

## Energy decisions reframed as justice and ethical concerns

**Authors:** Benjamin K. Sovacool<sup>1,2,\*</sup>, Raphael J. Heffron<sup>3</sup>, Darren McCauley<sup>4</sup>, Andreas Goldthau<sup>5,6</sup>

<sup>1</sup> Department of Business Development and Technology, Aarhus University, Birk Centerpark 15, DK-7400, Herning, 7400 Denmark

<sup>2</sup> Science Policy Research Unit, University of Sussex, Sussex House, Falmer, Brighton, BN1 9RH, United Kingdom

<sup>3</sup> Energy and Natural Resources Law Institute, Queen Mary University of London, 67-69 Lincoln's Inn Fields, London, WC2A 3JB United Kingdom

<sup>4</sup> Department of Geography and Sustainable Development, University of St. Andrews, Irvine Building, North Street, St. Andrews, Fife KY16 9AL United Kingdom

<sup>5</sup> Belfer Center for Science and International Affairs, Harvard University, 79 John F. Kennedy Street, Cambridge, MA 02138, United States

<sup>6</sup> School of Public Policy, Central European University, Nador ut. 9, Budapest, 1051 Hungary

\* Corresponding author, Science Policy Research Unit, University of Sussex,

[B.Sovacool@sussex.ac.uk](mailto:B.Sovacool@sussex.ac.uk)

### Abstract:

All too often, energy policy and technology discussions are limited to the domains of engineering and economics. Many energy consumers, and even analysts and policymakers, confront and frame energy and climate risks in a moral vacuum, rarely incorporating broader social justice concerns. Here, to remedy this gap, we investigate how concepts from justice and ethics can inform energy decision-making by reframing five energy problems—nuclear waste, involuntary resettlement, energy pollution, energy poverty, and climate change—as pressing justice concerns. We conclude by proposing an energy justice framework centred on availability, affordability, due process, transparency and accountability, sustainability, equity, and responsibility, which highlights the futurity, fairness, and equity dimensions of energy production and use.

## 1. Introduction

The structure of the global energy system and the pending consequences of climate change are among the central justice issues of our time, with profound implications for human happiness, welfare, freedom, equity, and due process.<sup>1</sup>

One global study distinguishing between “experienced” and “imposed” effects of climate change—essentially separating out primary emitters from those experiencing climate change—concluded that people in rich countries impose 200-300 times more health damage on others than they experience themselves as a result of their nation’s historical emissions.<sup>2</sup> Others argue that the costs of climate change will befall the weakest and least developed countries as well as the poorest in developed nations, while any benefits, if there are any, will likely accrue to the rich and powerful.<sup>3</sup>

Meanwhile, serious environmental burdens can arise from having too much energy (from waste, over-consumption, and pollution<sup>4</sup>) or from not having enough (from lack of access to modern forms of energy, under-consumption, and poverty). With increasing wealth, these environmental burdens shift in terms of severity, geographic scope, and temporal reach. For instance, a decline in household environmental risks through enhanced access to modern energy services, clean water, and better healthcare coincides with an increase in global risks such as climate change and other forms of transboundary environmental pollution. While solutions to some problems, like poverty, obviously require an increase in wealth, solutions to other problems, such as climate change, might well require a decrease in wealth.

Clearly, the current fossil fuel-based global energy system has many benefits but also many disadvantages, including significant health burdens that shorten lives, undermine the conditions for happiness, and impede a more just and equitable society. Yet most of us confront

and frame such climate and energy risks within a moral vacuum. It has been argued that our moral systems are ill-equipped to handle the complexity and expansiveness of modern-day energy and climate problems<sup>5,6</sup>, and that individuals will work to avoid feelings of responsibility for climate change or energy insecurity; some will even have optimistic biases, downgrading any negative information they receive and counterbalancing it with almost irrational exuberance.<sup>7</sup>

In this Perspective, we argue that concepts from ethics and justice provide an important structure to think about, and approach, the world's climate and energy dilemmas. We reframe five contemporary energy problems—nuclear waste, involuntary resettlement, energy pollution, energy poverty, and climate change—as justice and ethics concerns. We then synthesize justice elements into a common framework that energy decision-makers can utilize to create a more just and equitable energy future. By “decision-makers,” we refer not only to the more traditional notion of policymakers and regulators but also ordinary students, jurists, homeowners, businesspersons, investors, and consumers—essentially anyone that makes decisions or choices about energy conversion and use.<sup>8</sup> Admittedly, we take an anthropocentric perspective based upon social justice principles, though there are certainly justice claims that arise with how humans interact with non-human forms of life. Some have called this “cosmopolitan justice” since it acknowledges that all ethnic groups belong to a single community based on a collective morality.<sup>9</sup> Many scholars have taken up modern manifestations of these ideals, and have advanced the core arguments presented in Table 1.<sup>10 11 12 13 14 15 16 17 18 19</sup> These arguments underscore how all human beings have equal moral worth and, as we will argue, are deserving of “energy justice.”

**Table 1: Core Elements of Cosmopolitan Justice**

<b>An argument for</b>	<b>Explanation</b>
Individualism	Human beings and persons are the ultimate concern, not communities or nation-states
Universality	Justice concerns apply to everyone equally, regardless of their gender or social status
Responsibility	The way to individual and communal mutual benefit is to treat others as they themselves would wish to be treated
Identity	Although we are influenced by cultures and diversity of perspectives, one is a member of a global community of human beings

## 2. Reframing five energy problems as justice concerns

The five modern energy problems considered here cover what has been called the “wholesale” and “retail” attributes of justice: whether institutions are fair and impartial (in the case of involuntary resettlement and energy poverty), and whether individual outcomes are equitable (in the case of pollution, nuclear waste and climate change).<sup>20</sup>

These examples are not meant to be exhaustive and cover only a narrow range of the full spectrum of possible theories. Nor do they represent any definitive stance on which justice principles are absolutely agreed upon within the community of theorists or practitioners – healthy debates over the universality or relevance of justice principles continue to this day.<sup>21 22</sup> Instead, the justice theories utilized here were selected based on those being established within the field that are well known to the authors, and those easily applied to the energy sector. Although in many situations the justice principles elaborated below could apply across many energy issues, we have limited the discussion to one principle per problem to retain focus and depth.

