Energy Research & Social Science xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

Large dams, energy justice and the divergence between international, national and local developmental needs and priorities in the global South

Giuseppina Siciliano[a,*], Frauke Urban[a], May Tan-Mullins[b], Giles Mohan[c]

[a] Centre for Development Environment and Policy, SOAS, University of London, UK
[b] University of Nottingham Ningbo China, China
[c] The Open University, UK

ARTICLE INFO

Keywords:
Hydropower
Energy justice
Socio-technical system
Global South

ABSTRACT

This paper investigates from a socio-technical and energy justice perspective the lack of coordination of international, national and local developmental priorities and inclusion of local needs in the decision making process of large dam construction in the global South. The paper argues that the analysis of energy infrastructures as socio-technical systems requires an energy justice approach to capture the true environmental and social nature of energy production and consumption. In doing so, this paper proposes a conceptual framework called "The Energy Justice Framework for Dam Decision-Making" as a tool to inform energy decisions on infrastructure development based on energy justice principles and social impact assessment. The proposed framework is used in this paper to analyse distributional, procedural, restorative justice, and power relations throughout the entire dams' energy system in the case of four large dams located in Africa and Asia, namely Kamchay dam in Cambodia, Bakun dam in Malaysia, Bui dam in Ghana and the planned Zamfara dam in Nigeria.

1. Introduction

One of the main goal of the Sustainable Energy for All initiative promoted by the United Nations is to ensure access to affordable, reliable, sustainable and modern energy by 2030 from renewable sources, such as wind, water (i.e. hydropower), solar, biomass and geothermal [1]. Energy accounts for approximately 60% of global greenhouse gas emissions, therefore reducing the carbon intensity of energy production by increasing the share of renewable energy in the global energy mix is seen as a key objective in long term climate policies' strategies [1]. At the global level, Sub-Saharan Africa and developing Asia[1] account collectively for 97% of the total population without access to electricity [2]. Building hydropower dams has become an attractive policy solution to mitigate the climate and fuel development, especially in energy poor countries [3,4]. For example Africa holds almost 12% of the global hydropower potential but produces only 3% of global hydropower and exploits less than 10% of its technical capacity [5]. Many new large dam projects are planned in Sub-Saharan Africa with a projected increase in the share of electricity supply from 22% in 2014 to 26% in 2040 [6]. Southeast Asian countries plan to construct 61 gigawatts (GW) of new hydroelectric generating capacity by 2020 [7].

Indeed there are many benefits associated with hydropower development such as flood control, job creation, improved energy access [8]. However, large dams have also been the subject of controversy and debate for several decades as a result of their social and environmental impacts, the unequal distribution of costs and benefits and issues of fair and transparent decision making processes [9–13]. Moreover, Zarfl et al. [14] and Fearnside [15] argue that the climate mitigation potential of hydropower is being systematically overestimated, questioning its definition of a clean energy source. Sovacool and Valentine [16] argue that mega energy projects such as large hydropower dams are economically, socially and ecologically sub-optimal. This paper investigates the lack of coordination among international, national and local developmental priorities and the limited inclusion of local needs in the decision making process of large dam construction in the global South. It examines energy infrastructures as socio-technical systems from an energy justice perspective [17–19]. To do so this paper proposes the use of a new framework called *"The Energy Justice Framework for Dam Decision-Making"* (further discussed in Section 3.1) which brings together the most recent studies on large dams' social impacts

* Corresponding author at: Centre for Development Environment and Policy, SOAS, University of London, 36 Gordon Square, London, WC1H 0PD, UK.
E-mail address: g.siciliano@soas.ac.uk (G. Siciliano).

[1] According to the International Energy Agency's classification [2] developing Asia is composed of Bangladesh, Brunei Darussalam, Cambodia, China, Chinese Taipei, India, Indonesia, the Democratic People's Republic of Korea, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Viet Nam and other Asian countries and territories (Afghanistan, Bhutan, Cook Islands, East Timor, Fiji, French Polynesia, Kiribati, Laos, Macau (China), Maldives, New Caledonia, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu.

https://doi.org/10.1016/j.erss.2018.03.029
Received 21 July 2017; Received in revised form 25 March 2018; Accepted 27 March 2018

evaluation [20] and energy justice principles [19,21]. While there are several frameworks in the literature that have been applied to the analysis of the social impacts of dams (for an overview of these frameworks please refer to Kirchherr et al. [22]), the novelty of the framework proposed in this paper is that it integrates the energy justice principles into the analysis of the decision-making process of dams' development. The application of this framework to specific case studies shows how energy justice principles can be used in practice to analyse if specific energy projects respond to questions of energy justice, such as procedural, distributional and restorative justice, both ex-ante, in the planning phase, and ex-post construction. In this paper the proposed framework is used as a post-construction assessment tool to analyse three case studies of hydropower dams already in operation, namely Kamchay dam in Cambodia, Bakun dam in Malaysia and Bui dam in Ghana, and as a pre-construction tool to analyse one case of a planned dam, the Zamfara dam in Nigeria.

