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Energy for Metropolis

NADIA B. AHMAD*

Throughout the past decade, municipal governments have steadily increased climate change adaptation measures, natural resource conservation programs, and clean energy initiatives. Through energy efficiency measures and renewable energy mandates, cities are poised to make significant impacts in the reduction of greenhouse gas emissions and the mitigation of climate risks in the clean energy transition. This Article addresses municipal directives of advanced biofuels as an integral part of the clean energy transition. Existing laws and policies have critical design flaws. Specifically, the Renewable Fuel Standard (“RFS”) has proven to be burdensome and complex, producing more unintended consequences than desired outcomes. Problems with the implementation of the RFS indicate that Congress

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overestimated the capacity of the biofuel industry to produce energy and the ability of the retail gasoline market to accommodate ethanol. Consumer resistance to ethanol use and market pressures create problems for biofuel use. This Article is the third in a series related to the law and policy of advanced biofuels. Previously, I examined international dimensions in Blood Biofuels (Duke Environmental Law & Policy Forum) and federal efforts in Resiliency and Responsive Regulation for Advanced Biofuels (Virginia Environmental Law Journal).

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INTRODUCTION

We need more insurgency in the city in order to break unsustainable and privatizing patterns of urban development.

— Jeffrey Hou¹

When Socrates spoke of the “mother city” as a metropolis, he contemplated a founding city from which new “daughter” city-states were established, carrying the influence and rule of their “mother

¹ *Southeast Asia: Seven Make-or-Break Trends for Sustainability*, GREEN FUTURES, Oct. 2013, at 5 (quoting Jeffrey Hou, Associate Professor of Landscape Architecture, University of Washington, Seattle); accord Jeffrey Hou, *(Not) Your Everyday Public Space*, in INSURGENT PUBLIC SPACE: GUERRILLA URBANISM AND THE REMAKING OF CONTEMPORARY CITIES 1, 1–16 (2010) (“If public space is where identities, meanings, and social relationships in cities are produced, codified, and maintained, it is through insurgent public space that alternative identities, meanings, and relationships can be nurtured, articulated, and enacted.”).

city” overseas.² If a “daughter” city-state, or colony, sided with the enemy of its metropolis in any way, the colony was considered disloyal.³ At times, the colonists were welcomed by the natives and, at other times, they had to fight to win their lands.⁴ This early Greek notion of metropolis and the founding of new independent city-states are instructive for the purposes of seeing how modern urban areas can incorporate changes for new biofuel technologies and how the law can adapt to various socio-legal obstacles for diversifying urban renewable energy standards. Early adopters of the technology will serve as the beta group for future energy transitions. Some communities will welcome new technologies, and others will see them as threatening disruption rather than innovation. Given the different types of fuel and energy sources available—petroleum, natural gas, coal, solar, wind, biomass, geothermal, etc.—political will and community expectations wield influence over which fuel and energy sources certain individuals and businesses will select for their specific electrical and transportation needs.⁵ Global imbalances create rifts in the political economy, causing a need to reframe the power of knowledge along with the work of expertise, especially in the energy sector.⁶

Initiatives by municipal governments, in particular those of megacities, have dramatically increased climate change adaptation

² GREGORY NAGY, HOMER THE PRECLASSIC 9–12 (2010) (explaining that city-states of the Greek-speaking world, whether allies or enemies of Athens, considered Athens as the metropolis or “mother city” of all Ionian cities and that Ephesus was a “daughter” city of Athens).

³ THOMAS MARTIN, AN OVERVIEW OF CLASSICAL GREEK HISTORY FROM MYCENAE TO ALEXANDER loc. TRM OV 5.7 (2000), <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.04.0009%3Achapter%3D5%3Asection%3D7>.

The colony’s founder was in charge of laying out the settlement properly and parceling out the land, as Homer describes in speaking of the foundation of a fictional colony: “So [the founder] led them away, settling them in [a place called] Scheria, far from the bustle of men. He had a wall constructed around the town center, built houses, erected temples for the gods, and divided the land.”

Id.

⁴ *Id.*

⁵ See *infra* Part III.

⁶ See *generally* DAVID KENNEDY, A WORLD OF STRUGGLE: HOW POWER, LAW, AND EXPERTISE SHAPE GLOBAL POLITICAL ECONOMY 16–18 (2016).

measures, natural resource conservation programs, and clean energy initiatives over the past decade.⁷ In 2016, nearly fifty-five percent (55%) of the global population resided in urban settlements.⁸ By the year 2030, urban areas will “house 60 per cent of people globally and one in every three people will live in cities with at least half a million inhabitants.”⁹ Through energy efficiency measures and renewable energy mandates, cities are poised to make significant impacts in the reduction of greenhouse gas emissions and the mitigation of climate risks in the face of lax federal policies and international agreements.¹⁰ The forces of globalization and commerce have collided with the need for clean energy for healthy lives and livelihoods across the planet.¹¹

This Article addresses municipal regulation of advanced biofuels. As they stand now, existing laws and policies have critical design flaws. Specifically, the Renewable Fuel Standard (“RFS”) has proven to be burdensome and complex, producing more unintended consequences than desired outcomes.¹² Snags in the execution of the

