Marine Litter
Global Platform for Monitoring Marine Litter and **Informing Action - best practices**

1. What data and knowledge are needed?
2. Co-creation of research agendas and knowledge
3. Co-usage of knowledge

Co-Chairs:
Hans-Peter Plag
Daniel Martin

Based on discussions in a number of communities, including, e.g.
ConnectinGEO
IEEE-OES Plastic in the Ocean Initiative
Blue Planet Initiative

Plan

Discussions on:

1) **What data and knowledge are needed?** Best practices in gap analyses, identification and prioritizing of knowledge needs, including life cycle analyses and impact assessments;

(2) **Co-creation of research agendas and knowledge**: best practices in engaging with stakeholders, including participatory modeling;

(3) **Co-usage of knowledge**: best practices for the delivery of knowledge to decision and policy makers and for the engagement of scientists and researchers in policy making, including ethical considerations.

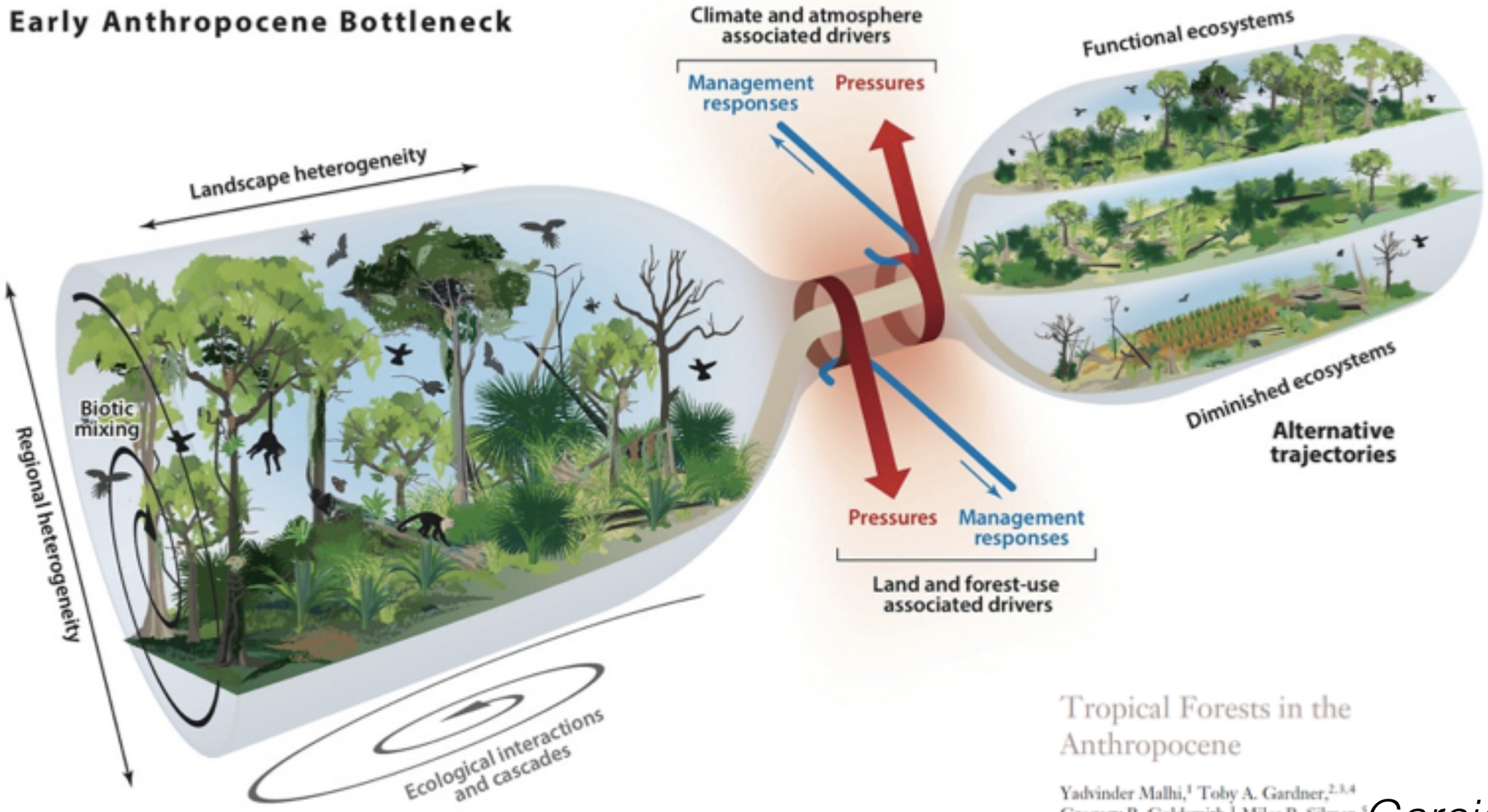
Plan

Discussions on:

1) **What data and knowledge are needed?** Best practices in gap analyses, identification and prioritizing of knowledge needs, including life cycle analyses and impact assessments;

What Data and Knowledge are Needed?

Focus: Addressing Anthropocene Risks (such as Marine Debris)



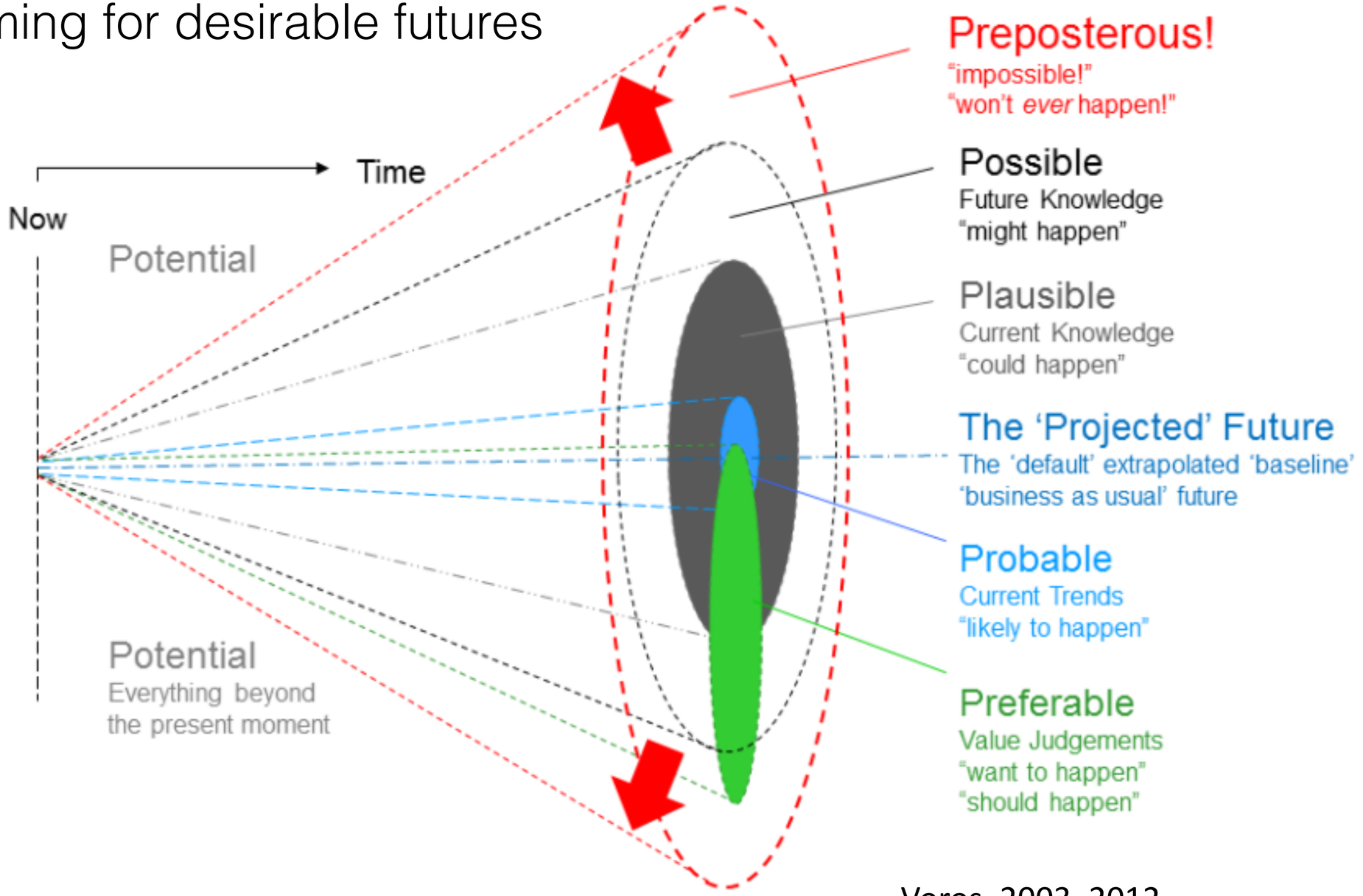
Tropical Forests in the Anthropocene

Yadvinder Malhi,[1] Toby A. Gardner,[2,3,4] Gregory R. Goldsmith,[1] Miles R. Silman,[5] and Przemyslaw Zelazowski[1,6]

Garcia, 2018

What Data and Knowledge are Needed?

Aiming for desirable futures



Preposterous!
"impossible!"
"won't *ever* happen!"

Possible
Future Knowledge
"might happen"

Plausible
Current Knowledge
"could happen"

The 'Projected' Future
The 'default' extrapolated 'baseline'
'business as usual' future

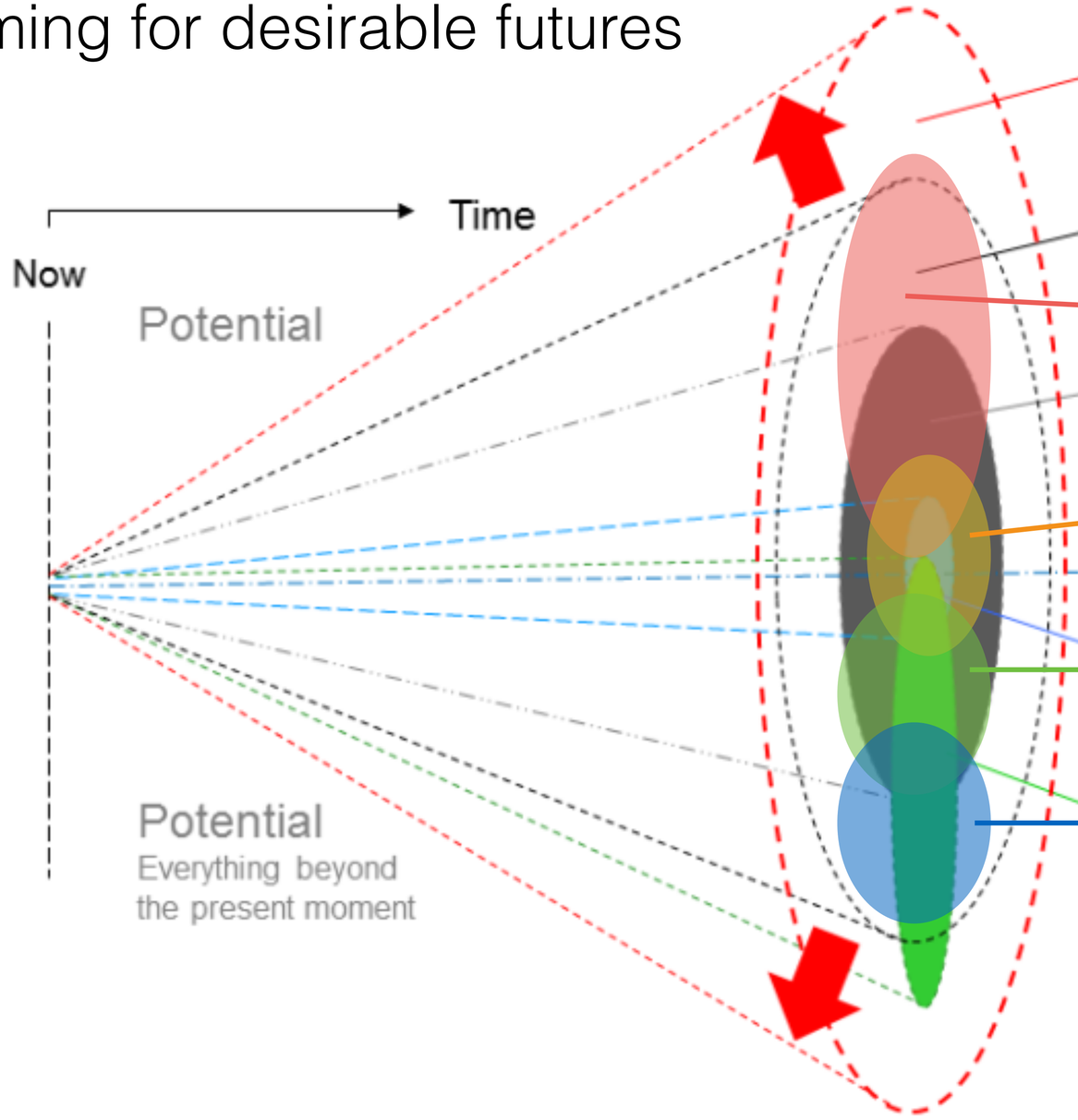
Probable
Current Trends
"likely to happen"

Preferable
Value Judgements
"want to happen"
"should happen"

Voros, 2003, 2012

What Data and Knowledge are Needed?

