

GLOBAL ENERGY JUSTICE

LAW
AND
POLICY

LAKSHMAN GURUSWAMY

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GLOBAL ENERGY JUSTICE

Law and Policy

LAKSHMAN GURUSWAMY

Nicholas Doman Professor of Law
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DEDICATION

This book is dedicated to Judge C.G. Weeramantry, the Sri Lankan born judge, professor, and scholar. His awe-inspiring life and work is an indelible testament to the universality of law in global society. His cascade of books, spanning an astonishing array of subjects, demonstrate why law is a universal global phenomenon that should shape societal mores. His works include those on human rights within countries and across traditional cultural divides, the concepts and international lineages of justice, the human and biophysical environment, nuclear power, technology, and comparative religious perspectives spanning Christianity, Buddhism, Hinduism and Islam.

Judge Weeramantry was a Judge of the Supreme Court of Sri Lanka, a Distinguished Professor at the University of Monash, and a Judge and Vice President of the International Court of Justice (ICJ) in the Hague. His contribution to the jurisprudence of the ICJ is unmatched. He brought unparalleled erudition, extraordinary passion, inimitable wisdom, and peerless vision to his role as an international judge. His great and enduring legacy spans the entire compass of international law.

It has been my privilege to know and treasure Christie as a mentor, philosopher, and friend. I am humbled by his friendship, and it is an honor to dedicate this book to him.

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Nasratuliah Shazad Sahak, and Cassidy Woodard reviewed and edited different chapters of this book with skill and expertise. As always, the assistance given by Jane Thompson, the Research and Reference librarian at the School of Law was nothing short of outstanding. The ever obliging Diana Avelis, Faculty Assistant, provided invaluable help at different stages of the MS.

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Chapter 1

ENERGY AND SOCIETY

We will be explaining the meaning of what may be an unfamiliar concept: “the energy poor.” The term conjugates a difficult abstraction: energy, with an elusive social construct: the poor. We will try to obtain a practical and functional, as distinct from a theoretical, understanding of the two parts of this term. The purpose of our endeavor is to appreciate the primary role of energy in society, and how it affects the energy poor. The objective of our book is to explore what can be done to address the energy poor within the frameworks of justice, law and policy.

I. The Concept of Energy

Defining what we mean by energy offers one way of demonstrating its importance. A definition tells you what something is and points to the fact that the word “energy” describes a particular phenomenon. A typical definition of energy, therefore, must offer hard verifiable facts that can be discovered by scientific investigation. But such a single, objective definition may not be possible for a number of reasons. First, definitions may vary according to who is seeking to define the phenomenon of energy.

For example, while they purport to define what they see as datum, physicists—who do not see energy through the same lens as chemists or biologists—may define energy in one way. Energy, as defined by the physicist, is an abstraction of the raw materials of the universe.¹ On the other hand, the definition offered by the chemist is based on what the chemist sees about the interactions and composition of matter.² The biologist by contrast sees energy through the prism of living organisms.³ Each of these definitions may be verifiable and accurate as far as the physicist or chemist or biologist is concerned. None of them can be accused of a wrong definition, nor can one claim that only their definition is true while those of the others is false.

Second, the difficulties of definition are compounded by the fact that the phenomenon of energy can be categorized as *potential* and

¹ This may lead the physicist to define energy as the ability to do work. Rachel Scherr, Hunter Close & Sarah McKagan, *Intuitive Ontologies for Energy in Physics*, 1413 AM. INST. PHYSICS 343 (2011).

² Leading to a definition of energy as the power created by the reaction of two substances.

³ This may lead the biologist to define energy as the transformations taking place in plants and animals when they collect energy from the sun and use carbon dioxide and water in the process called photosynthesis to produce sugars.

kinetic, and each of these categories may take differing forms.⁴ For example, *potential energy* is stored energy. Chemical energy is stored in the bonds between atoms and molecules. Mechanical energy is stored in objects by tension. Gravitational energy is stored in an object's height. Electrical energy is stored in a battery, and nuclear energy is stored in the nucleus of an atom.

The second category, *kinetic energy*, is the energy of motion. It too is expressed in different forms, such as radiant energy (e.g., sunshine), thermal (heat) energy caused by the vibration of atoms or molecules within substances, and motion energy from the movement of wind, water, or any other object. Both potential and kinetic energy need to be converted in order to do work. Consequently, the extent and use of energy found either in potential or kinetic energy depends on how it is converted. Moreover, given the categories and forms of energy referred to, it is difficult to offer one comprehensive definition that covers all these energy forms.

