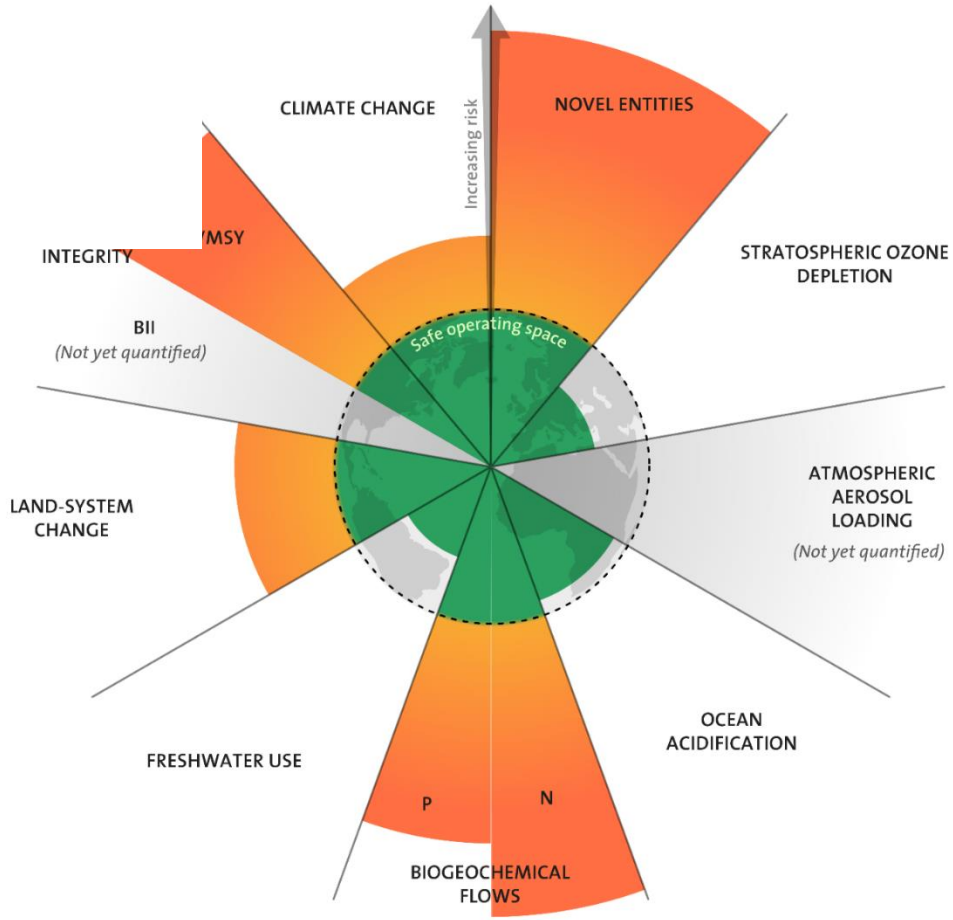


- Framework for sustainability assessment
- Key features of approaches to sustainability assessment
- Examples of integrated assessment:
  - The *KnowSDGs platform*
  - The life cycle assessment based *consumption footprint food platform*

*"A life of dignity for all **within the planet's limits** that reconciles economic prosperity and efficiency, peaceful societies, social inclusion and environmental responsibility is at the **essence of sustainable development**"*

COM(2016) 739 final: Next steps for a sustainable European future



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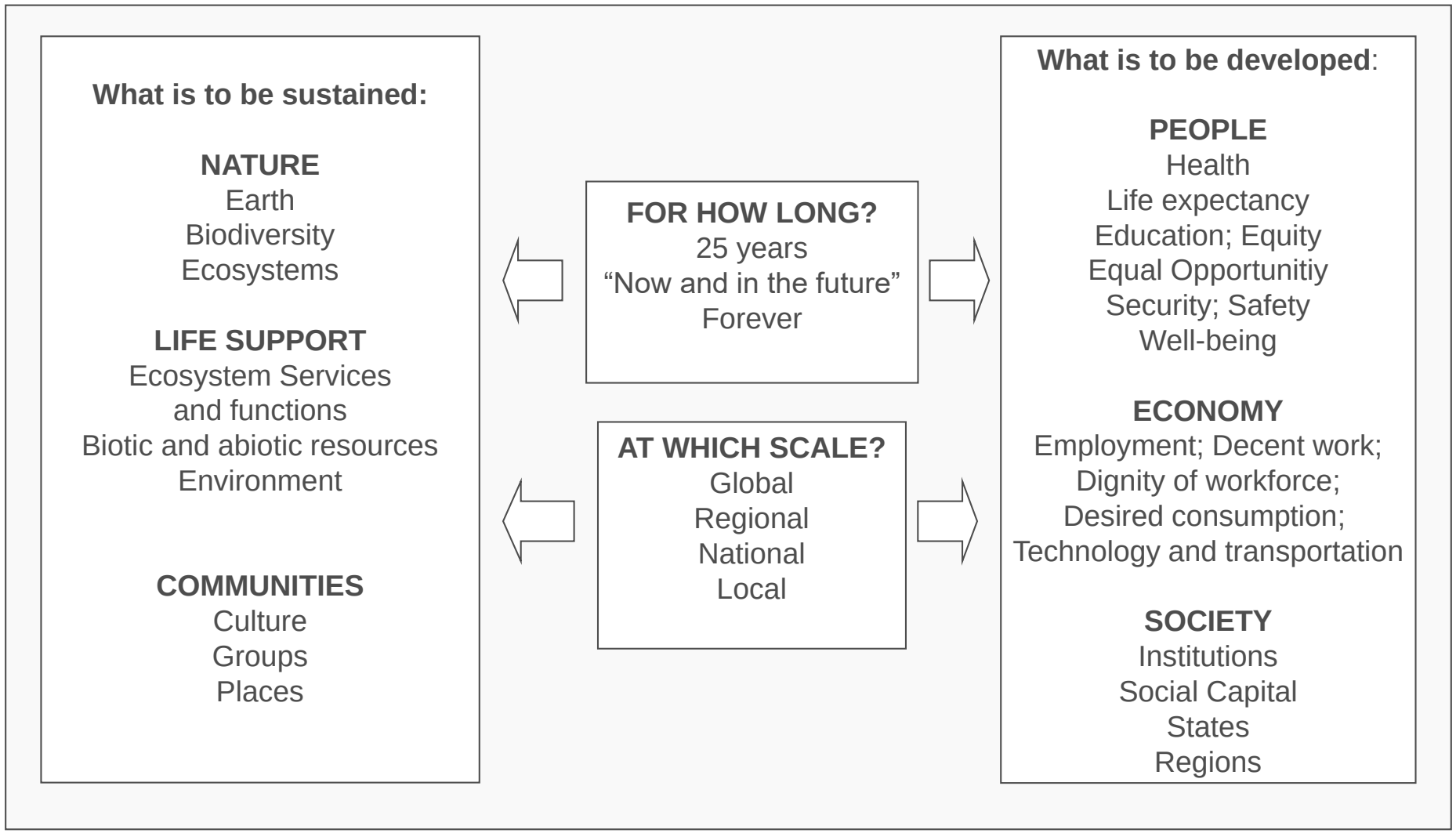
What is to be sustained and what to be developed?