Aiming for desirable futures



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Archetypal futures

Collapse

Continue

Discipline

Transformation

Voros, 2003, 2012

Dator, 2009;
Bengtson, 2018

What Data and Knowledge are Needed?

Aiming for desirable futures

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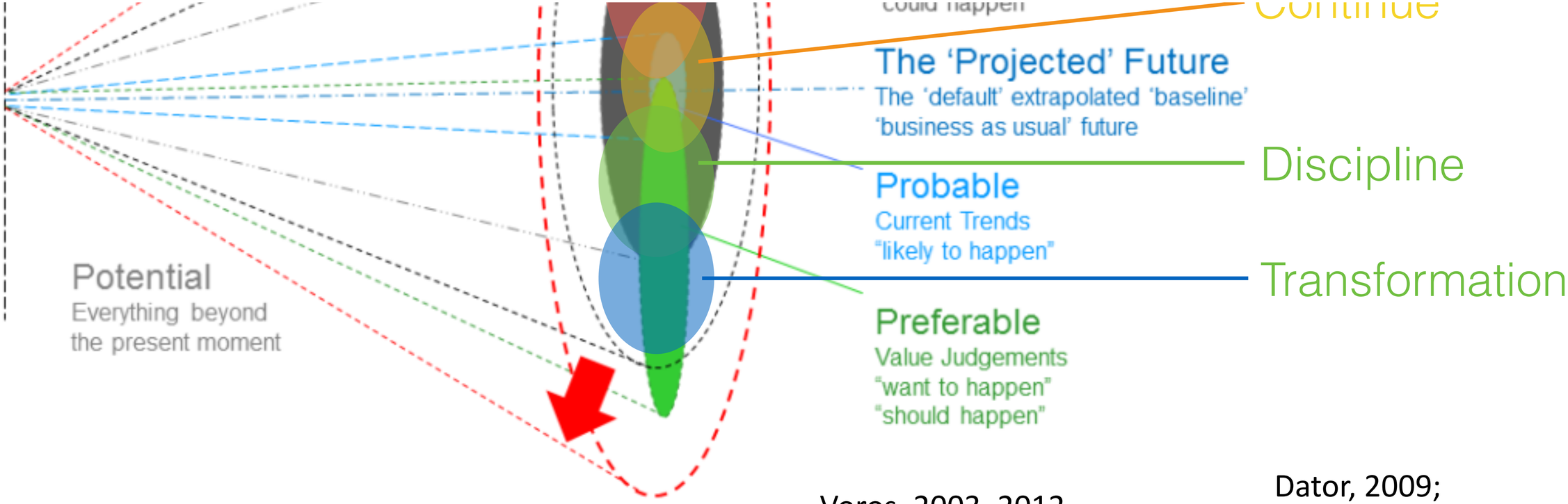
Archetypal futures

What are our assumptions about knowledge needs that guide gap analyses and prioritization?



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What Data and Knowledge are Needed?

Aiming for desirable futures

Archetypal futures

What are our assumptions about knowledge needs that guide gap analyses and prioritization?

In times of emerging Anthropocene Global Catastrophic Risks:

Can we continue to focusing on avoiding Type 1 Errors (no false alarms)?
or
Do we need to focus more on Type 2 Errors (not overlooking warning signs)?

Voros, 2003, 2012

Dator, 2009;
Bengtson, 2018

What Data and Kr

A LIFETIME OF PLASTIC

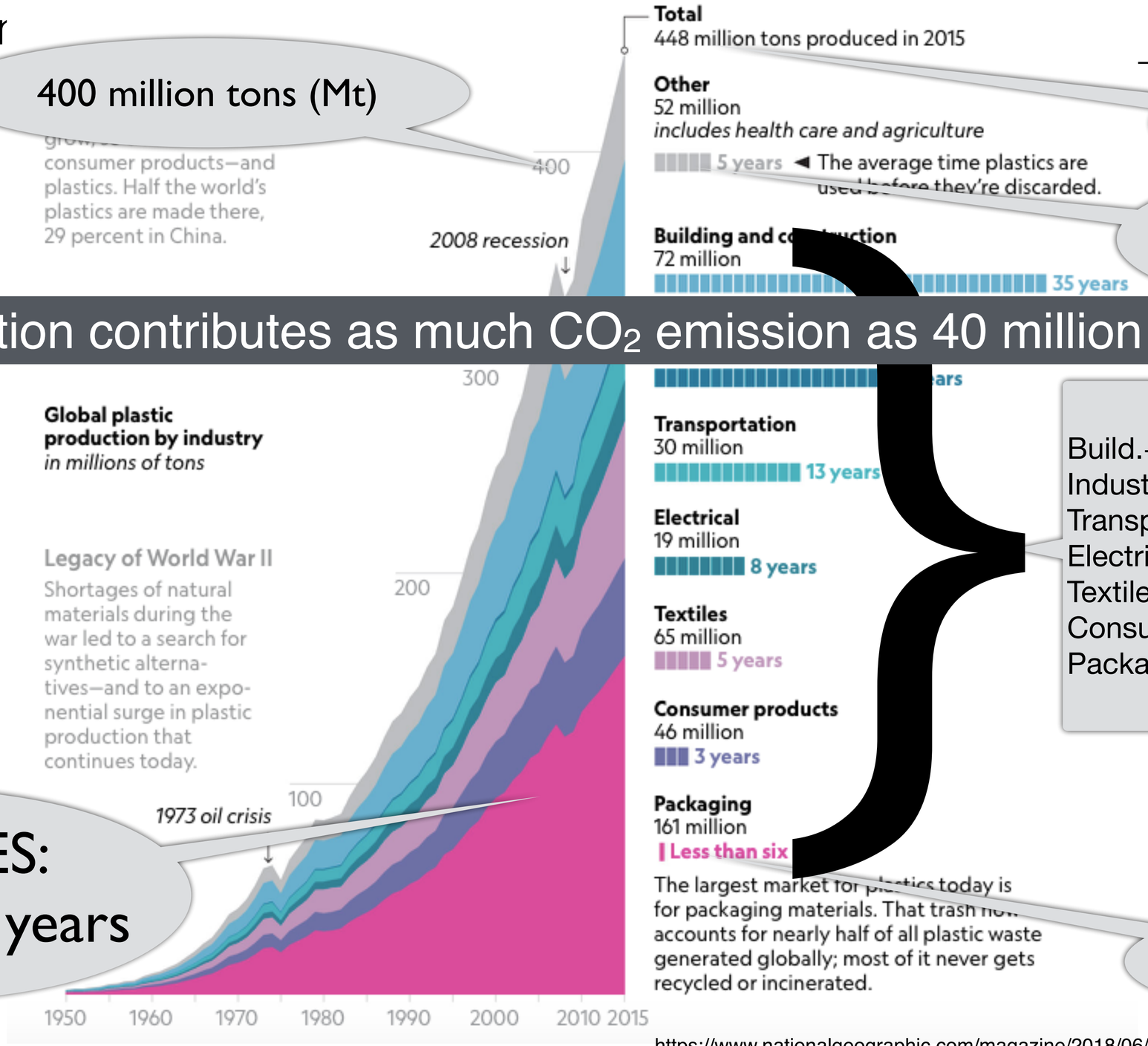
The first plastics made from fossil fuels are just over a century old. They came into widespread use after Worl and are found today in everything from cars to medical devices to food packaging. Their useful lifetime varies. Once disposed of, they break down into smaller fragments that linger for centuries.

400 million tons (Mt)

448 Mt in 2015

Average usetime: 5 years

Production contributes as much CO_2 emission as 40 million cars



Build.+Const.:	72 Mt, 35 yrs
Industrial mach.:	3 Mt, 20 yrs
Transportation:	30 Mt, 13 yrs
Electrical:	19 Mt, 8 yrs
Textiles:	65 Mt, 5 yrs
Consum. prod.:	46 Mt, 3 yrs
Packaging:	161 Mt, <0.5 yrs

LIFETIMES: 100 to 5000 years

161Mt < 6 months

JASON TREAT AND RYAN WILLIAMS, NGM STAFF
SOURCE: ROLAND GEYER, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

https://www.nationalgeographic.com/magazine/2018/06/plastic-planet-waste-pollution-trash-crisis/