⁷ See C40 CITIES, 10 YEARS OF RESULTS 1, 9 (2016), https://c40-production-images.s3.amazonaws.com/fact_sheets/images/11_C40_on_its_10-year_anniversary_reOct2016.original.pdf?1475504972 (describing C40 Cities Climate Leadership Group’s efforts between 2005 to 2015 to increase climate change awareness, reduce carbon emissions, clean the air, and help leaders identify effective energy conservation policies). “Megacity” is the term used to describe cities with eight-figure populations, which consist of seven percent (7%) of the world population. Tanza Loudonback, *Here’s How Much It Would Cost You to Live in the 10 Largest Megacities Around the World*, BUS. INSIDER (Oct. 20, 2017, 11:30 AM), <http://www.businessinsider.com/worlds-largest-cities-megacity-cost-of-living-2017-10>.

⁸ Dep’t of Econ. & Soc. Affairs, Population Div., *The World’s Cities in 2016*, at ii, U.N. Doc. ST/ESA/SER.A/392 (2016), http://www.un.org/en/development/desa/population/publications/pdf/urbanization/the_worlds_cities_in_2016_data_booklet.pdf.

⁹ *Id.*

¹⁰ See Claire Martin, *Which Major Cities Are Leaders in Reducing Greenhouse Gas Emissions?*, SMITHSONIAN.COM (Mar. 7, 2013), <https://www.smithsonianmag.com/science-nature/which-major-cities-are-leaders-in-reducing-greenhouse-gas-emissions-857410/> (discussing measures taken by five cities to reduce greenhouse gas emissions).

¹¹ See KENNEDY, *supra* note 6, at 16–18 (discussing tension between the political economy and the need for sustainability).

¹² Philip Rossetti, *The Renewable Fuel Standard’s Policy Failures and Economic Burdens*, AM. ACTION F. (Apr. 19, 2018), <https://www.americanactionforum.org/research/renewable-fuel-standards-policy>

RFS show that Congress miscalculated the capacity of the biofuel industry to produce energy and the ability of the retail gasoline market to accommodate ethanol.¹³ Consumer opposition to ethanol use and market pressures create teething problems for scaled up biofuel use.¹⁴ This Article considers the gaps in current regulatory systems for biofuels and addresses how to overcome these social, economic, and environmental hurdles to harness the full potential of biofuels in urban systems. One such network, known as the C40 Cities Climate Leadership Group (“C40”), includes a consortium of the megacities to combat climate change and enhance resiliency efforts.¹⁵ C40 builds systems and ideas to give cities an effective forum where they can “collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.”¹⁶ This Article provides a survey of data insights to formulate proposed systems for regulatory and governance mechanisms for the production and use of advanced biofuels in urban systems.

The objective of this Article is to identify patterns and trends in the production and use of biofuels in urban systems and their relationship to regulations.¹⁷ It will identify interest in, obstacles to, and concerns about urban biofuels.¹⁸ It will also suggest ideas for drafting regulatory, legal, and policy proposals that can synthesize ideas and address stakeholder concerns about urban biofuels.¹⁹ One possible concern that will be examined is how cities might develop the economies of scale to address climate change and risks to energy access.²⁰ Robust, multicriteria decision-making action plans can assist with prioritization and decision-making.²¹ These types of action

-failures-economic-burdens/.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *About*, C40 CITIES, <https://www.c40.org/about> (last visited Aug. 18, 2018).

¹⁶ *Id.*

¹⁷ This piece stems from two earlier law review articles: Nadia B. Ahmad, *Blood Biofuels*, 27 DUKE ENVTL. L. & POL’Y F. 265 (2017); Nadia B. Ahmad, *Responsive Regulation and Resiliency: The Renewable Fuel Standard and Advanced Biofuels*, 36 VA. ENVTL. L.J. 40 (2018).

¹⁸ *See infra* Part II.

¹⁹ *See id.*

²⁰ *See infra* Part III.

²¹ WORLD BANK, CLIMATE CHANGE, DISASTER RISK, AND THE URBAN POOR: CITIES BUILDING RESILIENCE FOR A CHANGING WORLD 84 (Judy L. Baker ed., 2012).

plans can assist cities and stakeholders with developing higher resilience and lower vulnerability against climate change.²² The term “resilience” is fraught with complexities. To understand the conceptualization of resilience in the context of urban areas, it is useful to analyze the various intentions of “resilient cities” to hone in on urban security, economics, building technology, building types, communities, counter-terrorism, social capital, climate change, and natural disasters.²³ In this milieu of what constitutes the framework for resilient cities, energy access and energy security remain at the forefront of priorities.²⁴ Advanced biofuels enhance existing systems for energy security and provide a means of transitioning to cleaner renewable energy sources, including solar and wind power.²⁵ Advanced biofuels are a sustainable stopgap measure for cities as they transition to ambitious clean energy targets.²⁶

This Article creates a comparative assessment of municipal laws and policies for the urban production and use of advanced biofuels

