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Sustainability assessment of nuclear power: Discourse analysis of IAEA and IPCC frameworks

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ABSTRACT

Sustainability assessments (SAs) are methodologically precarious. Value-based judgments inevitably play a role in setting the scope of the SA, selecting assessment criteria and indicators, collecting adequate data, and developing and using models of considered systems. Discourse analysis can reveal how the meaning and operationalization of sustainability is constructed in and through SAs. Our discourse-analytical approach investigates how sustainability is channeled from 'manifest image' (broad but shallow), to 'vision', to 'policy targets' (specific and practical). This approach is applied on the SA frameworks used by IAEA and IPCC to assess the sustainability of the nuclear power option. The essentially problematic conclusion is that both SA frameworks are constructed in order to obtain answers that do not conflict with prior commitments adopted by the two institutes. For IAEA 'sustainable' equals 'complying with best international practices and standards'. IPCC wrestles with its mission as a provider of "policy-relevant and yet policy-neutral, never policy-prescriptive" knowledge to decision-makers. IPCC avoids the assessment of different visions on the role of nuclear power in a low-carbon energy future, and skips most literature critical of nuclear power. The IAEA framework largely inspires IPCC AR5.

1. Introduction

The past two decades have seen growing acceptance of sustainable development (SD) as an overarching objective for the management of vital functional subsystems of society, such as water, food, shelter and energy. Politicians increasingly recognize that meeting the long-term challenge of SD requires the restructuring of these key subsystems under the guidance by long-term policy designs (Voβ et al., 2006). Climate change and energy are good examples. At the 2009 Copenhagen meeting, the international community agreed to keep global warming in 2050 below 2 °C higher than pre-industrial levels. Addressing climate change means decarbonizing electricity generation as a major change throughout the entire energy system, with a critical role for energy efficiency

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Abbreviations: EC, European Commission; IAEA, International Atomic Energy Agency; IEA, International Energy Agency; INPRO, International Project on Innovative Nuclear Reactors and Fuel Cycles; IPCC, Intergovernmental Panel on Climate Change; SA, sustainability assessment; SD, sustainable development; WCED, World Commission on Environment and Development.

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(IEA, 2014). In 2013, fossil-fueled thermal power (gas, oil, coal and peat) accounted for 67.1% of global electricity generation, with renewables (hydropower, wind, geothermal, biofuels, waste, and sunlight via photovoltaic conversion) (22.1%) and nuclear fission (10.8%) making up the remainder (EnerData, 2014). With CO_2 capture and storage at fossil-fuel power plants facing delayed commercialization (IEA, 2014), renewable energy supplies and nuclear fission are the remaining competitors which could substitute for fossil fuels in electricity generation.

In light of the threat of climate change, the restraints on nuclear power plant construction in the aftermath of the Chernobyl disaster (April 1986) are now being challenged in the 'nuclear renaissance' discourse, sailing under the flag "Nuclear power is not *the* solution, but there is *no* solution without nuclear power" (Nuttall, 2005; Mez, 2012). In the 'Summary for Policymakers' of the 'Fifth Assessment Report', the Intergovernmental Panel on Climate Change (IPCC) also labels nuclear power as a "*mature low-GHG emission source of baseload power*" that "*could make an increasing contribution to low-carbon energy supply*", provided that a "*variety of barriers and risks*" are overcome (IPCC WGIII, 2014, p. 23).

However important, 'low carbon' is but one attribute that power generation options should have in a sustainable energy future. The precise meaning of 'sustainable energy future' is contested, but the (non-)sustainability of energy options depends on their performance in delivering other policy objectives such as alleviating energy poverty, improving equity, reducing air pollution, enhancing energy security and securing economic wellbeing (Hugé et al., 2011). The IPCC explicitly states that "*sustainable development and equity provide a basis for assessing climate policies*" and therefore highlights the need for a comprehensive assessment of climate policies going beyond a focus on mitigation and adaptation policies alone to examine development pathways more broadly (IPCC WGIII, 2014, p. 4).