## **2.1 Involuntary resettlement as a violation of procedural justice**

Millions of individuals are involuntarily resettled due to energy projects every year in ways that violate modern notions of due process or procedural justice: planners are imposing on the free choice of individuals. Annually, about four million people are displaced by activities relating to hydroelectricity construction or operation, with 80 million displaced in the past fifty years by the construction of 300 large dams.<sup>23</sup> The Dene, Cree, and Metis indigenous peoples—inhabitants of North America for 12,000 years—have been repeatedly resettled by the expansion of oil tar sands production in Alberta, Canada.<sup>24</sup> One wide-ranging international survey estimated that between 1950 and 2009 at least 2.6 million people were displaced due to mining in India, while individual mines in Brazil, Ghana, Indonesia, and South Africa have involuntarily displaced between 15,000 and 37,000 people (each) from their homes.<sup>25</sup> In many instances, this happens without consent, without advance notification, and without an opportunity to seek redress for damages.<sup>26</sup>

Such practices can be framed as violations of procedural justice, which emphasizes principles of due process, representative justice, and justice as public participation.<sup>27</sup> Generally, these ideas centre on the following interrelated justice issues: Who gets to decide and set rules and laws, and which parties and interests are recognized in decision-making? By what process do they make such decisions? How impartial or fair are the institutions, instruments, and objectives involved? Procedural theories of justice are all concerned with process—with the fairness and transparency of decisions, the adequacy of legal protections, and the legitimacy and inclusivity of institutions involved in decision-making.<sup>28</sup> Put another way, procedural justice deals with recognition (who is recognized), participation (who gets to participate), and power (how is power

distributed in decision-making forums).<sup>29</sup> It pushes for concepts similar in environmental and risk policy discussions known as the “deliberative turn” towards democracy and engagement.<sup>30</sup>

Procedural justice seeks to ensure that the potential for stakeholder participation in the energy policymaking process at least roughly matches the importance (in aggregate and to each person affected) of the matter at stake and the irrevocability of any decisions that may be reached. It also necessitates effective recourse through judicial and administrative remedies and forms of redress. It suggests that communities must be involved in deciding about projects that will affect them; environmental and social impact assessments must involve genuine community consultation; and neutral arbitration should be available to handle grievances. It can, through free, prior, informed consent, demand proper representation of communities (including marginalized groups) and true power-sharing,<sup>31 32</sup> and it has facilitated further protections over the past few decades known as “impact-benefit agreements,”<sup>33</sup> “social licenses to extract,”<sup>34</sup> and “social licenses to operate.”<sup>35</sup>

## **2.2 Fossil fuel pollution as a human rights concern**

Power plants and conventional automobiles release a variety of noxious pollutants into the air that threaten human health and the vitality of crops, fisheries, forests, and natural habitats. However, these are unevenly distributed and produce inequitable impacts on children and minorities. Children in particular are vulnerable to the pollution from fossil fuels—they spend more time outdoors, breathe 50 percent more air per pound of body weight than adults, ingest polluted air while their respiratory systems are still developing, and are less likely to recognize symptoms, leading to delays in treatment.<sup>36</sup>

Meanwhile, in the US, for instance, people of colour and minorities bear a disproportionate share of poisons and environmental hazards.<sup>37</sup> The proximity of energy

infrastructures to indigenous communities, such as Native Americans, has resulted in serious health inequalities.<sup>38</sup> One meta-analysis of environmental pollution across 2,083 counties in the US found that toxic releases increase as a function of the number of minorities in the local population.<sup>39</sup> African Americans receive emergency hospital treatment for asthma attacks at more than 4 times the national average, and have children 3 times as likely to be hospitalized for treatment of asthma.<sup>40</sup>

In Eastern Europe, the Roma have been displaced from so many countries and cities that they are forced to reside in settlements akin to “environmental time bombs”. Roma communities in the Czech Republic and Slovakia, for example, reside in flats located above abandoned mines where they are prone to flooding, and susceptible to breathing methane gas. Others live in abandoned factory sites surrounded by mining wastes where children are fully exposed to toxins and suffer long-term health effects.<sup>41</sup> The Roma living along the Upper Tisza River in Hungary also must confront the highest risks of floods in the entire country.<sup>42</sup> Other studies of energy facilities have confirmed that the poor or marginalized suffer a “triple jeopardy” of being most exposed to higher levels of pollution, being more vulnerable and likely to suffer health impacts, and being least responsible for generating environmental problems in the first place.<sup>43</sup>

Such pollution can be reframed not only as a health concern, but also one of justice and human rights. Theories of justice centred on human rights hold that certain interests of individual persons are more important than the interests of society; that is, that a just society always respects and dignifies the individual.<sup>44 45</sup> Rights-centred notions of justice have a long history enshrined in all major religions and dating all the way back to antiquity (and probably further), while modern notions cut across the categories of civil, cultural, economic, political, and social rights. These modern iterations extend to basic issues of bodily health and integrity,

freedom from fear, and the right to enjoy an uncontaminated environment capable of sustaining established patterns of life.

