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Sustainability assessment of nuclear power

Discourse analysis of IAEA, IPCC, EC frameworks

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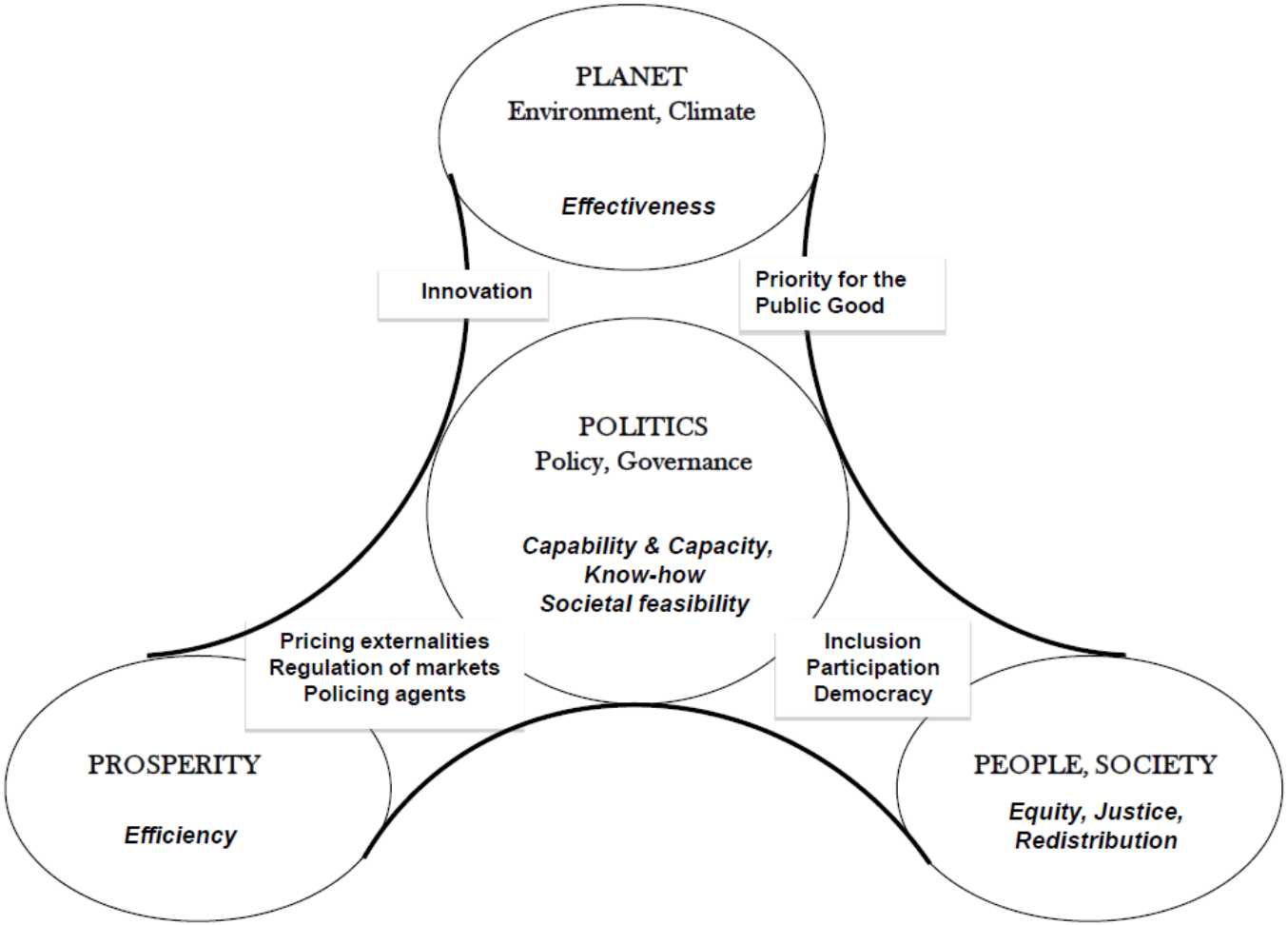
Overview

