



Framing the Research Agenda for New LCA: Relations to Governance

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Central position statement: preliminary

All New Governance situations can be reduced to a limited number of basic requirements on modelling in term of two dimensions:

- **MODEL USE**
Use of model results, passive; to interactive model use, producing adapted results; to model modification for incorporating relevant assumptions and mechanisms
- **MODEL COMPLEXITY**
Complexity of model used, in a stepwise manner going to relevant complexity



Questions and Answers

Main Question:

What will be the ***sustainability consequence*** of ***product/technology choice X***?

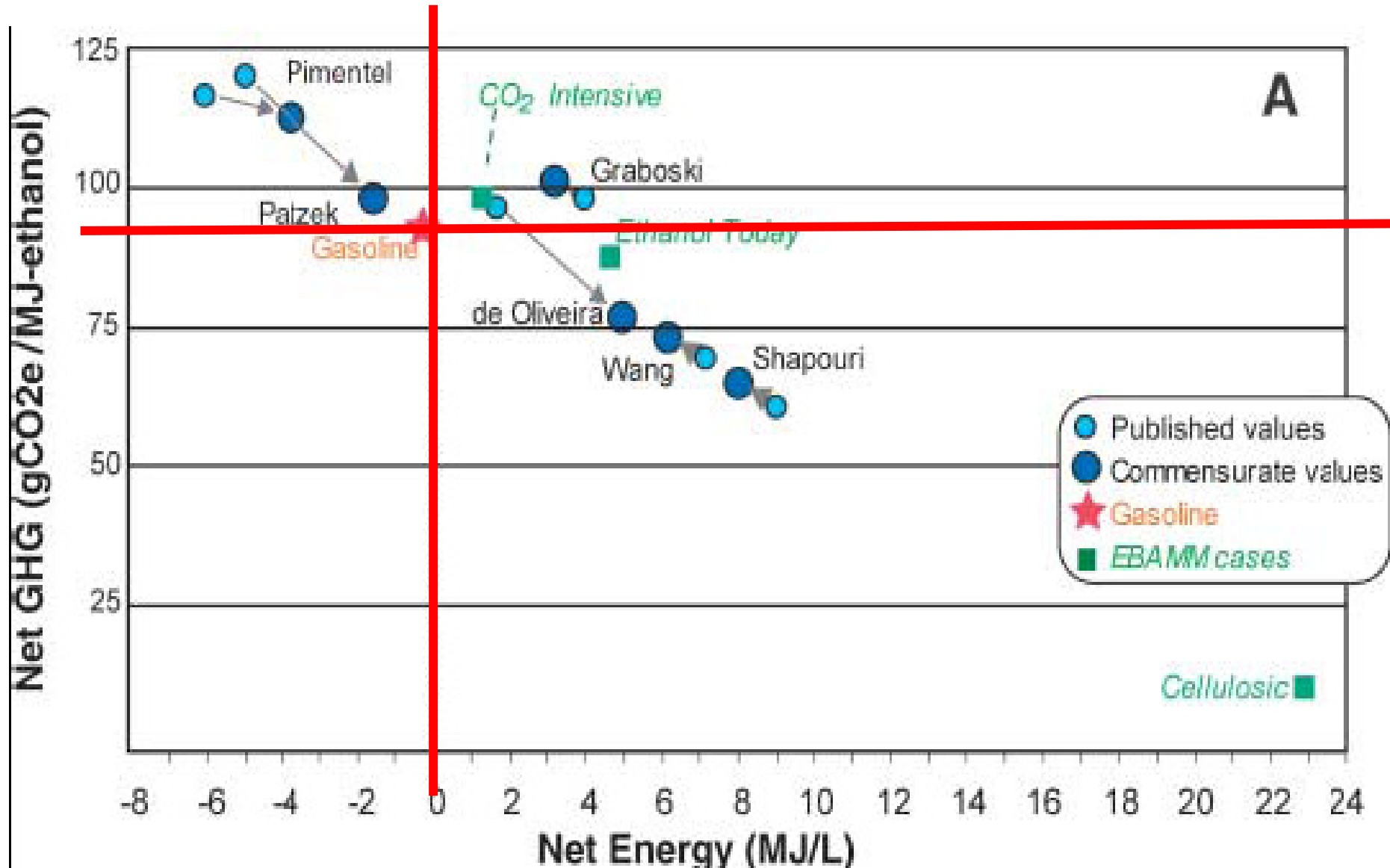
[Eg: large scale introduction of bio-ethanol/biofuel/
bio-energy]

Main Answer:

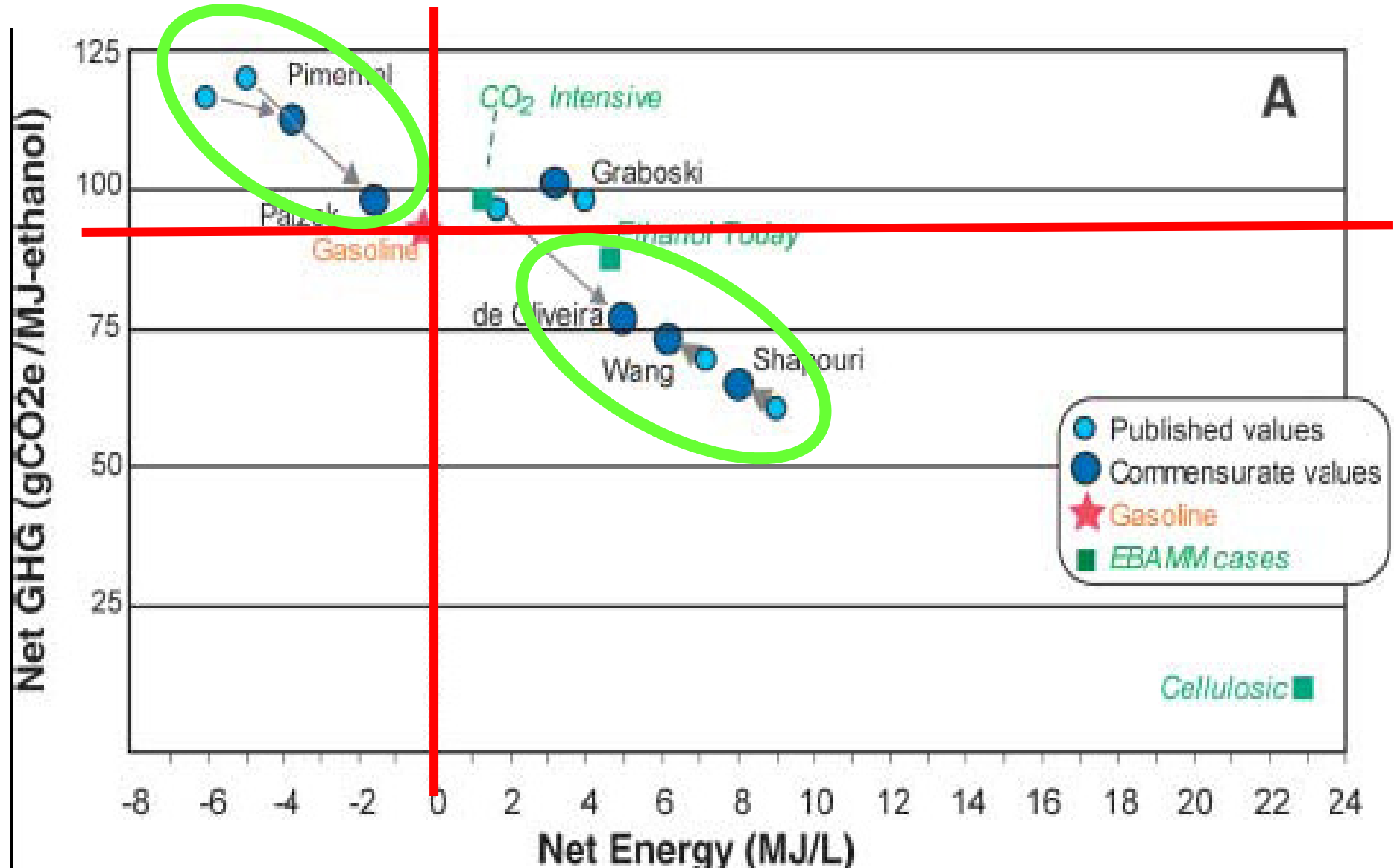
The ***world*** will ***develop*** differently from how it ***otherwise*** would have developed, in economic, environmental and social respect.



Example: Corn ethanol US Farrell et al (Science 2006)