2. Issues of energy justice and socio-technical systems in energy infrastructure development

Issues of energy justice, such as fairness of the energy decision making processes, equitable distribution of costs and benefits of energy services, recognition and restoration of the impacts, are pervasive in all aspects of the energy infrastructure supply chain, from production, transmission, right through to distribution and energy consumption [23,21,24]. For example, issues of production are inextricably connected to consumption when considering justice and equality in the location and distribution of energy services [25]. While energy supply is often viewed in the literature on energy studies as simply a technical and logistical process of boosting energy access, there is a growing interest in the interdisciplinary literature on energy transitions in analysing energy infrastructures as socio-technical systems [17,26,27,18]. Theories on socio-technical systems suggest that technological, environmental and social entities are intertwined in a complex web of interactions [28,29]. In this respect energy systems should be taken as both material in terms of their physical infrastructure and social in nature, as recognition that technologies involve a complex interaction with different dimensions, natural (i.e. the ecological context), socioeconomic (i.e. the people and the economic context) and political (i.e. institutions) [28–30]. From this perspective, equality and justice should be analysed throughout the entire energy system from decisions on infrastructure siting to how energy is produced, generated and transmitted to different beneficiaries [24]. Thus, from a socio-technical and energy justice perspective studies on energy infrastructures need to be reframed to look at energy services as a "political, deliberative challenge involving the satisfaction of competing preferences" in society ([19], p. 5). This way of looking at energy systems and infrastructures represents an opportunity to overcome the disconnection between energy policy and decision making with society, and therefore to reconcile energy decisions with international, national and local needs and priorities [31–33].

Nevertheless, even though scholars in the field of socio-technical systems acknowledge the importance of a just, fair and transparent decision making process for infrastructure development, aspects related to energy justice are still an emerging issue in the field. In the energy infrastructure literature, deliberative decision making processes and the interrelated justice aspects of distribution of costs and benefits and fair procedure are usually analysed as distinctive issues of concerns. Looking specifically at the literature on state-led energy projects, various studies highlight the unfair decision making process regarding these projects; usually, the people most affected are not involved in the planning and construction process [34–37]. In the case of dam projects, Marques et al. [38] uses a procedural justice approach to analyse the perceived trust of affected communities and shows the importance of project communication and involvement in the early phases of a project's implementation to increase acceptance within communities. Sellamuttu et al. [39] present different studies on dams' benefits distribution looking at institutional aspects and governance issues from a social justice perspective. Nordensvard and Urban [40] analyse the nexus between hydropower dams, corporate social responsibility and social justice using procedural and distributional justice and conclude that social innovation and justice should be considered by dam-builders to better mitigate the negative impacts of large dams. Studies on justice aspects applied to different energy technologies, such as wind and solar, are increasing but still few, especially for solar energy. Yenneti and Day [41] analyse procedural justice in the implementation of solar energy in India to illustrate how failures in the implementation of various aspects of procedural justice can result in negative livelihood impacts and marginalisation of rural communities. In relation to wind facility siting, Ottinger et al. [42] uses procedural justice to show how addressing community concerns can facilitate wind development and result in less controversial projects. Liljenfeldt and Pettersson [43] show that the poor consideration of distributional issues in the case of wind project development result in a higher likelihood of rejection of these projects by local populations. Even though the above mentioned studies provide good examples of how renewable energy projects can be analysed from a justice perspective they fail to provide a comprehensive framework integrating all the key elements of energy justice. In this paper we argue that to capture the true environmental and social nature of energy production and consumption, the analysis of energy infrastructures as socio-technical systems requires an approach which captures all the energy justice components, i.e. recognition, distribution, restoration and procedure. In doing so, in the next section we present an energy justice decision making framework that can be used as a tool to inform energy decisions on infrastructure development based on energy justice principles [19,21] and social impacts' evaluation [20]. It brings together technical aspects such as infrastructure siting, purpose of the dam and energy generation with energy justice concerns of distribution, procedure and restoration, as well as the energy justice principles of availability, affordability, inter/intragenerational equity, responsibility, resistance, due process, sustainability, intersectionality, transparency and accountability. Looking at energy decisions in the case of large dams from an energy justice decision making framework allows us also to consider power relations in terms of power and participation [44]. In other words, this paper analyses the ways in which state and corporate actors engage with host communities around project sites, particularly when resettlement takes place and when access to natural resources such as land, water and forests becomes limited to locals due to the dam-building [45–47]. Power in this case relates to the differential ability of different stakeholders (i.e. dam builders, financiers, government, local populations) to take part in the decision making process of dam construction and therefore to control and/or access natural resources and the benefits from resource exploitation [48–52,44].

3. Conceptual framework and methodology

3.1. The Energy Justice framework for dam decision-making

3.1.1. The Energy Justice framework

The Energy Justice Framework defines energy justice "as a global energy system that fairly disseminates both the benefits and costs of energy services, and one that contributes to more representative and impartial energy decision-making" ([19], p. 4), therefore it takes into account three key elements of justice, *recognition* of those affected by energy injustices, a fair *distribution* in society of costs and benefits derived from energy services and a fair *procedure* which refers to a fair decision making process. Moreover, the concept of *restorative justice* has been recently included as a new component of the Energy Justice framework. Restorative justice refers to the actions that need to be taken into account to mitigate the potential impacts that can result from energy decisions [24]. In the case of infrastructure development these