Examples of SUSTAINABLE DEVELOPMENT PRINCIPLES

Precautionary principle; Irreversibility; Regeneration; Substitutability; Critical Loads/carrying capacity; Holistic approach; Polluter Pays; Future generations; Good governance: i) Subsidiarity; ii) Proportionality; iii) Public Participation

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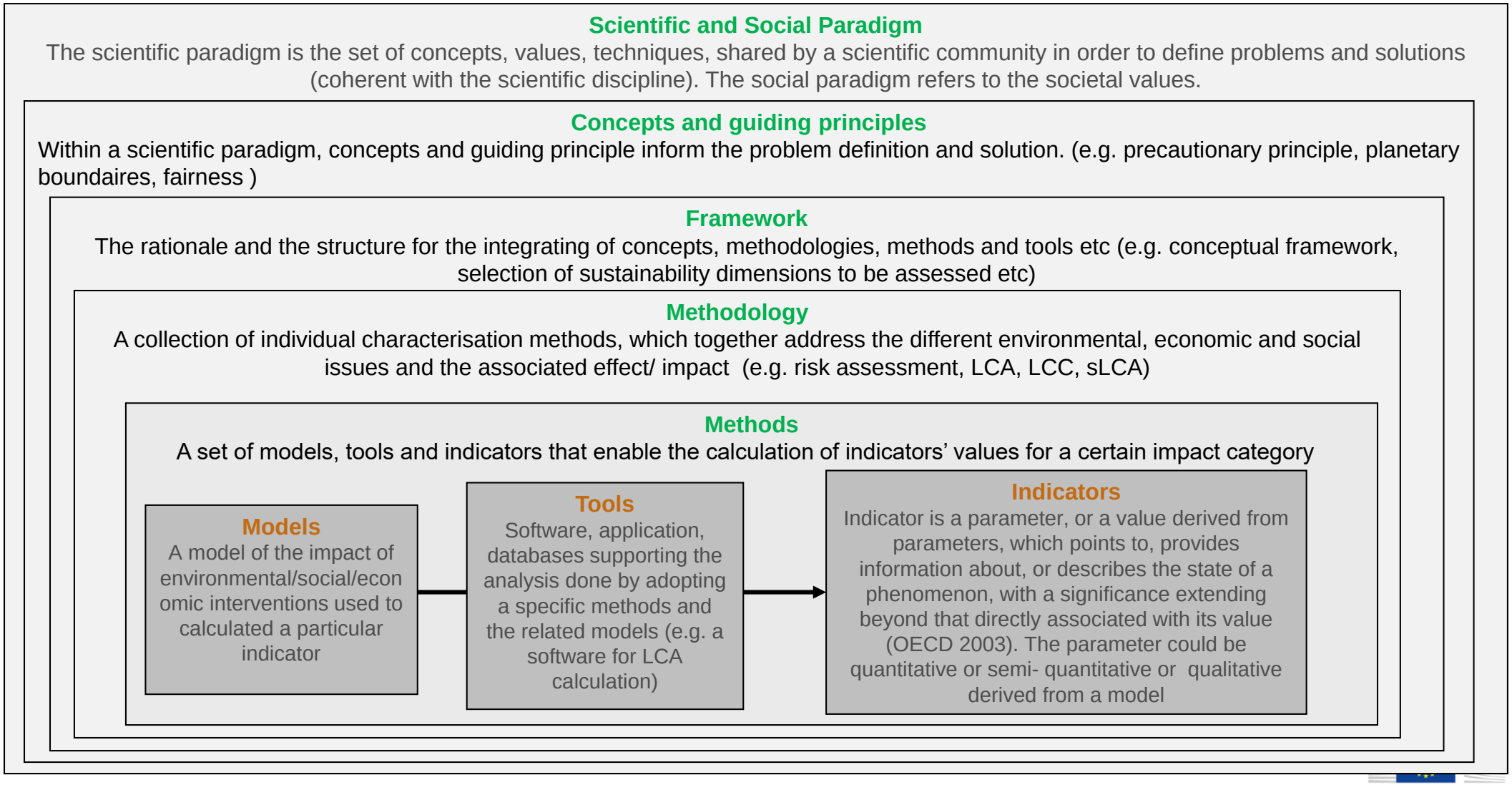
Modified from: Sala S., et al (2013) Progress in sustainability science: lessons learnt from current methodologies for sustainability assessment (Part I). International Journal of Life cycle Assessment 18:1653-1672

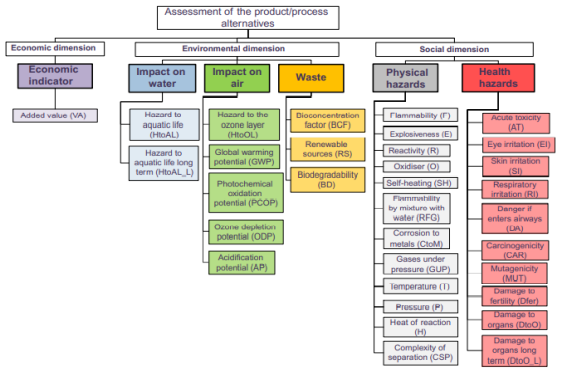
What is a framework for sustainability assessment?