- Sustainable Development (SD) 'revisited' from the Brundtland report
- Sustainability assessment (SA)
- Discourse analysis of sustainability assessment frameworks
- Review of frameworks used by IAEA, IPCC, EC
- Transparent, comprehensive, reflexive SA framework
- Conclusions & Recommendations

Sustainability 'revisited' from Brundtland report



Sustainability assessment (SA)

- Conceptual roots in EIA (Enviromental Impact Assessment)
- SA: more than adding economic and social impacts to EIA
- SA: pursuing sustainability + identifying its contextual specifics
- Value judgements pervade scoping, assessment criteria selection, collecting data, developing and using models, …
- Danger of ideological bias and misuse of SA to 'relabel' ongoing practices or to justify new strategies, policies or projects
- Include deliberative processes within a transdisciplinary perspective

Discourse analysis of SA frameworks

3 discourse levels of sustainability specification

❑ Manifest image

Largely metaphorical: some essence of sustainability, as metaphor, picture, easily understood catchphrases, … (e.g. the 3 pillars, 'spaceship earth',…)

❑ Vision

Outline of an attainable future: shared by relevant social actors, guiding their actions and interactions

❑ Policy target or goal

Ready-made for identified problem fields: clearly defined targets, actions, policy interventions, specified indicators etc.

IAEA framework

Manifest image

- 4 SD dimensions: economic, social, environmental, institutional
- Fuel use + GHG emissions: 'common sense' arguments for more nuclear power on a global scale.
- Institutional: only instrumental 'good governance' of nuclear activities.

Vision via INPRO (International Project on Innovative Nuclear Reactors and Fuel Cycles**) approach**

- Nuclear power part of a sustainable energy system in a Member State
- Comparison of different nuclear energy systems
- Comparison of components of a single nuclear energy system.
- Narrow techno-economic modelling predicates need for nuclear power, implying techno-economic aspects prevail over other

IAEA framework

Policy target or goal

- Elaborate system of basic principles, user requirements and criteria based on indicators with corresponding acceptance limits (thresholds).
- Acceptance limits are defined so that 'sustainability' in practice means complying with the best international standards currently in use.
- Fundamental ethical debate avoided / skipped.

IPCC (AR5) framework

Manifest image

- Ch. 4 adopts three-pillar SD model: economic, environmental, social
- SD seen as overarching framework for assessing climate mitigation options on each pillar, with special attention to equity.

IPCC (AR5) framework

Vision

- Nuclear power named as major low-carbon energy supply option among Renewable Energy and Carbon Capture & Storage.
- Narrow 3P discourse [Ch. 7 'Energy Systems']: nuclear compared to coal on energy security; local employment impact; legacy cost of waste and abandoned reactors.
- Ambiguous discourse on nuclear risks: 'public acceptance' issue (Ch. 7); notion of risks as 'real' barriers to nuclear energy deployment added in Summary for Policy Makers.

Policy target or goal

- IPCC avoids policy target discourse, because the watershed with policy-prescriptive discourses is considered too thin.
- Fundamental ethical debates on nuclear waste management, intragenerational equity and proliferation are avoided.

EC framework

Manifest image

SD reduced to ‘sustainable economic growth’ in line with EU agenda to become the ‘most competitive and dynamic knowledge-based economy’.

Vision

- Vision articulated by a ‘sustainable nuclear energy platform’ led by the nuclear industry, and facilitated by the EC.
- Mid-term (2030): preserve EU industrial leadership in nuclear new build.
- Long term (2050): develop breeder as ‘sustainable’ nuclear reactor

Policy target or goal

- Sustainability reduced to technical criteria for developing new nuclear reactor systems.
- ‘Public dialogue’ applied as one-way communication to argue technical feasibility, safety, and low-carbon benefits of nuclear power.
- Fundamental ethical debates on nuclear waste management, intragenerational equity and proliferation are avoided.