### **2.3 Energy poverty as a violation of distributive justice**

Almost 4 billion people remain mired in “energy poverty,” a term that connotes a lack of access to modern energy services, especially the provision of electricity or cleaner forms of cooking. This number includes approximately 1 billion people (15% of the global population, one in seven people) still lacking access to electricity and approximately 2.9 billion people (more than two in five) dependent on traditional forms of cooking (that is, cooking based on solid fuels such as dung or burning biomass), which are highly polluting.<sup>46</sup> As Figure 1 indicates, although the state of New York, US, may produce more net gross domestic product, its residents consume the same amount of electricity as the 791 million people of Sub-Saharan Africa and Western Africa, a per capita consumption ratio 38 times higher.

[Insert Figure 1 here]

People with limited or no access to energy services will generally have fewer educational opportunities, less access to fertile land and other natural resources, poorer health, negligible political representation, limited economic opportunities and inadequate access to health services.<sup>47</sup> The health impacts of energy poverty are particularly acute, with one recent study finding that emissions from residential energy use (such as heating and cooking) have the largest impact on premature mortality globally.<sup>48</sup> That study estimated 3.3 million premature deaths in 2010—an amount greater than those perishing from malaria and tuberculosis—and predicts as many as 6.5 million premature deaths by 2050 (12.5 deaths per minute), an amount that would be far greater than those suffering from HIV/AIDS. For those with access to energy, the poor are also disproportionately affected by oil price volatility. As a United Nations Development



Program study estimates, the oil price fluctuations between 2002 and 2005 made low-income households in developing Asia spend 171% more of their income for cooking fuels, 67% more for electricity and 55% more for lighting, often making people revert to traditional forms of energy.<sup>49</sup>

This unequal distribution of modern energy services can be framed as violating notions of distributive justice, whose theories are concerned with how social goods and ills are allocated among society.<sup>50 51</sup> Distributive justice deals with three aspects: What goods, such as wealth, power, respect, food, or clothing, are to be distributed? Between what entities are they to be distributed (for example, living or future generations, members of a political community or all humankind)? And what is the proper mode of distribution— is it based on need, merit, utility, entitlement, property rights, or something else?

Distributive justice theorists argue that, if physical security is a basic right, then so are the conditions that create it, such as employment, food, shelter, and a healthy living environment.<sup>52</sup> People are, therefore, entitled to a certain set of minimal energy services or “subsistence rights” which enable them to enjoy a basic minimum of wellbeing; included in this set of goods is the right to modern energy services.<sup>53 54 55</sup> People have a “positive right” to a clean and safe environment and to levels of energy services that provide them with a happy and healthy life.<sup>56</sup>

## **2.4 Nuclear waste as an insult to future generations**

Whatever one’s stance on nuclear power may be, one of its least controversial aspects is that it produces long-lived waste. A single nuclear reactor will typically consume an average of 32,000 fuel rods over the course of its lifetime, and it will also produce twenty to thirty metric tons of spent nuclear fuel per year—an average of about 2,200 metric tons annually for the entire US nuclear industry.<sup>57</sup> The global nuclear industry creates almost five times that amount—

10,000 metric tons of high-level spent nuclear fuel—each year, and the 31 countries operating nuclear power plants reported a total of 270,000 metric tons of accumulated spent fuel worldwide in 2015.<sup>58</sup> About 85 percent of this waste is not reprocessed, and most of it is stored onsite in special facilities at nuclear power plants.<sup>59</sup>

Nuclear power fosters an unbreakable commitment whereby society benefits from electricity-generation for a few decades, but in return has to bear the costs of managing nuclear waste for astonishingly long periods, often measured in millennia—one physicist even termed this a “Faustian Bargain.”<sup>60</sup> Put in terms perhaps easier to comprehend, nuclear reactors produce waste that will persist longer than our civilization has practiced Catholicism, longer than humans have cultivated crops, and longer than our species has existed, provoking some to classify them as essentially “immortal.”<sup>61</sup>

If one believes that there is a moral responsibility of current generations to protect future ones<sup>62 63</sup> – whereby people in the future have a right to enjoy a good life just as we do, but one undisturbed by damage or waste our energy systems will inflict over time<sup>64 65</sup> – then this waste is an imposition and burden.<sup>66 67</sup> Nuclear waste in particular can be reframed as a pernicious problem for future generations for at least three other reasons. First, it introduces a “cost” problem: even if the waste does not leak and technical standards ensure it is safe and protection remains at present levels, the costs of maintaining that waste are unfair, since only the present generation receives the benefits of nuclear electricity, and they do not have to bear the full financial burden of the waste. In other words, nuclear waste is a classic case of socializing costs to future and present taxpayers whilst privatizing immediate benefits to the nuclear industry.<sup>68</sup> Second, managing nuclear waste introduces a problem of “capability,” as it potentially erodes the ability of future generations to retain present levels of technological and managerial capacity that

might be lost somehow due to social or even armed conflicts over nuclear waste sites.<sup>69</sup> Third, it introduces the problem of “mistakes,” a situation where future generations face the risk of some type of accident, earthquake, or natural disaster that results in a catastrophic release of radiation.<sup>70</sup>

## **2.5 Climate change as contravened responsibility**

Historically, the US and Western Europe account for two-thirds of the primary build-up of carbon in the atmosphere, whereas the entire continent of Africa is responsible for just three percent of global emissions.<sup>71</sup> However, depending on the methodology utilized, 75 to 80 percent of the costs of climate change will be borne by those in developing countries,<sup>72 73</sup> varying according to their national economic structures, geographies, and resilience.<sup>74</sup> Indeed, looking at patterns of fatalities and economic damages from natural disasters, developing countries suffered 91 percent of fatalities and 51 percent of financial losses but accounted for only 12 percent of insured losses in 2007.<sup>75</sup> Over the period 1970 to 2008, the IPCC estimated that 95 percent of natural-disaster-related deaths occurred in developing countries.<sup>76</sup>