²² *Id.*; Saru M. Matambanadzo, *Embodying Vulnerability: A Feminist Theory of the Person*, 20 DUKE J. GENDER L. & POL’Y 45, 74 (2012) (discussing the view that vulnerability “emerges in part from embodied human needs and in part from the destabilizing forces of globalization, forces that upend traditional support systems and coping mechanisms.”). Matambanadzo notes, “The origin of vulnerability studies has been intertwined with international human rights laws and analyses of the economic and social impact of globalization.” *Id.* The World Bank underestimates the impact of vulnerability in the conceptualization of resiliency efforts, stating that such an approach could be used to “ensure that any given policy has no unacceptable consequences for stakeholders . . . [and] helps build policy mixes that are robust in most possible future scenarios.” WORLD BANK, *supra* note 21. The World Bank does assume that “application of robust decision-making strategies can be lengthy, requiring the involvement of many stakeholders, including city officials, multiple agencies, private developers, and community residents.” *Id.*

²³ Lawrence J. Vale, *The Politics of Resilient Cities: Whose Resilience and Whose City?*, 42 BUILDING RES. & INFO. 191, 193 (2014). This divergence indicates “either that resilience is excessively malleable as a term, yielding wildly divergent discussions about cities that have little to do with one another, or that the pairing of ‘resilient’ and ‘city’ usefully recognizes connections among subjects commonly viewed as unconnected can lead to fruitful insights if viewed together.” *Id.*

²⁴ *Id.* at 194.

²⁵ See *The Role of Advanced Biofuels in the Energy Transition*, ADVANCE FUEL, <http://www.advancefuel.eu/en/news/the-role-of-advanced-biofuels-in-the-energy-transition> (last visited Aug. 24, 2018).

²⁶ See *id.*

derived from abundant non-edible low-cost urban resources considering social, technological, and economic barriers and their interactions. With the expansion of conventional biofuels produced unsustainably from food sources, this Article aims to explore and demonstrate how advanced biofuels, derived from cellulosic materials and algae, are well suited for the energy needs of urban settings. My focus on urban biofuels stems from the ability of metropolitan areas to do the following: (1) combine high energy needs due to high population density with an abundance of low- or no-cost raw materials, such as yard and municipal wastes; and (2) produce significant social and economic impacts for society, such as energy access and security, job creation, and economic benefits.

This Article observes the short-term and long-term social and economic opportunities and risks associated with advanced biofuels and recommends ways for creating legal, regulatory, and policy frameworks to incentivize innovation and investment in advanced biofuels. In addition, this Article will identify legal, regulatory, and policy hurdles for the development of urban advanced biofuels and empirically evaluate existing data worldwide to contribute to a survey of how enhanced regulatory and governance mechanisms could catalyze the production and consumption of advanced biofuels.

This Article proceeds in three parts. Part I offers a theoretical framework for energy access by considering frameworks for resource dualism, energy competition, and capitalistic commodification. Part II presents a comparative overview of urban and rural systems in the United States. Part III turns to synergies between the urban systems and the RFS and gives recommendations for privatization and alleviation of economic and political hurdles.

I. THEORETICAL FRAMEWORK FOR ENERGY ACCESS

For biofuels, administrative laws are the lifeblood of the industry to create a transformation for a clean energy future. Higher levels of production and consumption of biofuels correlate with increased rates of environmental degradation and natural resource depletion.²⁷

²⁷ Peter Foster, *Biofuels 'Could Cause Serious Water Shortages,'* TELEGRAPH (Oct. 11, 2007, 3:00 PM), <https://www.telegraph.co.uk/news/earth/earth-news/3310024/Biofuels-could-cause-serious-water-shortages.html>; Michael Hagmann, *Most Biofuels Are Not "Green,"* EMPA (Sept. 23, 2012), <https://www.empa.ch/web/s604/biofuels..>

Agricultural and forest biofuels not only elevated environmental externalities, but also produced exceedingly steep social and economic impacts on food security, energy access, and water scarcity.²⁸ As statistician and risk analyst Nassim Nicholas Taleb states, “we have developed a fondness for neomantic complication over archaic simplicity.”²⁹ Taleb further highlights the modern fixation with complex systems:

The worst problem of modernity lies in the malignant transfer of fragility and antifragility from one party to the other, with one getting the benefits, the other one (unwittingly) getting the harm, with such transfer facilitated by the growing wedge between the ethical and the legal . . . [M]odernity hides it especially well. It is of course an agency problem.³⁰

Taleb’s analysis is illustrative of the variables involved with the complex systems used for biofuel policy in the United States. Justin Shepherd argues that the “nested structure of the US mandate also has implications for corn-ethanol and corn prices, and trade in both ethanol (including two-way trade with Brazil) and biodiesel” so that “prices of both biofuels and three main feedstocks: corn, soybean, and canola oil and sugarcane (and, thus, sugar) are being affected by the way in which the complex US RFS mandate works.”³¹ U.S. biofuel policies influence international, national, and subnational systems for food, fuel, energy, and water.³² In 2017, Florida A&M University convened the Energy Water Food Nexus

²⁸ See *supra* note 27.

²⁹ NASSIM NICHOLAS TALEB, *ANTIFRAGILE: THINGS THAT GAIN FROM DISORDER* 373 (2012).

