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Rethinking energy security and services in practice: National vulnerability and three energy pathways in Tajikistan

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ABSTRACT

To help answer questions about availability, accessibility, sustainability and other *dimensions* of energy security, the *vulnerability* approach concentrates the attention of policymakers on the assessment of risks associated with *natural, technical, political and economic* factors. This understanding, combined with a focus on *energy services* (e.g. lighting, heating, telecommunications, mobility, etc.) helps to prioritize actions to achieve the goal of energy security. This paper conceptualizes energy security as low vulnerability of vital energy systems and sustained provision of modern energy services. Taking Tajikistan as a case, this paper highlights key vulnerabilities including neglect of environmental conditions, insufficient energy production capacity, unreliable and expensive energy imports, dwindling power infrastructure causing technical and economic losses, inadequate transparency in the power sector, lack of regional cooperation in energy and water resources sharing, and inadequate financial resources to address these challenges. Three major proposals presented by the World Bank, the United Nations Development Program, and the Government of Tajikistan to achieve energy security in Tajikistan are evaluated. Specifically, they lack a focus on energy services and therefore overlook people's socio-cultural context and appropriate energy needs. This paper highlights energy services as critical to people's wellbeing and socio-economic development.

1. Introduction

Energy security is a complex and evolving concept (Ang et al., 2015; Brown et al., 2014; Cherp and Jewell, 2014; Hughes, 2009; Löschel et al., 2010; Månsson et al., 2014; Sovacool, 2013; Sovacool and Mukherjee, 2011; Vivoda, 2010; Winzer, 2012). Based on our review of the literature (Laldjebaev et al., 2016), and in agreement with Cherp and Jewell (2014) and Cherp et al. (2012), we adopt the following working definition of energy security: *low vulnerability of vital energy systems and sustained provision of modern energy services.* The *vulnerability* approach offers several advantages over conventional *dimensions* approaches (e.g. "4As" by Kruyt et al., 2009, "4Rs" by Hughes, 2009[1]) to energy security assessment. Firstly, the definition captures the various dimensions (e.g. availability, affordability, sustainability, etc.) of energy security that are outcomes of reduced vulnerability of energy systems arising from four major risk factors: "natural (e.g., resource scarcity, extreme natural events), technical (e.g., aging of infrastructure, technological accidents), political (e.g., intentional restriction of supplies or technologies, sabotage and terrorism), and economic (e.g., high or volatile prices)" (Cherp et al., 2012, p. 330). Secondly, along with exposure to risk, the resilience of energy systems is also considered. Thirdly, flexibility of application in diverse contexts allows for "(a) delineating vital energy systems; (b) exploring their vulnerabilities; and (c) understanding the political process which leads to the prioritization of certain energy systems and vulnerabilities" (Cherp and Jewell, 2014, p. 418). Finally, it grounds the assessment on provision of modern energy services, which is the ultimate rationale for energy security policies.

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[1] We will not discuss these approaches for they have been critiqued in detail by Cherp and Jewell (2014).

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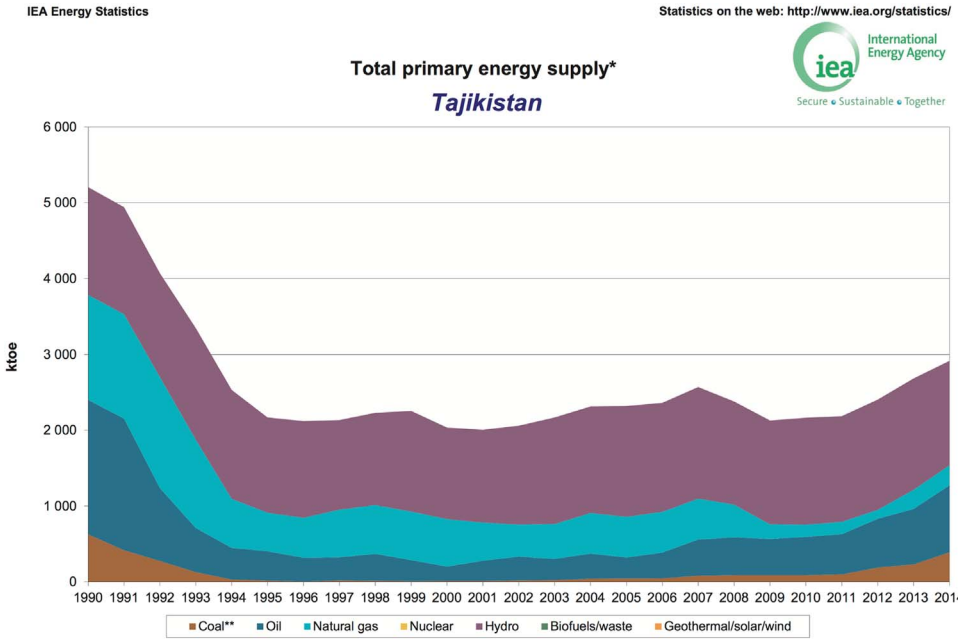

Fig. 1. Total primary energy supply, 1990–2014. *Source*: IEA Online Energy Statistics Database, 2014. Note: Following the collapse of the Soviet Union in 1991 the volume of energy supply in Tajikistan shrank by about half in three years. The total supply has not increased much since, but the share of fuels in the supply shifted towards greater dependence on hydropower.