Sustainability assessment (SA) of energy system options obviously triggers the questions 'What exactly is a sustainability assessment?', and 'How is such an assessment performed?'. We do not attempt to find answers from a normative or theoretical point of view. Rather we investigate actual SAs of nuclear fission power as performed by, or on behalf of, two institutions with acknowledged roles in energy system governance at the international level: the International Atomic Energy Agency (IAEA) and the Intergovernmental Panel on Climate Change (IPCC). A discourse-analytical focus on the IAEA's and IPCC's execution of SA shows how the concept of SD is framed in the context of energy system governance, and subsequently transposed into action-guiding policy prescriptions regarding the role of nuclear power. It is particularly relevant to investigate whether and how a rationalized assessment method like SA can deal with a technology that is profoundly marked by socio-political tensions and polarization within and across countries (Mez et al., 2009; Stirling, 2014). Under conditions of polarization – i.e. socio-political disagreement about both the 'facts' and the 'values' at stake – it is vital to the quality of democratic debate to equally represent all competing perspectives on the contentious issue at stake. The World Commission on Environment and Development (WCED) sees democracy as a central discourse-analytical category and a pivotal normative commitment, as is evident from the statements that SD requires "*a political system that secures effective citizen participation in decision making*" and "*an administrative system that is flexible and has the capacity for self-correction*" (WCED, 1987, p. 65).

This manuscript is structured as follows. Section 2 provides a brief review of the state of the art of SA (Section 2.1), the tailoring of a layered discourse-analytical framework for understanding how sustainability is interpreted and operationalized in the context of decision making regarding energy technologies (Section 2.2), and the revisit of the sustainability meta-discourse of the WCED report (WCED, 1987) as a benchmark for interpretations and operationalizations (Section 2.3). Section 3 reviews the SA of nuclear fission power as performed by IAEA and by IPCC. Section 4 discusses the overall conclusions and policy implications of the analysis.

2. Sustainability assessment and discourse analysis

2.1. *Sustainability assessment: the state of the art*

Sustainability assessment is a tool to help decision-makers select which actions should (not) be taken in an attempt to make society more sustainable. Pope et al. (2004) reveal that the conceptual roots of SA are embedded in environmental impact assessment practices dating back to the 1970s. Bond et al. (2012) also consider SA to be a 'third generation' impact assessment procedure, following environmental impact assessment and strategic environmental assessment. Similar to these procedures, SA also pursues a more rational form of decision-making, based on 'objective information' about the retrospective (in case of ex-post assessments) or expected (in case of ex-ante assessments) impacts of projects, plans, programs or strategies with SD objectives.

Despite shared roots, SA is more than a mere extension of environmental assessments with economic and social impacts, the so-called 'triple bottom line' (cf. Section 2.3). Gibson et al. (2005, p. 62) attribute to SA a double role: one for "*the general pursuit of sustainability*" and one for "*defining the specifics of sustainability in particular circumstances*". Because SA may range from broad policy strategies to applied policies, or from comprehensive energy systems to individual energy technologies; and because of the contested nature of the notion 'sustainability' itself (Söderbaum, 2007), there exists no one-size-fits-all SA procedure (Jordan, 2008). Every SA is a unique case, and is therefore also methodologically precarious (Grunwald, 2008). Value-based judgments inevitably enter the process of scoping the SA, selecting assessment criteria, collecting adequate data, developing and using models of considered systems, etc. (Latour, 2004). SAs are therefore particularly vulnerable to ideological bias and deliberate misuse, urging special care to safeguard and respect the rational terms of the exercise. In the case of SA, rationality is predicated on the quality of the deliberative process for raising, debating, negotiating and provisionally validating different claims to knowledge (Laes and Verbruggen, 2010; Frame and O'Connor, 2011; Grunwald and Rösch, 2011).