

Leadership aspects of regional development, energy security, and energy consumption

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Abstract This paper tackles the issue of regional development, as well as energy security and efficiency within the idea surrounding the concept of leadership. It can be seen that while some regions are lagging behind and falling into stagnation, others are prospering, even though the starting conditions seem to be equal. Moreover, given the same endowment and resources, some regions tend to yield poor energy efficiency and security, while other regions yield a steady growth and demonstrate innovations in energy generation, such as the use of renewable energy sources (RES). All in all, it can be concluded that the region's position in the local and international economy can be attributed to its level of leadership.

Our results show that leadership represents an important aspect of regional development and that leaders should benefit from higher government funding and support. In addition, we conclude that there is a link between the position of leading regions and their energy security, efficiency, and consumption.

1 Introduction

Regional development is dependent on a whole array of factors. Nevertheless, energy security constitutes one of the most important factors among them. Securing the steady, cheap, stable and safe supply of energy is a must for every regional stakeholders or local government.

Some remote regions (e.g. areas in Argentina, or Russian Far East) cannot rely on the energy supply from the central pipeline or electricity grid but have to secure their own energy instead (Lisin et al. 2018). Here is where the renewable energy sources (RES) start playing a key role. The correct and balanced use of RES might make any region, a country, or a group of countries (with European Union (EU) being a good example) autonomous and abundant in green and clean energy (Newbery et al. 2018).

Moreover, the problem of energy security also constitutes an interdisciplinary concept that simultaneously combines a whole array of perspectives (Cherp and Jewell 2011; Lisin et al. 2014). For example, there are energy, economic (market), as well as environmental perspectives. The energy perspective includes supply and demand balancing, the technical concept for the technical infrastructure and its management, and the diversification of the supply of energy resources (Konova et al. 2012). The economic perspective is to ensure an acceptable price for energy resources, while the ecological (or sustainability) perspective is related to ensuring a fair state of natural environment for future generations (Basak et al. 2012).

China is a good example for energy security and efficiency achieved from above (i.e. induced by the central government and authorities). The unified policy can skew the policymakers' goals and even distort the original goals through the enormous dispersion of developmental levels and the different effects of various factors (Zhang et al. 2019). With such global goals and tasks, the population, industry, public finances, and

investment focussing heavily on the core areas of cities in China, the decentralization of regional planning should be considered to improve the performance of electricity use (Zhou et al. 2010). The government must strike a balance between economic and social development in the regions. Industrial diversification, decentralization of economic activity, and the establishment of multiple cores for regional development would be helpful in achieving lower growth in electricity intensity in China.

In general, it is easy to agree upon the fact proposed by many researchers that the integrated consideration of industrial distribution and regional cooperation is necessary for the sustainability of economic growth (Sarkis and Zhu 2018). The price system should also be given the full scope to adjust the relationship between electricity consumption and economic activity.

The promotion of urbanization in a decentralized manner and the increase in industrial capacity could reduce the pressure on electricity caused by the urbanization in China. The effects of regional concentration and industrial intensification are greater than those of urbanization in development. The expansion of industrial chains could reduce power consumption in regions where development relies heavily on energy-intensive industries. The energy sector, which is of particular importance for national development, contributes to climate change in the short and long term and is affected. For example, sectoral measures to expand electricity generation capacity, strengthen and develop transmission and distribution networks, improve regional trade through interconnection of regional networks, improve access to electricity, promote renewable energy and introduce new technologies in power generation essential. Access to energy is seriously threatened by the progressive depletion of ecosystems and the impact of extreme weather events on infrastructure.

2 Energy consumption and energy security

The world energy consumption is the total energy that is generated and consumed by the entire human civilization. Energy from food is not included, and the extent of direct biomass burning is poorly documented. Institutions such as the International Energy Agency (IEA), the United States Energy Information Agency (EIA), and the European Environment Agency (EEA) regularly collect and publish energy data. Improved data and a better understanding of world energy use can highlight systemic trends and patterns that could help to track current energy issues and drive the development towards collectively beneficial solutions.

Nuclear energy raises a number of concerns, in particular with regard to nuclear safety, spent fuel, waste management, transboundary impacts and decommissioning. Some countries are extremely wary of using nuclear technologies and do not see undue concerns about using and developing additional technologies for the proper management and control of spent fuel and other nuclear materials. Some of these countries believe that the use of nuclear energy should be strengthened. In their view, nuclear energy is a sustainable source of energy with economic and ecological benefits. Increasing energy demand stimulates economic growth, but energy consumption also causes greenhouse gas emissions.

Figure 1 that follows, shows the world's total primary energy supply by source over the last 27 years. It becomes apparent that even though oil and coal are still dominating the total energy supply, the share of renewables is starting to play a more decisive role.