Through this lens, responding to climate change by building resilience—pursuing adaptation—is a global effort whose responsibility should befall mostly historical emitters, yet determining responsibility is a critical element of consideration.<sup>77</sup> From the justice and ethics perspective, the activities of one group of persons and countries overusing the atmosphere as their carbon “dump” have caused and continued to injure a different, much larger group. This is a matter of “corrective” justice since one group has engaged in wrongfully injuring another group, meaning the guilty should desist from their harmful actions and compensate their victims for damages.<sup>78</sup> Polluters and industrializing countries, the thinking goes, should be required to “clean up their own mess” and support others in adaptation. Part of the argument is historical,

since industrializing countries have emitted the most into the atmosphere to reach current levels. Another part is an argument from ecology, since one could characterize the atmosphere as a sink with limited space. Rich countries have exhausted the capacity of this sink, denied other countries their shares, and are required to pay compensation for this overuse.<sup>79</sup> Such inequalities must be “reversed” by imposing extra burdens on the countries and peoples responsible for inflicting and producing those inequalities.<sup>80 81</sup> Adaptation offers us the ability to subsume this responsibility.<sup>82</sup> There is a responsibility of governments to minimize environmental degradation and for industrialized countries responsible for climate change to pay to fix the problem (the so-called “polluter pays principle”).<sup>83 84</sup>

### 3. Towards an Energy Justice framework

As is perhaps obvious to readers by now, not all of the five justice frames presented above align with each other. To illustrate this point, consider a situation in which a community needs to take decisions on depletion rates of a given natural resource. The future generations criterion would suggest to set slow depletion rates, which would also fall in line with the principle that future generations should not be impacted by damage caused by the present energy systems. Yet, an important aspect of distributive justice also pertains to maximizing the utilization of resources to facilitate access by the poor and vulnerable. The latter, however, will decrease the more the world seeks to minimize the emission of greenhouse gases (the responsibility criterion) and invest in alternative energy resources with minimal levels of pollution (the human rights criterion). Some justice criteria call for expanded depletion, others for restricted depletion.

With this in mind, and in attempting to synthesize these divergent strands of thought, we define “energy justice” as a global energy system that fairly disseminates both the benefits and

costs of energy services, and one that contributes to more representative and impartial energy decision-making. It involves the following key elements:

- Distribution of costs, or how the hazards and externalities of the energy system are disseminated throughout society;
- Distribution of benefits, or how access to modern energy systems and services is distributed throughout society;
- Procedures, or ensuring that energy decision-making respects due process and representation.

These three components bring together core understandings of distributional and procedural justice alongside cosmopolitan (albeit anthropocentric) interpretations of equity and fairness. This conceptualization of energy justice demands that we seriously consider whether it is fair that one quarter of humanity has no access to cleaner forms of cooking or electricity, and another quarter has less than a tenth of what those of us in industrializing countries had a decade ago. It challenges us to not only coldly calculate costs and benefits, but to determine how these are distributed. It asks that we decide whether it is fair to deplete hundreds of millions of years of energy resources in a few generations, or to reap the benefits of greenhouse gas emissions, such as economic development, today at the expense of those not yet born tomorrow. It demands that we provide meaningful involvement and access to the decision-making process. It ensures the availability of information about energy, a condition of participation and informed consent. It subscribes to the notion of participatory governance as a mechanism of fostering comprehensive stakeholder inclusion and transparency as it seeks to represent minorities in decision-making, at all stages of the energy process, from agenda setting and formulation to siting and evaluation. It requires us to provide access to legal processes for challenging violations of energy rights. Our

conceptualization denies any such limits to where energy justice ought to apply, such as community boundaries to the scope of responsibilities, which instead hold regardless of space and time, apply across cultures, and apply ahead to future generations.

To operationalize the somewhat lofty moral elements of energy justice intimated above, Table 2 presents an energy justice framework based on eight principles that can be applied readily to real-world problems. We hope that this concept of energy justice can provide a common philosophical grounding to energy researchers and the energy community that can unite how we get to our targeted energy goals whether they be for 2030, 2050 or beyond. It is a mechanism that can begin to achieve a more just and equitable balance of all the competing aims in energy policy and ensure that the trade-offs that are made in the energy sector are inherently more just and equitable in their societal outcomes rather than favouring different sections or factions within society.

**Table 2: Energy Justice Decision-Making Framework**

<b>Principle</b>	<b>Description</b>	<b>Contemporary applications</b>
<b>Availability</b>	People deserve sufficient energy resources of high quality	Investments in energy supply and energy efficiency; upgrades to infrastructure
<b>Affordability</b>	The provision of energy services should not become a financial burden for consumers, especially the poor	Fuel poverty eradication efforts; low income assistance for weatherization efficiency improvements; retrofits to older buildings
<b>Due process</b>	Countries should respect due process and human rights in their production and use of energy	Social and Environmental Impact Assessments; Free Prior Informed Consent
<b>Transparency and accountability</b>	All people should have access to high quality information about energy and the environment and fair, transparent, and accountable forms of energy decision-making	The Extractive Industries Transparency Initiative; Independent Accountability Mechanisms; international accounting standards (IFRS) for energy subsidies
<b>Sustainability</b>	Energy resources should not be depleted too quickly	Natural Resource Funds designed to save for future generations; systems benefits charges
<b>Intragenerational equity</b>	All people have a right to fairly access energy services	The UN's Sustainable Energy for All Initiative; Sustainable Development Goal 7
<b>Intergenerational equity</b>	Future generations have a right to enjoy a good life undisturbed by	Promoting environmentally friendly forms of low-carbon energy such as

	the damage our energy systems inflict on the world today	renewables or efficiency which can minimize externalities or prolong resource efficacy; implementing environmental bonds
<b>Responsibility</b>	All nations have a responsibility to protect the natural environment and reduce energy-related environmental threats	United Nations Framework Convention on Climate Change; the Green Climate Fund

#### 4. Discussion

The concepts and tools offered by philosophy and justice theory are complex and diverse; some overlap with others and each has their own particular themes and leading authors. Despite this variation, however, such concepts suggest multiple conclusions for energy and climate research and practice.

