Social Life Cycle Assessment in Biobased Industries: Identifying Main Indicators and Impacts

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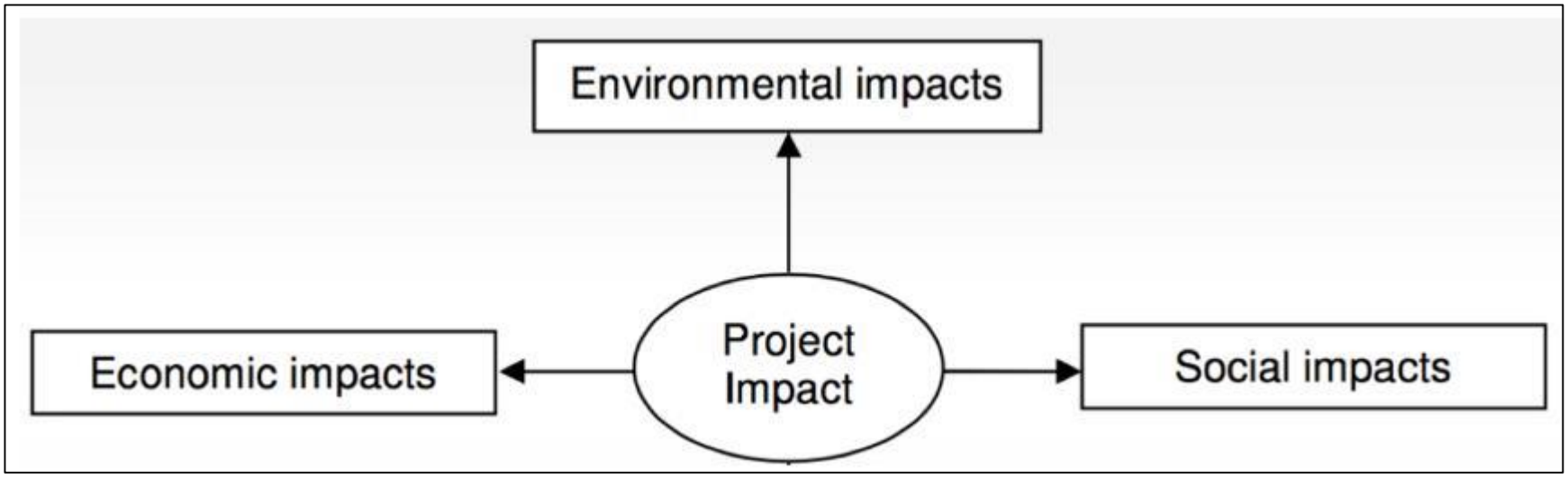
KNOWLEDGE IN ACTION

Bio-industry's sustainability

✓Why considering social aspects?



Multi-dimensional impacts of projects

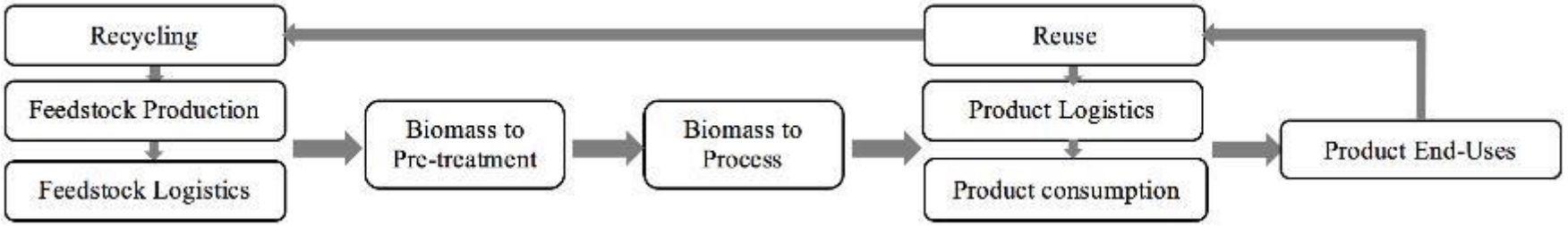
Biobased industries: Carbon capture, use & storage

An integrated suite of technologies that can capture up to 90% of the CO2 emissions