Modified from: Sala S., et al (2013) Progress in sustainability science: lessons learnt from current methodologies for sustainability assessment (Part I). International Journal of Life cycle Assessment 18:1653-1672

Conceptual and operational frameworks

Conceptual → Operational → Including criteria and scoring systems



SSG class	Solvent	Environmental - Waste	Environmental - Impact	Health	Safety	LCA ranking
Alcohols	Ethylene glycol	4	9	8	9	9
	1-Butanol	5	8	8	8	5
	Diethylene glycol butyl ether	5	7	10	9	7
	Isoamyl alcohol	7	7	7	8	6
	2-Ethylhexanol	9	6	8	7	6
	2-Butanol	4	7	7	7	6
	1-propanol	3	7	5	8	7
	Ethanol	3	8	10	7	9
	2-propanol	3	9	9	7	5
	t-butanol	3	10	7	7	8
	Methanol	3	10	5	8	9
Esters	t-butyl acetate	7	10	7	7	7
	Butyl Acetate	7	8	9	8	5
	n-Propyl acetate	6	7	8	7	5
	Isopropyl acetate	5	8	8	7	6
	Ethyl Acetate	4	8	8	4	6
	Methyl acetate	2	10	7	5	7
	Dimethyl carbonate	5	7	8	7	8
Aromatics	p-Xylene	8	2	7	5	7
	Toluene	7	3	6	4	7
	Fluorobenzene	4	2	4	5	1
Ketones	Methyl isobutyl ketone	7	6	6	7	2
	Acetone	2	9	8	5	3
	Methyl ethyl ketone	3	6	8	5	3
Polar Aprotics	N-Methyl-2-pyrrolidone	4	6	8	9	3
	dimethyl acetamide	4	7	2	10	3
	Dimethyl formamide	4	6	2	8	6
	Dimethylpropylene urea	4	7	5	9	4
	Dimethylsulphoxide	4	4	8	3	6
	Formamide	3	7	2	10	8
	Acetonitrile	2	6	6	8	4
Acids	Propionic acid	5	8	4	9	7
	Acetic acid	3	8	4	8	8
Alkanes	Cyclohexane	5	6	8	2	7
	Methyl cyclohexane	7	5	8	2	7
	Heptane	6	3	9	1	7
	2-Methylpentane	5	3	5	1	7

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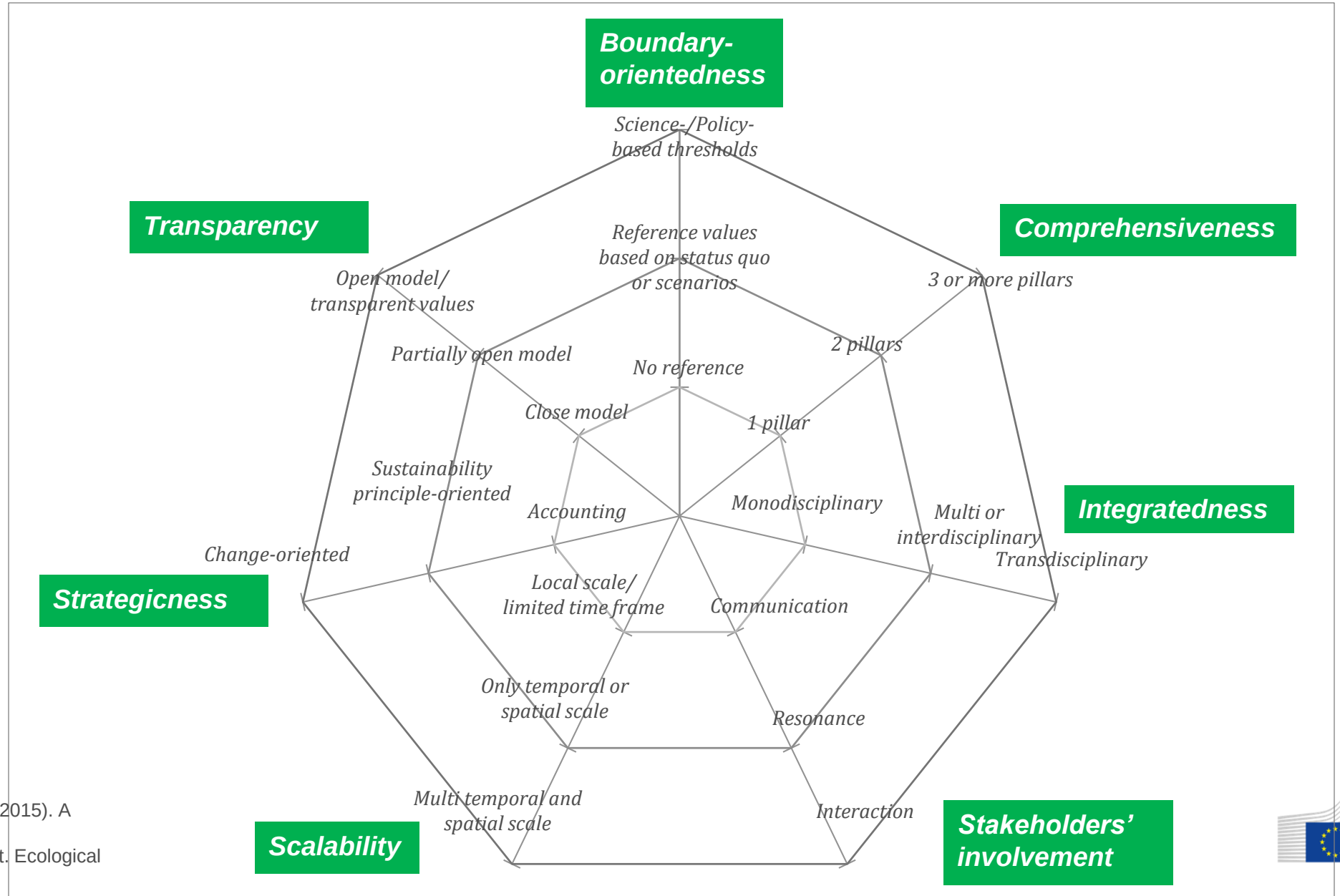
Key features of sustainability assessment methods



Modified from: Sala et al (2015). A Systemic Framework for Sustainability Assessment. Ecological Economics 119: 314-325

