



Life Cycle Assessment, why it lagged behind and how it will race forward

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Why it lagged behind and how it will race forward

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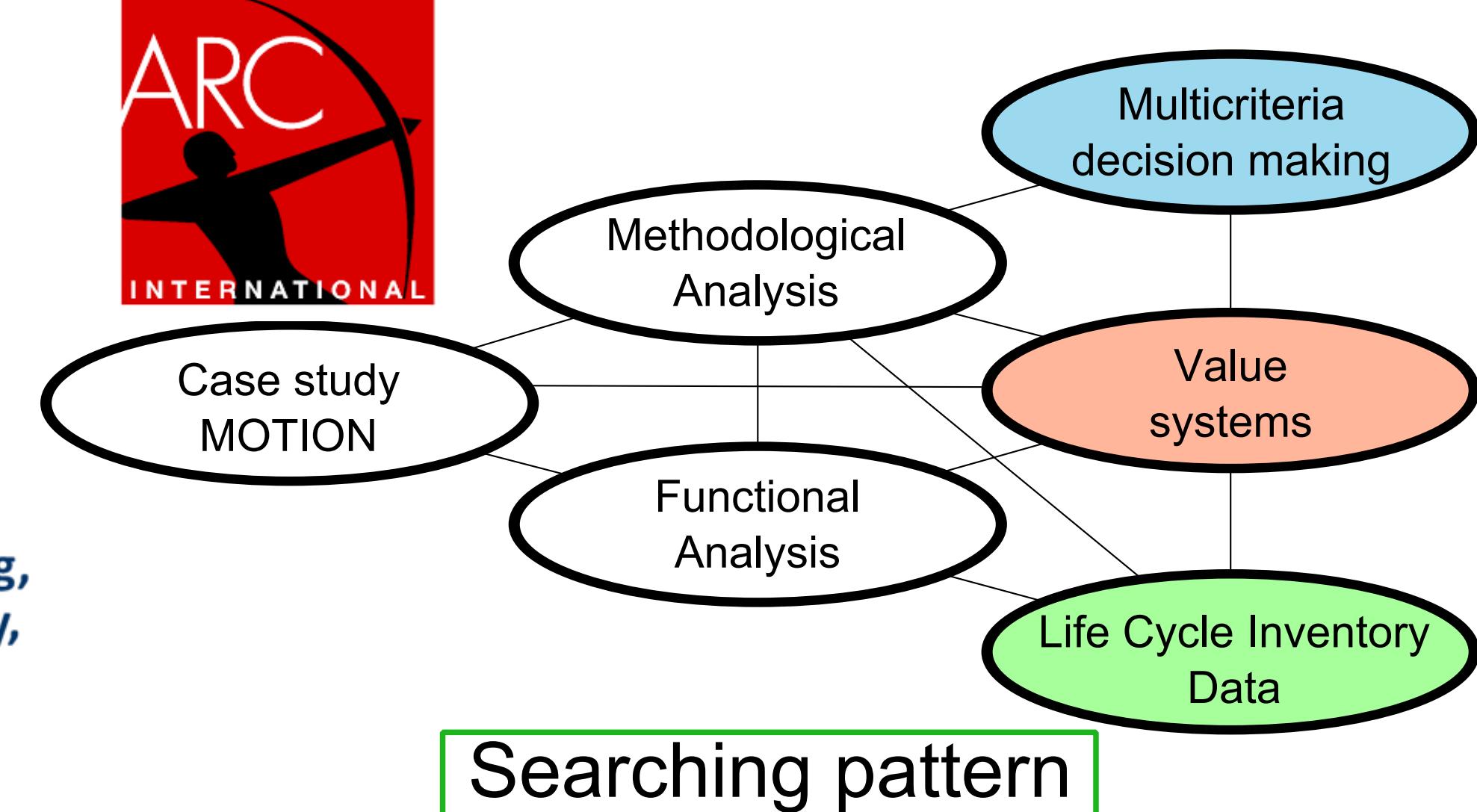
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Context

MOTION is a research project for ecodesign of glass making stainless steel tools.

Life Cycle Assessment (LCA) methodology is applied for evaluating environmental impacts. It is a leading methodology, but is criticised for being time-consuming and inconsistent due to numerous "modeling choices".

This study lies in field of ecodesign and has pre-existent framework, tools and sectorial rules. However, ADEME's requested to handle social, economical and environmental attributs combined to ILCD compliance. They put us in a position that we could not miss the present results.