Biobased industries: Algal biofuel conversion technologies

Introduction

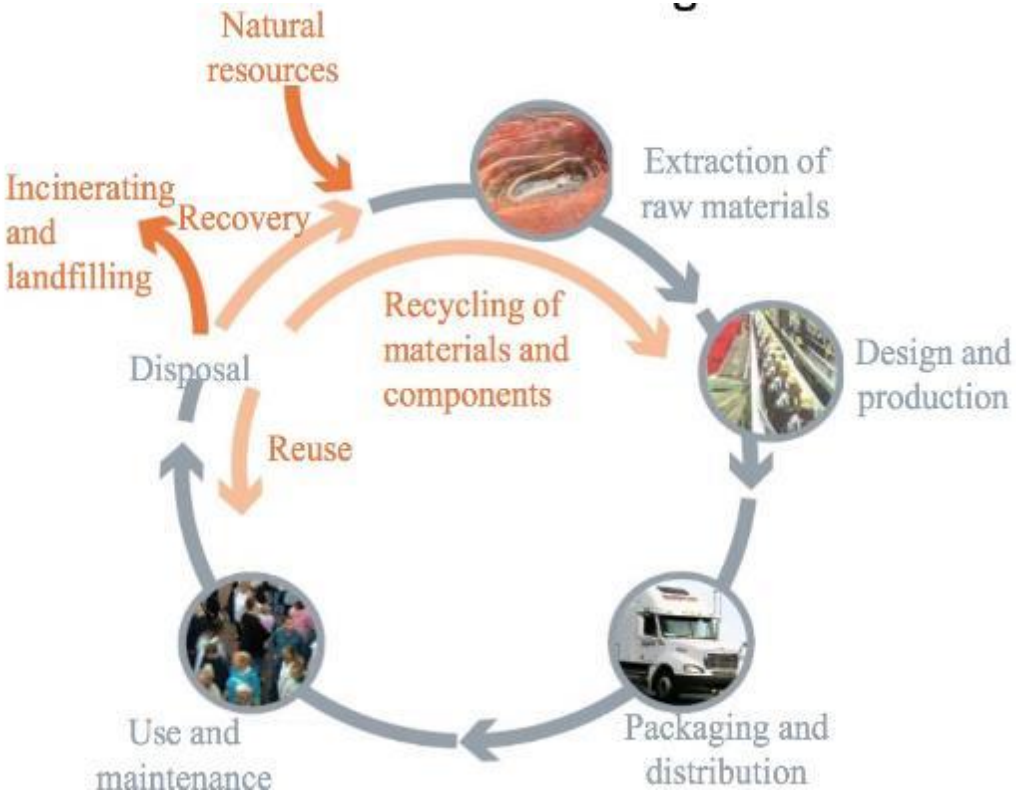
- ✓ Which are the social aspects and how can they best identified? The answers to these questions vary from one supply chain to another.



Schematic overview of a general biobased product value chain

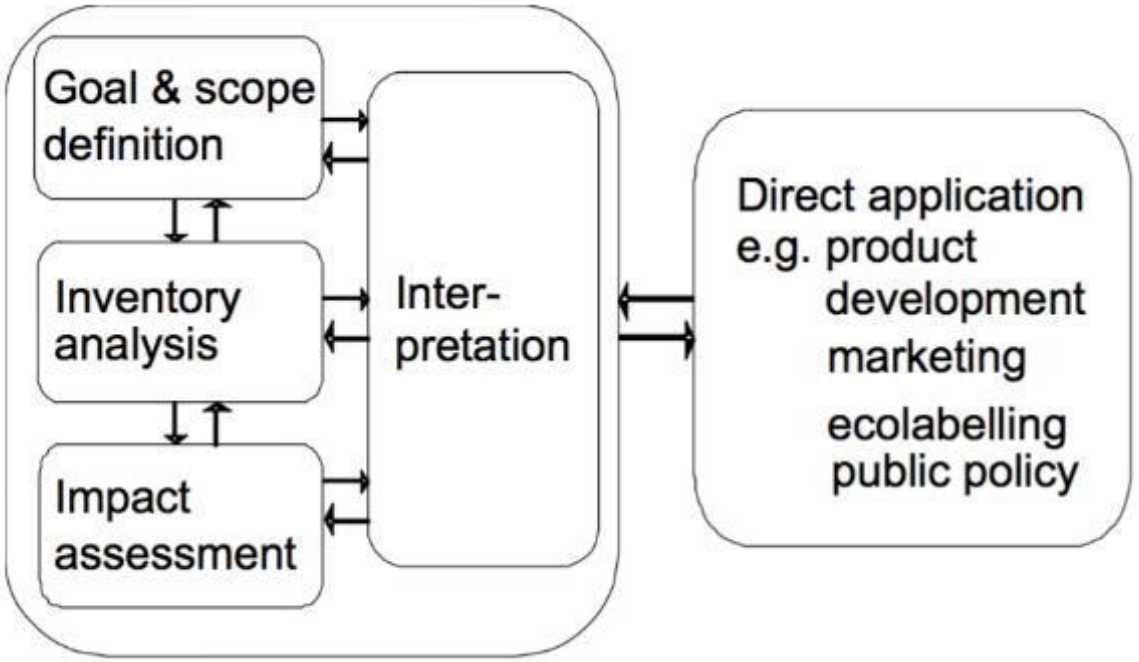
Main techniques for social sustainability assessment

