

Resolving society's energy trilemma through the Energy Justice Metric



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HIGHLIGHTS

- Energy justice advances energy policy with cosmopolitanism and new economic-thinking.
- An Energy Justice Metric is developed and captures the dynamics of energy justice.
- The Energy Justice Metric (EJM) compares countries, and energy infrastructure.
- EJM provides an energy policy decision-making tool that is just and equitable.

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ABSTRACT

Carbon dioxide emissions continue to increase to the detriment of society in many forms. One of the difficulties faced is the imbalance between the competing aims of economics, politics and the environment which form the trilemma of energy policy. This article advances that this energy trilemma can be resolved through energy justice. Energy justice develops the debate on energy policy to one that highlights cosmopolitanism, progresses thinking beyond economics and incorporates a new futuristic perspective. To capture these dynamics of energy justice, this research developed an Energy Justice Metric (EJM) that involves the calculation of several metrics: (1) a country (national) EJM; (2) an EJM for different energy infrastructure; and (3) an EJM which is incorporated into economic models that derive costs for energy infrastructure projects. An EJM is modeled for China, the European Union and the United States, and for different energy infrastructure in the United Kingdom. The EJM is plotted on a Ternary Phase Diagram which is used in the sciences for analyzing the relationship (trilemma) of three forms of matter. The development of an EJM can provide a tool for decision-making on energy policy and one that solves the energy trilemma with a just and equitable approach.

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1. Introduction

The energy trilemma is emerging as a key problem for government. There are many variations to what the trilemma entails but they all have the same problems at its core – those emanating from economics, politics and the environment. The energy trilemma is visualized as a triangle and it is advanced here as emanating from the energy law and policy triangle–this is illustrated simplistically below in Fig. 1. The aim of trying to achieve a balance between the competing demands (of economics, politics and the environment) of the energy law and policy triangle is known as

the energy trilemma; i.e. in essence, the challenge of balancing the energy law and policy triangle raises the question of the energy trilemma and how society aims to resolve this?

Energy law and policy is in the center of the triangle and on the three vertices of the triangle are economics (for example, energy finance), politics (for example, energy security) and environment (for example, climate change mitigation) – though there are many other issues under each of the three issues. These three issues are trying to bring energy law and policy towards their direction. In essence, effective and efficient energy law and policy will balance these three aims to deliver the best outcome to society. However, if one examines energy law and policy in more detail often it is just one of these points that dominates the energy agenda; more often than not it is economics.

It is proposed here that the solution to resolving the Energy Trilemma is through 'Energy Justice'. Energy justice can achieve a

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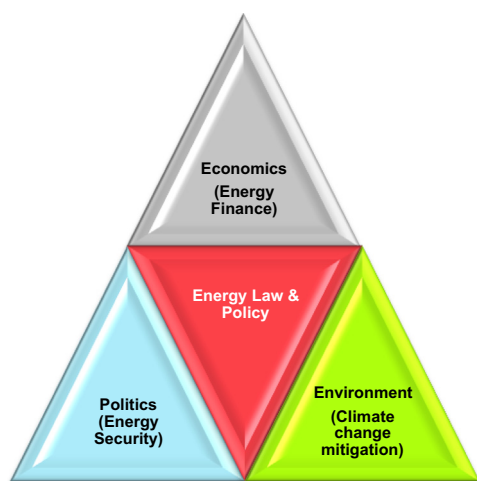


Fig. 1. The Energy law and policy triangle – The ‘Energy Trilemma’.

just and equitable balance between the three dimensions of the Energy Trilemma. It is significant that it is a *just and equitable* balance and not simply an *efficient* balance that is the aim of energy justice. This represents a move away from solely having economic thinking drive policy aims.

Energy justice is a conceptual framework, which seeks to identify when and where injustices occur and how best law and policy can respond (Heffron and McCauley, 2014; McCauley et al., 2013; Sovacool and Dworkin 2015). It calls on academics and practitioners to critically evaluate the implications of energy policies. Energy justice begins with questioning the ways in which benefits and ills are distributed, remediated and victims are recognized (McCauley et al., 2013). This paper advances energy justice through advocating that the concept be underpinned by cosmopolitan philosophy, interdisciplinarity and a more effective approach towards future generations.