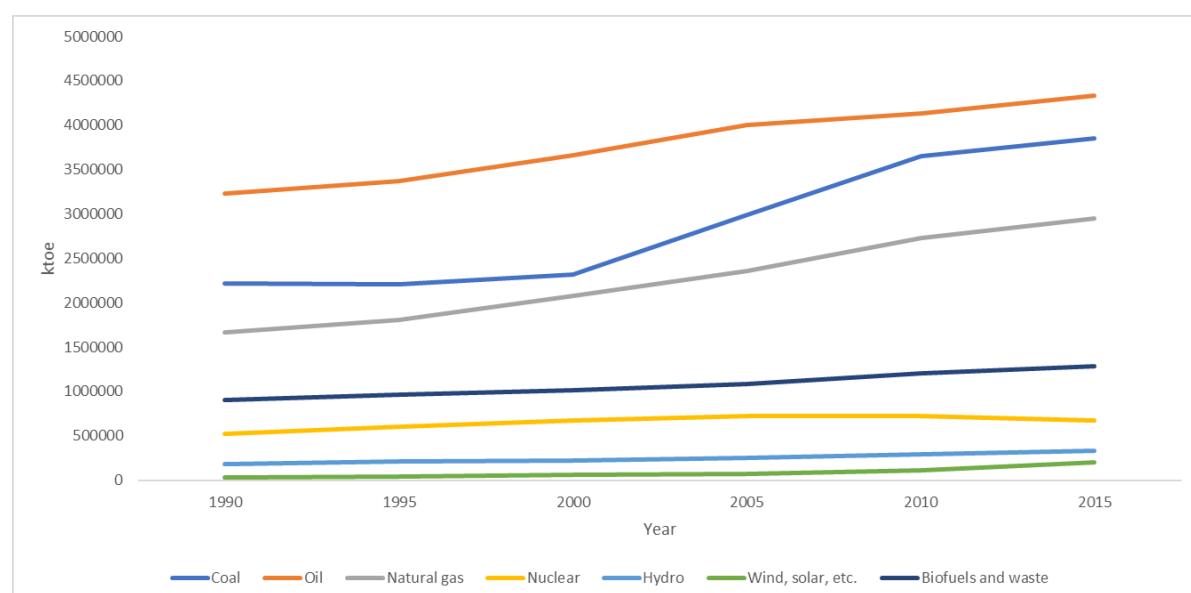


Fig. 1. World's total primary energy supply by source (1990-2017)
Source: IEA (2019)

Over the past ten years, increasing attention to global warming and climate change has focused on the relationship between environmental pollutants, energy use and economic growth. In order to effectively control greenhouse gas emissions and ensure the sustainability of economic development, it is important to better understand the links between greenhouse gas emissions, energy consumption and economic growth. The demand sectors include transportation, industry and others (the sum of the demand for energy for households, businesses and agriculture). Demand is broken down into energy sources for industry and other sectors. The results show that the income elasticity of energy demand decreases with economic growth.

On the other hand, energy consumption in residential and road traffic is growing more slowly than real general domestic product (GDP), as is total final energy demand. Cities must set strict guidelines and standards to develop sustainable urban energy systems and reduce the use of unsustainable technologies and practices. Governments must not only enact legislation regulating energy consumption and consumption, but also create incentives to promote research, innovation and, above all, the introduction of greener and more efficient technologies. Governments should also seek cooperation between local and international partners to enable local businesses to increase their knowledge, expertise and market reach.

In order for each region to adapt to its local specificities, the authorities need to develop decentralized energy systems and infrastructures, and have specific laws and control systems to either promote the use of sustainable energy or reduce the use of energy and discourage use environmentally harmful, inefficient technologies and consumption habits. Financial resources and mechanisms play a key role in the implementation of Agenda 21. For developing countries, global development aid is an important source of external finance, and new and additional resources for sustainable development and energy for sustainable development and the implementation of Agenda 21 will be needed (Strielkowski et al. 2016). Therefore, all financial obligations of Agenda 21, in particular those contained in Chapter 33, and the provisions on new and additional resources that are both reasonable and foreseeable, are urgently needed.

According to the International Energy Agency (IEA 2014), energy security is defined as the uninterrupted availability of energy sources at an affordable price. In general, energy security means the state of the economy, which enables the generation of energy, ensures stable supplies and meets environmental requirements. Another definition of energy security is the analysis of the state and possibilities of energy production and the anticipation of disturbances of this process (Probierz 2015).