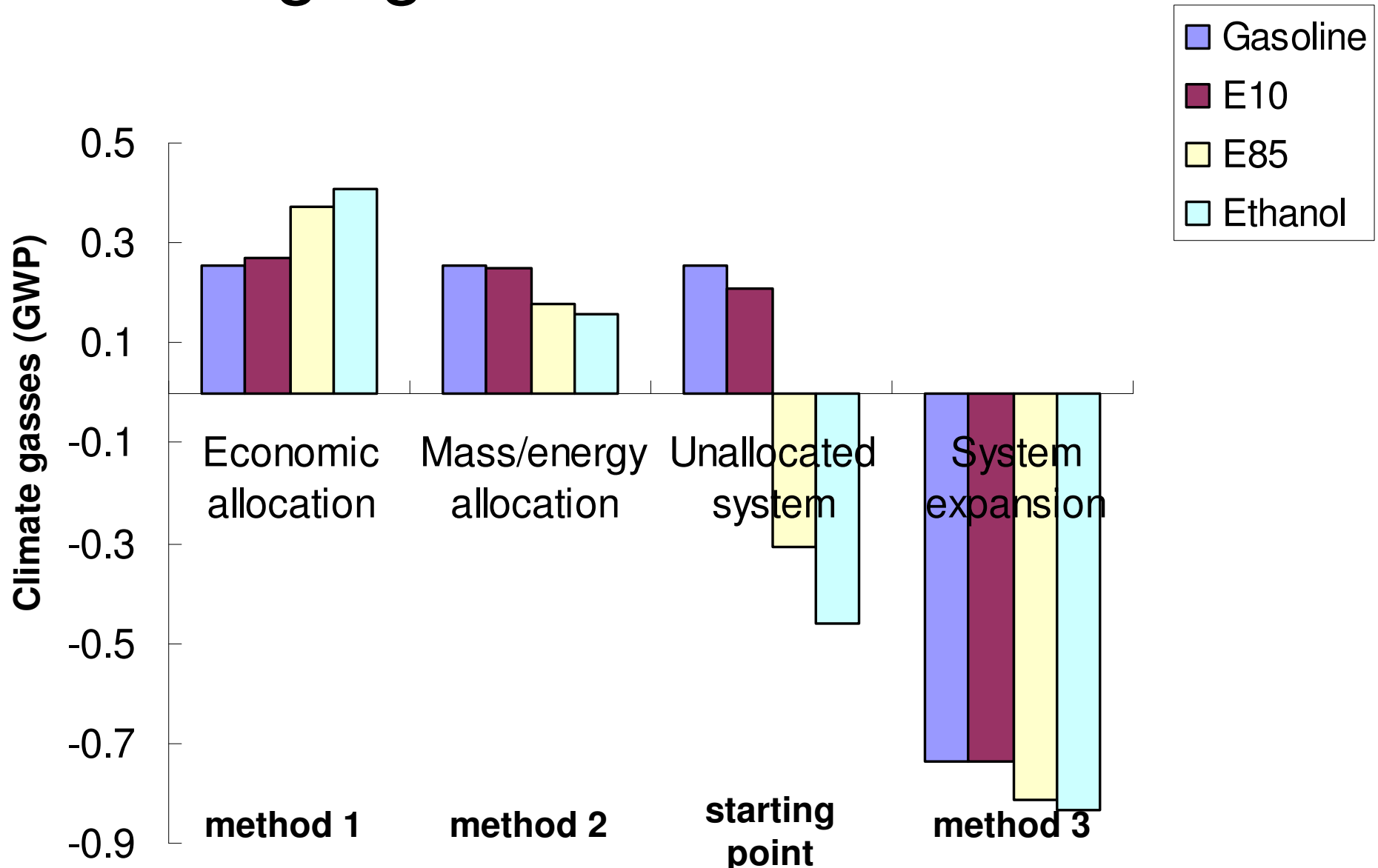


Farrell et al (Science 2006)





Several ISO-LCA methods: Diverging results. Source: Lin Luo





Framing the questions

- **Sustainability & Life Cycle Analysis:**
Domain of new LCA
- **Modes of Governance:**
 - *Requirements* for governance modes
 - *Facilitating* governance modes