First, we need to think about energy technology and systems as more than simply hardware, as beyond a black box. They are not merely devices for distributing barrels of oil, conduits for cubic metres of natural gas, mechanisms for conveying coal, or intricate socio-technical systems delivering electricity, mobility, heat, and so forth. Instead, energy systems can also be mechanisms of resource extraction that deplete assets available for future generations to present ones, systems of segregation that separate negative externalities of energy production from the positive attributes of energy consumption, and symbols of exclusion, marginalization, or unfair decision-making processes. To some, energy systems and their effects on the climate and society can even impinge upon notions of spirituality and religion.<sup>85 86</sup> Assessments of energy systems that ignore these (sometimes hidden) dimensions threaten to make them appear natural or normal. In extreme cases, injustices can become crystalized into energy infrastructure by project planners, or accumulate through years of routines and practices by consumers.

Second, energy analysis and planning should be informed by more than the usual tools of cost benefit analyses, techno-economic models, or scientific and engineering projections about

new technologies or scenarios. Energy system interventions are about more than technology and economic development; they are about political power, social cohesion, and even ethical and moral concerns over equity, due process, and justice. Energy systems can be reconceived as a political, deliberative challenge involving the satisfaction of competing preferences; a social dilemma pitting, at times, the climatic and development goals of energy security or improved resilience against the pressing needs of marginalized and vulnerable populations; and a moral quandary revolving around how energy burdens and benefits are fairly, or unfairly, disseminated. No matter how noble the intentions of engineers and planners, or how well interventions or new energy systems are designed, they have their own inescapable underlying ramifications for justice. Perhaps more personally, even readers convinced they may be “winners” of the existing energy system today could find themselves—or their future kin—“losers” tomorrow.

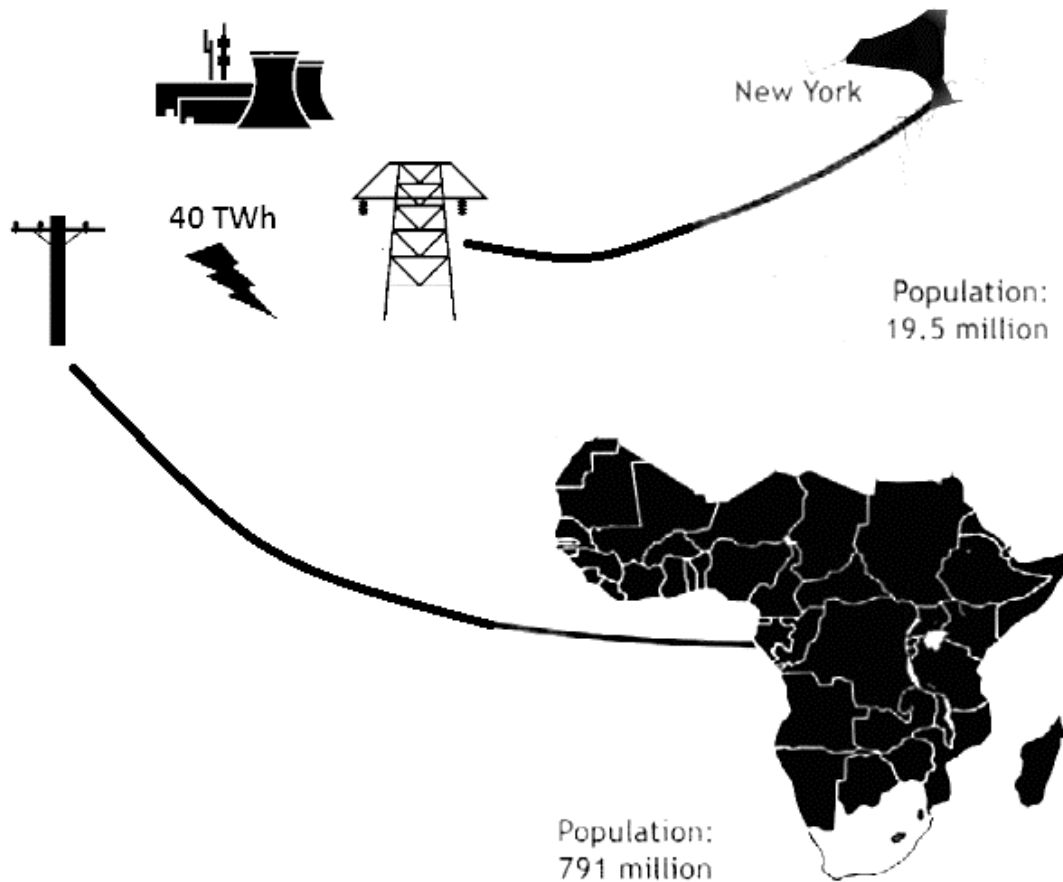
As such, we hold that energy issues can be reframed not only as matters of national security, economic competitiveness, or environmental degradation, but as matters of social justice. Many justice theorists would question the underlying morality of forcing people to abandon their homes for energy projects, imposing the burden of pollution on the young and vulnerable, violating basic civil liberties and human rights, misappropriating energy funds, and creating an energy system with unequal access. This demands that contemporary analysts, policymakers, and even consumers begin to reconsider their energy decisions not only as technical and economic or even environmental concerns, but also as moral ones.