- **Analytical tools**
  - Social Impact Assessment (SIA)
  - Socio-economic Impacts Assessment (SEIA)
  - Social Life Cycle Assessment (SLCA)



The Product Life Cycle

Social life Cycle Assessment (SLCA)



General steps for SLCA

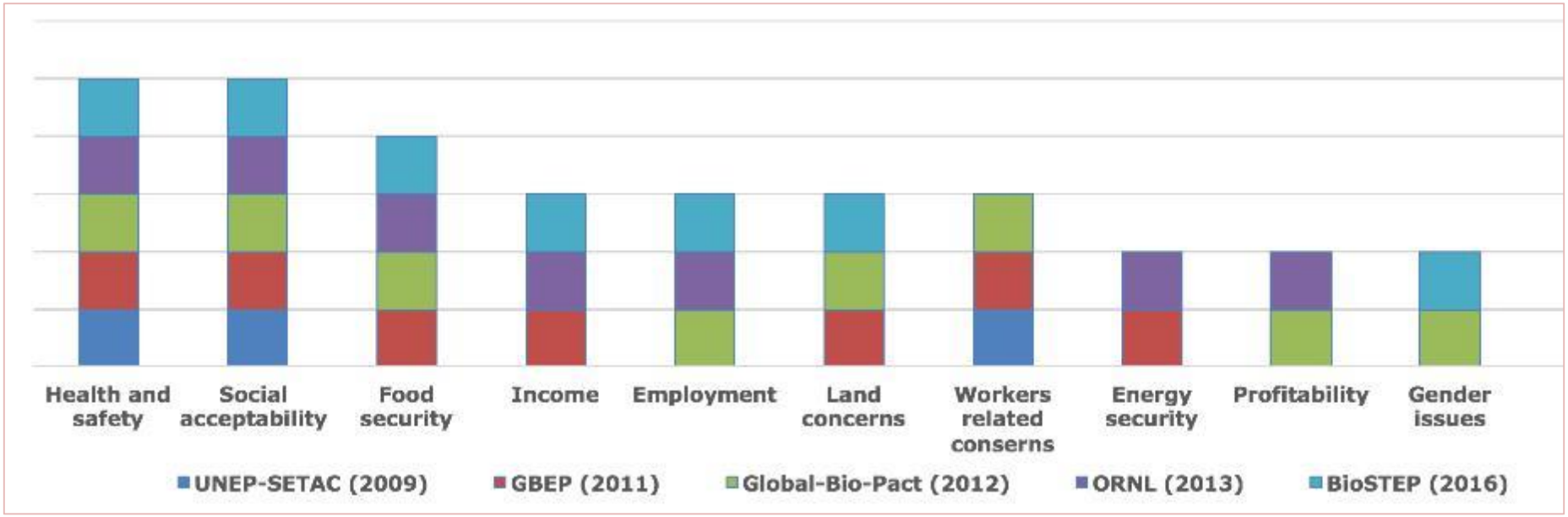
Before inventory analysis:

- ✓ What are the suitable frameworks
- ✓ What are the main criteria for identifying social indicators
- ✓ What are the common social indices applied in the reviewed framework

Identifying indicators

- ✓ Stakeholder identifications
- ✓ Presenting a comprehensive and universal set of indicators already existing in literature to the stakeholders identified
- ✓ Overview of the existing guidelines and frameworks for identifying social indicators and impact categories

Main social indicators suggested in the main frameworks for social life cycle assessment of biobased industries