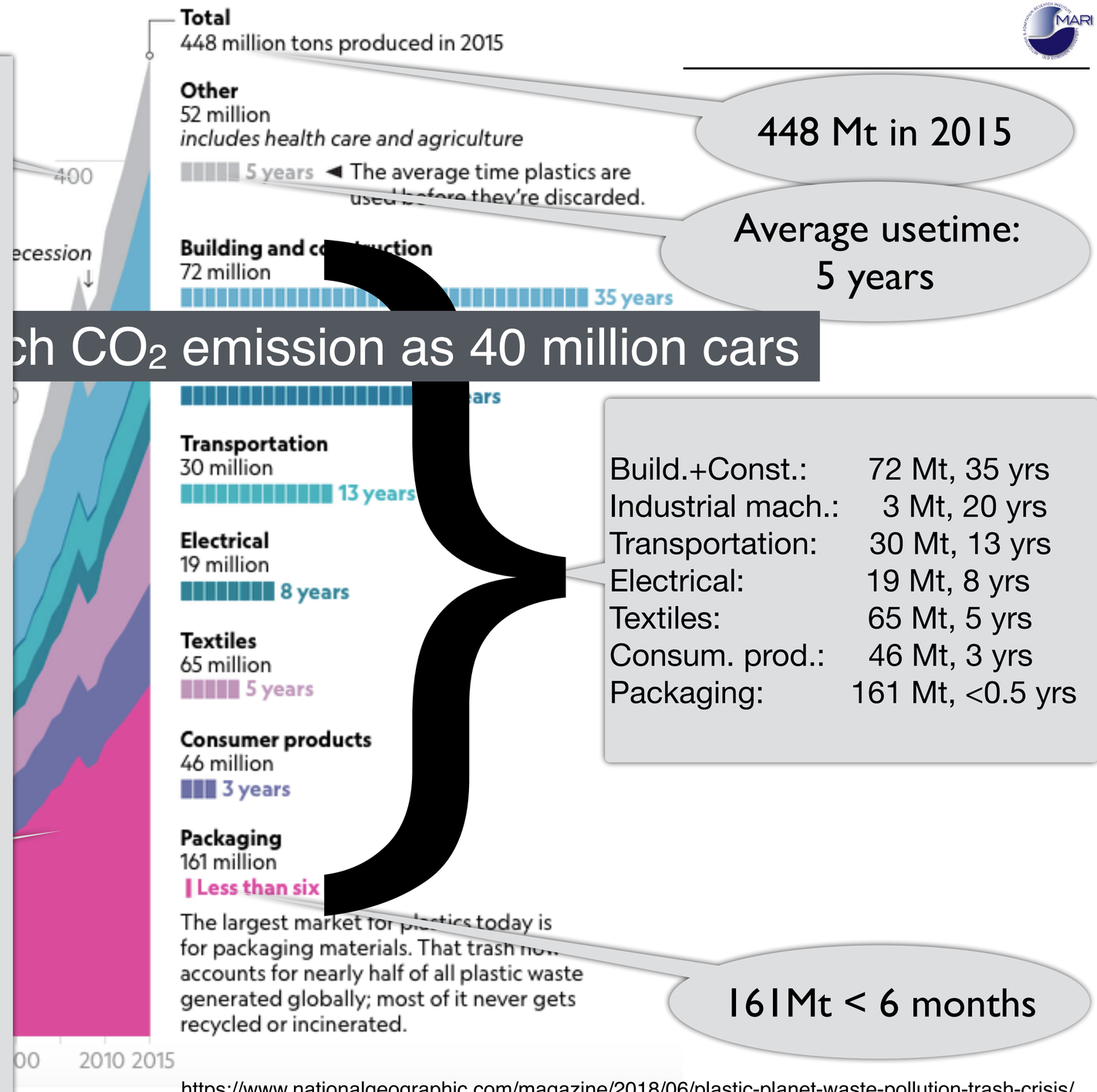
What Data and Kr

2% annual increase in production:
2025: 550 Mt
2035: 670 Mt
2045: 817 Mt

Total production:
2015: 7 Bt
2045: 26 Bt

1% in the ocean: 260 Mt

In coastal built environment prone to disasters:
1.7 Bt



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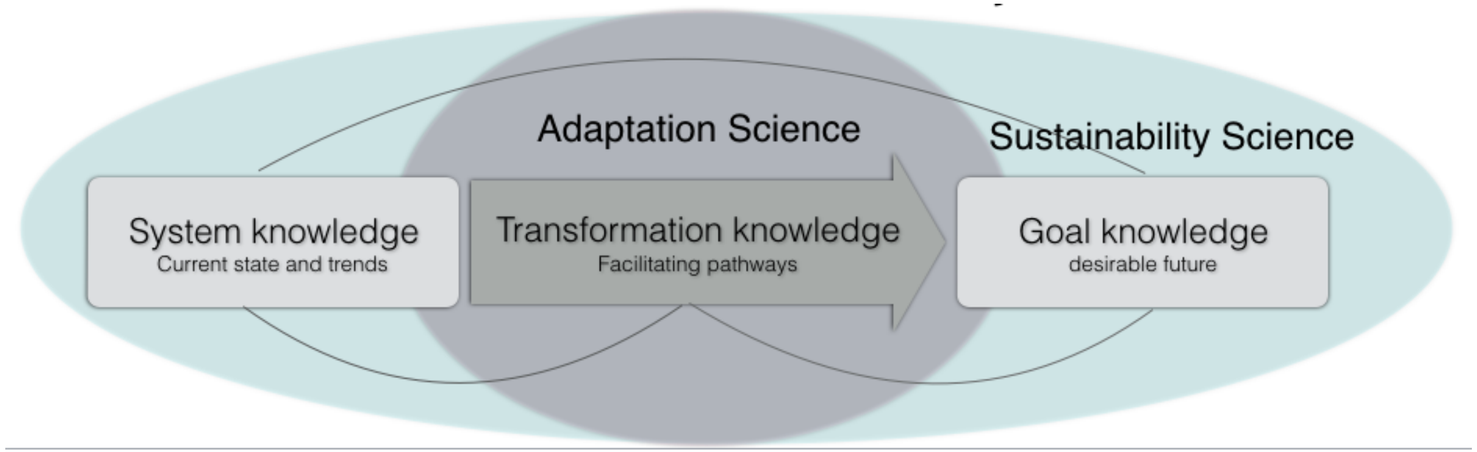
Plastics in the planetary physiology will impact the 500 Billion to
1 trillions of people to come during the next 5,000 years.

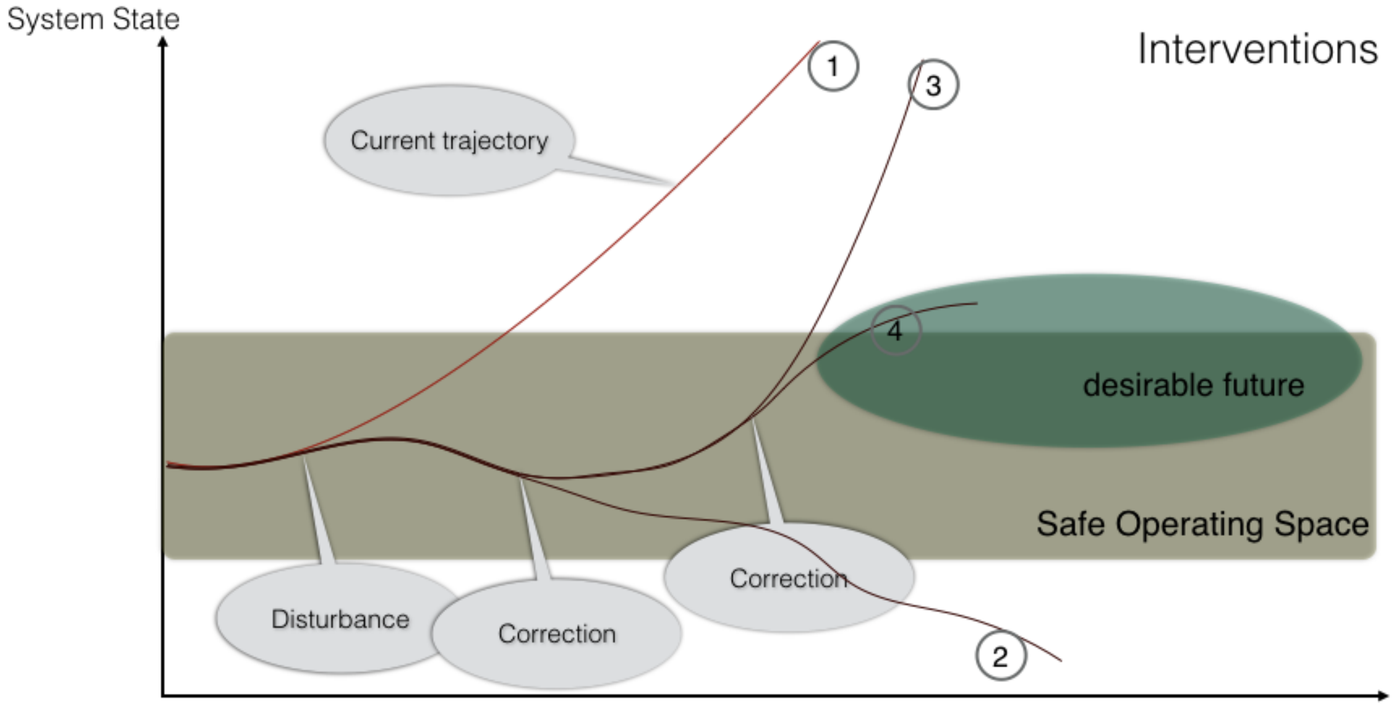
Does the plastics crisis violate the rights of those not yet born?

Does science have an ethical obligation to create the knowledge society needs to assess and address the risk?

What Data and Knowledge are Needed?

Efforts to reach a desirable future

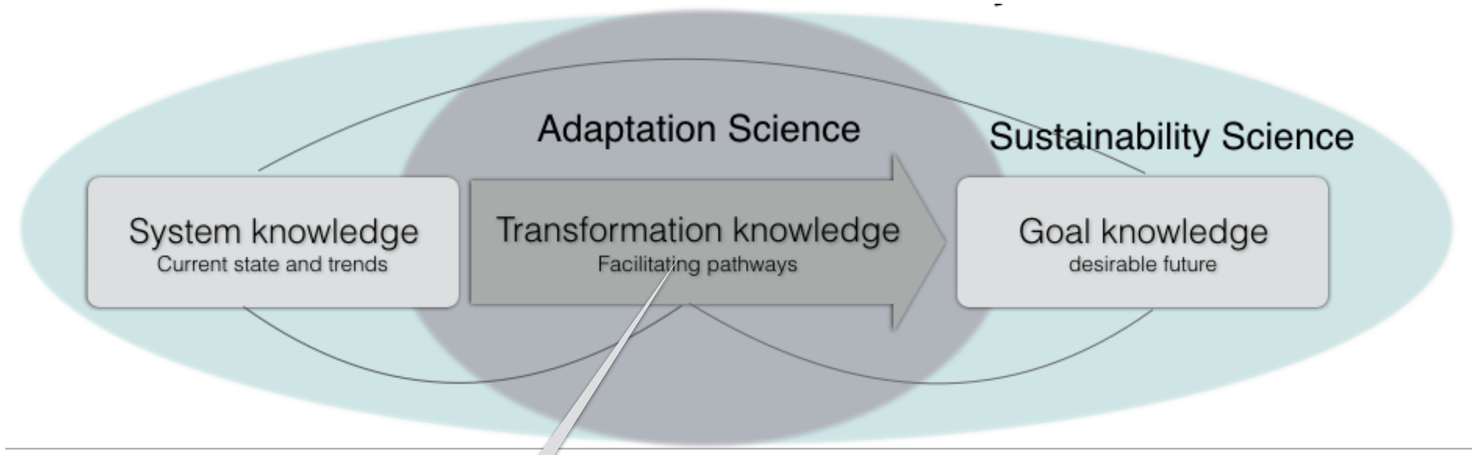




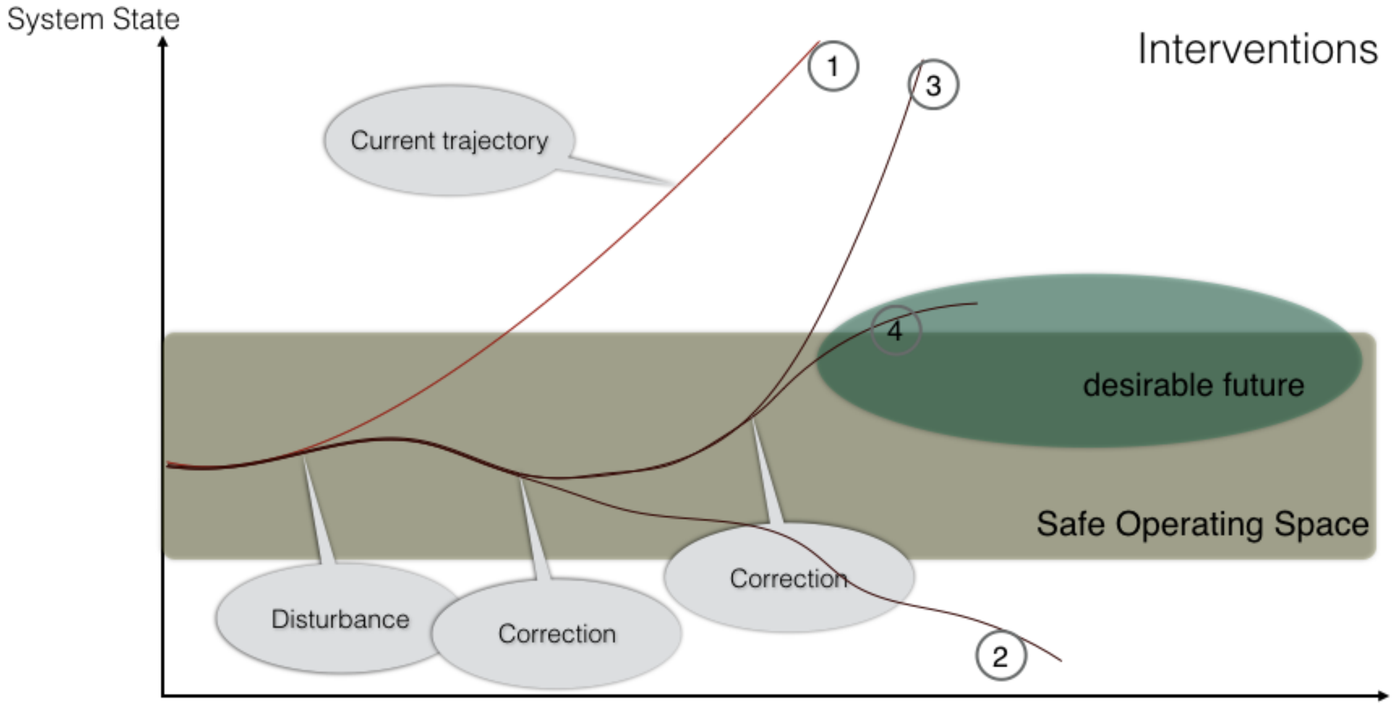
Plag and Jules-Plag, 2019

What Data and Knowledge are Needed?