In sum, a conceptual account of justice, even if well-grounded in philosophical theory, is of little consequence unless it can actually inform and influence energy practices, decision-makers, and public choices. Or, to paraphrase from the justice literature, with ethics the proof in the pudding lies not in its making, but in its eating.<sup>87</sup>





**Figure 1: Disparities in Electricity Consumption Between New York state and Sub-Saharan Africa**



*Strikingly, the state of New York in the US, home to less than 20 million residents, consumes in aggregate roughly the same amount of electricity each year consumed by the 791 million people of Sub-Saharan Africa (excluding South Africa). New York residents consume more than 2,000 kWh per capita compared to Sub-Saharan Africans who consume about 52 kWh. Adapted from*

## 5. References

- 
- <sup>1</sup> Jones, B.R., Sovacool, B. & Sidortsov, R.V. Making the Ethical and Philosophical Case for 'Energy Justice'. *Environmental Ethics* **37**, 145-168 (2015).
- <sup>2</sup> Kirk R. Smith, Manish A. Desai, Jamesine V. Rogers, and Richard A. Houghton, "Joint CO<sub>2</sub> and CH<sub>4</sub> accountability for global warming," Proceedings of the National Academy of Sciences, **110**, E2865-E2874 (2013)
- <sup>3</sup> Matthew, R.A. Climate Change and Human Security. in *Climate Change: What It Means for Us, Our Children, and Our Grandchildren* (eds. DiMento, J.F.C. & Doughman, P.) 161-180 (MIT Press, Cambridge, 2007).
- <sup>4</sup> Wilkinson, P., Smith, K., Joffe, M. & Haines, A. A Global Perspective on Energy: Health Effects and Injustices. *Lancet* **370**, 965-977 (2007).
- <sup>5</sup> Jamieson, D. *Reason in a Dark Time: Why the Struggle Against Climate Change Failed — and What It Means for Our Future*, (Oxford University Press, Oxford, 2014).
- <sup>6</sup> Markowitz, E.M. & Shariff, A.F. Climate Change and Moral Judgment. *Nature Climate Change* **2**, 243-247 (2012).
- <sup>7</sup> Stoknes, P.E. Rethinking climate communications and the psychological climate paradox. *Energy Research & Social Science* **1**, 161-170 (2014).
- <sup>8</sup> Sovacool, B.K. & Dworkin, M. *Global Energy Justice: Problems, Principles, and Practices*, (Cambridge University Press, Cambridge, 2014).
- <sup>9</sup> Moellendorf, D. *Cosmopolitan Justice*, (Westview Press, Boulder, 2002)., p. 171.
- <sup>10</sup> Beitz, C. Cosmopolitan Ideals and National Sentiment. *Journal of Philosophy* **80**, 591-600 (1983).
- <sup>11</sup> Held, D. *Cosmopolitanism: Ideas and Realities*, (Polity Press, Cambridge, 2010).
- <sup>12</sup> Pogge, T. Cosmopolitanism and Sovereignty. *Ethics* **103** 48–75 (1992).
- <sup>13</sup> Sen, A. *Resources, Values and Development*, (Basil Blackwell, Oxford, 1984).
- <sup>14</sup> Sen, A. *Development as Freedom*, (Oxford University Press, Oxford, 1999).
- <sup>15</sup> Nussbaum, M.C. *Creating Capabilities: The Human Development Approach*, (Belknap Press, Cambridge, 2011).
- <sup>16</sup> Singer, P. *One World: The Ethics of Globalization*, (Yale University Press, New Haven, 2002).
- <sup>17</sup> Brock, G. *Global Justice: A Cosmopolitan Account*, (Oxford University Press, Oxford, 2009).
- <sup>18</sup> Weiss, E.B. *In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity*, (Transnational Publishers, Dobbs Ferry, NY, 1989).
- <sup>19</sup> Harris, P.G. Introduction: Cosmopolitanism and Climate Change Policy. in *Ethics and Global Environmental Policy: Cosmopolitan Conceptions of Climate Change* (ed. Harris, P.G.) 1-19 (Edward Elgar, Cheltenham, 2011).
- <sup>20</sup> Barry, B. *Theories of Justice*, (University of California Press, Los Angeles, 1989).
- <sup>21</sup> Lawrence M. Hinman, C.T.a.W., ). *Ethics. A Pluralistic Approach to Moral Theory*, (Wadsworth, Boston, MA, 2008).
- <sup>22</sup> Sandel, M. *Justice: What's the Right Thing To Do?*, (Farrar, Straus and Giroux, New York, 2009).