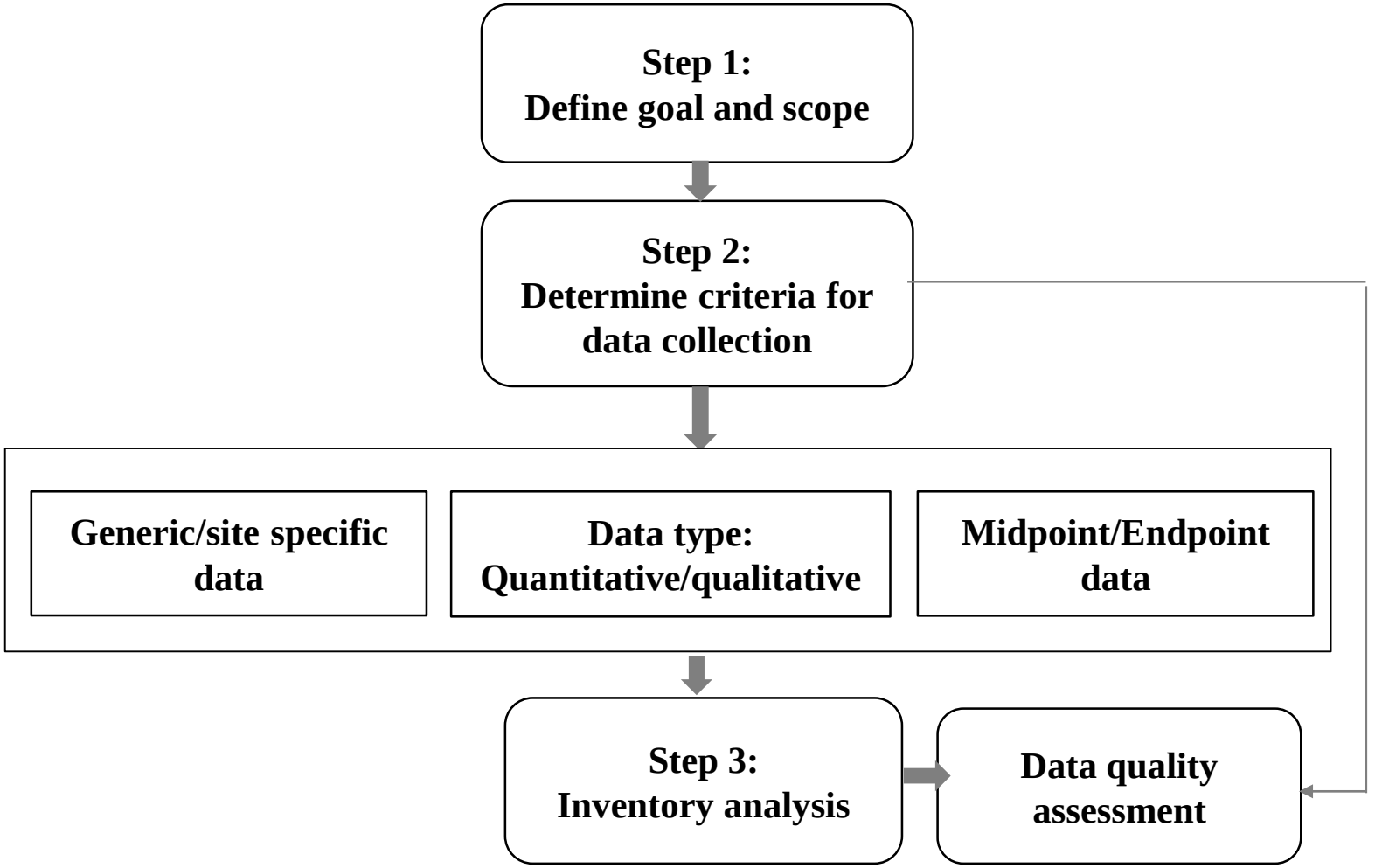


Main impact categories and performance indicators: An example

CATEGORY	INDICATOR	UNITS
Social Well- Being	Employment	Number of full time equivalent (FTE) jobs
	Household income	Dollars per day
	Work days lost due to injury	Average number of work days lost per worker per year
	Food security	Percent change in food price volatility
Social Acceptability	Public opinion	Percent favorable opinion
	Transparency	Percent of indicators for which timely and relevant performance data are reported
	Effective stakeholder participation	Percent of documented responses to stakeholder concerns and suggestions reported on an annual basis
	Risk of catastrophe	Annual probability of catastrophic event
Energy Security	Energy security premium	Dollars per gallon biofuel
	Fuel supply volatility	Standard deviation of monthly percentage price changes over one year
External Trade	Terms of trade	Ratio (price of exports/price of imports)
	Trade volume	Dollars (net exports or balance of payments)
Profitability	*Return on investment (ROI)*	*Percent (net investment/ initial investment)*
	Net present value (NPV)	*Dollars (present value of benefits minus present value of costs)*
Resource conservation	*Depletion of non-renewable energy Resources*	*Amount of petroleum extracted per year (MT)*
	Fossil Energy Return on Investment (fossil EROI)	*Ratio of amount of fossil energy inputs to amount of useful energy output (MJ) (adjusted for energy quality)*

