



# Understanding attitudes toward energy security: Results of a cross-national survey

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## ABSTRACT

Energy security is embedded in a complex system encompassing factors that constitute the social environment in which individuals are immersed. Everything from education, to access to resources to policy and cultural values of particular places affects perceptions and experiences of energy security. This article examines the types of energy security challenges that nations face and characterizes the policy responses that are often used to address these challenges. Drawing from a survey of energy consumers in Brazil, China, Germany, India, Kazakhstan, Japan, Papua New Guinea, Saudi Arabia, Singapore, and the United States, we conduct a cross-national comparison of energy security attitudes as well as analyze each country's energy resources, consumption characteristics and energy policies. Through multivariate regression analysis and case studies we find that socio-demographic and regional characteristics affect attitudes towards energy security. Specifically, we find a strong relationship between level of reliance on oil imports and level of concern for a variety of energy security characteristics including availability, affordability and equity. Our results reaffirm the importance of gender and age in shaping perceptions of security, but also extend existing literature by elucidating the impacts of country energy portfolios and policies in shaping climate and security perceptions. Level of development, reliance on oil, and strong energy efficiency policies all affect individuals' sense of energy security. In sum, we find that energy security is a highly context-dependent condition that is best understood from a nuanced and multi-dimensional perspective.

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## 1. Introduction

The traditional conception of energy security addresses the relative availability, affordability, and safety of energy fuels and services. The [World Bank Group \(2005\)](#), for example, tells us that energy security is based on the three pillars of energy efficiency, diversification of supply, and minimization of price volatility. Consumer advocates and users tend to view energy security as reasonably priced energy services without disruption. Major oil and gas producers focus on the stability of their access to new reserves, while electric utility companies emphasize the integrity of the electricity grid. Politicians dwell on protecting energy resources and infrastructure from terrorism and war. From a distinct vantage point, scientists, engineers, and entrepreneurs characterize energy security as a function of strong energy R&D, innovation, and technology-transfer systems. These diffuse conceptions of energy security map onto distinct national energy-

security concerns, which undoubtedly are reflected in the attitudes of citizens.

Given the complex nature of energy security, emerging energy security challenges, and differing socioeconomic attitudes, it is important to understand the factors that shape individual perspectives on energy security. The literature suggests that demographic factors play a considerable role in determining perception of and exposure to energy security. However, social identity as influenced by place of residence is also important in shaping perceptions of security. Energy security is embedded in factors that constitute the social environment in which individuals are immersed, including everything from education to access to resources to policy and cultural values of particular places.

This article examines the types of energy security challenges that nations face and characterizes the policy responses that are often used to address these challenges. To do this we analyze a ten-country survey of attitudes towards energy security, evaluating not only demographic characteristics, but also national characteristics that constitute the level of energy vulnerability or security to which respondents are exposed. We have designed our survey to focus on energy as a whole—cutting across multiple sectors, technologies, and commodities—rather than individual fuels to

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reflect the reality of modern energy production and usage (dependent on a portfolio of different sources). This broadens the focus to collective energy security rather than narrower concepts like oil or grid security. In addition to evaluating socio-demographic characteristics, we seek to strengthen existing literature by incorporating geographic considerations into our survey. We triangulate our survey with data informing the level of energy security of each of the countries evaluated. These data include a wide spectrum of national policies and energy profiles that constitute the energy environment in which individuals reside.

Our results reaffirm the importance of demographic characteristics, but also add new insight into the types of energy profiles that promote stronger perceptions of and interest in energy and climate security. In particular, we find a strong negative correlation between the level of reliance on oil imports and citizen valuations of energy security. Likewise we find a negative correlation between the level of economic development (as measured by GDP per capita) and the emphasis placed on security characteristics including availability, welfare, affordability, transparency, and environmental stability.

The article proceeds with six sections. In Section 2 we examine the types of energy security challenges that nations face and characterize the common policy responses. We then describe the research design used in our cross-national comparison of energy security attitudes (Section 3). We present our descriptive results in Section 4, beginning with an overview of each country's energy resources and consumption characteristics as well as the energy policies they have in place. Then, turning to a comparison of their views of energy security, we focus on variations in respondents; assessments of 20 attitudinal measures. In Section 5, we explore the socio-demographic and regional characteristics of attitudes towards energy security through multivariate analysis. The article concludes with an overview of our findings and recommendations for future research.