But, the inability to offer one true, accurate, objective, or comprehensive *definition* of energy does not preclude us from trying to understand the *concept* of energy. It is possible to begin with a "primitive notion" about the concept of energy as found in mathematics and logic that could lead us toward a working definition.⁵

Although "definitions" and "concepts" are usually situated within mathematics and formal systems⁶ of logic or mathematics, they also apply to all kinds of other phenomena and social systems, like law. In fact, the evolution of definitions and concepts of law are analogous to those that apply to energy and shed light on how we can understand what we mean by energy. For example, a number of leading legal philosophers have refrained from defining law, but have thought it more useful to explain the concept of law.⁷ Similarly, scientists have defined energy as the capacity for doing work or, in other words, the capacity to move an object into or out of some position.⁸ While this definition may be criticized as a description of what energy does rather than what it is, it is nonetheless a working and functional definition. Given that the readers of this book are

⁴ *Kinetic and Potential Energy*, DIFFEN, http://www.diffen.com/difference/Kinetic_Energy_vs_Potential_Energy (last visited Nov. 22, 2015).

⁵ Alfred Tarski, *Introduction to Logic: And to the Methodology of Deductive Sciences* 118 (Oxford Univ. Press 1946).

⁶ The Editors of Encyclopedia Britannica, *Formal System: Logic*, ENCYCLOPEDIA BRITANNICA, <http://www.britannica.com/topic/formal-system> (last visited Nov. 29, 2015).

⁷ H.L.A. Hart, *The Concept of Law* 14–17 (2d ed. 1994); Richard Posner, *Overcoming Law* vii (reprint ed. 1996); Ronald Dworkin, *Law's Empire* 104 (1986).

⁸ Harold H. Schobert, *Energy and Society: An Introduction* 13 (2d ed. 2014).

predominantly law students or lawyers, we will compare the concept of energy to law.⁹

II. Comparing the Concepts of Law & Energy

Neither energy nor law offer conclusive definitions that encompasses all attributes of those terms. Nonetheless, energy, like law, is both real and universally used. They function as critical determinants in shaping society. Both energy and law are constantly employed to construct and fashion the essential socio-economic, political, and ecological fabric of societies the world over.

The lack of an authoritative canonical definition of law does not prevent us from studying specific branches of law, such as constitutional, criminal, contract, tort, property, environmental, and commercial law. From our study of these subjects, we begin to understand that law is a ubiquitous, yet complex, socio-political phenomenon. It creates the foundations of the economic, political, and social structures of a state and governs the manner in which society regulates and mediates relationships between people.

Notwithstanding the immense power asserted by law, legal philosophers across the centuries have differed over the definition of law—not unlike scientists who have differed over the definition of energy. Some legal philosophers like the English jurist John Austin (1790–1859) defined law as the general command of a sovereign backed by force.¹⁰ His followers are called analytical jurists or legal positivists. Others have disagreed on whether command and force are essential and necessary attributes of law. Historical jurists like Sir Fredrick Pollock pointed to the villages in India governed by customary laws that were not created by a sovereign or backed by force.¹¹

Ronald Dworkin argued that, in deciding hard cases, judges often invoke legal principles that do not derive their authority from an official act of promulgation. These principles must be characterized as law because judges are bound to consider them when relevant.¹² This contradicts Austin's pedigree thesis that a proposition of law is valid only by virtue of having been formally promulgated by a sovereign. H.L.A. Hart offered the most compelling

⁹ What we are trying to do is to explain the concept of energy by analogizing energy to law. The law referred to is national, not international, law. As we have noted above, this book makes the case for global energy justice to be institutionalized as international law, but that is not what we are attempting to do at this point.

¹⁰ John Austin, *The Province of Jurisprudence Determined* (Wilfrid E. Rumble ed., Cambridge Univ. Press ed. 1995).

¹¹ Fredrick Pollock, *Law and Command*, 1 LAW MAG. & REV. 189, 194–95 (1892).