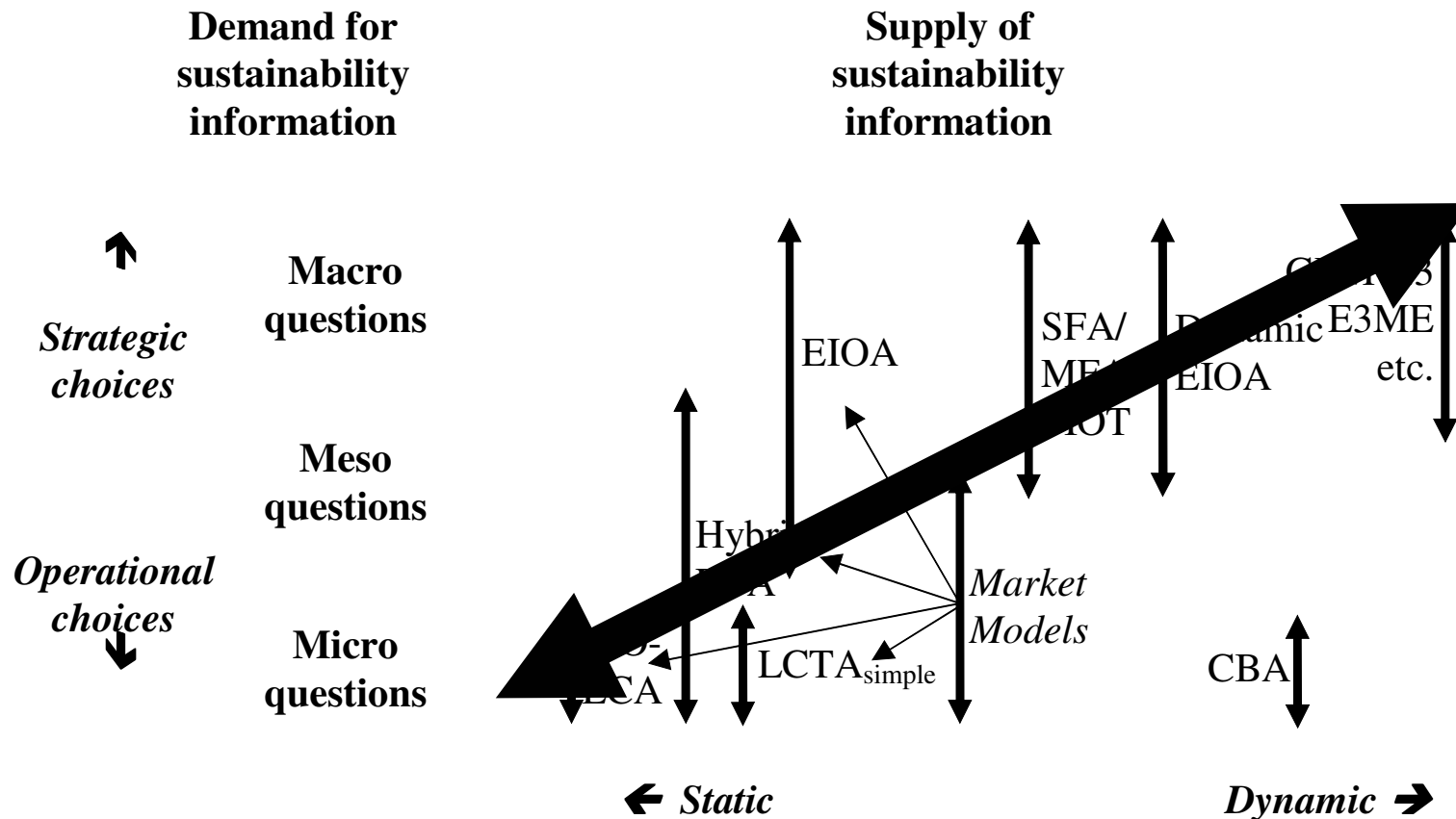


Framing the questions

- Sustainability & Life Cycle Analysis
 - LCA as part of the Sus-Pie:
 - **Technology choices**
 - **Function focus**
 - **Differentiated technologies as to regions**
 - Other parts of the pie, to be related to **(avoiding confusion)**
 - **Location choices**
 - **Site specific risk assessment**



Main lines in question & answers: from simple to complex





Framing the questions

- Modes of Governance
 - Formal-traditional
 - The policy process
 - The implementation process
 - Bargaining in the shadow of the law
 - Acting in the shadow of the law
 - Reflexive, Horizontal, Participatory New Governance
 - EU modes:
 - Community Method; Intergovernmental Method
 - OMC, social dialogue, partnership principle
- Scott and Trubek (2002) summary:**



D3 (2007); Scott and Trubek (2002); Heritier (2002):

- Experimentation and knowledge creation
- Flexibility and revisability
- Diversity and decentralisation
- Multiple government levels
- Multiple participation by civil societies
- Deliberation among stakeholders
- Voluntarism
- Non-binding targets and soft law
- Subsidiarity
- Inclusion of all actors concerned

Conclusions on requirements and options: →

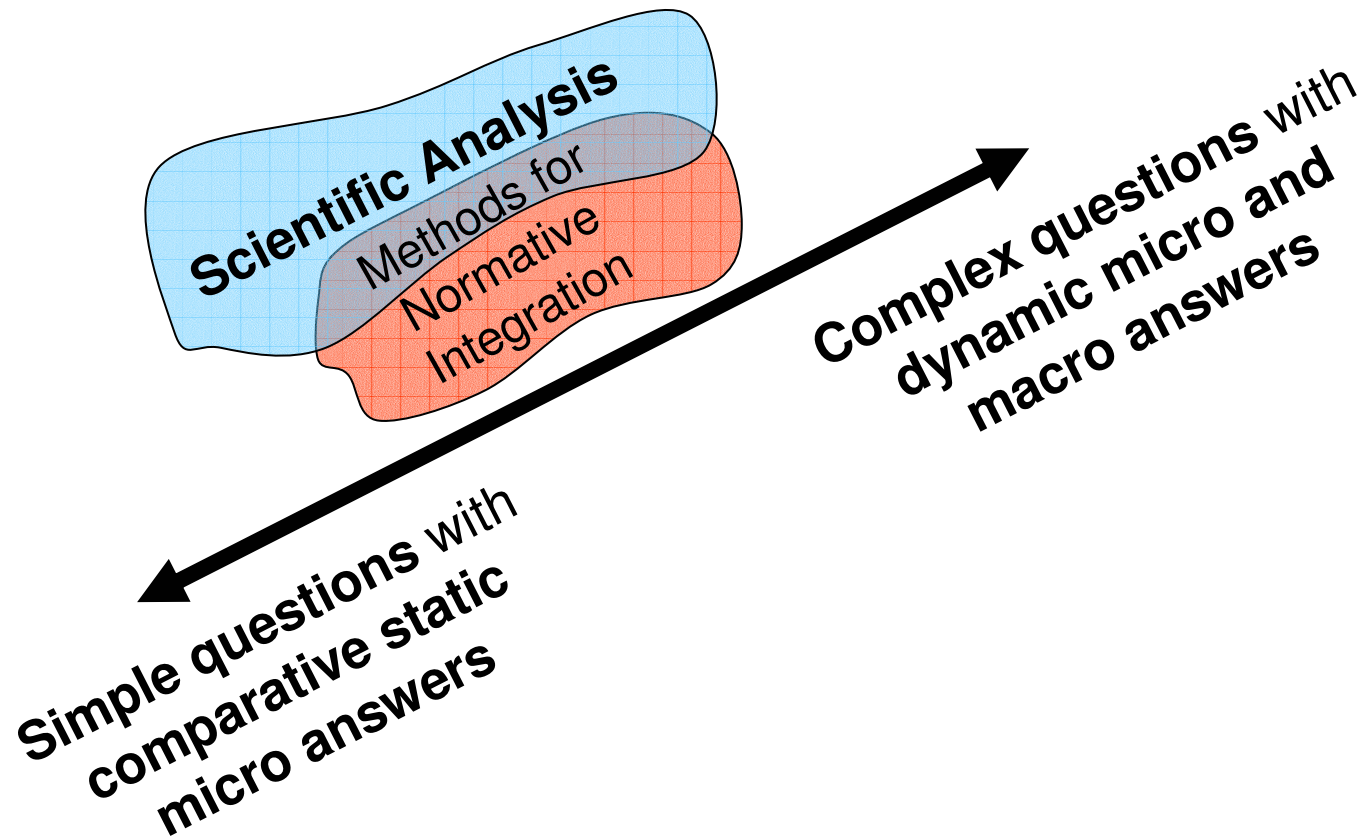


Conclusions on requirements and options for LCA in New Governance

- Broad communication between diverse actors
- Diverse levels of detail in analysis between actors
- Diverse capacities for sustainability modelling
- Diverging scope of questions in different domains
- Diverging types of questions between actors
- However:
One sustainability concept to be filled in