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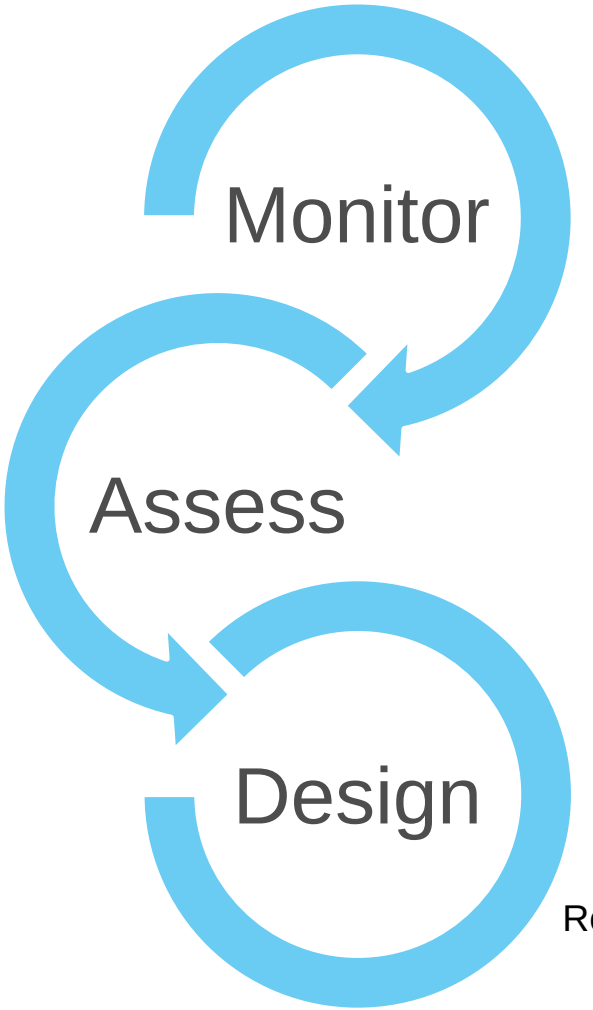
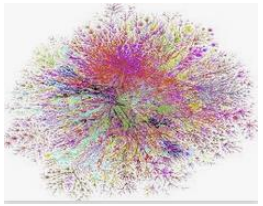
How to monitor, assess and design sustainable solutions



Knowledge management, including monitoring

Complex systems sciences

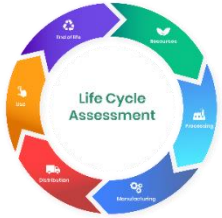


Storytelling

Regenerative economy

Foresight

Life cycle assessment



Modelling (environmental and socio-economic)

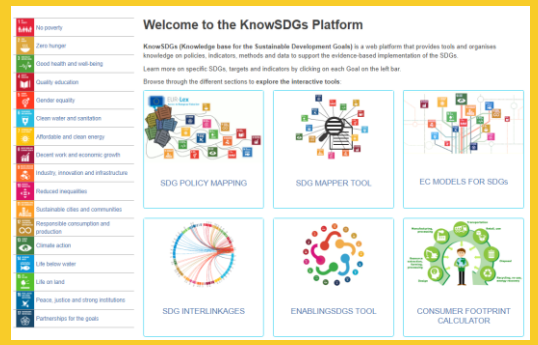
Responsible innovation

Example of two platforms for integrated assessment developed by the JRC:

QUALITATIVE

KnowSDGs platform

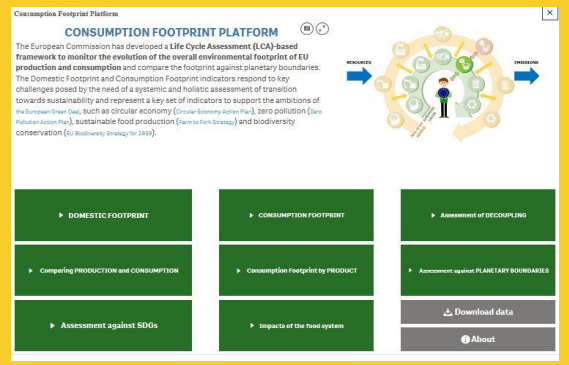
https://knowsdgs.jrc.ec.europa.eu/



QUANTITATIVE

Consumption footprint

https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

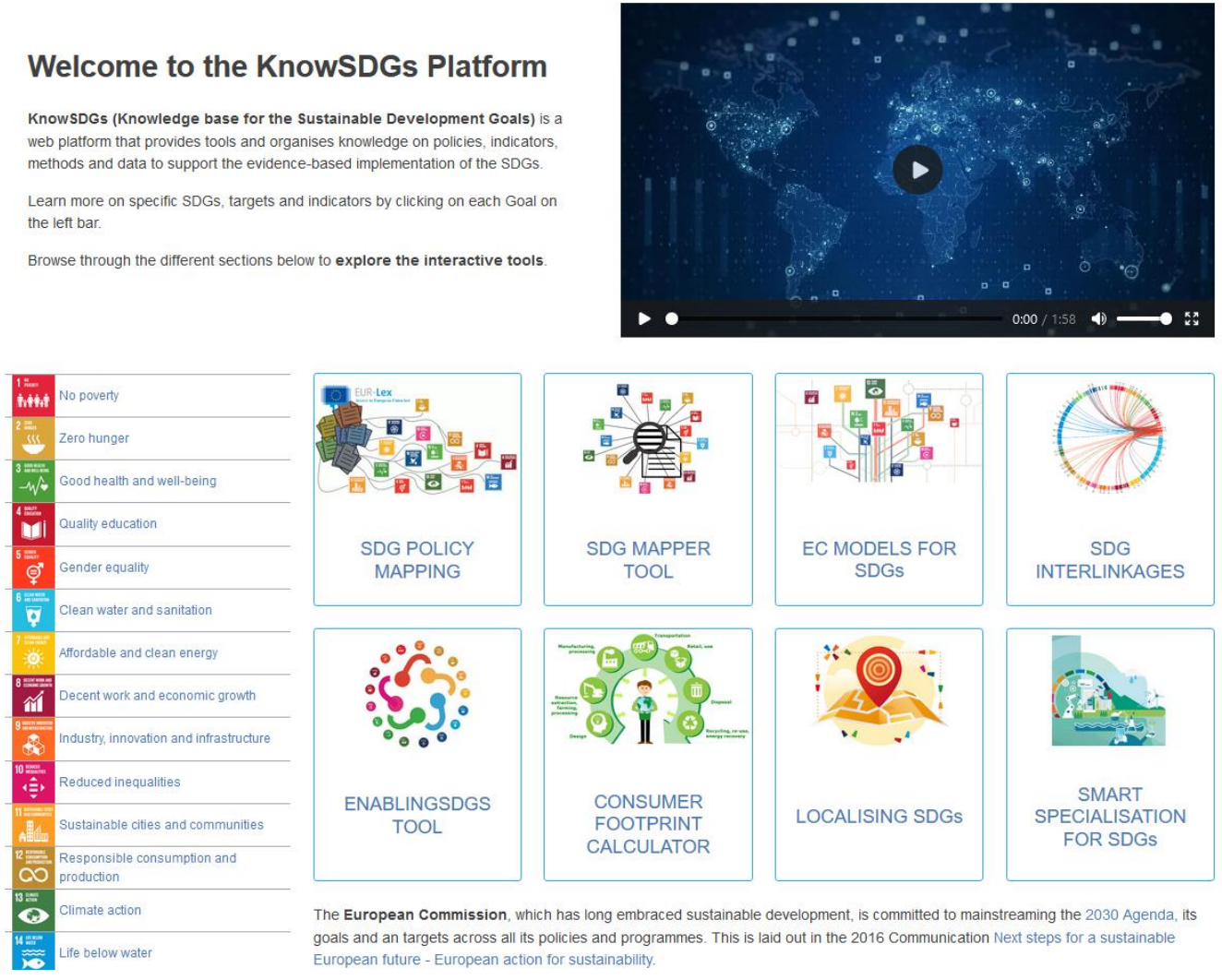


KnowSGDs platform: How to concretely align policies and programs to the Agenda 2030 and its goals?

The Better Regulation **tool#19** on SDGs recommends the use of the [KnowSDGs](https://knowsdgs.jrc.ec.europa.eu/) **platform** for the integration of SDGs in IA and legislative proposals

Purpose

- Facilitate policy-makers to contextualise EU policies within SDGs framework
- Highlight the potential contribution of EU actions to SDG implementation
- Help to recognize cross-cutting policies, identify gaps, highlight interlinkages, strengthen policy coherence

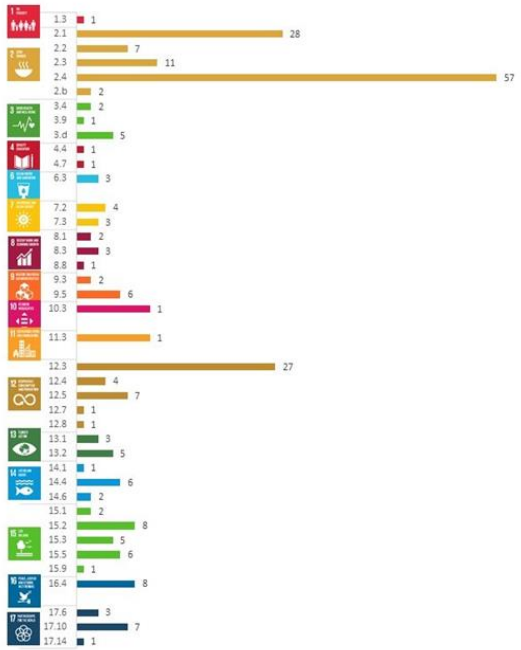


https://knowsdgs.jrc.ec.europa.eu/

Example: Mapping SDGs in the context of Sustainability of the Food System

JRC SDGMapper tool to identify relevant SDGs and targets
(BR Toolbox #20 https://knowsdgs.jrc.ec.europa.eu/sdgmapper)

F2F targets → Literature review → **Mapping of relevant SDGs for FSFS**



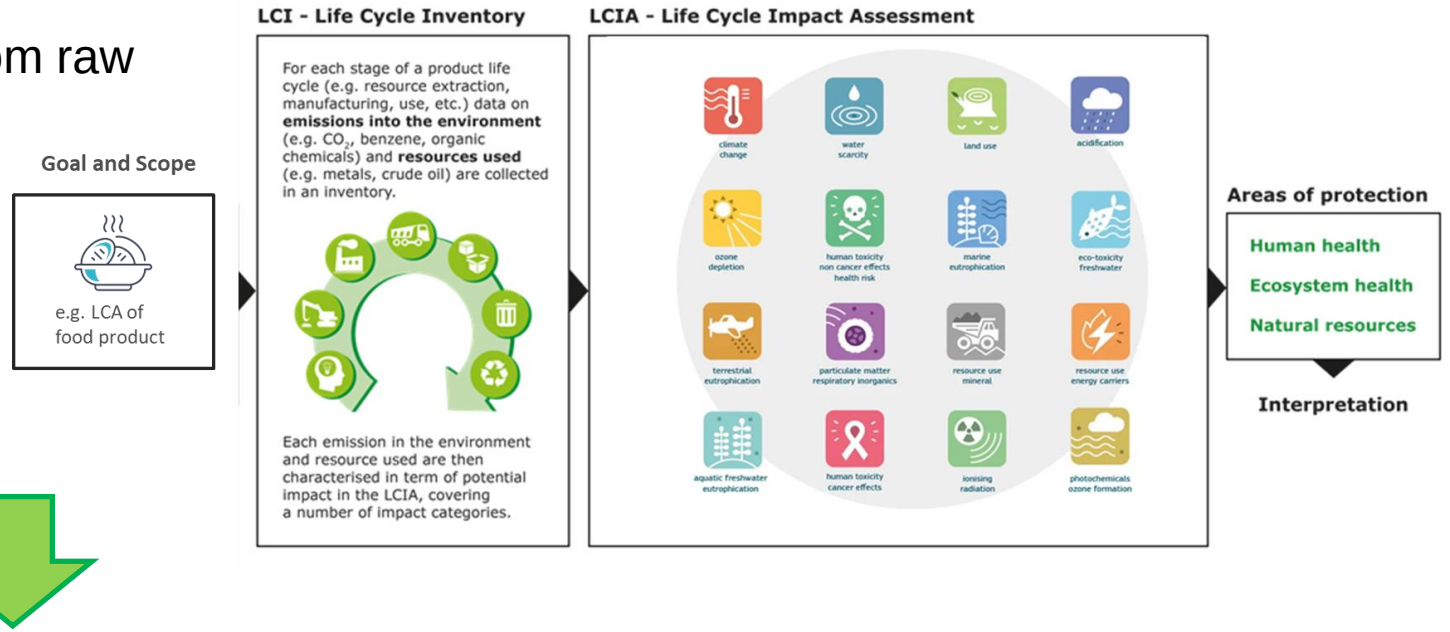
	EXPLANATION – rationale for including the target
1 NO POVERTY **GOAL 1: NO POVERTY** **End poverty in all its forms everywhere**	
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	Poverty reduction is essential to end hunger and ensure food for all. Vice versa, food security is a precondition to end poverty.
1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	Social protection programs have positive effects on the capacity of farm households to become more productive and resilient.
1.4 By 2030 ensure that all men and women, particularly the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership, and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services including microfinance	Empowerment of poor and vulnerable population groups represents a major lever in transformative change.
1.5 By 2030 build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	Food systems that are resilient to extreme events reduce the impact of such events on the most vulnerable.
2 ZERO HUNGER **GOAL 2: ZERO HUNGER** **End hunger, achieve food security and improved nutrition and promote sustainable agriculture**	
2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	F2F objective: access to healthy, sustainable, affordable food
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	F2F objective: access to healthy, sustainable, affordable food
2.3 By 2030, double the agricultural productivity and incomes of small-	F2F "Fair economic return in the food