¹² Ronald M. Dworkin, *Taking Rights Seriously*, 40 (Harvard Univ. Press 1977).

criticism of Austin's thesis relating to the use of force. He argued that the command of a gunman ordering someone to hand over her money was not a law just because it was backed by force. According to Hart, legal rules are obligatory because people accept them as standards, and in limited cases, punish deviations.¹³ It is this internal point of view, and not force, that creates a sense of obligation, and gives law its legitimacy.¹⁴

But whatever their differences about the definition of law, all these theorists agreed on the fact and importance of law in society. Their theoretical disharmony does not affect their view that the legal system is in fact a recognizable social phenomenon that governs society. Similarly, whatever the theoretical differences about the definition of energy, it is a reality in every aspect of our lives from food and clothing to shelter, transportation, communication, and medicine. It is a ubiquitous biophysical phenomenon, or fact of life and human history, analogous to the socio-political phenomena of law.

III. A Brief History of Human Energy Use

Humans are endlessly engaged in transforming or converting energy found in the environment into energy useful for human purposes. Such energy can be classified as either endosomatic or exosomatic. Transforming food energy into muscular power is endosomatic (or metabolic) energy. Transforming energy outside the human body into useful energy is exosomatic energy. Exosomatic energy is an essential element of societal development,¹⁵ and some scholars conclude that all civilizations are founded upon, and determined by, the sources of energy they control.¹⁶

The hominid family of primates emerged about 5 million years ago, with modern humans (*homo sapiens*) appearing around 240,000 B.P. (before the present).¹⁷ Throughout history, humans have focused on controlling the energy flows and stores inherent in the natural world.¹⁸ For the vast majority of this time, humans relied solely on endosomatic energy in the form of chemical (caloric) energy obtained from food that produced the mechanical (kinetic) energy of working

¹³ Hart, *supra* note 7, at 80.

¹⁴ *Id.* at 56.

¹⁵ Mario Giampietro, Kozo Mayumi, & Alevgul H. Sorman, *Energy Analysis for a Sustainable Future* 27 (Routledge 2013).

¹⁶ E.g., Leslie A. White, *Energy and the Evolution of Culture*, 45 AM. ANTHROPOLOGIST, 335–56, 345 (1943).

¹⁷ Schobert, *supra* note 8, at 18.

¹⁸ James C. Williams, Ph.D., *History of Energy*, THE FRANKLIN INST. (Apr. 25, 2006), http://www.academia.edu/170347/History_of_Energy_Scientists_and_the_Franklin_Institute_Making_Their_Cases_Philadelphia_PA_The_Franklin_Institute_2006.

muscles. Eventually tools, such as axes, oars, grindstones, spears, and arrows, were developed to make more efficient use of endosomatic energy in the procurement and processing of foodstuffs.¹⁹

Archaeological evidence suggests that while humans have been making use of fire for at least 500,000 years, the ability to start a fire at will and control the fire as desired only emerged around 9,000 B.P. Domestication of animals began more than 10,000 B.P., but the use of draft animals to do work for humans was more recent, probably arising about 7,000 B.P. Thus, for 97 percent of human history, we have relied solely on muscle power to do work.²⁰ A breakthrough in human development occurred 3,000 B.P. with the development of the waterwheel, which was probably used to grind grains. This marked the first time that humans had mastered a source of energy to do work that was not based on human or animal muscle power.²¹ Windmills were developed much more recently, about 900 B.P.

The development of the steam engine in the early eighteenth century represented a true revolution in energy technology²² and also “permanently established the link between fossil energy resources and industrialization.”²³ Steam engines combine heat and water to convert thermal energy into mechanical energy, and this new technology was eagerly put to use in the early stages of the industrial revolution. Importantly, steam engines gave manufacturers the freedom to build facilities in locations without ready sources of flowing water or wind power. Moreover, steam engines provided the power for locomotives and ships to move goods and people. However, steam power came with significant and immediate environmental costs, most notably widespread deforestation in Europe. As a result, coal became the fuel of choice among the early industrialized nations, eventually to be unseated by oil during the first half of the twentieth century.

By the late nineteenth century, energy demand in industrialized countries had grown considerably.²⁴ This demand was met by the development of electric energy, an incredibly versatile energy source that can be transmitted over vast distances and put to a wide variety of uses. The first electric power plants were hydroelectric facilities relying on flowing water as their energy source, converting mechanical energy to electrical energy. Subsequent power plants

¹⁹ White, *supra* note 16, at 337.