Efforts to reach a desirable future



Developing and validating Transformation Knowledge



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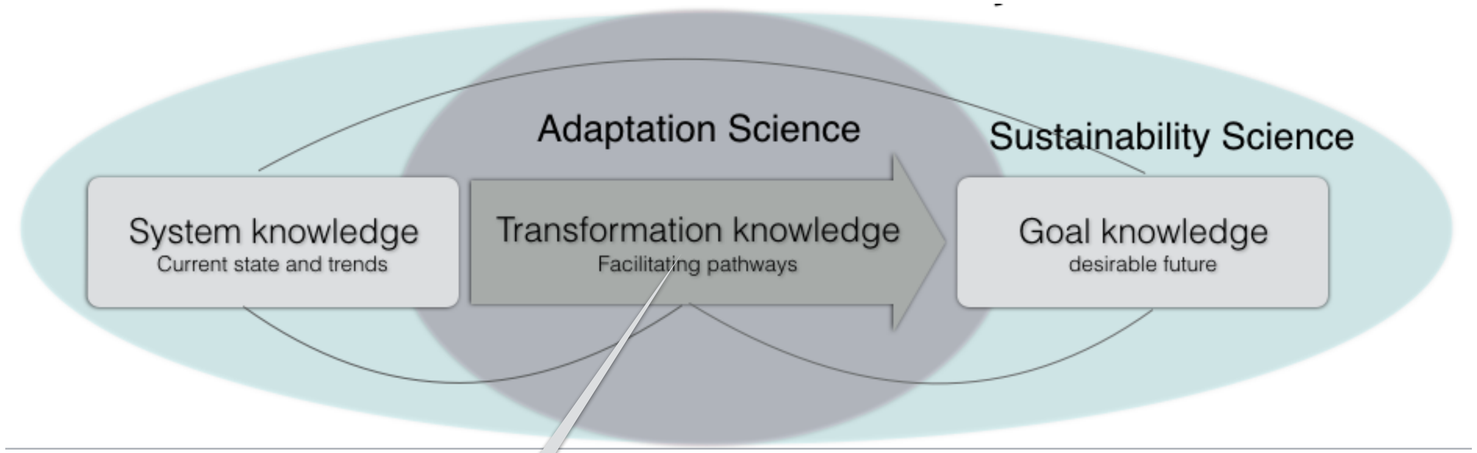
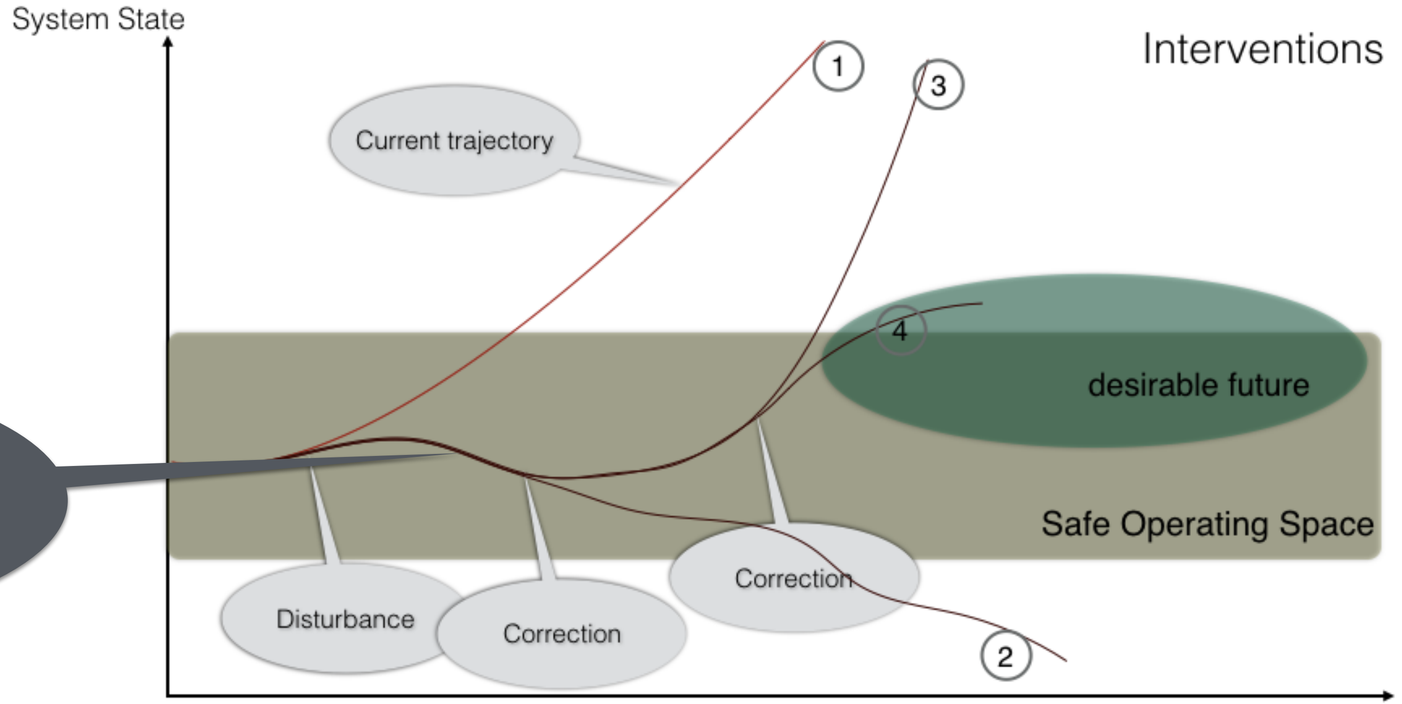


Developing and validating Transformation Knowledge

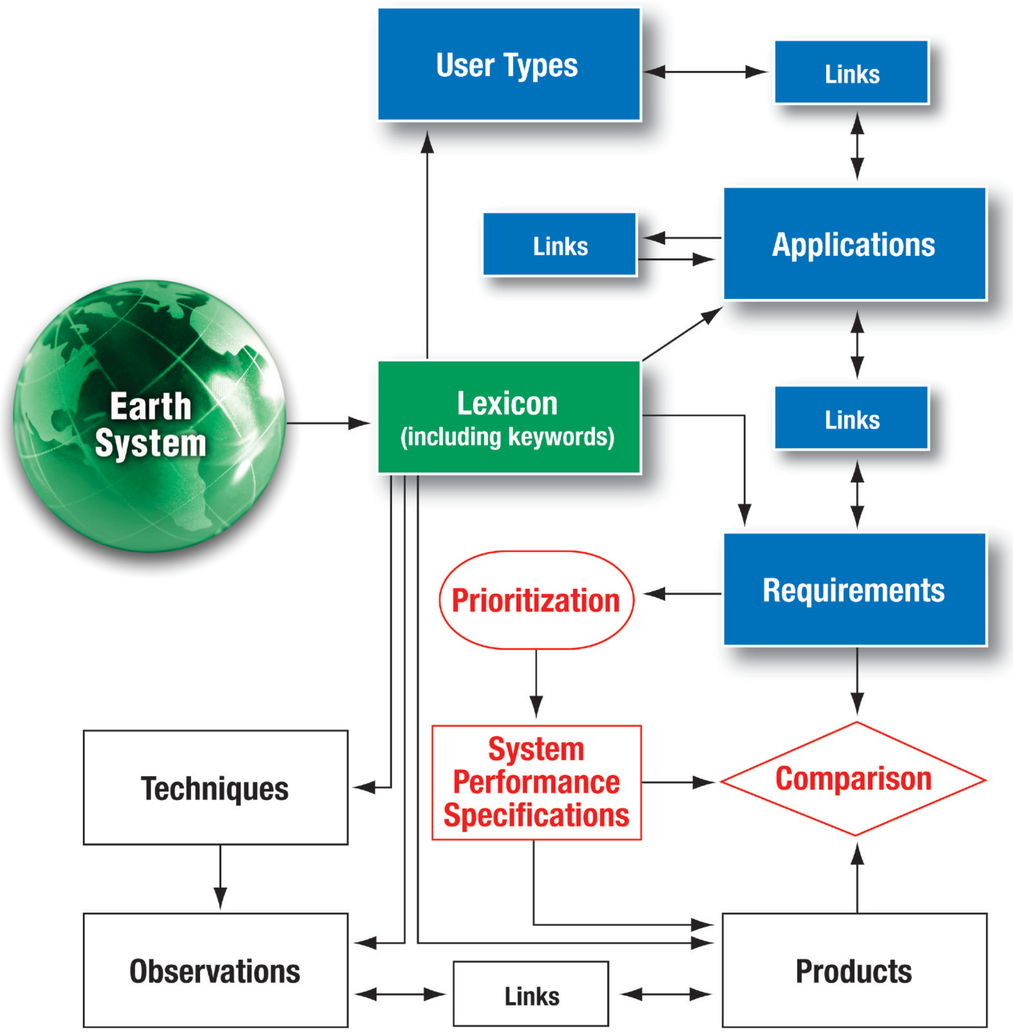
Supporting interventions, monitoring impacts, developing corrections



Plag and Jules-Plag, 2019

What Data and Knowledge are Needed?

Methodologies for Gap Analysis

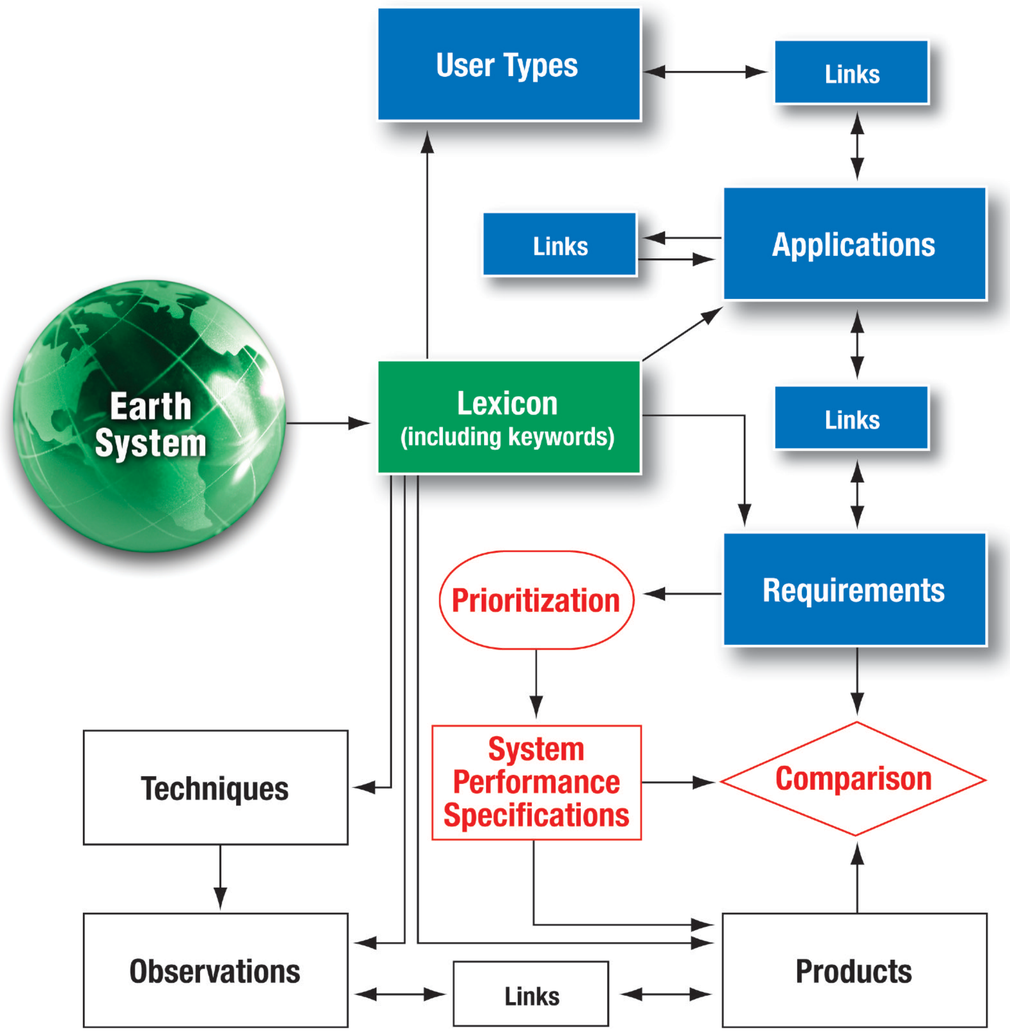


For example:
GEOSS User requirement Registry

Plag et al., 2018

What Data and Knowledge are Needed?

Methodologies for Gap Analysis



1. Top-Down thread 1: Identification of a collection of observation requirements and specifications from generic goals for sustainability of the global civilization as expressed in the GEOSS Strategic Targets, the SDGs, and the adherence to the planetary boundaries.

For example:
GEOSS User requirement Registry

Plag et al., 2018

What Data and Knowledge are Needed?

Spectrum of Methodologies for Gap Analysis

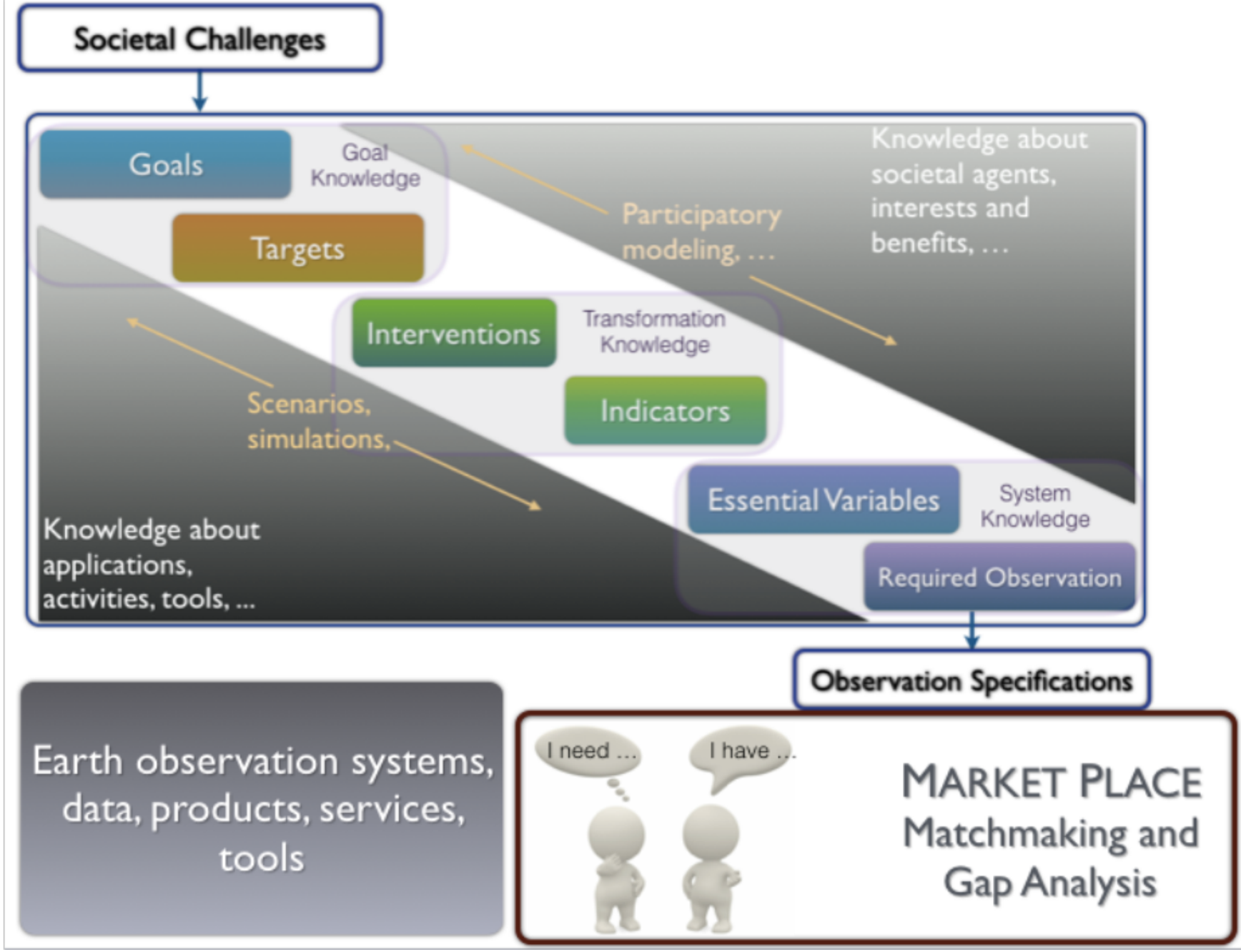
ConnectinGEO

TDT1: Goal-Based	TDT2: International Programs	BUT1: Community/ Expert-Based	BUT2: Discovery and Access Broker	BUT3: Industry Challenge