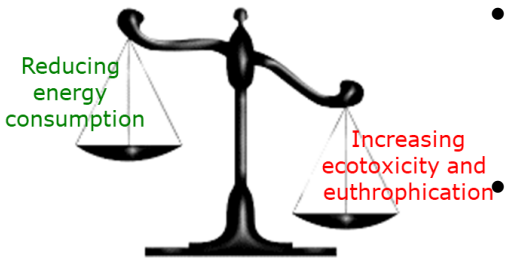
What is Life Cycle Thinking?

Life Cycle Thinking (LCT) is the basic concept referring to the need of **assessing burden of *products/ sectors/ projects* adopting an holistic perspective**, from raw material extraction to end of life.

To make LCT operational, several methods exist:

- Life cycle assessment (LCA)
- Life cycle costing (LCC)
- Social life cycle assessment (sLCA)
- ..





- Help identifying the **most important burdens** and the **most relevant life cycle stages** contributing to environmental/ social impacts (material extraction, manufacturing, use phase etc.)
- Avoid **burden shifting,** in terms of impact categories, or of life cycle stages, or on a geographical and temporal scale

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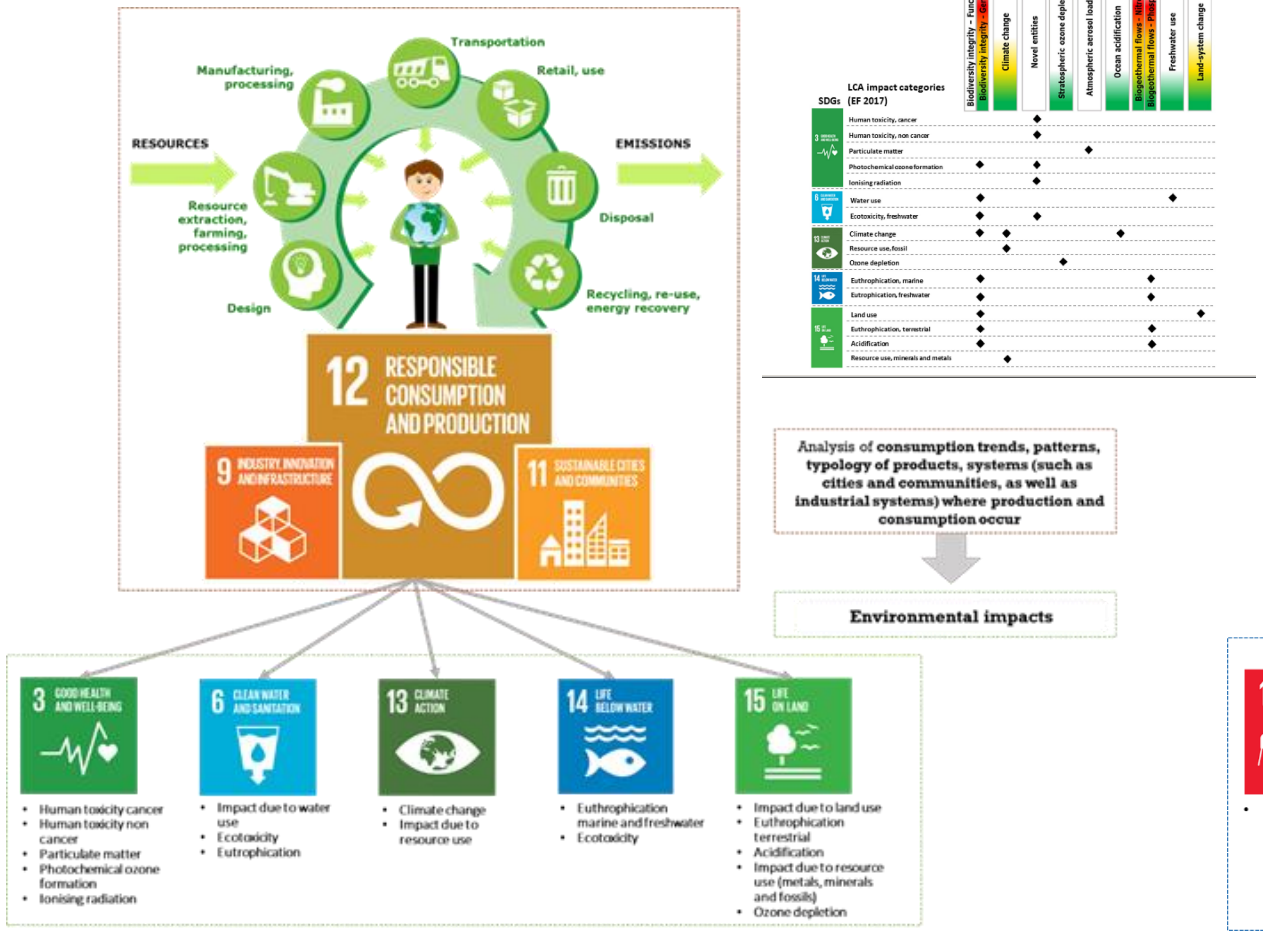
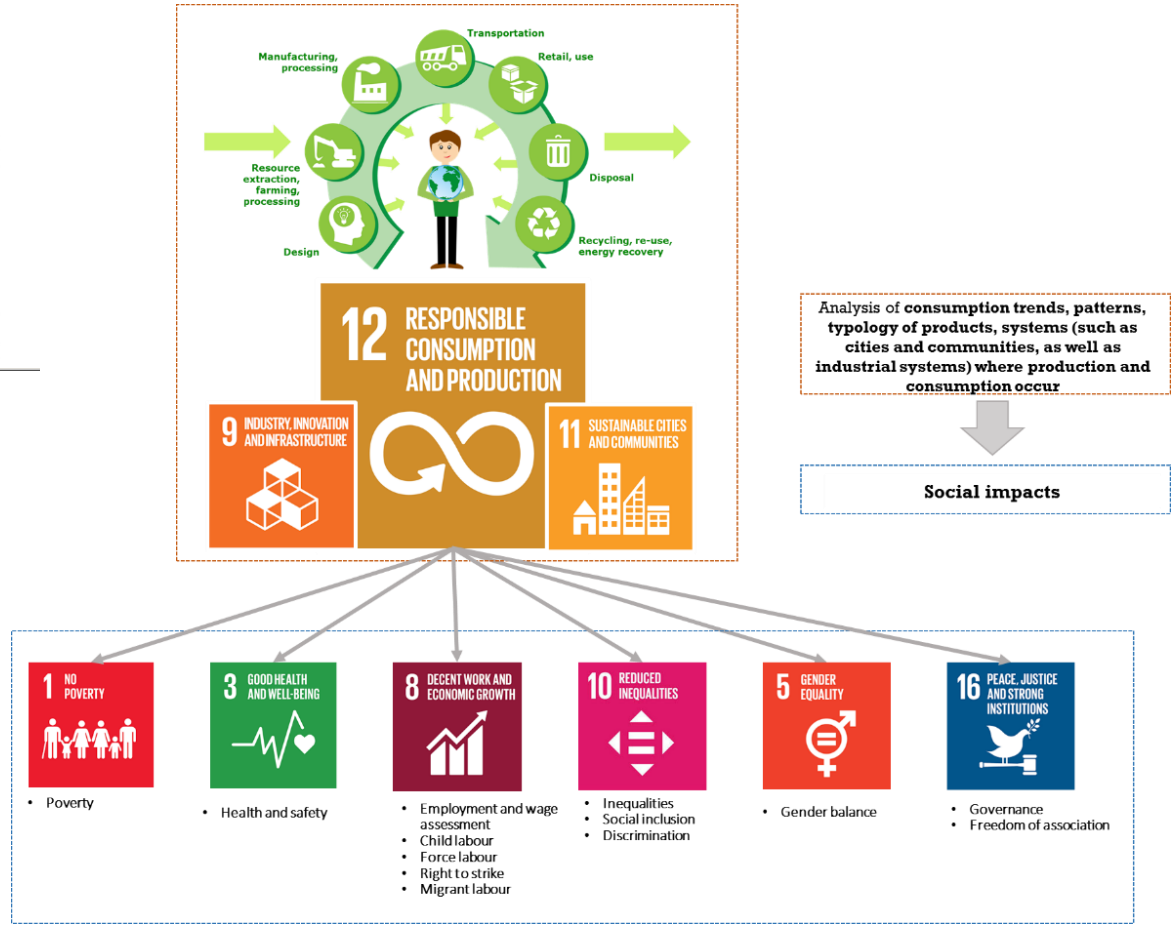
LCA categories of impacts, planetary boundaries and SDGs