Energy justice is a relatively new concept but it can deliver more direct and long-term change. As part of this new research agenda this paper aims to quantitatively analyse energy justice through the calculation and modeling of an *Energy Justice Metric*. This *Energy Justice Metric* (EJM) can influence what new energy infrastructure is built and consequently may mean that society chooses those energy infrastructure projects that satisfy criteria that allocate and distribute the full costs and benefits in a *just and equitable* method for current and future generations. The *Energy Justice Metric* represents a first step in analysing energy justice with a quantitative approach.

This paper will first detail briefly what energy justice is before stating the justification for its application into policy on energy infrastructure development and the subsequent effect on climate change policy. It will present the logic and parameters behind the development of the *Energy Justice Metric* before modeling it using a Ternary Phase Diagram. This also allows for the plotting of the EJM graphically so that comparisons can be made between countries and energy sources and with the Energy Law and Policy Triangle. The EJM is analyzed for China, the European Union and the United States. In addition, the EJM is calculated for different energy sources in the UK – i.e. coal, oil, gas, nuclear energy and wind. The data used is sample data to demonstrate the model.

2. What is energy justice?

Energy justice is a relatively new term and has been in wide use for less than a decade. However, as a concept it has only been explored very recently by McCauley et al. (2013), Sovacool (2013),

Sovacool et al. (2013), Heffron and McCauley (2014) and Sovacool and Dworkin (2014, 2015). The concept for use in this paper will be taken from the briefer description given by McCauley et al. (2013) and Heffron and McCauley (2014) which in essence is similar in approach to the others. A more complete analysis is given in Sovacool and Dworkin (2014, 2015) and in Sovacool et al. (2013). Further, the concept of energy justice is advanced here as being intertwined with new energy infrastructure development. Here it is proposed that this is where the value and effectiveness of energy justice can be delivered in policy application.

Energy justice provides a framework, which is able to engage with and reform the dominant paradigms of energy-based thinking in society. Unlike environmental and climate justice, it is not rooted in anti-establishment social movements. The unequal distribution of environmental ills and associated risks led to the emergence of environmental justice movements in the US throughout the 1970s (Schlosberg, 2013). The siting of polluting or waste infrastructures in less affluent areas of the US gave rise to protests and other forms of direct action, and the proliferation of environmental organizations alongside a substantial body of academic thought. In a similar vein, the perceived failure of the Kyoto Protocol triggered the rise of ‘climate protests’ at the lack of international progress on carbon reduction targets (Paavola and Adger, 2006). The climate justice agenda has more recently sought to explore such bottom-up initiatives in urban contexts throughout the world (Bulkeley et al., 2012).

Drawing upon and advancing the literature in environmental and climate justice, the energy justice framework is based upon three key elements of energy justice (McCauley et al., 2013): distributional justice, procedural justice and justice as recognition. The proceeding paragraphs detail the three elements of energy justice and how they link into the energy system and supply chain. This connection, it is argued, offers a unique opportunity to engage policy makers and academics in a new approach to decision-making on energy infrastructure.

2.1. Distributional justice

Energy justice is an inherently spatial, temporal and societal concept that includes both the physically unequal allocation of environmental benefits and ills, and the uneven distribution of their associated responsibilities (Walker, 2009), for example exposure to risk. Thus, energy justice can appear as a situation where “questions about the desirability of technologies in principle become entangled with issues that relate to specific localities” (Owens and Driffill, 2008: 4414) and represents a call for the distribution of benefits and detriments across all members of society regardless of income, race, etc. UK research demonstrates that it is often the poorer and less powerful social groups that are disproportionately affected (Todd and Zografos, 2005). One avenue for research is, for example, to consider the extent to which the siting of energy infrastructure in the United Kingdom is leading to distributional injustices.

For example, in the United Kingdom wind energy projects are facing distinct local opposition, although this is different from the opposition that nuclear energy projects have faced in the past, which has tended to be from national environmental movements and not at the local level (where they in many cases receive support, e.g. at Wylfa in Wales). Other major projects—such as coal plant projects, and even transport projects such as Heathrow Terminal 5 and the prospective high-speed rail project (HS2—London to Birmingham High-speed Rail Project)—would receive similar or more opposition in the planning process than a nuclear energy project. Already, the search for shale gas in the United Kingdom is facing strong objections due to the nature of the “fracking” process involved. However, objections can contribute to

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