³⁰ *Id.* at 375.

³¹ Justin Shepherd, *The Complex Structure of the U.S. Biofuel Mandate*, in *THE ECONOMICS OF BIOFUEL POLICIES* 171, 171 (2015) (“[T]he primary driver of prices and trade since early 2013 has been the ethanol blend wall in the United States and more recently, uncertainty in what the Environmental Protection Agency (EPA) will finally rule for 2014 (which at the time of writing, has still not been resolved), both having implications for the way forward . . .”).

³² *About the Nexus*, FLA. A&M U. ENERGY WATER FOOD NEXUS INT’L SUMMIT 2017, <http://www.famuenergywaterfoodnexus.org/summit/overview> (last visited Aug. 18, 2018).

International Summit to address this new science enterprise and promote public-private partnerships to develop a broader dialogue on the United Nations Sustainable Development Goals.³³

Bettering the lives of poor households is a pressing concern for modernization and development in the twenty-first century.³⁴ Despite the negative impacts on human health and economic disadvantages for the lack of energy access, limited progress has been made to improve energy access for the world's poor.³⁵ Measuring energy use and consumption requires basic assumptions such as "the type of energy consuming equipment . . . their sizes, efficiencies and intensity of use."³⁶ "Several different methods" have been used to develop formulas for energy use and consumption.³⁷ These formulas and calculations offer a means to measure energy poverty, providing insights into "unmet basic needs and depressed economic and educational opportunities that are particularly pervasive among women, children, and minorities."³⁸

³³ *Id.*; F.E. Guerra-Pujol, Of Coase and Copyrights: The Problem of 'Aesthetic Judgements' 3 (Feb. 4, 2006) (unpublished manuscript) (on file at <https://ssrn.com/abstract=1452423>) (discussing Coase's theory that that "many legal problems, such as air and noise pollution, are 'reciprocal in nature[.]'" to illustrate that in whichever way a system is designed, there will be winners and losers). Guerra-Pujol writes

[t]he smoke harms the neighbors who live downwind from the factory. But as Coase goes on to show, the problem of the factory smoke and the neighbors is reciprocal in nature because someone will be harmed no matter how the case is decided. In short, we must harm the owner of the factory in order to avoid harming the neighbors, and vice versa, we must harm the neighbors in order to avoid harming the factory owner.

Id.

³⁴ See Ambuj Sagar, *Alleviating Energy Poverty for the World's Poor*, 33 ENERGY POL'Y 1367, 1367 (2005).

³⁵ *Id.*

³⁶ Shonali Pachauri & Daniel Spreng, *Energy Use and Energy Access in Relation to Poverty*, 39 ECON. & POL. WKLY. 271, 272 (2004).

³⁷ See Roger Revelle, *Energy Use in Rural India*, 192 SCI. 969, 969 (1976).

³⁸ Christian E. Casillas & Daniel M. Kammen, *The Energy-Poverty-Climate Nexus*, 330 SCI. 1181, 1181 (2010). The gender disparities that arise from access to energy are not as pervasive as those that arise from sexual violence. Yet electricity and lighted neighborhoods improves the lives and livelihoods of women giving them greater economic empowerment. *Id.* Nancy Chi Cantalupo states

[b]ecause, as the Secretary General of the United Nations has stated, "[v]iolence against women is a form of discrimination

When peering into our own lives, we can observe the amount of energy consumption and still ignore the calls of nature to reduce. After a long day, I wander outside to rest on a rattan bench on my back porch while snuggling my eight-and-a-half-month-old daughter. She clings to me as she tries to doze off into her late afternoon siesta. As I am preparing to take my seat, I sniff the air and decide against my proposed action. The reason for my sudden change of mind is because I smell wood. It is burning. The stench of burning wood is abominable even in controlled burns. The edge of Rock Springs Run State Park down the street looks as though it has been decimated. The forest along State Road 46 near the Wekiva River has also been chopped to bits, or using the industry term, *cleared*. The trees were *cleared* to make way for the world or, as a friend quipped, to make Orlando “a real city.” The trees were *cleared* to connect State Road 417 with State Road 429 to complete the beltway around Orlando.³⁹ They call it an *interconnect*, an *interchange*, and an *intersection* for bypassing the hustle and bustle, the traffic jams, and the parking lot otherwise known as Interstate 4, which the locals call I-4.⁴⁰

When Hurricane Irma barreled through Central Florida in the twilight hours several months earlier, the most extensive damage was the debris from fallen trees and the dangers such debris posed.⁴¹

and a violation of human rights . . . [that] can only be eliminated . . . by addressing discrimination, promoting women’s equality and empowerment, and ensuring that women’s human rights are fulfilled,” Title IX’s main goals are creating rights and remedies for victims and ending not only harassment and violence but also its discriminatory effects.

Nancy Chi Cantalupo, *For the Title IX Civil Rights Movement: Congratulations and Cautions*, 125 YALE L.J.F. 281, 284 (2016). Providing access to energy not only leads to greater economic opportunities; it limits the effects of the lack of electricity to improve access to education, health, and a better environment. *Id.*

³⁹ Stephen Hudak, *State Road 46 Intersection Will be Moved This Week as Part of Wekiva Parkway Project*, ORLANDO SENTINEL (July 18, 2018, 4:25 AM), <https://www.orlandosentinel.com/news/orange/os-state-road-46-intersection-shift-20180718-story.html>.