Sala et al. 2020 Environmental sustainability of European production and consumption assessed against planetary boundaries. Journal of Environmental Management 269, 110686

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The Consumption Footprint platform

Consumption Footprint: set of 16 life cycle-based indicators whose purpose is to **assess the environmental impacts of the consumption patterns at EU and Member State levels.**

Selection of representative products

Food:
45 products in 17 product groups
↓
More than 85% of consumed food products

e.g. Meat, dairy, eggs, cereal-based products, sugar, oils

And others:

Calculation of consumption intensity

Quantification of the consumption intensity of each **representative product**:

- Apparent consumption = production + imports – exports
- Modelling of entire sector (i.e., housing, mobility)

Data from, e.g., Eurostat, FAOstat, literature.

Assessment of potential environmental impacts

Environmental Footprint (EF) 3.0
16 midpoint impact categories

▼

Normalisation and weighting into **single weighted score**

and **Biodiversity Footprint**

https://publications.jrc.ec.europa.eu/repository/handle/JRC126257
https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

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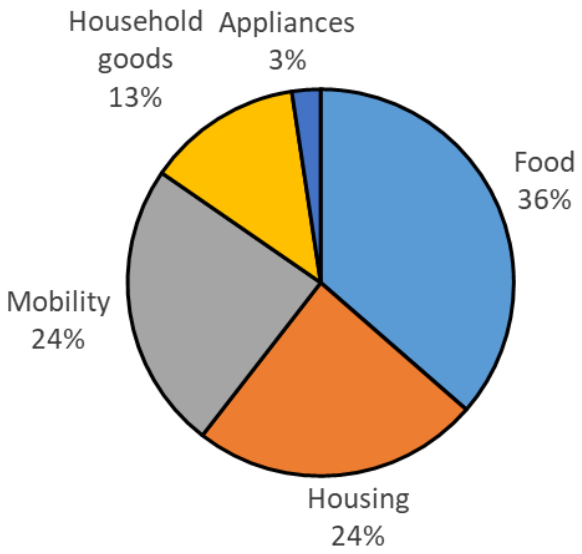
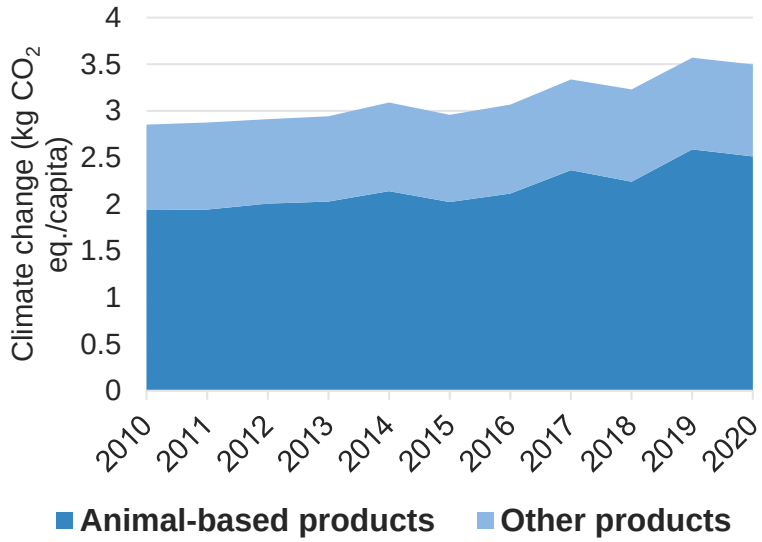
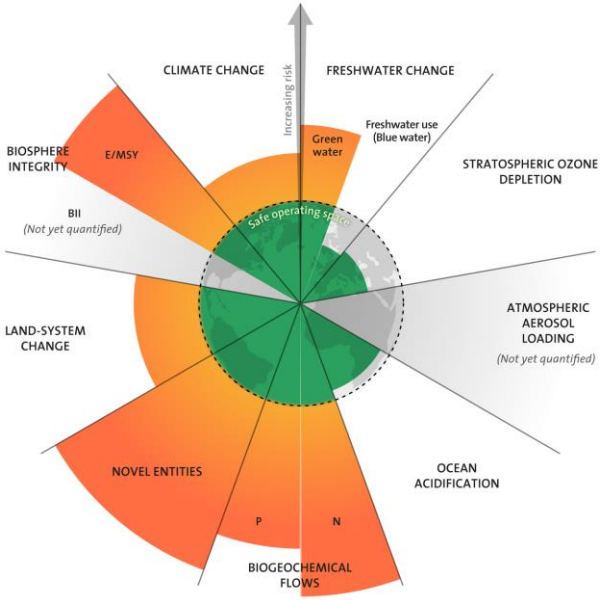
Impacts of EU-27 food consumption considering the entire supply-chain