Transparent, comprehensive, reflexive SA framework (1): PLANET

1. Power supply systems will soon need to switch entirely to low-carbon resources and technologies on a global scale. The low-carbon options selected should also be robust enough to withstand intensifying climate change impacts such as droughts, floods, water scarcity, and storms.
2. A large-scale power station is embedded in a local environment, whose ecological resilience has to be maintained without irreversible loss. Contamination from the power plant should be contained or have no long-term effects on human spaces and other habitats.
3. Fission power involves processing uranium, of limited availability, at competitive fuel prices. If it succeeds in its revival, as IEA scenarios predict, nuclear power must offer a solution for the future scarcity of conventional uranium.
4. The consensus on the priority role of energy use efficiency and on the deployment of renewable energy potentials is unequivocal because of SD arguments. Other power supply options must prove that they support and stimulate these two strategies and will never be an obstruction to their crucial growth.

Transparent, comprehensive, reflexive SA framework (2): PROSPERITY

1. Real economic wealth is based on proper cost accounting of the products, services, activities and practices which comprise domestic product (GDP). It is therefore necessary to identify and quantify the external costs, benefits, risks and irreversible impacts inherent to the lifespan of a nuclear fission cycle. End users should also pay the full cost; if not, the bill will be footed by others, now or in the future.
2. Power generation options are studied in a dynamic context and we learn from past experiments and experiences in order to improve technologies and practices. A new technology is adopted for development when its future cost price is expected to decline because of learning.
3. Access to electricity is a condition for SD. The electricity supply systems of the future must be affordable for the majority of countries in the world.
4. Electricity supply is considered secure when users are guaranteed continuous delivery at affordable prices. It is reliable when black-outs and brown-outs happen only occasionally. The value of security and reliability depends on the end uses of electricity and on users' willingness to pay.

Transparent, comprehensive, reflexive SA framework (3): RISKS

1. All economic activities should be amenable to full-indemnity coverage by international insurance and re-insurance companies. If not, costs will be transferred to others in the present or in the future.

2. Sustainable practice entails nuclear plant owners and operators being held strictly liable for the risks occasioned by their nuclear activities. The very long-term and potentially irreversible impacts also need identification and assessment.

3. The proliferation of nuclear weapon capabilities is to be limited and reduced.

Transparent, comprehensive, reflexive SA framework (4): PEOPLE

1. Affordable electricity bills pave the way to increased access to electricity-based services.

2. The 'polluter pays' principle is solid and fair in assigning environmental responsibilities. In power generation systems, the final electricity users should be liable for the full costs and risks inherent to particular technologies and plants.

3. Power plants are acceptable only when free of major hazards.

4. Core changes for SD include the exploitation of other natural resources with new technologies and investments that meet the needs of developing countries.

Transparent, comprehensive, reflexive SA framework (5): POLITICS

1. A scientifically rooted, independent agency or panel (similar to IPCC for climate change) is necessary to study and follow up on nuclear power performance (past, present and future).

2. Independent and accountable nuclear regulatory institutions and processes are established and monitored publicly.

3. At national/regional levels, the public interest prevails over private profit, and democratic institutions prevail over technocracy.

4. At local levels, citizens can engage in debate about energy system governance, and participate in the deployment of local energy systems.

Conslusions & Recommendations

- Adopt 4 main dimensions of Sustainable Development (SD) as lattice for sustainability assessment frameworks
- Three discourse levels: Manifest image – Vision – Policy target or goal
- SA frameworks used by IAEA, IPCC, EC:
  - Sustainability of nuclear power accepted prior to SA
  - Discourses biased, skipping major issues
- Transparent, comprehensive, reflexive SA framework constructed on 4 main SD dimensions

Thank you

Based on:

Aviel Verbruggen and Erik Laes, “Sustainability assessment of nuclear power: discourse analysis of IAEA, IPCC, and EC frameworks”, submitted to *Energy Policy*

Aviel Verbruggen, Erik Laes and Sanne Lemmens (2014), “Assessment of the actual sustainability of nuclear power”, *Renewable and Sustainable Energy Reviews* 32, pp. 16-28.