Feasibility of low carbon pathways

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In pathways limiting global warming to 1.5°C with no or limited overshoot as well as in pathways with a higher overshoot, CO₂ emissions are reduced to net zero globally around 2050.

‘probing the limits of practical political possibility’ (Rawls, 2001).
The feasibility concept

It is feasible for X to J to bring about O in Z

• ‘Feasible for whom?’: X, agents
• ‘Feasibility of what?’: J, actions; O, outcomes
• ‘Feasible when and where?’: Z, contexts

It is feasible for societies to reduce emissions to zero and stabilize temperature, globally by 2050

Gilabert and Lawfard-Smith, 2012
Illustration of a feasibility space and feasibility frontier

- Observed cases of climate action define a dynamic feasibility space (shaded area) which may expand in the future beyond the current feasibility frontier.
- Observed cases without climate action outside of the feasibility space:
  - With historical cost and capacity (solid line).
  - And projected cost and capacity (dashed arrow).
- Stars probably leading to action in the future.

Feasibility when and where?

Jewell and Cherp 2019
Progress to a ‘realistic utopia’

Goals

Hard constraints

Soft constraints

Pathways

Policies, enablers

Descriptive Feasibility

Normative Desirability

IAM focus

context
Progress to a ‘realistic utopia’

- 2°C, SDG
- C cycle, tech. potential
- Zero CO2 in 2050, land use
- CO2 tax, education, nudge
- Energy price increase

Europe, now
Ex-post Feasibility assessment at the option level

Historical rates

Experts
Van Sluisveld et. Al 2018
System level feasibility: a five step proposal

1. Define dimensions of interest (ie 6 ones from IPCC 1.5SR), and option level granularity (ie key supply and demand side strategies, non energy options)

2. Identify indicators at option level from literature and expert judgement. Categorize to:
   - dimensions of interest
   - most appropriate metric (ie disruption, rate of change, scale)
   - desirability vs feasibility (hard vs soft constraints)

   For each indicator: feasibility relevance, feasibility corridors, confidence, enabling factors

3. Aggregation into composite indicators of feasibility concerns. Key issues (Greco et. Al 2019): weighting (expert/data driven), aggregation (compensatory, non compensatory), robusteness (GSA). Use different hierarchies for desirable vs feasible indicators.

4. Visualization of multi-dimensional feasibility corridors of AR6 scenarios. Identification of representative pathways

5. Discussion of enabling conditions and other feasibility-enabling factors
Challenges of composite indexes

Weighting
- No or equal
- Plurality of weight (experts, stakeholders, voting)
- Data driven (correlation, regressions, PCA, DEA)

Aggregation
- Compensatory (linear, geometric)
- Non compensatory

Weighting and aggregation are related depending on interpretation of weights
- Trade offs (can be compensatory)
- Importance (only non compensatory)

Robustness
- Uncertainty and sensitivity analysis
- Robust rankings and others
Multi dimensional feasibility visualization

https://mgiacomo.com/ipcc/sr15multi.html
Irrversible investments

Rozenberg et. Al 2019

Drouet et. Al 2019, WITCH IAM, ENGAGE project
Irreversible investments

Drouet et. Al 2019, WITCH IAM, ENGAGE project