Climate change impacts of EU food system are **3.6 times the Planetary Boundary**



EU food consumption represents **36% of the overall climate change** of EU Consumption (2018)

Food impacts have **increased by 30%** in the last decade, with animal-based products representing around **70%** of the impact

https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html?bookmark=food

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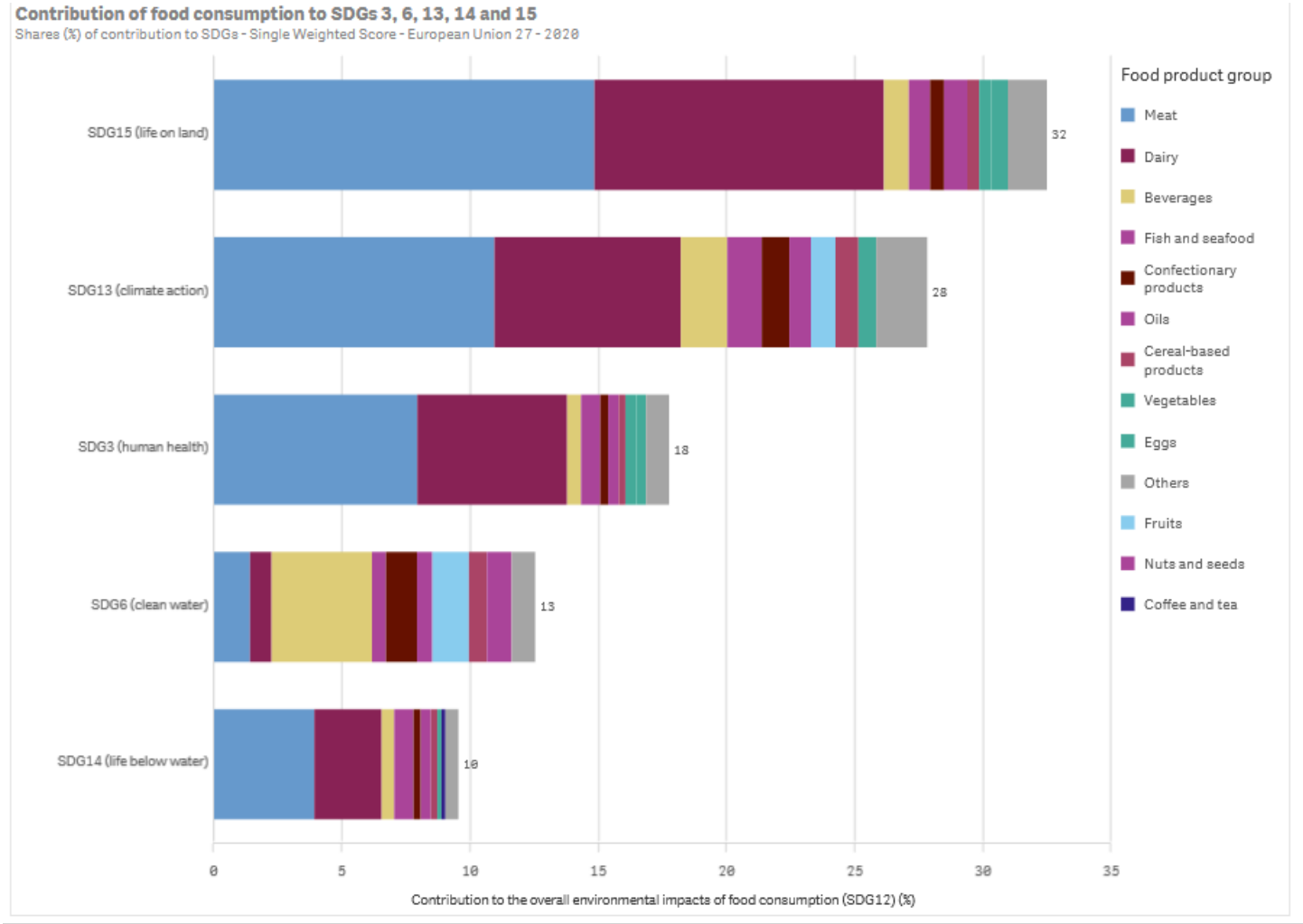
Impacts of food system on SDGs by product groups



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Conclusions

- Sustainability science is a solution-oriented discipline requiring that a scientific and a social paradigms are set and the underpinning values are transparently reported
- Sustainability assessment framework should help the identification of the sustainability dimensions to be assessed and the best suited approaches for the assessment
- Qualitative and quantitative approaches are needed:
- The **JRC KnowSGDs platform** enable the **qualitative assessment of the link between a policy intervention and the SGDs** and their possible interlinkages.
- Life cycle thinking and assessment may support **the quantitative integrated modelling of socio- economic and environmental aspects**, their link with sustainability targets and the with SDGs, e.g. as in the **consumption footprint platform**

Thank you

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