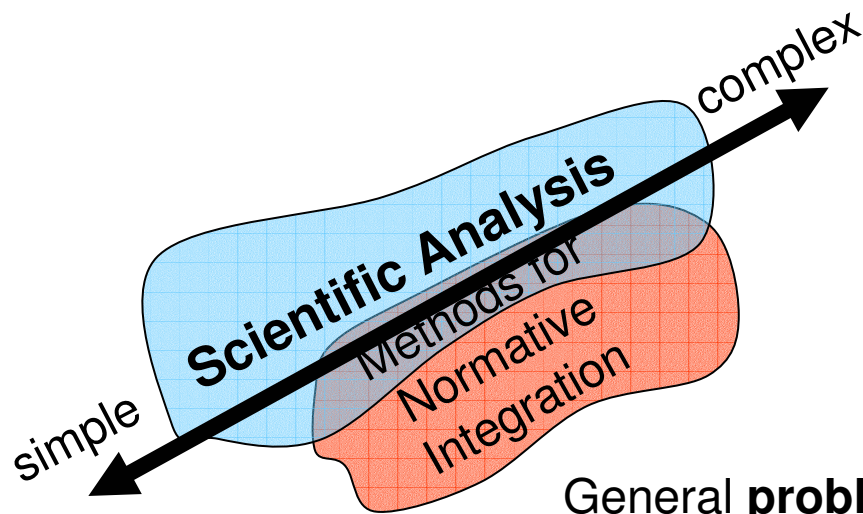


Scientific Analysis & Normative Integration





Scientific Analysis and Normative Integration: Applied analysis (1)



General **goal** in **all** applications:

- What will happen?
[all relevant facts resulting]
- How do we evaluate these results?
[Integrated evaluation by operational method or operational procedure]

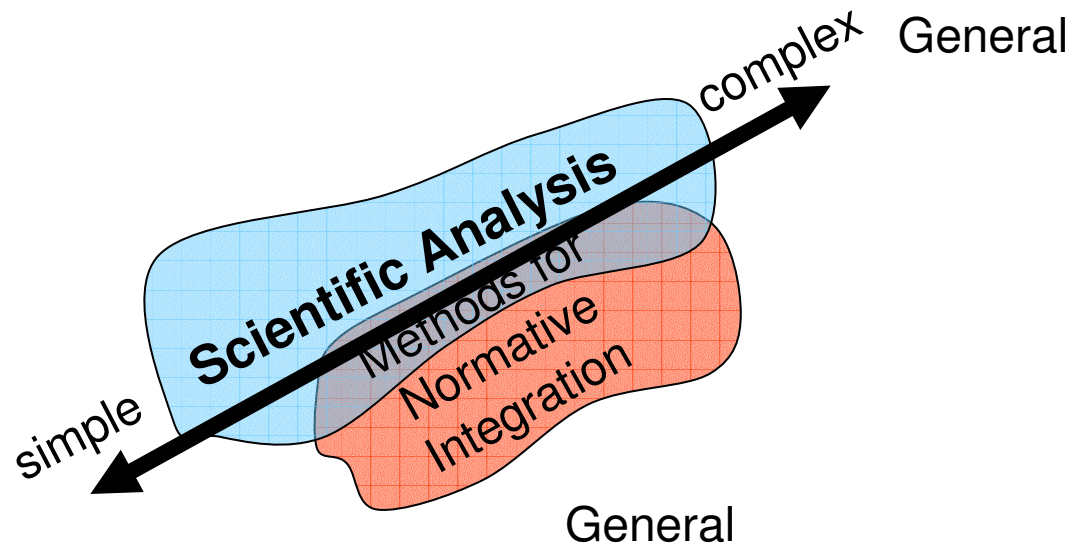
General **problem** in all applied science:

- Simple models give **simple** and **conditional** answers, with **conditions not understood** by users
- Complex models are always **partial** and **not really operational**, and are **not understandable** for most users in their limitations

Limits of prediction:
the future is only partly determined
[tsjernoby]; oil crises; internet; ..]



Scientific Analysis and Normative Integration: Applied Analysis (2)





Example biofuel: Level 1 & 2

Level 1. Bioenergy is climate neutral

- From carbon dioxide to carbon dioxide, with solar radiation driving the cycle.

Clearly true, but quite too simple. (time)

Level 2. Life cycle systems view.

Specifying the economic activities involved:

For car fuel

- Agriculture & Ethanol:
 - fossil energy inputs and energy rich fertiliser.
 - NO_x emissions, a more powerful climate gas.
 - Ethanol production requires high energy input



Example biofuel: Level 3

Level 3. Life cycle system. System boundary.