Based on Practical Action (2014) work, *energy services*[2] can be conceptualized as energy relative to services that it can provide to people. Energy needs, then, are framed as a range of services that can be provided by tapping on different energy sources. As such, energy needs/services are stratified in terms of their immediacy to basic survival necessities of people: *for households, for earning a living,* and *for community*.

Using a novel *vulnerability* approach, this paper assesses threats and responses to Tajikistan's energy system, and it applies an analytical lens, using the four risk factors (natural, technical, political, economic) to reveal critical shortcomings that can be detrimental to energy security if not addressed adequately. Massive shortages of key energy carriers, such as electricity, natural gas, and fuel, such as gasoline and diesel, have crippled efforts aimed at achieving greater prosperity for the people of Tajikistan. Alleviation of such energy shortages and providing "reliable and high quality access to energy for the entire population, for industries and services, and to ensure the efficient use of energy in order to reduce poverty" are the main objectives of energy security in Tajikistan (Energy Charter Secretariat, 2010, p. 11). To achieve this goal, three major proposals have been advanced by the World Bank (Fields et al., 2013), the United Nations Development Program (Bukarica et al., 2011; Morvaj et al., 2010a, 2010b), and the Government of Tajikistan (Open Joint Stock Company 'Rogun HPP, n.d., Rogun HPP, n.d.).[3] Although these proposals are dated (2013, 2010/11 and 2008 respectively), they represent the existing options because no new alternatives to energy policy have been proposed. At stake is people's wellbeing, and therefore, it is important to assess their contribution to achieving energy security in Tajikistan. An evaluation of these proposals shows that they overlook the complexity of the energy needs and the role of local communities in addressing their energy priorities. As a way to remedy these shortcomings, we will recommend an alternative approach to energy security, namely the *energy services* approach based on Practical Action (2014) work. This approach requires a refocus from energy *sources* to *services*, which helps avoid the trap of accounting for energy stocks at the expense of meeting people's needs. Such a paradigm shift, facilitated by combining a *vulnerability* and *energy services* approaches, will inform effective policy to achieve energy security.

2. An overview of energy security in Tajikistan

This section provides an overview of the energy situation in Tajikistan by taking stock of energy sources and analyzing energy production and consumption patterns. This analysis provides the necessary context, in which to place the subsequent evaluation of energy security options provided in the following section.

2.1. National supply

For those unfamiliar with the country, the total primary energy supply (TPES) for Tajikistan in 2012 equaled 2805 kilotons of oil equivalent (ktoe) and was comprised of hydropower (47.2%), oil (30.3%), coal (13.4%) and natural gas (9.1%) (IEA, 2014a). According to Musayeva et al. (2009), hydro resources in Tajikistan hold a substantial power generation potential that is estimated at 527 billion kilowatt-hours (kW h), but technical potential is 317 billion kWh, or 60% per year. This ranks Tajikistan eighth in the world (EDB, 2008), second in electricity per capita worldwide (Fakirov, 2012), and first in the world in its hydropower potential. For hydrocarbons, the endowments for coal are estimated at about 4.452 billion tons, for gas, 8.517 trillion cubic meters, and for oil, 117.6 million tons (Musayeva et al., 2009). Recent reports of discovery of large reserves in the Bokhtar region of Tajikistan claim as much as 114 trillion cubic feet of gas and 8.5 billion barrels of oil (Collins and White, 2013). Recoverable oil potential is estimated at 27 billion barrels (EurasiaNet, 2012). However, domestic production only meets 16% of the national demand for coal,

[2] This concept is reviewed by Fell (2017) who finds a distinction between the desired end service or state and the energy service used to provide it, and formulates a new definition: "Energy services are those functions performed using energy which are means to obtain or facilitate desired end services or states." The PPEO 2014 approach is in line with Fell's (2017) finding and definition.

[3] Abbreviations: CAPS – Central Asian Power System; CASA-1000 – Central Asia South Asia Electricity Transmission and Trade Project; CHP – Combined Heat and Power (plant); EDB – Eurasian Development Bank; EE – Energy Efficiency; GBAO – Gorno-Badakhshan Autonomous Oblast; GDP – Gross Domestic Product; GW – Gigawatt; GWh – Gigawatt hour; HPP – Hydropower Plant; ICT – Information and Communication Technology; IEA – International Energy Agency; km – kilometer; km^2 – square kilometer; km^3 – cubic kilometer; ktoe – kiloton of oil equivalent; kW – kilowatt; kWh – kilowatt hour; MW – Megawatt; NGO – Non-governmental Organization; PPEO – Poor People's Energy Outlook; PV – Photovoltaic; RES – Renewable Energy Sources; RFE-RL – Radio Free Europe Radio Liberty; sHPPs – small-scale Hydropower Plants; TALCO – Tajik Aluminum Company; TPES – Total Primary Energy Supply; UNDP – United Nations Development Program.