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Energy governance in the context of energy service security: A qualitative assessment of the electricity system in Bangladesh

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HIGHLIGHTS

- Conceptual framework of energy governance with respect to energy service security.
- Inductive thematic analysis yields 13 energy governance indicators in 4 dimensions.
- Qualitative assessment of Bangladesh's electricity system.
- Policymakers face several challenges to achieve energy service security.
- Current policies are in conflict with climate change mitigation targets.

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ABSTRACT

Soaring energy demand in developing Asian countries presents a challenge for existing centralized systems and monopolistic electric utilities since these often fail to reliably provide energy service security. Inclusive energy governance could serve as a hedging mechanism against several inherent problems such as supply disruptions and corruption practices, and thus improve energy service security. This study therefore (i) proposes a conceptual framework for energy governance in developing countries and (ii) applies this framework to qualitatively assess the energy service security perspectives of the electricity system in Bangladesh via an interpretive research approach. Relevant governance indicators were first identified in an inductive thematic analysis of systematically selected literature. Bangladesh's electricity system was then subsequently qualitatively analyzed on the basis of secondary data and official reports. The findings indicate the presence of weak institutions in the electricity sector and a lack of market competition, and the need for consistent policy implementation, proper pricing and information disclosure mechanisms. In addition, other challenges such as endemic corruption and bureaucratic complexities, underdeveloped grids and insufficient resource logistics also need to be addressed. While international interventions and national policies favor a heavy take-up of fossil fuels in order to achieve energy security and energy equity, environmental sustainability is largely ignored. The study concludes that the integration of energy governance and energy security perspectives is crucial to understanding and addressing the challenges of a just energy transition in the face of the standard energy trilemma in developing countries.

1. Introduction

1.1. Energy governance in the electricity system

Resource and energy-intense economic growth in developing Asia represents a significant challenge when attempting to achieve a just energy transition [1–3], especially when considering the energy trilemma, i.e. the competing goals of energy security, energy equity, and environmental sustainability [1,4]. The emerging revolution in the Asian energy paradigm involves a growing and latent energy demand on the one hand, and path-dependent fossil fuel regimes on the other hand [5]. At the same time, several countries suffer from intense climate change vulnerabilities [5].

While such complex challenges call for multilateral cooperation in energy governance, i.e. cooperation on local, regional and global levels, the current institutional settings seem inappropriate [1,6–9]. The quality of governance is suffering from fragmented institutional arrangements, inconsistent policy processes, and unclear levels of authority across diverse energy-related institutions and actors [8–12]. Resource-nationalist strategies prevail and require energy diplomacy in

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securing energy resources [13–15].

The environmental and social acceptability of energy generation heavily depends on the regulating capacity of local institutions and transparent policy frameworks [16]. However, political imperatives, incumbent lobbying, and intellectual property rights often induce complications which need to be addressed [8]. An effective governance regime is thus instrumental in the de-carbonization of energy systems [17].

The electricity system is of particular interest due to its significant CO_2 emissions, as well as its vulnerability to short-term disruptions [18–19]. Monopolistic electric utilities in developing Asia often fail to properly address reliable electricity provision [7,20–21]. The regulatory governance of the electricity sector in such countries is affected by weak institutional capacity, political instability, poor technical and financial performance, state budgetary constraints, and donor-driven lending mechanisms [20,22–23]. Energy governance could serve as a hedging mechanism against supply disruptions, corruption, (e.g., in infrastructure construction and operation of electric utilities), and against non-technical losses (e.g., electricity theft or illegal connections) [24]. With improved energy governance it is supposedly also easier to enhance the security of energy services as well as to manage political pressure, tax and subsidy burdens, or the mitigation of cross-border free-riding on climate change [9,25].

The various perspectives of energy governance do rarely receive distinct research attention [12]. Energy governance is commonly treated as a sub-indicator in energy security studies. Only a few studies [16,26–28] have used quantitative indicators for governance, including quality of governance, trade and connectivity, competition, transparency etc. Sharma and Balachandra [29] studied both quantitative and qualitative indicators in the context of policy and institutions representing energy sector governance. Ang et al. [25] highlighted government policies, infrastructure planning, energy taxes and subsidies, information dissemination and energy diplomacy as the key perspectives of governance. Apart from that, a number of studies have included qualitative or quantitative indicators related to policy or politics, but not from a governance perspective. For example, one framework for evaluating energy security [30] includes six worldwide governance indicators (WGIs) such as political stability, regulatory quality, rule of law and control of corruption, but only as sub-indicators to measure socio-political strength. Other studies [31–33] also used WGIs to assess electricity provision. In contrast, [34] introduced the sovereign credit rating as a proxy indicator for political-economic strength in order to measure energy security. Apart from that, only relatively few studies [16,35–37] have incorporated qualitative indicators such as institutional politics, international aspects, geopolitical conflict, and market liquidity to assess energy security (for details, see Supplement A).