- Allocation method determines outcomes, and
- Is widely disputed within the scientific community.
- Corn stover ethanol example quantified.
 - 2nd generation lignocellulosis based ethanol production



Example biofuel: Level 4 & 5

Level 4 Adding economic mechanisms

- Supply and demand: additional fuel = increased energy supply → higher use

Level 5 Rebound mechanisms.

- Partly market and income, partly cultural. No agreement on methods, with increased modelling complexity.



Example biofuel Level 6

Level 6 Broader economic mechanisms:

Beyond the investigated technology system

- Income effects; propensity to consume
- More market effects, corn & stover for biofuel will:
 - raise the price of corn, pressing out soy in the process and raising its price in turn. Soy and sugar cane production in Brazil increases, as does cassava in Asia. Thai cassava is transported to China, using cheap coal there for making ethanol at the high prices induced by US fuel policy.
 - More intense agriculture is required, globally, with increasing environmental impacts.



Example biofuel level 7 & 8

Level 7 Increased human biomass production: more human appropriation of nature.

- Indonesia burning and Brazil developing: unchecked economic mechanisms
 - Pristine ecosystems transformed into production sites, pioneer capitalism.

Level 8 Policy feedback loops

- Active policies for developing pristine nature.
- Active policies to protect nature areas.

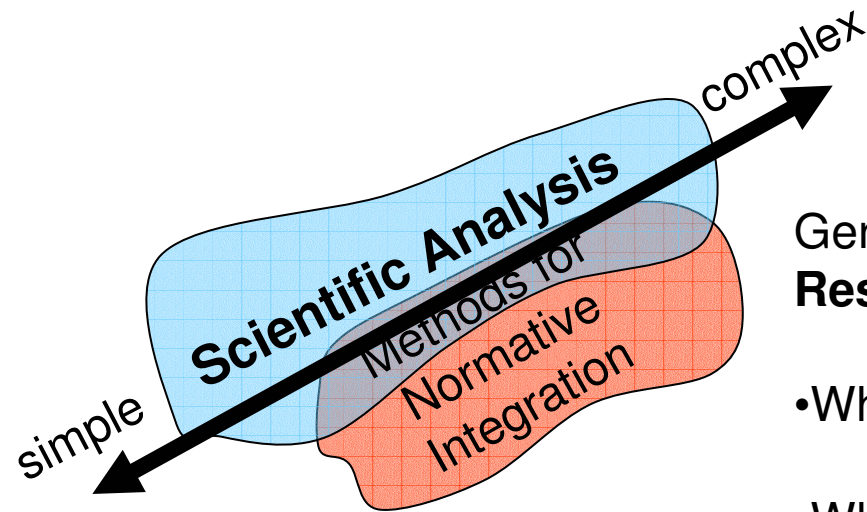


Example biofuel: Level 9

Level 9 Cultural feedback mechanisms at a societal level

- Through political and institutional mechanism.
 - Rising incomes lead to a higher environmental conscience, political action and improvement global environmental management. Nature reserves, etc.

Scientific Analysis and Normative Integration: Applied Analysis (3)

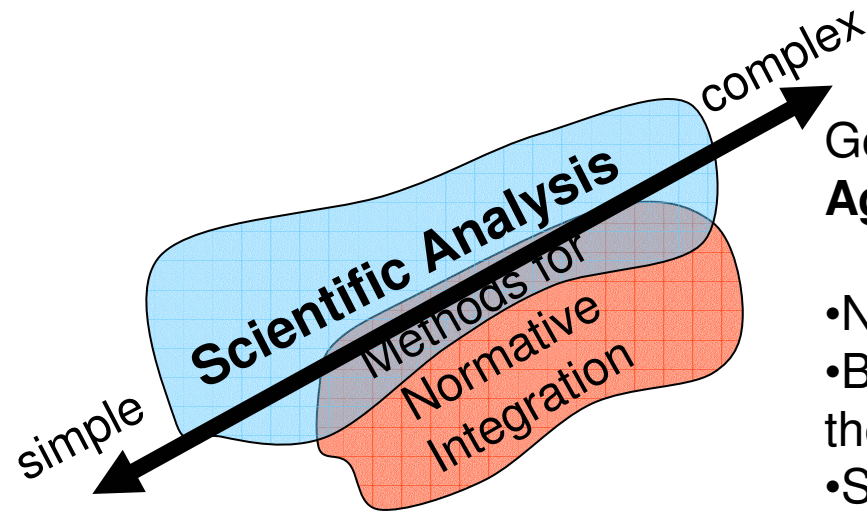


General structure for scoping of Research Agenda:

- What is needed?”
“all”
- What is there?
“simple and sketchy”
- “What is lacking?
“almost all”
- What can be supplied ST, MT & LT?
“General features”
“Specific domain knowledge”



Scientific Analysis and Normative Integration: Applied Analysis (4)