²⁰ Schobert, *supra* note 8, at 19.

²¹ *Id.* at 18–19.

²² John Fanchi, *Energy in the 21st Century* 149–51 (3d ed. 2013).

²³ Williams, *supra* note 18.

²⁴ Fanchi, *supra* note 22, at 151.

have employed fossil fuels, and more recently nuclear fission, geothermal, wind, and solar power, to produce electricity. The development of alternating current technology allowed the transmission of electricity over long distances, enabling the development of regional power transmission grids to distribute the electricity generated at a network of large-scale power plants.²⁵ By the early twentieth century, electricity had emerged as the favored method for transmitting energy, and researchers responded with a range of products that extended the ways in which humankind could apply this electricity.²⁶

In the 1950s and 1960s, nuclear power emerged as a widely touted solution to the world's energy problems.²⁷ Physicist Marie Curie's work on uranium compounds in the nineteenth century set the stage for subsequent discoveries regarding the intrinsic power of the atom. This sparked intense research in atomic physics in Europe in the early decades of the twentieth century, resulting in the understanding that a uranium atom, when split with a neutron, would cause a self-perpetuating chain reaction of atom splitting, releasing tremendous amounts of energy in the process. As World War II broke out, the United States became particularly interested in possible military applications of nuclear fission, leading to the development of the atomic bomb. The United States also created the Atomic Energy Commission to oversee nuclear weapons development and to promote nonmilitary applications of nuclear energy. Other nations were also interested in mastering nuclear technology, both to further their national security interests as well as to provide inexpensive electricity for industrial and domestic use. The world's first civilian nuclear power plant began operations in 1954 in the Soviet Union, and industrialized nations rushed to construct nuclear plants to meet the seemingly ever-growing demand for electric power. Moreover, nuclear power, although environmentally problematic in its own right, was not associated with acid rain and some of the other environmental impacts of fossil fuels that had been identified by the nascent environmental movement, and many of the dangers of nuclear power were not yet fully appreciated. However, the 1979 Three Mile Island nuclear plant accident in Pennsylvania, followed by the catastrophic nuclear reactor meltdowns at Chernobyl, Ukraine, in 1986 and Fukushima, Japan, in 2011, raised serious questions regarding the safety of nuclear power plants and galvanized nuclear power opponents. These incidents, coupled with the unresolved problem of the long-term disposal of nuclear waste, have dramatically slowed the expansion of nuclear power.

²⁵ *Id.* at 152–54.

²⁶ Williams, *supra* note 18.

²⁷ *Id.*

Since the late 1990s, renewable energy technologies have blossomed into a rapidly growing segment of the industrialized world's energy mix, thus emerging "as a key solution to the triple challenges of energy supply, security, and climate change."²⁸ "Renewables" are generally defined as energy sources that use fuel available at no cost or that can be continually replenished, and the term thus encompasses a series of disparate technologies:

1. *Wind*—the fastest growing, which powers technologically sophisticated machines, clustered in "farms," that generate electricity.
2. *Direct sunlight*—captured either by photovoltaic cells (PVs) or by mirrors or other technologies that concentrate the light and transform its energy into electric current.
3. *Biofuels*—ethanol, biodiesel, and advanced biofuels (made of algae, cellulose, or other feedstock), all of which substitute for gasoline, diesel, or potentially, jet fuel.
4. *Biomass*—wood or other plant materials pelletized or otherwise treated and burned in a power plant; also wood or dung that people in developing countries burn for heating and cooking.
5. *Geothermal*—either hot water or hot steam pumped from beneath the ground to the surface to drive an electricity-producing turbine.
6. *Hydropower*—falling or pressurized water that drives turbines; dams are increasingly criticized on environmental grounds and thus are hard to build in many countries.
7. *Passive solar*—now also known as green buildings, which take advantage of the natural habitat to reduce energy consumption, and which often overlaps with energy efficiency.²⁹

Critically, these technologies are not based on finite resources and have the added benefit of much lower carbon footprints than conventional energy sources. However, renewables remain a small part of the world's energy mix, and their development to date has often relied on government subsidies. Therefore, the role of renewable energy technologies in the coming decades is not yet clear

²⁸ Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World* 528 (rev. ed. 2012).

²⁹ *Id.* at 529–30.