Goals: & Method:

- Understand the causes of current LCA failure and identify solutions to overtake them.
- Analysis of LCA's function, reviewing current LCA methodology and criticisms.

Current state and critics

LCA.1.0	Approach: By tools and applications	Framework: ISO 14040 ISO 14044 ILCD guidance	Tools: Simapro GaBi Umberto etc.
	Application: Biofuels Design Metal Building etc.	Respectives sub-framework: PCRs Allocation rules EPDs	

John REAP 2008.
« A survey of unresolved problems in life cycle assessment ». [2]

Table 1 LCA problems by phase

Phase	Problem
Goal and scope definition	Functional unit definition ^a Boundary selection ^a Social and economic impacts ^a Alternative scenario considerations ^a
Life cycle inventory analysis (LCI)	Allocation Negligible contribution ('cutoff') criteria Local technical uniqueness
Life cycle impact assessment	Impact category and methodology selection Spatial variation Local environmental uniqueness Dynamics of the environment Time horizons
Life cycle interpretation	Weighting and valuation ^a Uncertainty in the decision process Data availability and quality
All	Data availability and quality

a One might reasonably consider these problems to be pivotal decisions.

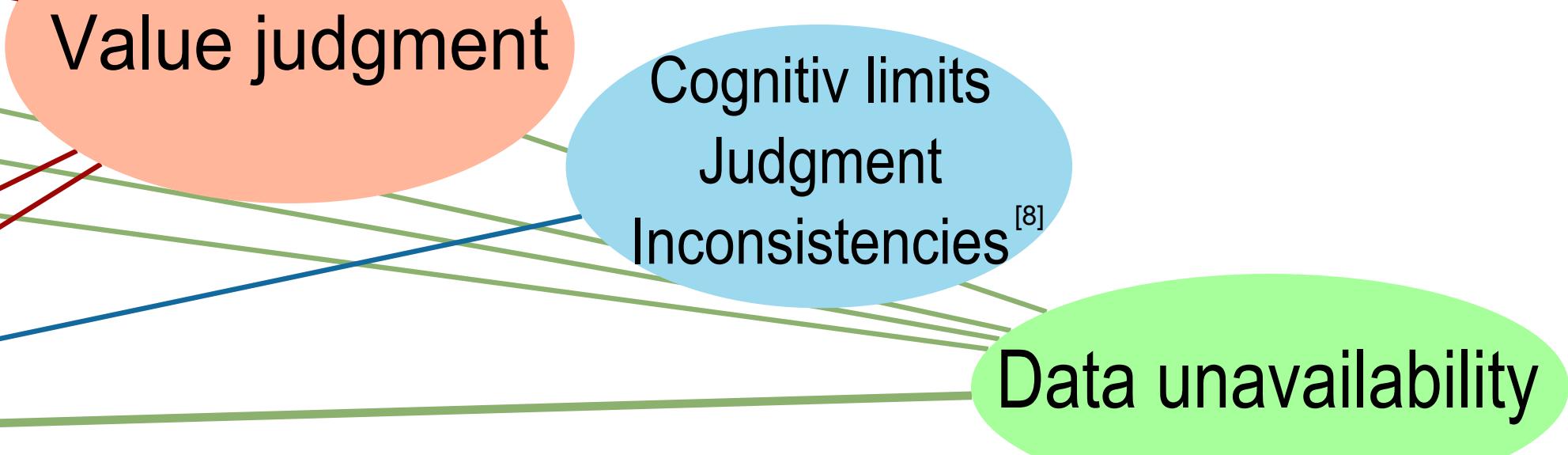
Main life cycle assessment framework issues

Decision support?	Kind of process-changes in background system / other systems	
	None or small-scale	Large-scale
	Situation A	Situation B
	"Micro-level decision support"	"Meso/macro-level decision support"
ILCD study types, Modified		

(with C1: including interactions with other systems, C2: excluding interactions with other systems)

2 Inconsistency and gaps in ILCD - ISO rules :

- Logical deadlock loop:
No interpretation for disclosed comparative study.
Interpretation needed in boundary definition.
No guidance to handle the needed judgement.
Impossible ban against weighting.



CONCLUSION: LCA NEEDS UPGRADING

LCA.1.0 is in a dead end !

LCA.1.1

Approach:
By goal and methodology

- Judgment integration
- ISO/IEC 14040-4:2006/NP Amd 1
- One standard acknowledging multiple judgments.

LCA = MCDA

New development direction:
Psychology integration, the building of judgment
Piaget ; Kohlberg ; Gilligan ; Bègue ; Meyer

LCA.2.0

LCA.3.0

Approach:
For operationalisation of a corrected methodology

LCA aims at holism. It needs:

- Interactivity (2.0)
- Scalability (3.0)

LCA = ABM
Agent Based Modelling.