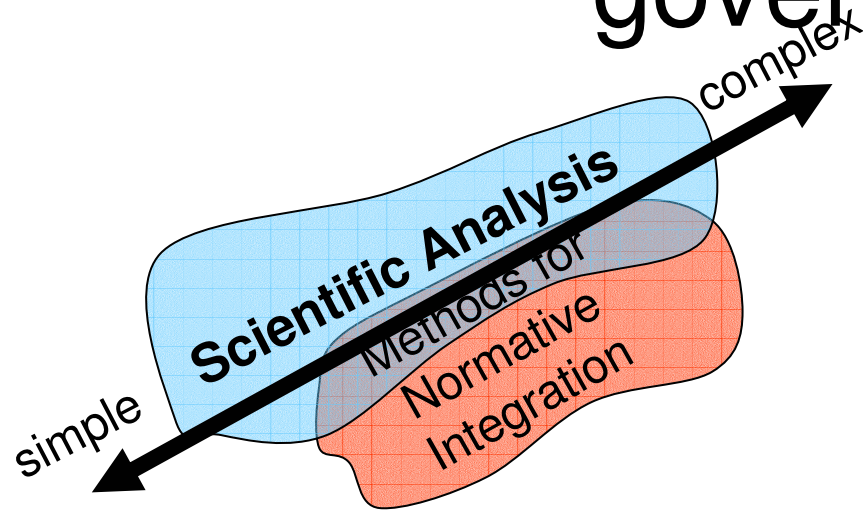


General approach in Research Agenda:

- Not one model-of-all
- Basic meso and macro models covering the domain of sustainability analysis
- Scenarios to cover main uncertainties at meso-macro level
- Micro models for technology relations
- Linking models for specific micro questions
- Basic methods and/or procedures for evaluation
- Interfaces for specific user groups
- Data for specific application domains



Applied Analysis and Evaluation 1: traditional hierarchical governance, government focus



Hierarchical policy formation:

- Large multi-level models
 - Micro-meso-macro; local/regional global; multi-environmental problem; ST-MT-LT; feasibility checks on alternatives; ...

- Large data bases

- Limited evaluation in models

Hierarchical policy implementation:

- Planning approach

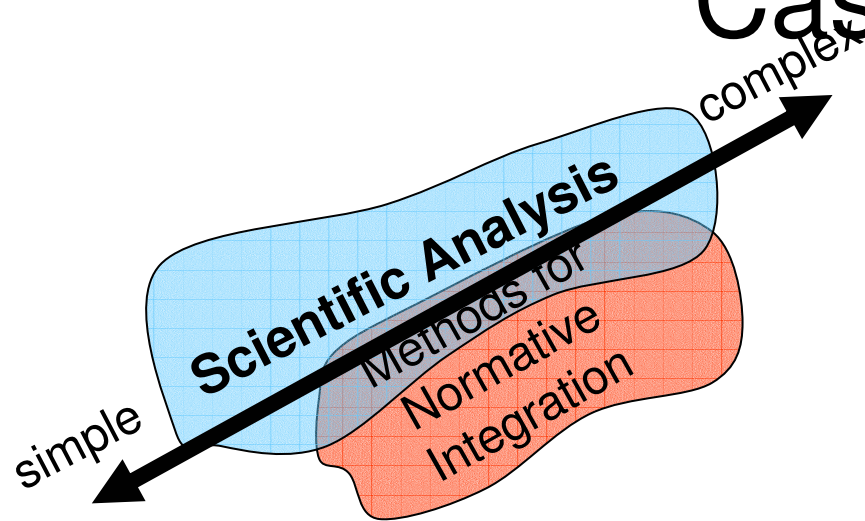
- Derived simple technology rules for implementing personnel

- Need-to-know for firms limited



Applied Analysis and Evaluation 1: hierarchical governance

Case biofuels



Hierarchical policy formation:

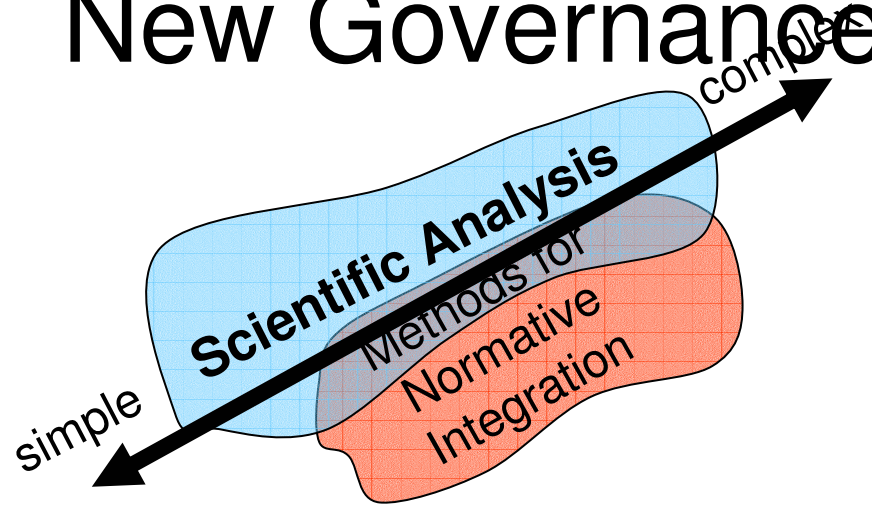
- Large multi-level models: **Fully lacking**
- Large data bases: **Not available**
- Limited evaluation: **NA**

Hierarchical policy implementation:

- Planning approach: **no overall plan**
- Derived simple technology rules for implementing personnel; **rules of thumb**
- Need-to-know for firms limited; **none**



Applied Analysis and Evaluation 2: New Governance (+Old): which actors?