ORNL (2013)

Main steps for collecting data for indicators of bio-industry



Towards a modified assessment framework

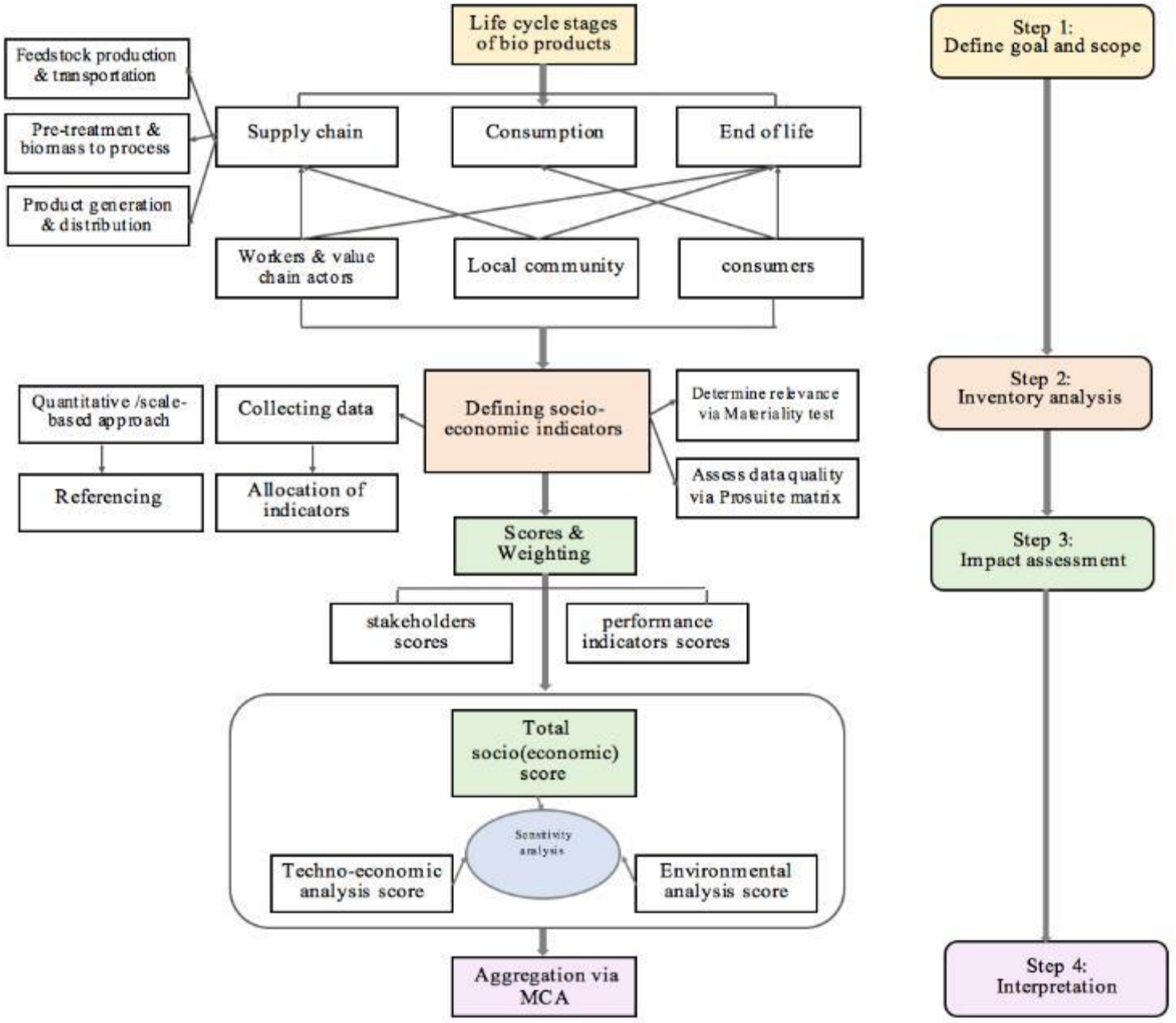
- Based on the same four main iterative stages of life cycle assessment (LCA)

- Recent SLCA based evaluation tools:

✓ Prospective Sustainability Assessment of Technologies (ProSuite, 2013)

✓ Product Social Impact Assessment (2016)

Proposed assessment framework



Conclusions and future research

- No one best approach: Depending on the scope of the study and the priorities of the stakeholders involved
- Additional research is required

✓ Apply the proposed methodology to the case study

✓ How to proceed to integrate social issues in the TEA assessment of bio-based industries?

Questions?