⁴⁰ *Id.* See FLA. DEP’T TRANSP., FPID: 238275-7-52-01, ANALYSIS AND DETERMINATION: SR 429/SR 46 – WEKIVA PARKWAY CROSSING OVER THE WEKIVA RIVER 5–8 (2015).

⁴¹ Mary Shanklin, *Damages from Hurricane Irma Mount in Central Florida*, ORLANDO SENTINEL (Oct. 18, 2017, 2:05 PM), <http://www.orlandosentinel.com/news/hurricane-irma-recovery/os-bz-irma-damage-20171018-story.html>.

The morning after Hurricane Irma on September 11, 2017, my family and I went outside to assess the damage. I was focused on the property casualties—roofs, cars, roads, electrical lines, windows, mailboxes, etc. My four-year-old middle child remarked at the pain of seeing the tree limbs on the ground and the uprooted tree trunks.

“Mama, the trees have fallen. Look at them . . .”

Her voice trailed off. She had never experienced this level of devastation. As a youngster, her innocence captured a sensitivity that I had overlooked as an adult: the agony of seeing trees destroyed.⁴² In Arabic, this idea, called *fitrah*, is used to designate the natural human nature or inclination.⁴³ *Fitrah* literally means creation, initiating existence, and “the natural or original constitution with which a child is created in [the] mother’s womb.”⁴⁴ This idea is also captured with an Earth-centered approach to jurisprudence and contrasts with an anthropocentric perspective to the onslaught of development.⁴⁵ Viewing humans as stewards of the Earth, instead of as its tillers and

⁴² I limited my initial understanding of the devastation to property damage, but my daughter saw beyond it to the broader, longer-lasting consequences. Margaret Montoya analyzes this fragile balance of insiders and outsiders from a personal perspective. She writes, “Outsiders are also faced with the gnawing suspicion that the public identities available to them are limited to those reflecting the values, norms and behavior of the dominant ideology.” Margaret E. Montoya, *Mascaras, Trenzas, y Grenas: Un/masking the Self While Un/braiding Latina Stories and Legal Discourse*, 17 HARV. WOMEN’S L.J. 185, 197 (1994).

⁴³ Ammar Fauzi, *Islamic Mysticism and the Paradigm of Fitrah*, 2 KOM ČASOPIS ZA RELIGISKE NAUKE [KOM J. RELIGIOUS SCI.] 23, 35–36 (2013) (Serb.).

⁴⁴ ABDULAZIZ SACHEDINA, ISLAM AND THE CHALLENGE OF HUMAN RIGHTS 93 (2010). Fauzi expands on this notion of *fitrah*:

Hence the man’s reason d’être is *fitrah*; because of *fitrah*, all human beings was created and born; because of it, each of them is growing, surviving and striving for eternal life. Everybody’s nature is solely defined by *fitrah*. In the following clause of the verse, *fitrah* is described as the essence that can never be changed, as a substance that belongs to everyone without any difference at all, a light that always flames, remains pure and authentic since the beginning of one’s birth. In a popular *hadith*, “Every baby was born on the basis of *fitrah*.”

Fauzi, *supra* note 43, at 36.

⁴⁵ See Judith E. Koons, *Earth Jurisprudence: The Moral Value of Nature*, 25 PACE ENVTL. L. REV. 263, 263–65 (2008). Koons is concerned that deforestation is being used to accommodate agribusiness at an alarming rate. *Id.* at 326.

cultivators, is not complex to understand or nuanced in any way, but it is difficult to do, even for me.

As I wake up early the next morning to carpool/haul my seven-year-old to school in my vehicle fueled by hydrocarbon resources, I see the remnants of the burnt wood. I thought they could have at least used it for wood-based biofuels. In one night of damage from Hurricane Irma, the City of Orlando collected more than 274,000 cubic yards of vegetative hurricane debris.⁴⁶ I looked across the fog resting on the still and shallow tides of the Wekiva River and thought there had to be a more expedient way. Less than a month later, Representative Darren Soto introduced a bill into the U.S. House of Representatives for the designation of the Kissimmee River as a “Wild and Scenic River.”⁴⁷ The effort would help restore the original flow of the river to protect the ecosystem and decrease flooding in future water hazard events associated with extreme weather and sea level rise.⁴⁸ Why can’t more policy makers put the environment ahead of corporate profits?

The thought also occurred to me that we could burn our forests for fuel instead of watching people die in the Middle East over natural resource conflicts for petroleum and liquefied natural gas (“LNG”) pipelines.⁴⁹ What a thought. Instead, the forests were *cleared*.⁵⁰ I have watched the fires burn and burn the vestiges of the Wild Florida of my youth to the ground, to ashes. In April 2018, Environmental Protection Agency (“EPA”) administrator Scott Pruitt told a group of foresters in Georgia that the EPA would deem

⁴⁶ Stephen Hudak, *Hurricane Irma Left a Mess Behind, but Local Officials Say They’re Ready for the Next One*, ORLANDO SENTINEL (Sept. 7, 2018, 3:45 PM) <http://www.orlandosentinel.com/news/hurricane-irma-recovery/os-central-florida-hurricane-debris-ready-20180906-story.html>.