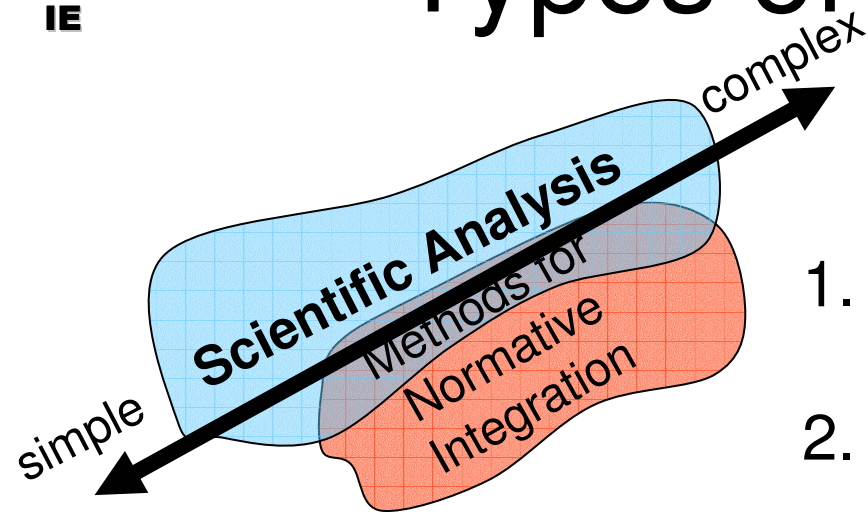


1. Simplified case outcomes
2. Simplified models case interactive
3. Meso level society assessment, interactive
4. Reduced outcomes of complex models
5. Making and using complex models

	Type:
• <i>General policy bodies: Multilevel</i>	4
• <i>Specialised agencies: Multilevel</i>	5
• <i>Feed back agencies</i>	3
• <i>Firms associations</i>	3, 4
• <i>Large firms</i>	2, 4
• <i>Small firms</i>	1, 2
• <i>Specialised civic society groups</i>	3, 4, 5
• <i>Consumers</i>	1
• <i>Citizens</i>	4



Types of applications



1. Simplified case outcomes, with evaluation ready made
2. Simplified models case interactive, conditional evaluation
3. Meso level society assessment, interactive, limited evaluation
4. Reduced outcomes of complex models, with partial evaluation
5. Making and using complex models, evaluation structure with limited evaluation



Functional requirements of applications: preliminary

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Principles for Research Agenda

- ***Unified framework for multi-actor communication:*** “Talking about the same” in 1 to 5. (\neq single model-of-all; \neq toolbox!!)
- Unified modelling background
 - analytics of structure
 - supply of fitting partial models, with mutual relations specified
- Generally developed link of micro to meso and macro consequences
- Linking micro analysis to available knowledge on mechanisms
- Decentralised model application
 - Hence: Decentralised availability of data
 - Hence: Decentralised availability of models
 - Hence: Decentralised availability of tools



Elements in research agenda

- Linking meso actions to meso and macro performance
- Incorporating market mechanisms in the analysis (Rebound = elasticity of supply and demand + income elasticity of demand + cultural mechanisms)
- Getting boundaries to location specific analysis clear
- Getting main uncertainties in dynamic development into scenarios
- Simplifying complex models to PC level
as by ***replacing complex mechanism by generally available scenarios***
- Specifying specific user capabilities and their development potential
- Developing interfaces for specific user applications
- Guiding formulation of questions (silly questions: silly answers: eg fallacy of disaggregation: influence of change to biofuel in Copenhagen is limited, partial analysis allowable. No, such decisions not taken at city level hence more aggregate question&answer required.



Layered analysis: bottom up and top down

Add to simple analysis what is needed for the question at hand

Bottom up:

- From simple:
biodiesel as separate fuel or as additive to fossil diesel, same amount of biofuel [ISO-LCA]
- To not so simple:
what role can biodiesel play in EU energy supply [ISO-LCA + partial market analysis]
- To complex:
how can we shift to a biobased economy, with biofuel as part of broader bio-energy use [ISO-LCA + partial market analysis + global scenario analysis]

Top down:

- How far do we need to detail IPCC scenarios to see the environmental and socio-economic bottlenecks in the supply of biomass-for-energy?

After JP Hettelingh in Calcas workshop Leiden, June 2007



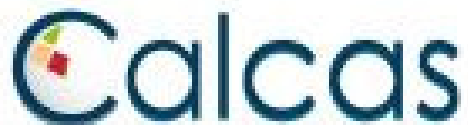
Conclusions

- New Governance requires both decentralised and centralised analysis in the multi-actor processes of (combined) policy development and implementation
- A unified framework of analysis is required for useful communication
- One single model is not possible
- Micro level analysis can be placed in a meso and macro framework
- Partial models and scenarios can be linked
- Questions can be analysed as to their relevant focus and then can better be answered.
- For virtually all applications an interface is needed linking more complex modelling to simplified applications.



Conclusion on New Governance and Research Agenda

New Governance requirements
on Life Cycle Modelling
for sustainability decision support
can be reduced to
a limited number
of functional requirements (eg 5).





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Ascending and descending methods