Plag, 2016

What Data and Knowledge are Needed?

Goal-Based Gap Analysis



Plag and Jules-Plag, 2019

Prioritization of Gaps

SMART gap formulation

- **S**pecific — Specific proposed action to remedy
- **M**easurable — Outcome for success of the remedy
- **A**chievable — Indicative cost estimate
- **R**elevance — User impact if not remedied
- **T**ime bounded — Action on short-, mid- or long-term

- **R**isks — Risk register for non-resolution (+impact, +probability)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640276.

de Maziere et al., 2016

Prioritization of Gaps

Utilizing Graph Data Linking Requirements and Applications

For SEE-IN KB entries:

$$\hat{r}^{\text{glob}}(A) = \sum_{i=1}^{L_A} w_i \cdot \hat{r}_i^{\text{glob}}, \tag{6}$$

L_A: number of entries E_i that are targets in the links with entry A being the source;
w_i: weight of the link between A and E_i;
r_i^{glob}: global relevance of E_i.

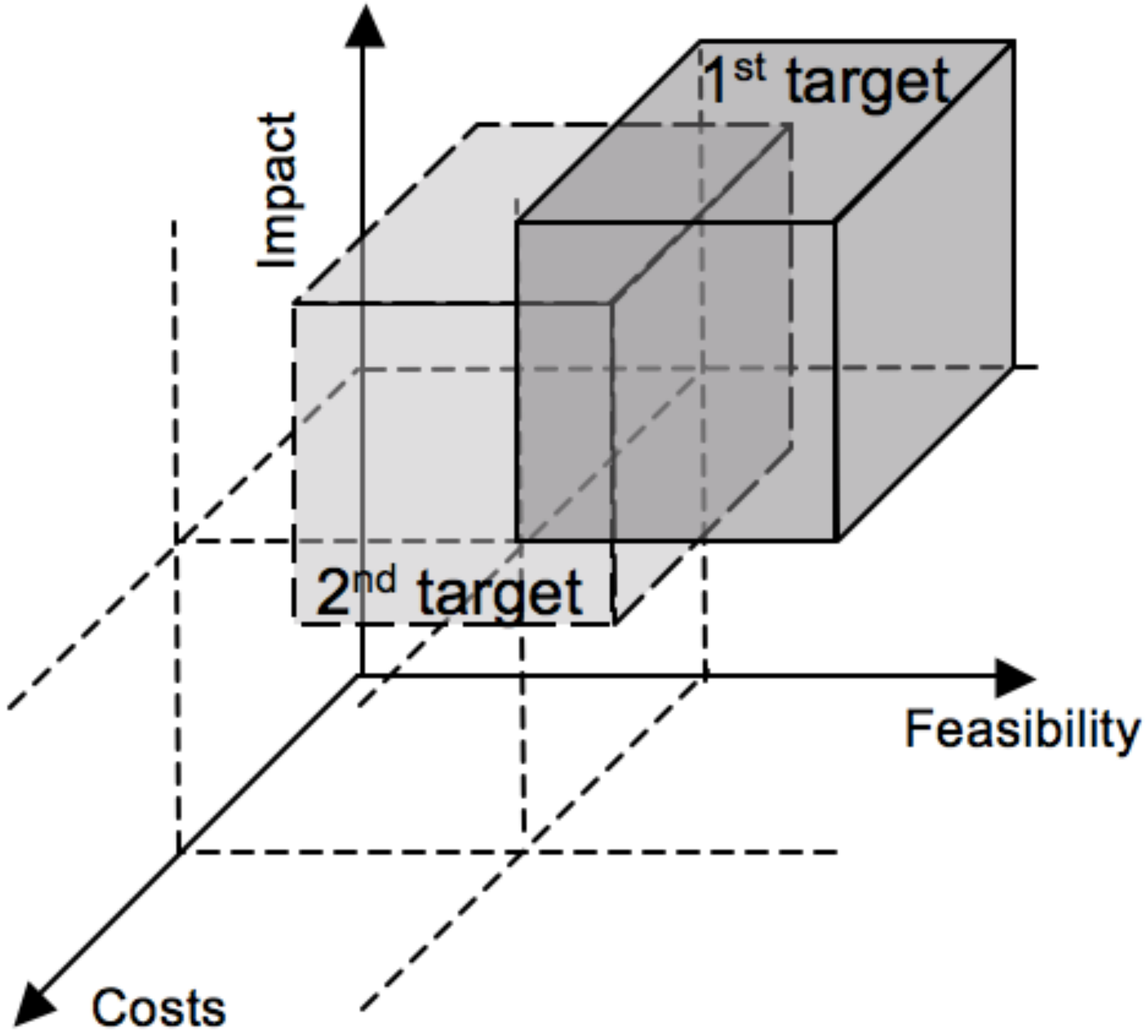
For external datasets or products:

$$r^{\text{glob}}(B) = \sum_{i=1}^{K_B} \hat{r}_i^{\text{glob}}, \tag{7}$$

K_B: number of requirement entries R_i that are met by dataset or product B;
r_i^{glob}: global relevance of requirements R_i.

Prioritization of Gaps

Feasibility and impact versus cost and time needed



$$p = \frac{f * i}{c * t}$$

p: priority
f: feasibility
i: impact
c: cost
t: time needed

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Discussions on:

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What approaches to knowledge gap analyses and knowledge need prioritization?
What (best) Practices are available?
How can we decide on what is BEST?

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Discussions on:

(2) **Co-creation of research agendas and knowledge**: best practices in engaging with stakeholders, including participatory modeling;

Co-Creation of Research Agendas and Knowledge

Goal: Create Knowledge Used by Societal Agents

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A statement is knowledge if it is justified, true and believed

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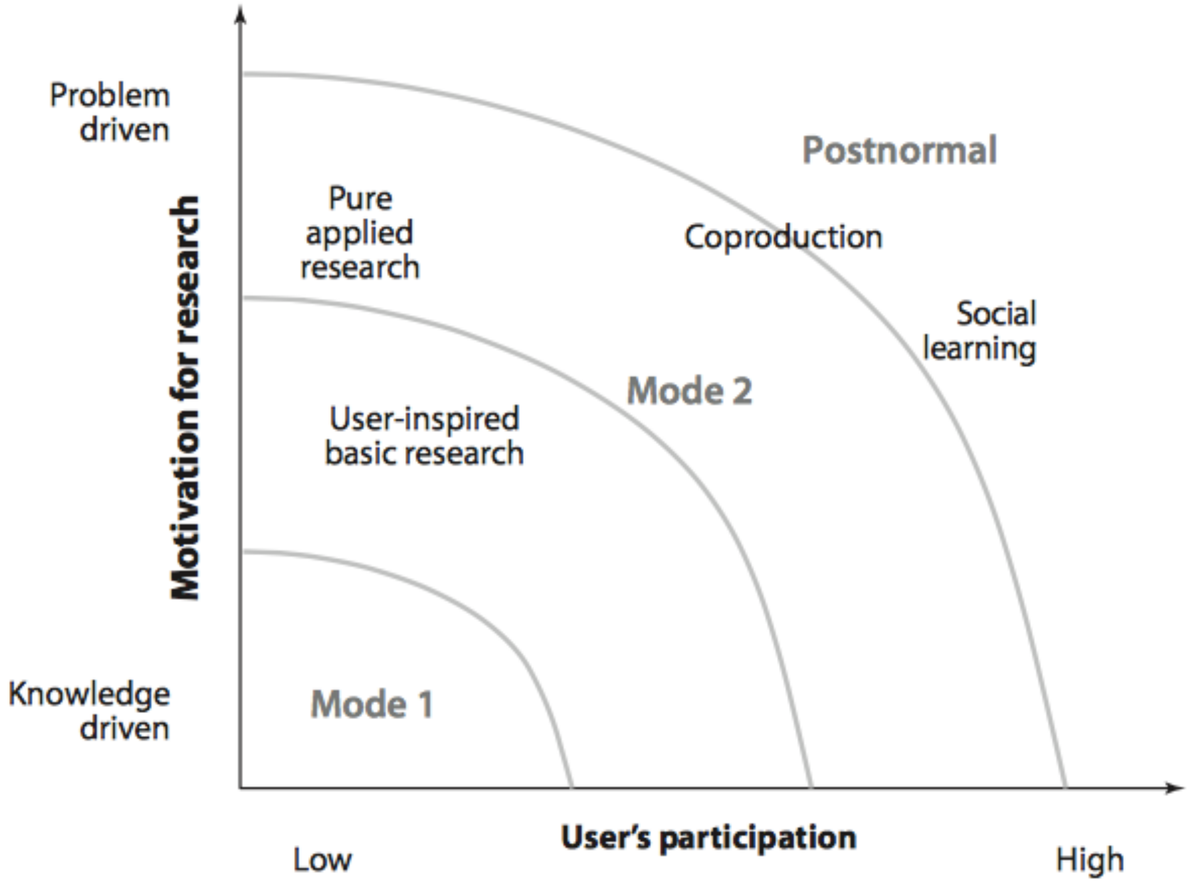

Kirchhoff et al., 2013

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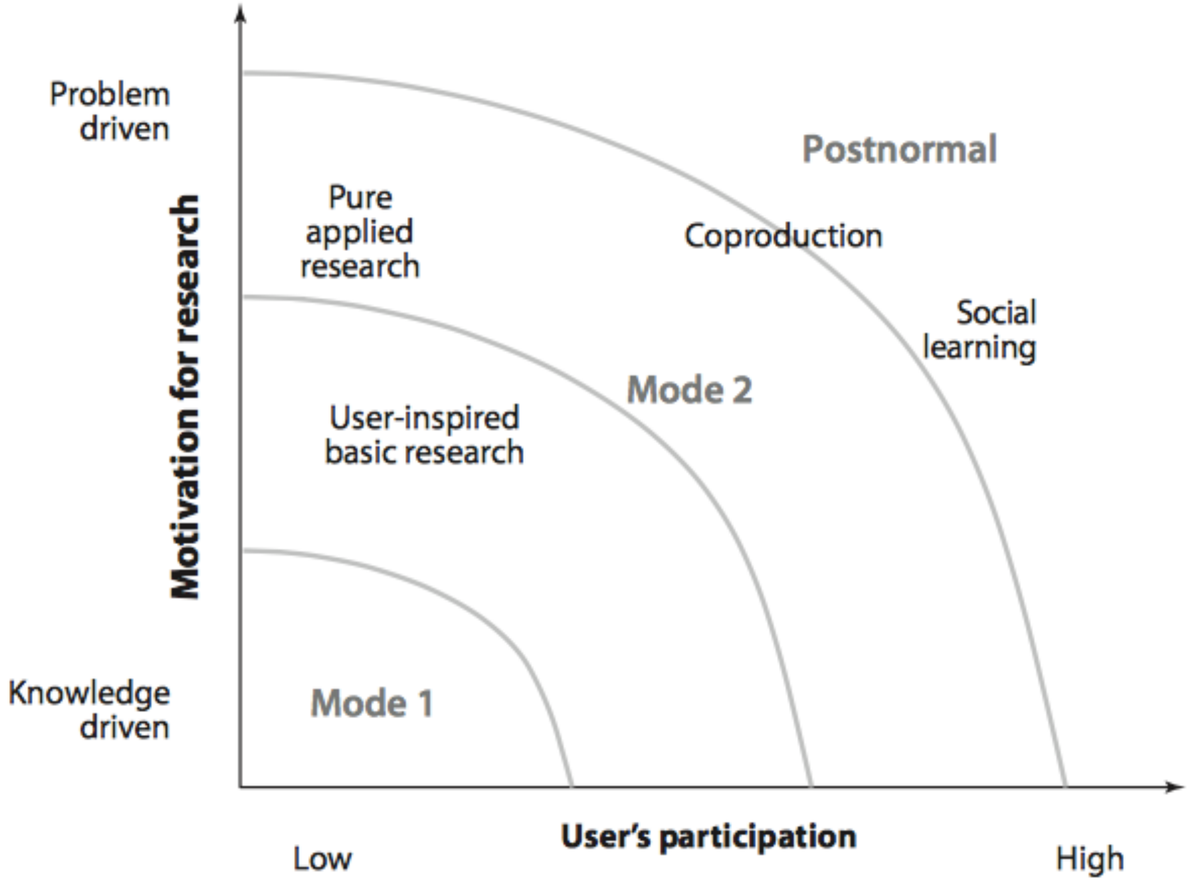