⁴⁷ H.R. 3961, 115th Cong. (2d Sess. 2017); Press Release, U.S. House Representative Darren Soto, Soto’s Kissimmee River Bill Passes House by Unanimous Consent (Apr. 16, 2018), <https://soto.house.gov/media/press-releases/soto-s-kissimmee-river-bill-passes-house-unanimous-consent>.

⁴⁸ Press Release, U.S. House Representative Darren Soto, *supra* note 47 [hereinafter Press Release, U.S. House Representative Darren Soto].

⁴⁹ See Michael T. Klare, *Fighting for Oil: 21st Century Energy Wars*, MIDDLE E. EYE (July 10, 2014, 11:00 AM), <https://www.middleeasteye.net/esays/fighting-oil-21st-century-energy-wars-608245442>.

⁵⁰ Michael I. Volk et al., *Florida Land Use and Land Cover Change in the Past 100 Years*, in *FLORIDA’S CLIMATE: CHANGES, VARIATIONS, & IMPACTS* 51, 52 (Eric P. Chassignet et al. eds., 2017).

wood burning from managed forests and other stationary sources to be “carbon neutral” for purposes of energy production at power plants.⁵¹ Leaders in the timber industry praised the decision, stating that it reflected “long-standing scientific principles and Congressional direction.”⁵² At the same time, biogeochemist William Schlesinger, global change biologist Beverly Law, systems dynamics expert John Sterman, and international environmental policy expert William Moomaw, warned of the dangers of this change on the account of basic science: “We must reduce greenhouse gas emissions now, not increase them.”⁵³

Since my first born was an infant, I have been researching several policy alternatives to agriculture and forest biofuels, including

⁵¹ Miranda Green, *Pruitt Declares that Burning Wood is Carbon Neutral*, HILL (Apr. 23, 2018, 2:15 PM), <http://thehill.com/policy/energy-environment/384441-pruitt-declares-that-burning-wood-is-carbon-neutral> (“Members of Congress have made similar legislative pushes to recognize wood burning as carbon neutral. In 2016, a group of Senators tried to pass the policy change through larger bipartisan energy bill. More recently, a provision included in the fiscal 2018 federal spending bill unveiled in March urged the heads of the EPA and Energy Department to “reflect the carbon-neutrality of forest bioenergy and recognize biomass as a renewable energy source.”).

⁵² *Id.*

⁵³ William H. Schlesinger et al., Opinion, *Pruitt Is Wrong on Burning Forests for Energy*, N.Y. TIMES (May 3, 2018), <https://www.nytimes.com/2018/05/03/opinion/pruitt-forests-burning-energy.html>. The authors argue

The simple fact is that cutting and burning trees adds carbon dioxide to the atmosphere, trapping radiant heat from the earth and making the planet warmer. The added carbon dioxide is removed from the atmosphere only if the forest that is cut down is replaced by a new generation of trees. (Trees and other green plants remove carbon dioxide from the air and use it to make leaves, wood and roots through photosynthesis.) But regrowth takes time, a century or more for native forests, assuming they don’t fall victim to wildfire or disease. And regrowth never occurs if the land is developed or converted to pasture or farmland.

Moreover, throughout the many decades before the replacement forests can grow enough to remove the extra carbon dioxide from the atmosphere, the previously added gas will thaw more permafrost and melt more ice, make ocean acidification worse, accelerate global warming, speed sea-level rise, increase the incidence of extreme weather, worsen drought and water stress, and hurt crop yields — effects that will persist for centuries or longer.

Id.

the use of advanced biofuels such as algae, seaweed, yard debris, and waste cooking oil. The declaration of wood biofuels as carbon neutral shocks the conscience. I remain uncertain about what world my children will have when they are my age. I hope that when they are older they still have the forest. I hope we have not burned our forests and food for fuel in this vain and hapless attempt at sustainable forestry and agriculture.

A. *Environmental Ethics and Dualism*

The concepts of land ethics and environmental ethics are useful for addressing why concerns for nature should be calculated in production and development of biofuel regulations. Aldo Leopold presented four ideas regarding land ethics:

(1) the moral community should include soils, waters, plants, and animals . . . ; (2) the role of *homo sapiens* should be changed from conqueror to plain member of the land community; (3) we can be moral only in relation to something we can see, feel, understand, love, respect, admire, or otherwise have faith in; and (4) “a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community; it is wrong when it tends otherwise.”⁵⁴

This fourth idea is referred to “as the moral maxim of Leopold’s land ethic,” claiming “the rightness or wrongness of actions is determined by reference to the consequences of those actions—a familiar consequentialist ethical principle.”⁵⁵ Leopold saw these consequences as the “integrity, stability, and beauty of the biotic community.”⁵⁶ Leopold’s other three claims “go beyond those made by either canonical philosophy or revised environmental ethics (such as animal ethics).”⁵⁷

⁵⁴ Karen J. Warren, *Feminist Environmental Philosophy*, STAN. ENCYCLOPEDIA PHIL. (Aug. 29, 2014), <https://plato.stanford.edu/archives/sum2015/entries/feminism-environmental> (citing ALDO LEOPOLD, A SAND COUNTY ALMANAC 204, 214, 223–25 (photo. reprint 1987) (1949)).