Developement need: Scientific communities shall massively open and connect themselves, and develop open semantic web solutions for scalable knowledge production.

Remaining problem:
The way scientific communities produce and share knowledge.

Recognition and acceptance of value judgment

A major democratic opportunity

Use of MCDA softwares

A need for implementation [4]

Data availability

A need for making it accessible and machine readable.

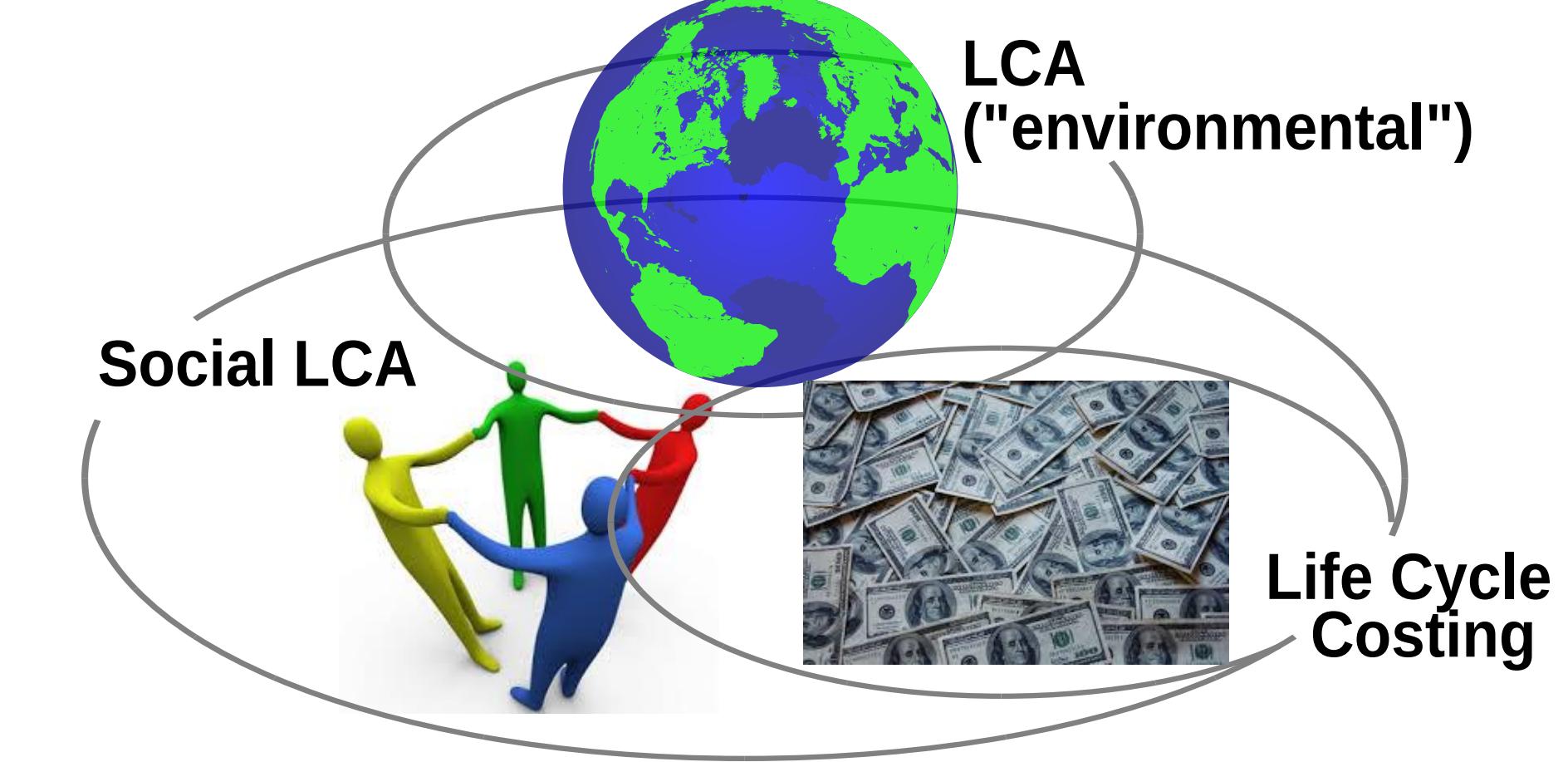
Data quality is a consequence of the opening to revision of data.