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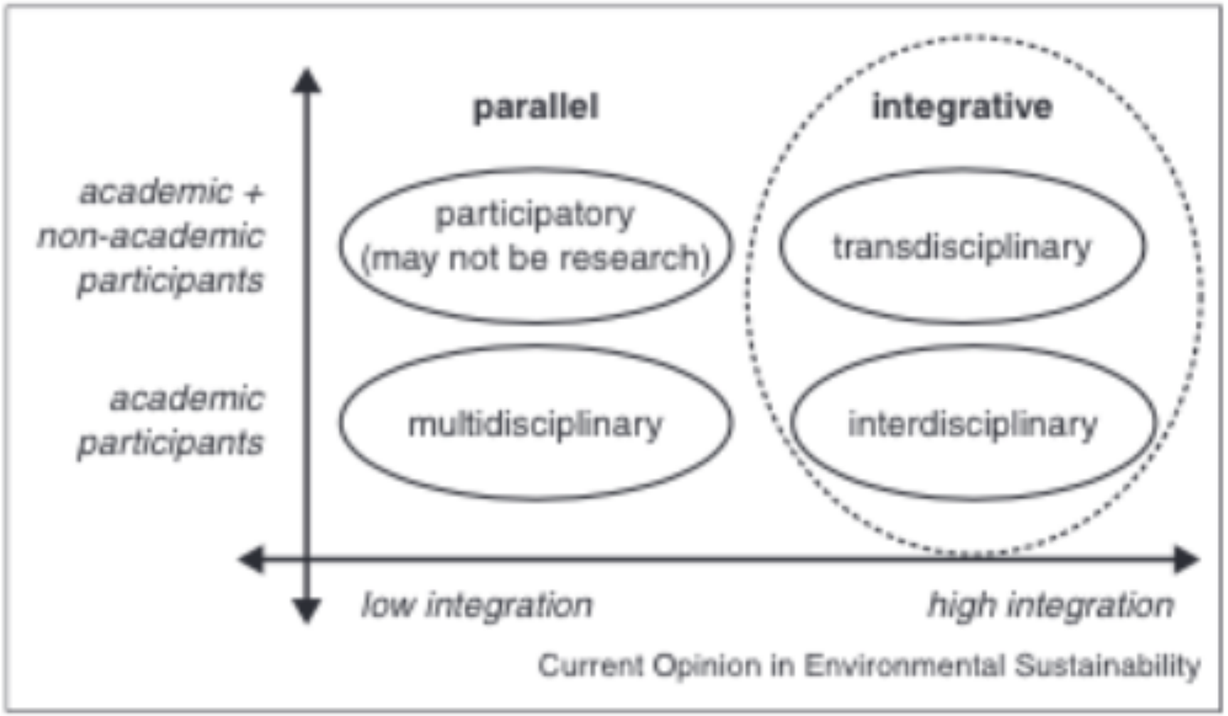

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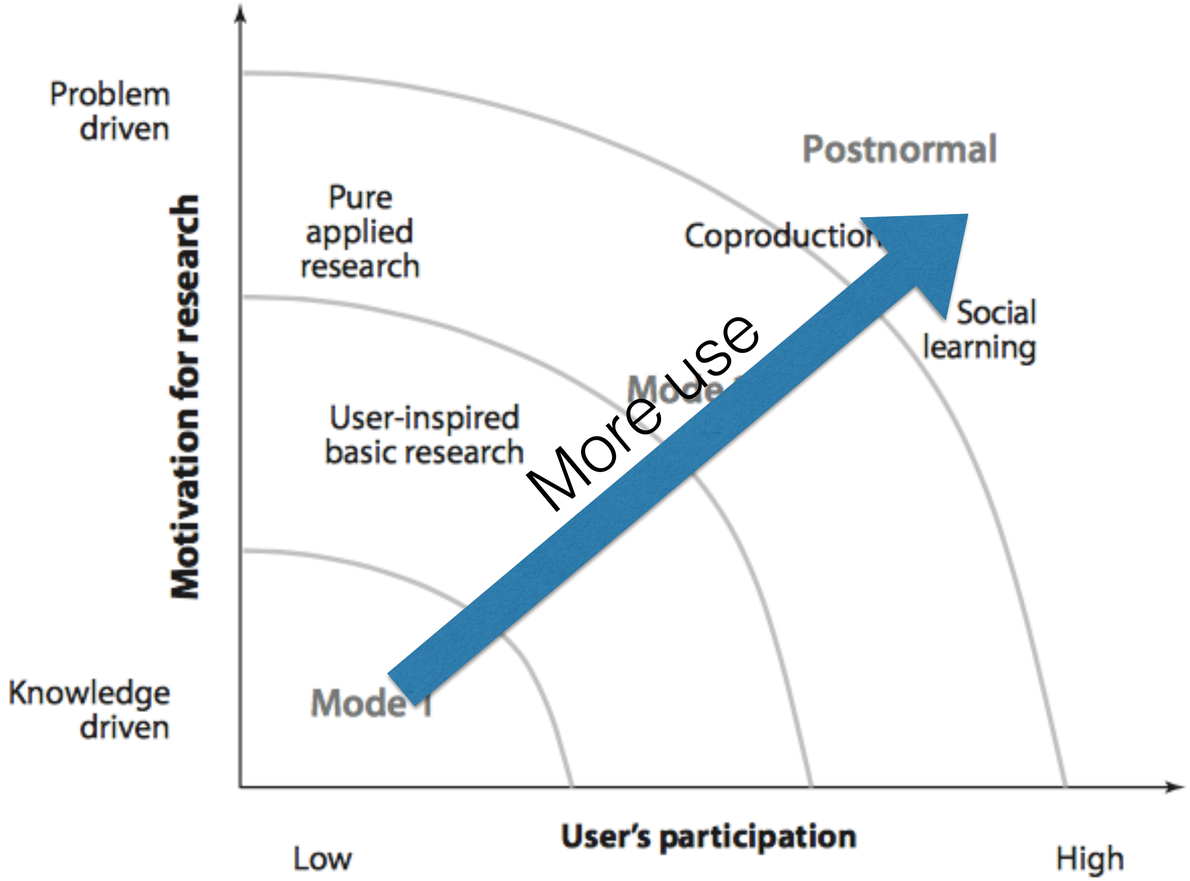

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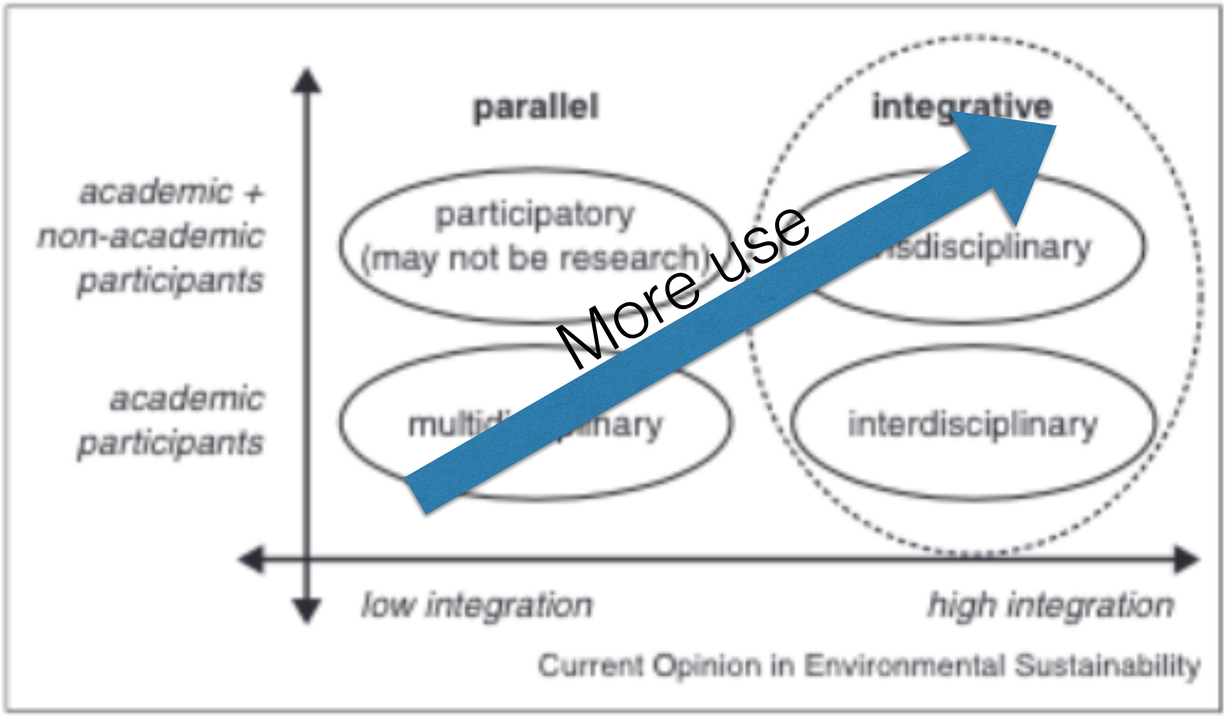

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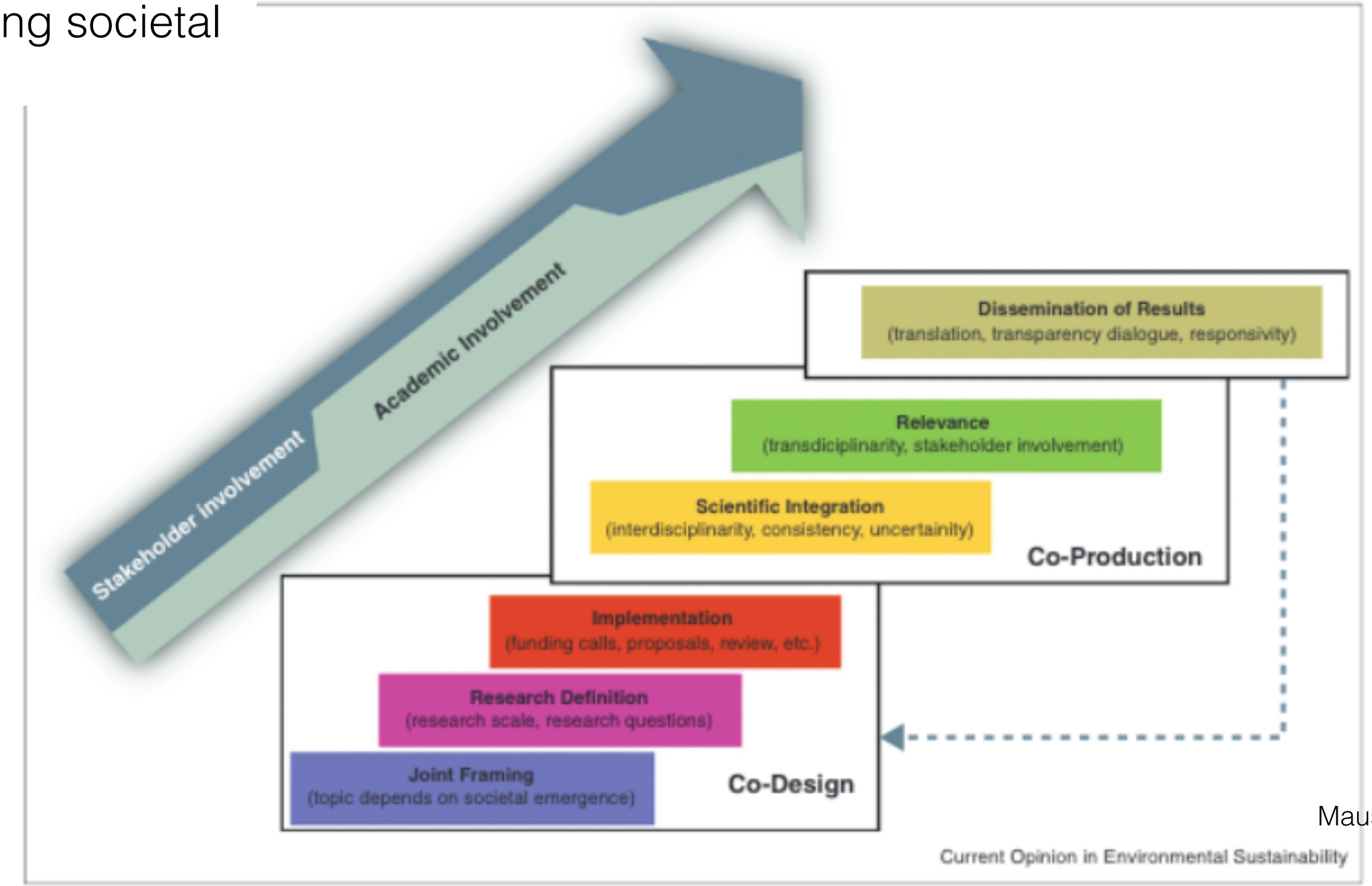
Co-Creation of Research Agendas and Knowledge