⁵⁵ Warren, *supra* note 54.

⁵⁶ *Id.*

⁵⁷ *Id.*

This philosophical framework for environmental ethics is also linked to the idea of dualism with respect to nature. Traditionally, dualism was used to explain hierarchies of male and female, but this concept can also be expounded upon to address links between the human and the non-human, the powerful and the powerless, and the monied and the impoverished.⁵⁸ This hierarchical thinking and dualism manifests in notions of domination and control of the natural world, including human chauvinism (anthropocentrism), which leads to the destruction and degradation of the natural environment by humans.⁵⁹

Val Plumwood asserts that forms of oppression from previous eras and still today have left vestiges “in western culture as a network of dualisms, and the logical structure of dualism forms a major basis for the connection between forms of oppression.”⁶⁰ She argues that “western culture has treated the human/nature relation as a dualism and that this explains many of the problematic features of the west’s treatment of nature which underlie the environmental crisis, especially the western construction of human identity as ‘outside’

⁵⁸ *See id.* (“[B]edrock dualisms in canonical philosophy—such as culture versus nature and mind versus body—have historically not been gender-neutral; they have associated males/men with superior culture and mind, and both females/women and animals with inferior nature and body.”).

⁵⁹ Andrew Brennan & Yeuk-Sze Lo, *Environmental Ethics*, STAN. ENCYCLOPEDIA PHIL. (June 3, 2002), <https://plato.stanford.edu/archives/win2016/entries/ethics-environmental/>.

The dualistic way of thinking, for instance, sees the world in polar opposite terms, such as male/female, masculinity/femininity, reason/emotion, freedom/necessity, active/passive, mind/body, pure/soiled, white/coloured, civilized/primitive, transcendent/immanent, human/animal, culture/nature. Furthermore, under dualism all the first items in these contrasting pairs are assimilated with each other, and all the second items are likewise linked with each other. For example, the male is seen to be associated with the rational, active, creative, Cartesian human mind, and civilized, orderly, transcendent culture; whereas the female is regarded as tied to the emotional, passive, determined animal body, and primitive, disorderly, immanent nature. These interlocking dualisms are not just descriptive dichotomies, according to the feminists, but involve a prescriptive privileging of one side of the opposed items over the other.

Id.

⁶⁰ VAL PLUMWOOD, *FEMINISM AND THE MASTERY OF NATURE 2* (1993).

nature.”⁶¹ Apart from the east-west divide of natural resource exploration, other social, political, and economic systems of hierarchies exist to exacerbate environmental degradation.⁶² In particular, poor households and impoverished communities in both First World and Third World nations bear the brunt of extractive industries as well as the next wave of agricultural and forest biofuel development and production.⁶³ Renee Hatcher argues that conversations about urban areas, particularly the economic conditions of black neighborhoods, fail to account for centuries of redlining, employment and housing discrimination, predatory policing, and targeted enforcement of petty crimes.⁶⁴

When looking at the prospect of human development of the wild, Holmes Rolston put forward his idea of nature-culture division: ““The architectures of nature and of culture are different, and when culture seeks to improve nature, the management intent spoils the wilderness.””⁶⁵ Light said that the divisions of dualism would

⁶¹ *Id.* Plumwood argues, “[a] detailed analysis of dualism also shows that its characteristic logical structure of otherness and negation corresponds closely to classical prepositional logic, the leading logical theory of modernity.” *Id.* Blanche Cooke more explicitly points out “the power of white heteropatriarchal ideologies to invert order and to obfuscate, hide, and legitimize the inversion.” Blanche Bong Cooke, *Biased and Broken Bodies of Proof: White Heteropatriarchy, the Grand Jury Process, and Performance on Unarmed Black Flesh*, 85 UMKC L. REV. 567, 571 (2017).

⁶² See Marlene Cimons, *How Economic Inequality Exacerbates Environmental Degradation*, PROJECT EARTH (May 24, 2017, 1:42 PM), <https://project-earth.us/how-economic-inequality-exacerbates-environmental-degradation-1796423246> (arguing that social and economic inequality worsen climate change).

⁶³ See generally Piya Abeygunawardena et al., *Poverty and Climate Change: Reducing the Vulnerability of the Poor Through Adaptation* 8 (World Bank, Working Paper No. 52176, 2009) <http://documents.worldbank.org/curated/en/534871468155709473/pdf/521760WP0pover1e0Box35554B01PUBLIC1.pdf>.

⁶⁴ Renee C. Hatcher, *The Everyday Economic Violence of Black Life*, 25 J. AFFORDABLE HOUSING 275, 276 (2017) (“Often there are conversations about the condition of Black neighborhoods, without the mention of redlining; conversations about the poverty rate in the Black community, without discussing the employment and housing discrimination experienced by Black citizens. Most often, there are conversations about Black criminality, without the mention of predatory policing in low-income Black neighborhoods or the targeted enforcement of petty crimes on Black citizens.”).