W3C Semantic Web

Decision handling

Multiple Incommensurable Attributes:



Multiple heterogeneous attributes evaluation:

► Needs values and preferences expression^[7]

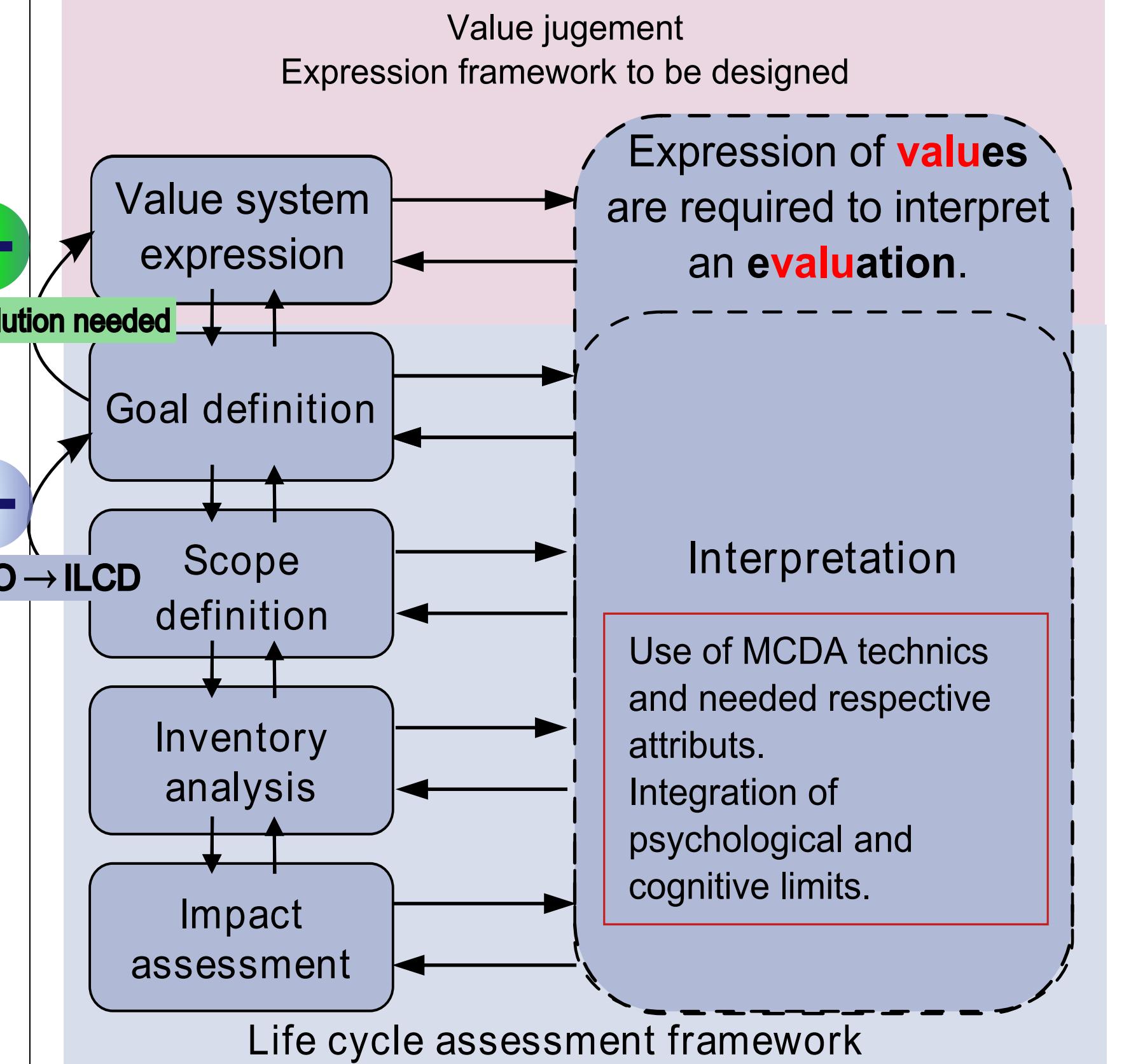
► Tends to reach cognition overload^[6]

So LCA requires:

► Multi-Criteria Decision Analysis tools (MCDA)

PROPOSITION

ISO/IEC 14040-4:2006/NP Amd 1, or its equivalent open standard, needs to start.



PERSPECTIVE

We are eager to see:

- Renewal of standards [ISO, ILCD, PEF]
- Implementation of MCDA advanced tools
- Semantic web as LCI resource
- The societal debate about values

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