Engaging societal agents



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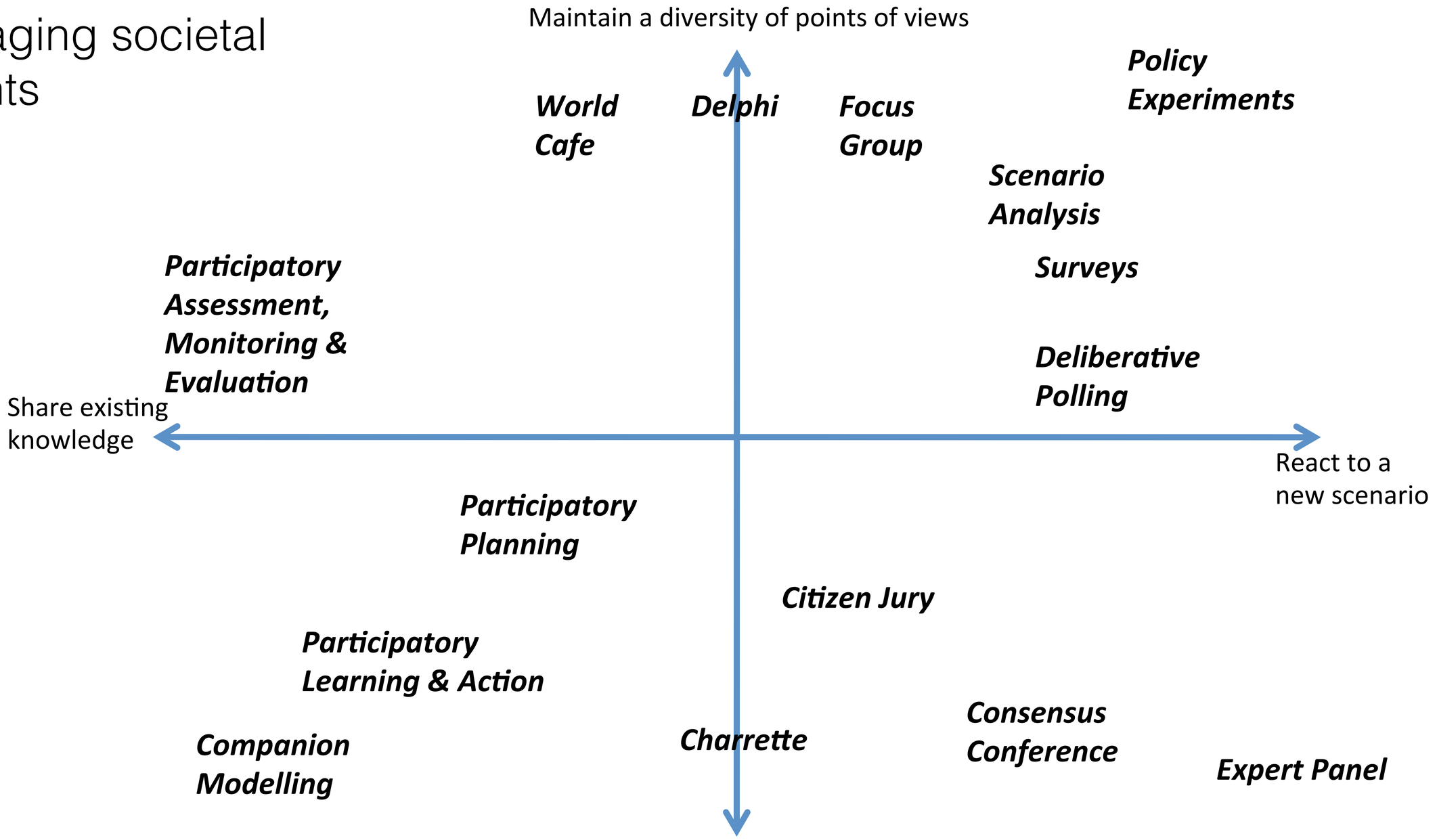

Adapted from Van Asselt (2001)

Plan

Discussions on:

(2) **Co-creation of research agendas and knowledge**: best practices in engaging with stakeholders, including participatory modeling;

What approaches to co-creation of research agenda and co-creation of knowledge?
What (best) Practices are available?
How can we decide on what is BEST?

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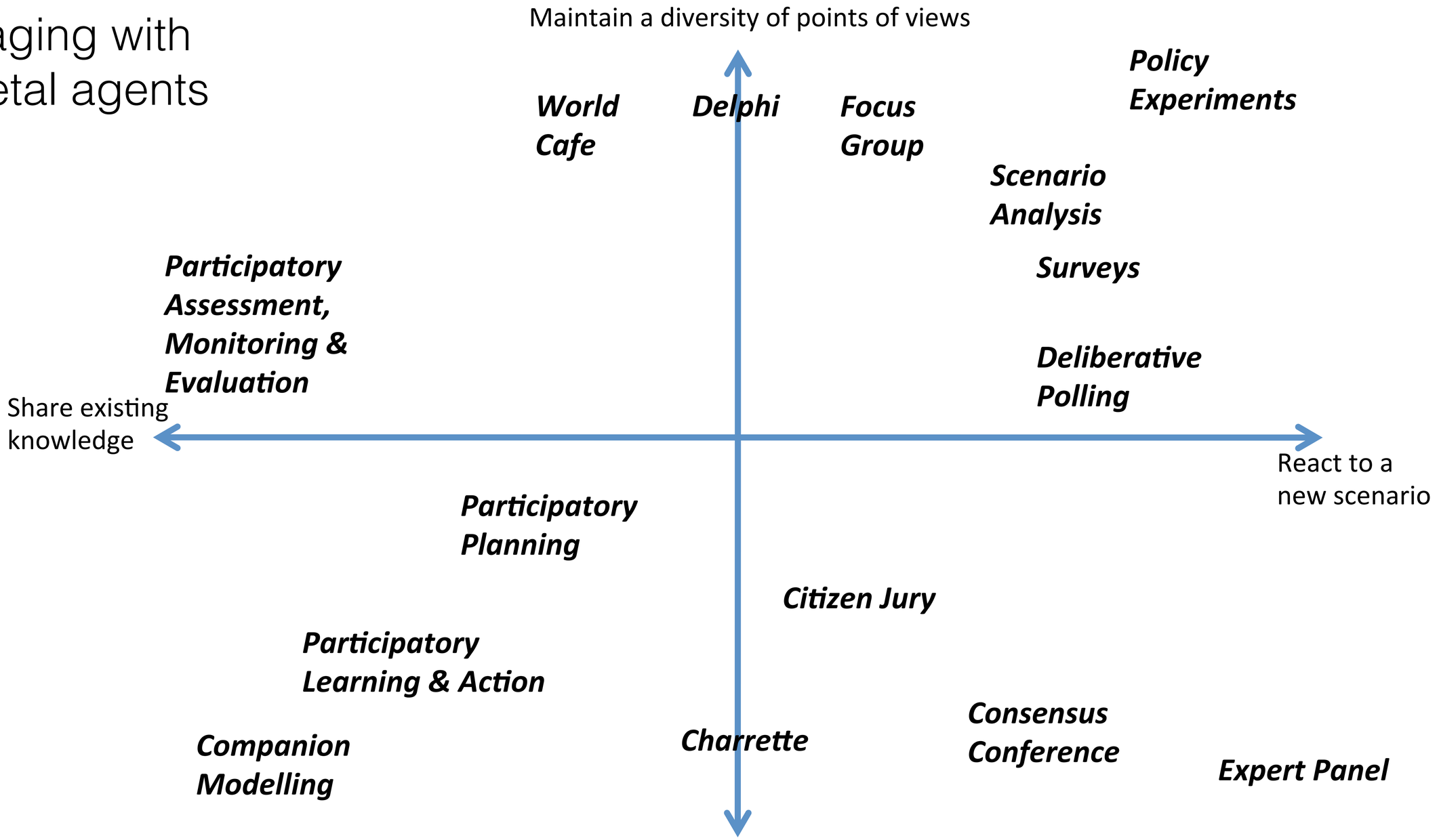
Discussions on:

(3) **Co-usage of knowledge**: best practices for the delivery of knowledge to decision and policy makers and for the engagement of scientists and researchers in policy making, including ethical considerations.

Co-Usage of Knowledge

Engaging with societal agents



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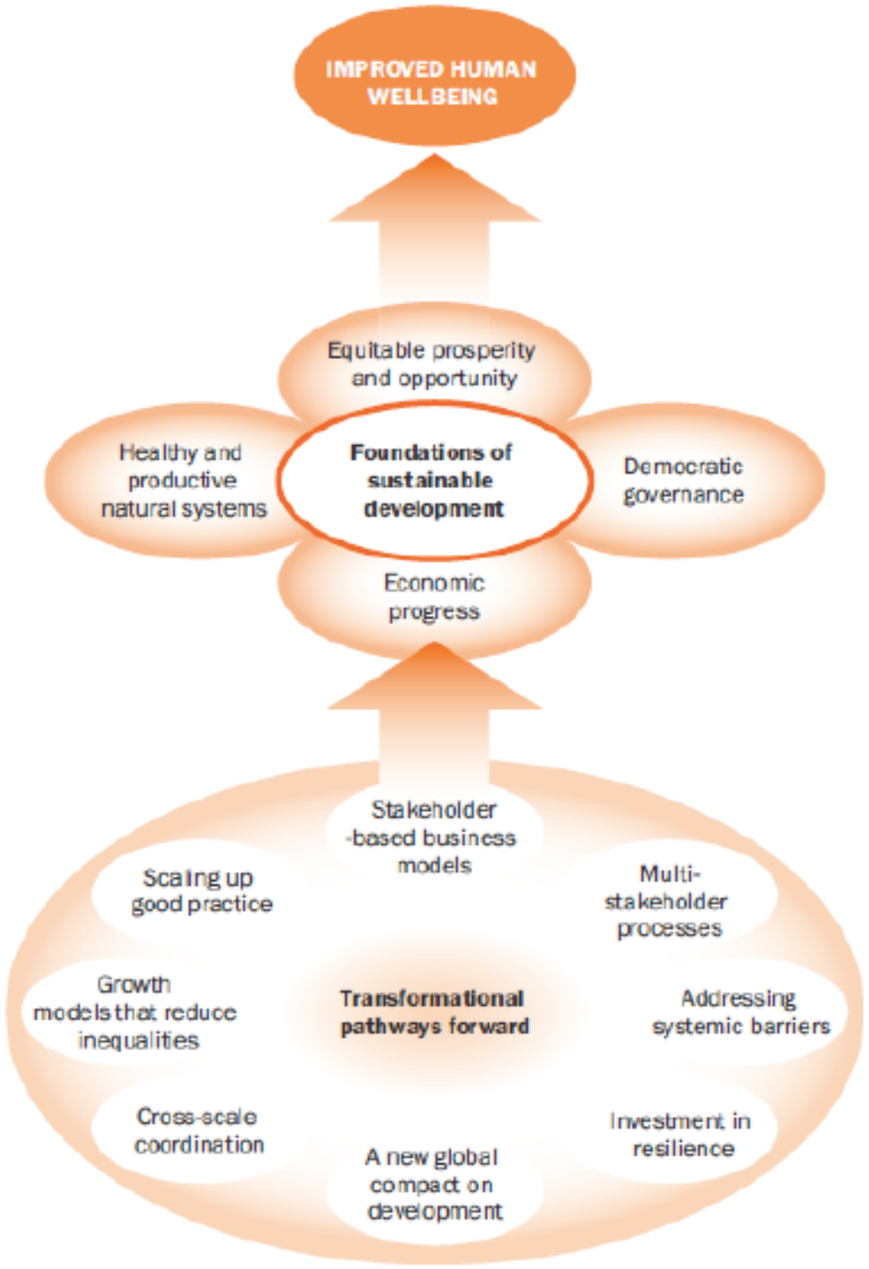
Co-Usage of Knowledge