- <sup>23</sup> World Commission on Dams. *The Report of the World Commission on Dams*. (Earthscan Publications Ltd, London and Sterling, VA, 2001).
- <sup>24</sup> Walsh, S. & Stainsby, M. The Smell of Money: Alberta's Tar Sands. in *Sparking a Worldwide Energy Revolution: Social Struggles in the Transition to a Post-Petrol World* (ed. Abramsky, K.) (AK Press, Oakland, 2010).
- <sup>25</sup> Downing, T.E. *Avoiding New Poverty: Mining-Induced Displacement and Resettlement*. (International Institute for Environment and Development, 2002).
- <sup>26</sup> Hunter, D. Using the World Bank Inspection Panel to Defend the Interests of Project-Affected People. *Chicago Journal of International Law* 4, 201-211 (2003).
- <sup>27</sup> Walker, G. *Environmental Justice: Concepts, Evidence, and Politics*, (Routledge, London, 2012).
- <sup>28</sup> Weston, B.H. Climate Change and Intergenerational Justice: Foundational Reflections. *Vermont Journal of Environmental Law* 9, 375-430 (2008).
- <sup>29</sup> Paavola, J., Adger, W.N. & Huq, S. Multifaceted Justice in Adaptation to Climate Change. in *Fairness in Adaptation to Climate Change* (eds. Adger, W.N., Paavola, J., Huq, S. & Mace, M.J.) 263-277 (MIT Press, Cambridge, 2006).
- <sup>30</sup> Habermas, J. *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy*, (MIT Press, Cambridge, MA, 1996).
- <sup>31</sup> Colchester, M. & Ferrari, M.F. Making FPIC - Free, Prior and Informed Consent - Work: Challenges and Prospects for Indigenous People. (Forest Peoples Project, 2007).
- <sup>32</sup> United Nations. *Free Prior Informed Consent and Beyond: The Experience of IFAD*. (IFAD Geneva, 2005).
- <sup>33</sup> Hitch, M. & Fidler, C.R. Impact and Benefit Agreements: A Contentious Issue for Environmental and Aboriginal Justice. *Environments Journal* 35, 45-69 (2007).
- <sup>34</sup> Tilton, J.E. Mineral endowment, public policy and competitiveness: a survey of issues. *Resources Policy* 18, 237-249 (1992).
- <sup>35</sup> Wilburn, K.M. & Wilburn, R. Achieving Social License to Operate using Stakeholder Theory. *Journal of International Business Ethics* 4, 3-16 (2011).
- <sup>36</sup> Kleinman, M.T. *The Health Effects of Air Pollution on Children*, (University of California Press, Los Angeles, 2000).
- <sup>37</sup> Ard, K. Trends in Exposure to Industrial Air Toxins for Different Racial and Socioeconomic Groups: A Spatial and Temporal Examination of Environmental Inequality in the U.S. from 1995 to 2004. *Social Science Research* 53, 375-90 (2015).
- <sup>38</sup> Holifield, R. Environmental Justice as Recognition and Participation in Risk Assessment: Negotiating and Translating Health Risk at a Superfund Site in Indian Country. *Annals of the Association of American Geographers* 102, 591-613 (2012).
- <sup>39</sup> Allen, D.W. Social Class, Race, and Toxic Releases in American Counties," *The Social Science Journal* 38 (2001): 13-25. *The Social Science Journal* 38, 13-25 (2001).
- <sup>40</sup> Ottaviano, D.M. *Environmental Justice: New Clean Air Act Regulations and the Anticipated Impact on Minority Communities*, (Report from the Lawyer's Committee for Civil Rights Under Law, New York, 2003).
- <sup>41</sup> Steger, T. *Making the Case for Environmental Justice in Central and Eastern Europe*. (CEU Center for Environmental Law and Policy, Budapest, 2007).

- 
- <sup>42</sup> Linnerooth-Bayer, J. & Vari, A. Extreme Weather and Burden Sharing in Hungary. in *Fairness in Adaptation to Climate Change* (eds. Adger, W.N., Paavola, J., Huq, S. & Mace, M.J.) 239-259 (MIT Press, Cambridge, MA, 2006).
- <sup>43</sup> Walker, G. *Environmental Justice: Concepts, Evidence, and Politics*, (Routledge, London, 2012).
- <sup>44</sup> Berkovitz, D.M. Pariahs and Prophets: Nuclear Energy, Global Warming, and Intergenerational Justice. *Columbia Journal of Environmental Law* **17**, 245-326 (1992).
- <sup>45</sup> Dworkin, R.M. *Taking Rights Seriously*, (Harvard University Press, Cambridge, MA, 1978), p. xi.
- <sup>46</sup> World Bank. *Global Tracking Framework: Energy Access*. (Washington, DC, 2015).
- <sup>47</sup> Sovacool, B.K., Sidortsov, R.V. & Jones, B.R. *Energy Security, Equality, and Justice*, (Routledge, London, 2014).
- <sup>48</sup> Lelieveld, J., Evans, J.S., Giannadaki, D., Fnais, M. & Pozzer, A. The contribution of outdoor air pollution sources to premature mortality on a global scale. *Nature* **525**, 367-371 (2015).
- <sup>49</sup> UNDP. *Overcoming Vulnerability to Rising Oil Prices: Options for Asia and the Pacific*, (United Nations, New York, 2007).
- <sup>50</sup> Rawls, J. *A Theory of Justice: Revised Edition*, (Belknap Press, Cambridge, MA, 1999).
- <sup>51</sup> Dworkin, R.M. *Sovereign Virtue: The Theory and Practice of Equality*, (Harvard University Press, Cambridge, MA, 2000).
- <sup>52</sup> Shue, H. Human Rights, Climate Change, and the Trillionth Ton. in *The Ethics of Global Climate Change* (ed. Arnold, D.G.) 292-314 (Cambridge University Press, Cambridge, 2011).
- <sup>53</sup> Rao, N. & Baer, P. Decent Living' Emissions: A Conceptual Framework. *Sustainability* **4**, 656-681 (2012).
- <sup>54</sup> Shue, H. Subsistence Emissions and luxury emissions. *Law Policy* **15**, 39-59 (1993).
- <sup>55</sup> Shue, H. *Basic Rights: Subsistence, Affluence and U.S. Foreign Policy*, (Princeton University Press, Princeton, NJ, 1980).
- <sup>56</sup> Caney, S. Cosmopolitan Justice, Responsibility, and Global Climate Change. *Leiden Journal of International Law* **18**, 747-775 (2005).
- <sup>57</sup> Funk, A. & Sovacool, B.K. Wasted Opportunities: Resolving the Impasse in United States Nuclear Waste Policy. *Energy Law Journal* **34**, 113-147 (2013).
- <sup>58</sup> Australian Nuclear Association. *Current Status of Spent Nuclear Fuel*, ANA Information Sheet (Engadine, AUS, 2015).
- <sup>59</sup> Sovacool, B.K. & Funk, A. Wrestling with the Hydra of Nuclear Waste Storage in the United States. *Electricity Journal* **26**, 67-78 (2013).
- <sup>60</sup> Weinberg, A.M. Social Institutions and Nuclear Energy. *Science* **177** 27-34 (1972).
- <sup>61</sup> Weinberg, A.M. Immortal Energy Systems and Intergenerational Justice. *Energy Policy* **13**, 51-59 (1985).
- <sup>62</sup> Shue, H. Responsibility to Future Generations and the Technological Transition. in *Perspectives on Climate Change: Science, Economics, Politics, Ethics* (eds. Sinnott-Armstrong, W. & Howarth, R.B.) 265-283 (Elsevier, Amsterdam, 2005).
- <sup>63</sup> Nolt, J. Greenhouse Gas Emissions and the Domination of Posterity. in *The Ethics of Global Climate Change* (ed. Arnold, D.G.) 61-76 (Cambridge University Press, Cambridge, 2011).