## 2. Conceptual framework

This section introduces readers to the concept and practice of energy security, broadly defined as equitably providing affordable, reliable, efficient, environmentally benign, proactively governed and socially acceptable energy services to consumers. The first part of this section illustrates different national strategies towards achieving energy security followed by a brief discussion of energy security challenges such as growing demand, infrastructural limitations, and climate change. The final part summarizes socioeconomic attitudes and perceptions towards energy supply, energy use, and the environmental constraints involved with the energy sector.

### 2.1. The range of energy security: sufficiency to dependency

In the United States, energy security has generally meant the availability of sufficient energy resources and services at affordable prices (Lesbirel, 2004). The oil security policy of the United States was formalized by the Carter Doctrine, which stated that any effort by a hostile power to block the flow of oil from the Persian Gulf would be viewed as an assault on the vital interests of the United States and would be repelled by “any means necessary, including military force” (Klare, 2007). Under various precedents, oil security has meant ending all oil imports, eliminating imports only from the Middle East, merely reducing dependence on foreign imports, and entirely weaning the country off oil. US energy-security policy has historically also included maintaining a strategic petroleum reserve, reducing physical threats to energy infrastructure, and preventing the proliferation of nuclear weapons in “non-nuclear

weapons states” and non-signatories to the Nuclear Non-Proliferation Treaty such as Iran and North Korea (Sovacool and Brown, 2010). More recently, concern about an increasingly fragile U.S. electricity grid has become more evident (EPRI, 2011) and is heightened by the expanded electrification of US military operations (U.S. Army, 2010; U.S. Department of Defense, 2011).

Other countries with limited energy resources have deployed different strategies to achieve security. Japan has pursued an energy security strategy of diversification, trade, and investment, as well as selective engagement with neighboring Asian countries to jointly develop energy resources and offset Japan's stark scarcity of domestic reserves (Atsumi, 2007; Toichi, 2003). Conversely, in the United Kingdom energy security tends to be associated with promoting open and competitive energy markets that will provide fair access to energy supplies, foster investment, and deliver diverse and reliable energy at competitive prices (Chang and Lee, 2008).

Similarly, the focus on energy security in countries that are struggling to meet their energy requirements is quite distinct. China, for example, has viewed energy security as an ability to rapidly adjust to their new dependence on global markets and engage in energy diplomacy, shifting from its former commitments to self-reliance and sufficiency (*zi li geng sheng*) to a new desire to build a well-off society (*xiaokang shehui*) (Bambawale and Sovacool, 2011a). China's current approach to energy security entails buying stakes in foreign oil fields, militarily protecting vulnerable shipping lanes, and an all-out “energy scramble” for resources (Cheng, 2008; Dadwal, 2007; Kim and Jones, 2005; Xu, 2006).

Among the countries with excess supplies of oil and natural gas, the focus on energy security takes on other forms. As one example, Russia appears to pursue an energy security strategy of asserting state influence over strategic resources to gain primary control over the infrastructure through which it ships its hydrocarbons to international markets. Restricting foreign investment in domestic oil and gas fields is an important element of this strategy. Buoyed by this strategy, Russia was recently able to triple the price of natural gas exported to Belarus and Ukraine because those countries were completely dependent on Russian supply (Sevastyanov, 2008). Nevertheless, ‘security of demand’ is critical for Russia, and it aims to reassert state control over strategic resources and gain primacy over the main pipelines and market channels through which it ships its petroleum and natural gas to international markets (Yergin, 2006). Saudi Arabia similarly pursues energy security by maintaining security of demand for its oil and gas exports (Bambawale and Sovacool, 2011c). In contrast, Australia's strategy involves cultivating a strong demand for uranium, natural gas, and coal trading (Leaver, 2007, 2008; Wu et al., 2008). Venezuela and Colombia focus on minimizing attacks on oil, gas, and electric infrastructure (Barrera-Hernandez, 2004).

International comparisons of energy security highlight the interdependence of countries enmeshed in larger relationships between and within producers and consumers of energy fuels and services. Globally, trade in energy commodities amounted to more than US\$ 3 trillion in 2011, including oil, natural gas, coal, and uranium (Brown and Sovacool, 2011). As a result, few countries are truly energy independent. As Fig. 1 shows, the world's known oil reserves (1.2 trillion barrels) are concentrated in volatile regions, as are the largest petroleum companies. The three biggest petroleum companies—the Saudi Arabian Oil Company, the National Iranian Oil Company, and Qatar Petroleum—own more crude oil than the next 40 largest oil companies combined. The 12 largest oil companies control roughly 80% of petroleum reserves and are all state owned.

Therefore, although oil and gas resources are internationally traded in what superficially resembles a free market, most supplies

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