Using Knowledge for pathways to sustainable development

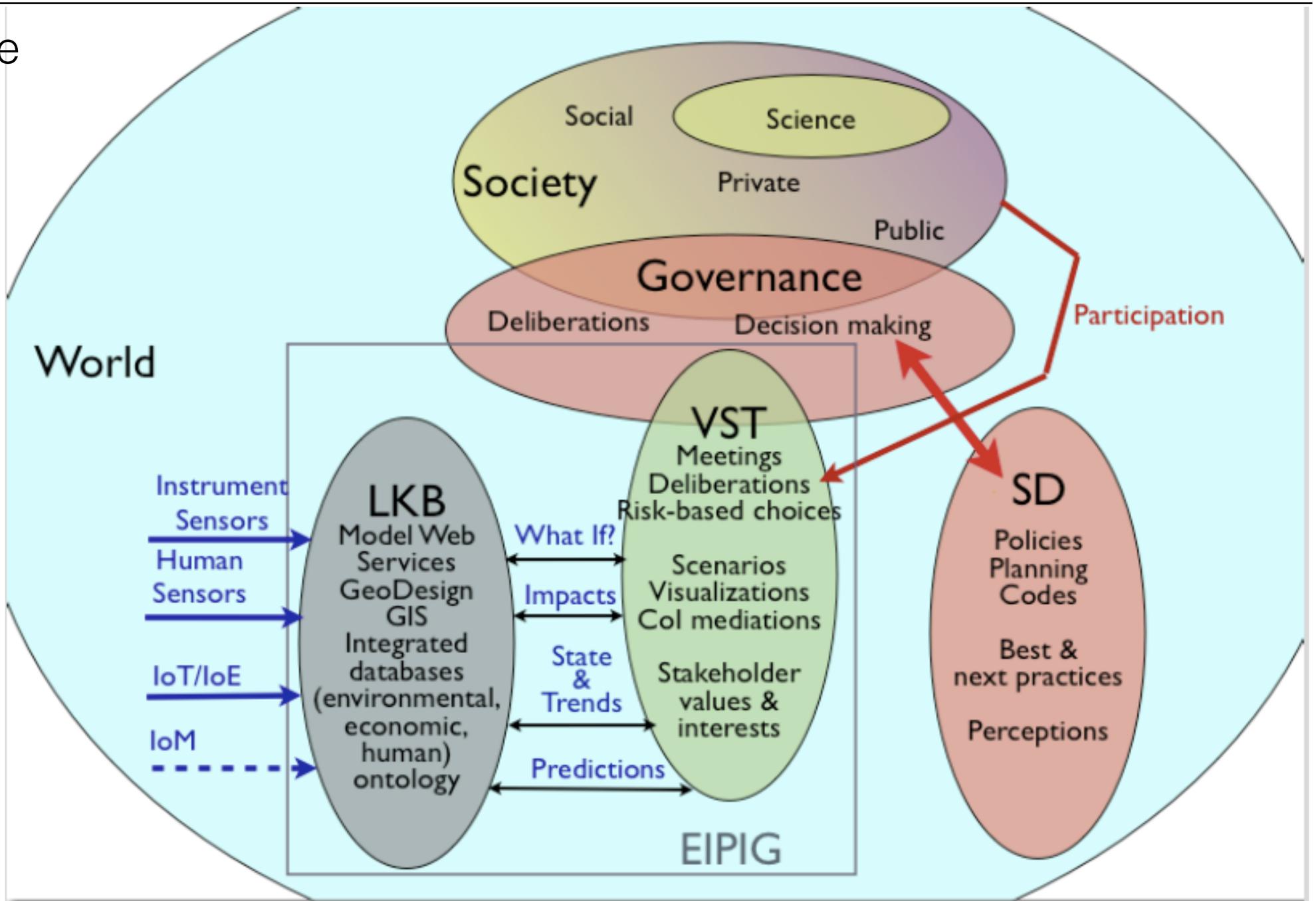


From		To
Development assistance	→	A universal global compact
Top-down decision making	→	Multi-stakeholder decision-making processes
Growth models that increase inequality and risk	→	Growth models that decrease inequality and risk
Shareholder value business models	→	Stakeholder value business models
Meeting "easy" development targets	→	Tackling systemic barriers to progress
Damage control	→	Investing in resilience
Concepts and testing	→	Scaled up interventions
Multiple discrete actions	→	Cross-scale coordination

Fig. 1: Sustainable development requires transformational pathways forward to a sound foundation of sustainable development. Most of the transformations depend on access to comprehensive knowledge bases and participation of stakeholders in the creation of knowledge and the processes that lead to decisions. Multi-stakeholder processes are crucial for democratic governance. From IRF2015 (2013).

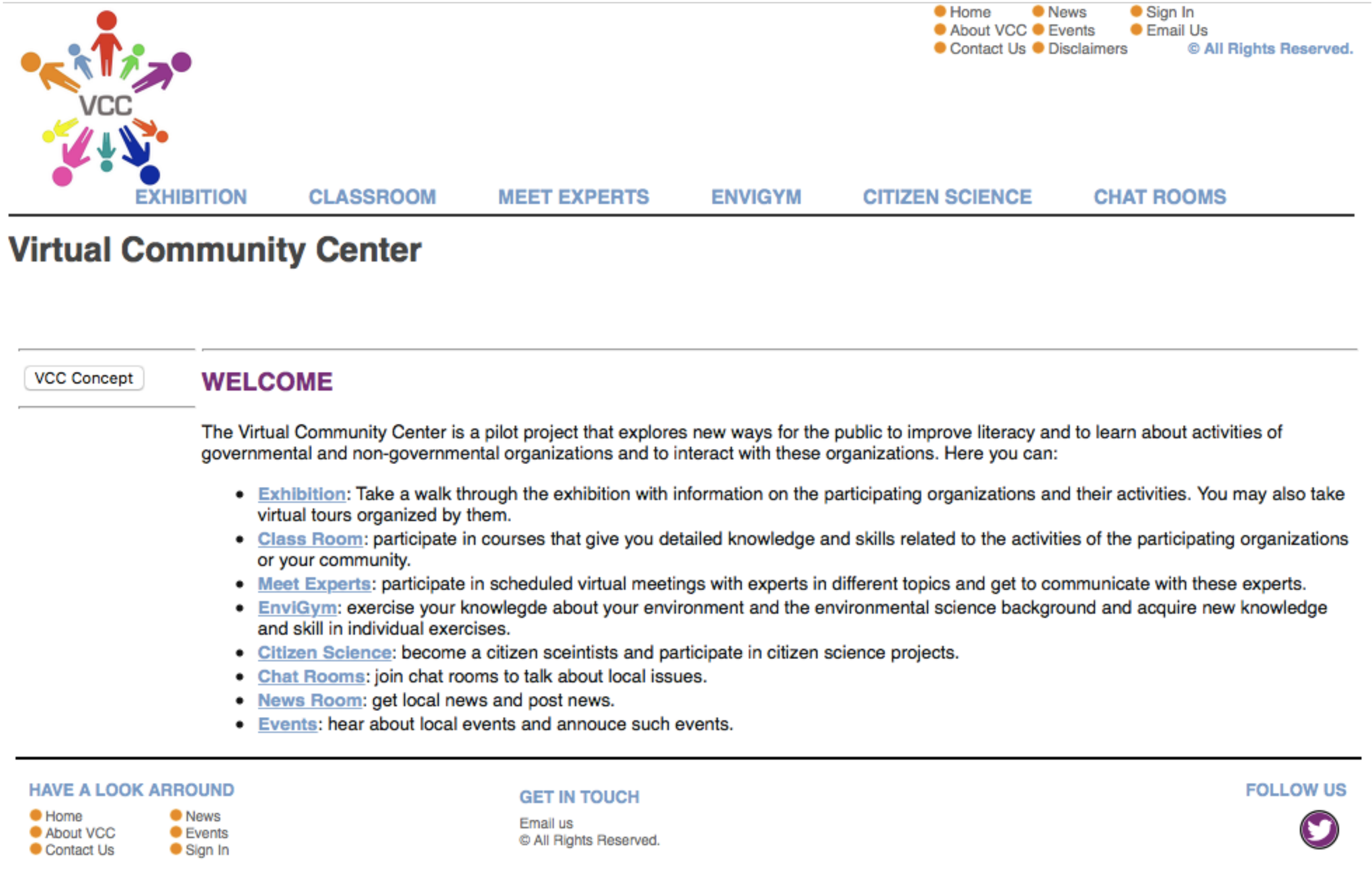
Co-Usage of Knowledge

Integrating science into society



Co-Usage of Knowledge

Transforming society



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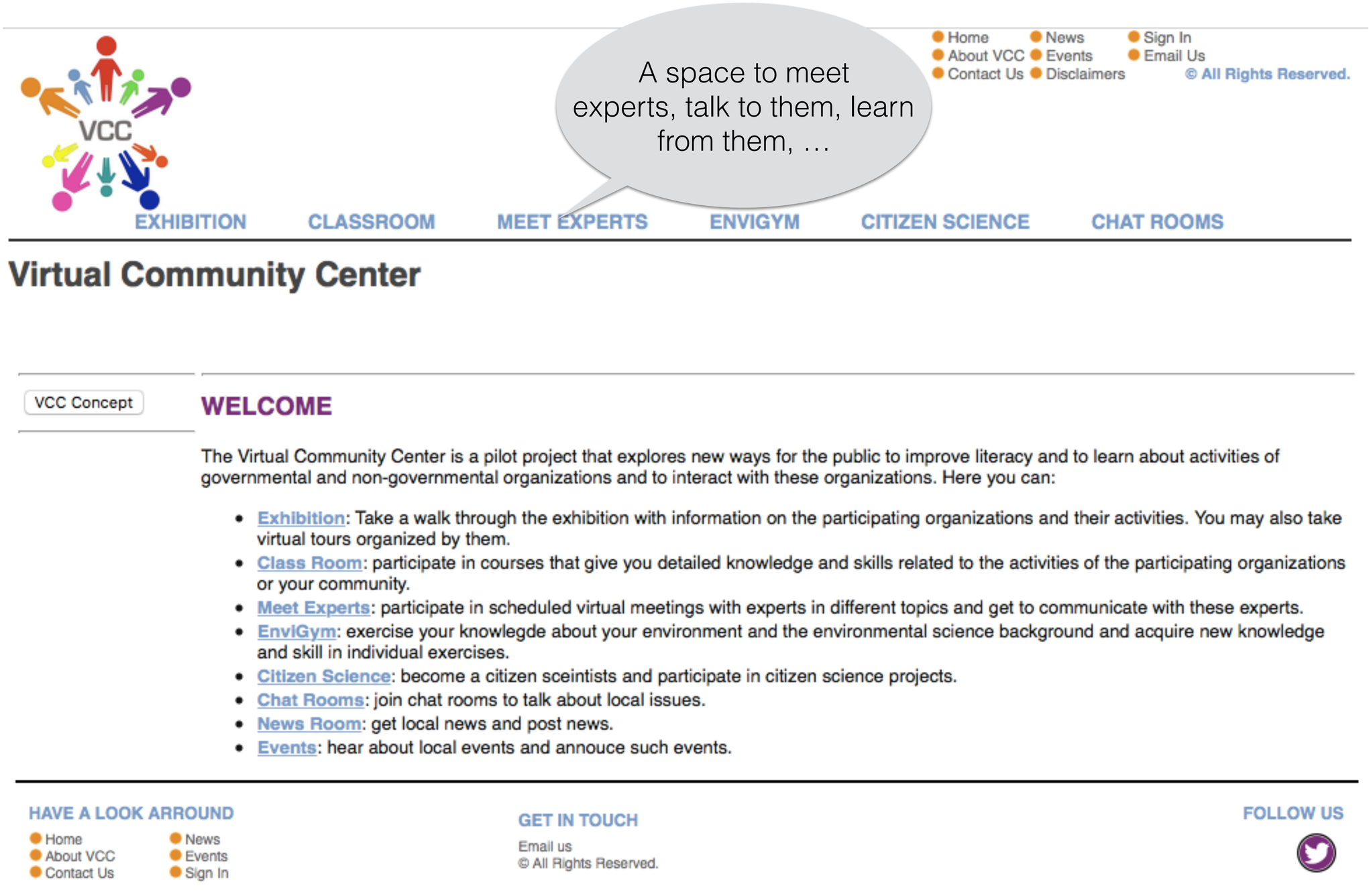

Plan

Discussions on:

What ways do we (experts/researchers) have to support the societal use of knowledge?
What (best) Practices are available?
How can we decide on what is BEST?

(3) **Co-usage of knowledge**: best practices for the delivery of knowledge to decision and policy makers and for the engagement of scientists and researchers in policy making, including ethical considerations.