- 
- <sup>64</sup> Barry, B. Circumstances of justice and future generations. in *Obligations to Future Generations* (eds. Sikora, R. & Barry, B.M.) (Temple University Press, Philadelphia, 1978).
- <sup>65</sup> Barry, B. Intergenerational Justice in Energy Policy. in *Energy and the Future* (eds. MacLean, D. & Brown, P.G.) 15-30 (Rowman and Littlefield, Totowa, NJ, 1983).
- <sup>66</sup> Barry, B. The Ethics of Resource Depletion. in *Democracy, Power, and Justice: Essays in Political Theory* (ed. Barry, B.) 511-525 (Clarendon Press, Oxford, 1989).
- <sup>67</sup> deShalit, A. *Why Posterity Matters: Environmental Policies and Future Generations*, (Routledge, London, 1995)., p. 6.
- <sup>68</sup> Ash, J. New Nuclear Energy, Risk, and Justice: Regulatory Strategies for an Era of Limited Trust. *Politics & Policy* **38**, 255-284 (2010).
- <sup>69</sup> Shrader-Frechette, K. *What Will Work: Fighting Climate Change with Renewable Energy, Not Nuclear Power*, (Oxford University Press, Oxford, 2011).
- <sup>70</sup> Bodde, D.L. A Neutrality Criterion for Radioactive Waste Management. in *Energy and the Future* (eds. MacLean, D. & Brown, P.G.) 120-128 (Rowman and Littlefield, Totowa, NJ, 1983).
- <sup>71</sup> Prouty, A.E. The clean development mechanisms and its implications for climate justice. *Columbia Journal of Environmental Law* **34**, 513–540 (2009).
- <sup>72</sup> Hope, C. How deep should the deep cuts be? Optimal CO<sub>2</sub> emissions over time under uncertainty. *Climate Policy* **9**, 3–8 (2009).
- <sup>73</sup> Bruin, K.d., Dellink, R. & Agrawala, S. Economic Aspects of Adaptation to Climate Change: Integrated Assessment Modeling of Adaptation Costs and Benefits. (OECD, Paris, 2009).
- <sup>74</sup> Gupta, J. et al. Mainstreaming climate change in development cooperation policy: Conditions for success. in *Making Climate Change Work For Us: European Perspectives on Adaptation and Mitigation Strategies* (ed. Neufeldt, M.H.H.) 319–339 (Cambridge University Press, Cambridge, 2010).
- <sup>75</sup> Peake, S. & Smith, J. *Climate Change: From Science to Sustainability*, (Oxford University Press, Oxford, 2009).
- <sup>76</sup> IPCC. *Managing the risks of extreme events and disasters to advance climate change adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*, (Cambridge University Press, Cambridge, 2012).
- <sup>77</sup> Frumhoff, P., Heede, R. & Oreskes, N. The climate responsibilities of industrial carbon producers. *Climatic Change* **132**(2015).
- <sup>78</sup> International Council on Human Rights Policy. *Climate Change and Human Rights: A Rough Guide*. (International Council on Human Rights Policy, Versoix, CH, 2008).
- <sup>79</sup> Gardiner, S.M. Ethics and global climate change. in *Climate Ethics: Essential Readings* (eds. Gardiner, S., Caney, S., Jamieson, D. & Shue, H.) 3–35 (Oxford University Press, Oxford, 2010).
- <sup>80</sup> Caney, S. Cosmopolitan Justice, Responsibility, and Global Climate Change. *Leiden Journal of International Law* **18**, 747-775 (2005).
- <sup>81</sup> Neumayer, E. In defence of historical accountability for greenhouse gas emissions. *Ecological Economics* **33**, 185–192 (2000).
- <sup>82</sup> Eriksen, S. et al. When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development* **3**, 7–20 (2011).

<sup>83</sup> International Council on Human Rights Policy. *Climate Change and Human Rights: A Rough Guide*. (International Council on Human Rights Policy, Versoix, CH, 2008).

<sup>84</sup> Neumayer, E. In defence of historical accountability for greenhouse gas emissions. *Ecological Economics* **33**, 185–192 (2000).

<sup>85</sup> Robert J. Brulle & Robert J. Antonio, The Pope's fateful vision of hope for society and the planet, *Nature Climate Change* **5**, 900–901 (2015).

<sup>86</sup> Anabela Carvalho, The Pope's encyclical as a call for democratic social change, *Nature Climate Change* **5**, 905–907 (2015)

<sup>87</sup> Singer, P. *Practical Ethics*, (Cambridge University Press, Cambridge, 1993), p. 8.

<sup>88</sup> International Energy Agency, United Nations Development Programme, United Nations Industrial Development Organization, 2010. *Energy Poverty: How to Make Modern Energy Access Universal?* Paris: OECD.