A critical review of the existing literature reveals that the selection of energy governance indicators is rather generic; a systematic selection of context-specific energy governance indicators is rarely attempted [1]. For example, WGIs include a range of several hundred sub-indicators to assess overall governance perception. However, a workable set of indicators for international governance domains is still lacking for context-specific energy research. An attempt to quantify qualitative indicators using proxy attributes often undermines the robustness of energy security studies. For example, the underlying subjective foci such as trade willingness, level of openness and political conflicts between states are often excluded in assessing political stability or political affectability [38–40]. Moreover, political aspects, such as transnational cooperation, national and international market structure or regime effectiveness, have largely been overlooked in energy security studies [16,38,41].

In terms of assessment, indicator-based approaches are predominant; a set of disaggregated or aggregated energy indicators generally assess system performance based on a number of simplified assumptions and complex manipulations [14,42]. Due to their very nature, quantitative approaches often present a 'partial and simplified view' [43] and disguise dynamic relationships between the system elements in question [39,44–45]. Statistical analyses of WGIs fail to incorporate complex interactions between governments, institutions and electrification due to the necessarily simplified additive assumptions [31]. Data availability is another important pre-requisite that often cannot be met in the developing countries [14,29,46–47]. In fact, energy governance in general, and how the quality of governance influences energy service security in particular, is rather difficult to quantify [25,34,48–49]. Sovacool [47] opined that "quantification does not mean that determining what is measurable captures what is always meaningful".

The inclusion of qualitative indicators definitely facilitates a deeper understanding of the subject matter under study [50]. Qualitative approaches thus tend to support quantitative measures [25]. With regards to energy governance and energy security, only a few studies [1,51–52] have aimed for qualitative empirical analyses.

The aim of this paper is thus (1) to develop a conceptual framework for energy governance while taking account of different energy service security perspectives and (2) to apply this framework to a qualitative analysis of Bangladesh's electricity system. We applied an inductive thematic analysis to systematically derive those relevant energy governance indicators that influence energy service security in developing countries. Choosing Bangladesh as a case study contributes to an improved understanding of emerging economies in Asia, as has been proposed in recent energy research agendas [53]. The relevant contextual factors for Bangladesh and its fast-growing economy [50] are the rising electricity demand, limited indigenous fuel reserves, a patchy and state-controlled energy infrastructure, technological destitution, and climate change vulnerabilities. This study thus aims to be of benefit not only to academics, but also to national and international policymakers in understanding complex trade-offs between energy governance and energy service security based on a set of interpretive qualitative toolkits.

The remainder of the paper is structured as follows: In Section 1.2 the authors' perspective on energy governance and energy security is defined. Section 2 describes the chosen research approach. In Section 3, we present a qualitative conceptual framework for analyzing energy governance, which is then applied in Section 4. Section 5 concludes the paper by summarizing the main findings and reflecting on the relevance of integrating energy governance and energy security perspectives.

1.2. Energy governance and energy security

The concept of energy governance is highly context-dependent; it usually includes attributes related to politics and policy [54], such as international interactions, interactive and coordinated arrangements, institutionalized rules, and, last but not least, a complex and diverse array of actor groups [1,24,55]. Thus, we understand energy governance as a process of coordination in which institutional properties (system of rules, policies) and interdependent (public-private) actor constellations interact to decide how to provide energy services.

The concept of energy security is still ambiguous and slippery due to multi-faceted contextual interpretations [1,14,30,56–57]. Several studies defined energy security using multidimensional perspectives [44,46,58], such as the "four As of energy security" – availability, affordability, accessibility and acceptability- or, "four key dimensions" – availability, affordability, reliability and environmental sustainability [14,16]. Alternatively, Cherp and Jewell [18,59] prescribed three perspectives (sovereignty, robustness and resilience) to assess the vulnerability of 'vital energy systems' and Gracceva and Zeniewski [43] proposed five key systemic properties of energy security, namely stability, flexibility, adequacy, resilience and robustness. We take a slightly different approach to defining energy service security, as we aim for an integration of energy governance phenomena. By energy service security, we thus refer to the security of access to reliable, affordable and modern energy services (electricity), security of energy