In order to ensure energy security, efforts must be made to reduce the internal and external risks to energy systems and to manage the remaining risks. Within the EU, the establishment of the single market faces problems related to inadequate energy infrastructure. Therefore, it is important to allow the construction of a single transmission network that improves both supply security and competitiveness. The lack of opportunities to become independent of the EU from importing energy has influenced the expansion of energy policy in terms of demand management. Therefore, it is important to take action that reduces the risk of dependency.

3 Energy security and renewable energy sources: a discussion

With such issues as global warming and pollution that the world is facing nowadays, it becomes obvious that the shift to the green or renewable energy is a necessary step humanity needs to make changing its energy mix forever. Promoting the development of new technologies, the promotion of renewable energy sources and the diversification of energy sources. It needs to be noted, however, that energy is only one factor in conflict which often aggravates existing political instability.

At national level, decentralization and diversification of energy supply would reduce the role of national governments as energy suppliers and distributors. One also needs to realize the implications stemming from some of the political transition's energy transition risks, including stranded fossil fuel wealth, cyber security for integrated grid management, and the need for equitable transition strategies for sector workers develop that suffer from it.

Generally, the relatively rapid and almost simultaneous emergence of India and China as major players in the global energy scene has raised questions about whether adjustments to the existing international energy system are needed and whether new institutions for energy and environmental security will evolve (Tripahi et al. 2016; or Gopal et al. 2018). It is in the collective interest of all nations that India and China become full members of the international energy community and are responsible stakeholders who are responding to their growing importance to the global energy markets. Against the background of the strategic realignment of foreign policy in Asia, the United States in particular is interested in the energy security of India, China, and Asia as a whole.

The use of renewable energy increases energy security and reduces the dependency on fossil fuels. This feature can be used for any project specifications in order to lay the foundation for energy efficiency, and in particular, specify project goals, goals, and strategies for energy efficiency. India and China are becoming increasingly aware of that and the ratio of RES in both countries is growing. However, the pace of this growth is

still very slow and would not be capable of securing a steady energy supply within the nearest future. Thence, new approaches and new technologies need to be used.

Another important aspect of energy security is smart cities and smart homes. The concept is not new but with the rise of the Internet and the quality of connection, it became possible to deploy smart meters, tiny devices capable of monitoring, reporting, and even driving the energy consumption and use. In addition, there are several ways how to conserve and save energy by rationing its use or changing the behavioural patterns that would allow for better and more efficient use of electricity or heating at households and office buildings. All of those belong to the so-called “Internet of Energy” (IoE) that is a sub-section of the “Internet of Things” (IoT) (Mahmud et al. 2018). However, even though both concepts are very often mentioned by the media and reported as the future for the energy consumption, it has to be remembered that very few compatible standards exist. The technology is still very young and immature to be deployed at a large scale.

However, when smart cities and smart homes are mentioned, one also needs to think about cybersecurity and hacker attacks on the infrastructure and smart grids. Digital technologies that are applied to energy networks might bring enormous benefits, but they can also cause great threats in the ways many of us cannot even imagine or comprehend.

Increase building performance by incorporating predictive power models and system controls such as occupancy and daylight sensors, CO₂ sensors, and other air quality alarms. Environmentally certified buildings often provide a healthier working and living environment, which contributes to increased productivity and improved health and comfort of employees. In addition, there are also such improvements as the city lights – enormous amounts of energy can be saved by shifting from sodium lamps to LED lights (Hadipour et al. 2018). It is even possible to put together a long list of benefits in implementing a LED strategy that ranges from improving air and water quality to reducing solid waste, benefiting owners, occupiers and society at large. When the LED rating is sought, the cost of initial design and construction often increases.

4 Conclusions and discussions

All in all, it becomes clear that leadership in regional development is entwined with the energy security and consumption. Global changes that include the climate change, the changes in the energy mix, as well as environmental concerns risen by not only stakeholders and specialists but also by common people (or even teenagers) are calling for a more serious focus on these topics.

When it comes to the energy security and energy consumption, the technological side needs to be concerned. With digital technologies finding their way to every part of our lives, energy sector is not going to be different in embracing those technologies for its benefits. However, there is still a long way to go before the existing standards for smart meters and smart homes are going to be unified and the households and consumers are going to change their energy consumption patterns.

Last but not least, it needs to be remembered that the existing energy mix is based on fossil fuels due to the economic and technological reasons, even though most of the technologies are quite obsolete and counterproductive. Take electricity generating from burning coal, for example. The technology leaves most of the energy wasted and creates considerable pollution. However, it still remains the major and widely used technology in place.

The new technological leap might alter the energy security and consumption as we know it beyond our today's comprehension. New sources of energy might be discovered, or better and more effective solutions of energy storage might be invented. All of these would mean that the existing paradigms of energy security and consumption would have to be revised and redesigned.

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