⁶⁵ Andrew Light, *The Urban Blind Spot in Environmental Ethics* 9–10 (Lancaster Univ. Dep’t of Philosophy Thingmount Working Paper Series, Paper No.

either “discount the value of urban areas or ignore them, and hence urban environmental problems, altogether.”⁶⁶ This view of dualism shows how the environmental degradation of nature impacts peoples and societies in varying ways. Advanced biofuels offer a means to democratize power production in urban areas through collection of municipal solid waste, wastewater, yard waste, and other similar sources.⁶⁷ Looking at the subtleties of competing energy sources shows how a diverse energy portfolio, including advanced biofuels, can lead to greater energy reliability and energy security.

B. *Energy Competition and Commodification*

Climate change reports show the intensified concern for environmental protection and the need to address large scale global disasters.⁶⁸ The U.S. conceptualization of energy security entails the “availability of sufficient supplies at affordable prices, protecting Middle East suppliers and shipping lanes against piracy, maintaining a strategic petroleum reserve, and reducing physical threats to energy infrastructure.”⁶⁹ Other countries also define energy security based on their political and land concerns.⁷⁰ The regulation literature

3-02, 2014), http://www.lancaster.ac.uk/users/philosophy/awaymave/online_resources/andrew%20light.pdf (quoting HOLMES ROLSTON III, *PHILOSOPHY GONE WILD* 134–35 (1986)).

⁶⁶ Light, *supra* note 65, at 10.

⁶⁷ See, e.g., *Biomass—Renewable Energy from Plants and Animals*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/index.php?page=biomass_home (last updated June 21, 2018).

⁶⁸ See generally INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS* 749 (2007); NICHOLAS STERN, *THE ECONOMICS OF CLIMATE CHANGE*, at xiii, 3 (2007).

⁶⁹ Benjamin K. Sovacool & Marilyn A. Brown, *Competing Dimensions of Energy Security: An International Perspective* 6 (Ga. Tech Sch. Pub. Policy, Working Paper No. 45, 2009), <https://smartech.gatech.edu/bitstream/handle/1853/27736/wp45.pdf>; see also Donald N. Zillman & Michael T. Bigos, *Security of Supply and Control of Terrorism: Energy Security in the United States in the Early Twenty-First Century*, in *ENERGY SECURITY* 145, 145–69 (Barry Barton et al. eds., 2004); see generally Leon Fuerth, *Energy, Homeland, and National Security*, in *ENERGY & SECURITY: TOWARD A NEW FOREIGN POLICY STRATEGY* 411, 411–24 (Jan H. Kalicki & David L. Goldwyn eds., 2005) (discussing U.S. foreign policy in the Middle East in light of energy and national security).

⁷⁰ See Sovacool & Brown, *supra* note 69, at 6–7.

addresses the “tradeoffs between prices (carbon tax) and quantity (cap-and-trade) measures.”⁷¹

The last three centuries provide evidence of changing political and economic structures because of the power of capital and carbon industrialization. This phenomenon is referred to in the context of the Global South as “petro-development.”⁷² The ongoing and future economic crises caused by the overgrowth of fossil capitalism⁷³ require more legal attention regarding the reliance on carbon energy, the centrality of energy in the economy, and how energy shapes the current and future order of the world.⁷⁴ These trends will impact energy security, concerns for environmental justice, and the deepening of economic inequality.⁷⁵ Providing alternatives to fossil fuels would lessen the reliance on hydrocarbon intensive commercialization.⁷⁶ The socioeconomic framework that led to the rise and fall of Enron and other energy related companies is known as political capitalism.⁷⁷ This political capitalism was distinct from free-market capitalism because it involved a mixed economy, where business interests would pursue, acquire, and use government interference for their own benefit despite costs to customers and taxpayers, as well as their competitors.⁷⁸

⁷¹ Yacov Tsur & Amos Zemel, *On the Dynamics of Competing Energy Sources* 4 (Hebrew Univ. of Jerusalem, Dep’t of Agric. Econ. & Mgmt., Discussion Paper No. 15.09, 2009), <http://ageconsearch.umn.edu/bitstream/155265/2/yacov-solar.pdf>; see Simon Dietz & David J. Maddison, *New Frontiers in the Economics of Climate Change*, 43 ENVTL. & RES. ECON. 295, 298 (2009).

⁷² Jesse Salah Ovadia, *Oil-Backed Capitalist Development in the Global South: A Case of Positive Oil Exceptionalism?*, in ENERGY, CAPITALISM AND WORLD ORDER 79, 87 (Tim Di Muzio & Jesse Salah Ovadia eds., 2016).

⁷³ Elmar Altvater, *The Social and Natural Environment of Fossil Capitalism*, 43 SOCIALIST REG. 37, 54 (2007).

⁷⁴ See generally Jeanne Marie Zokovitch Paben, *Green Power & Environmental Justice—Does Green Discriminate?*, 46 TEX. TECH. L. REV. 1067, 1097, 1110 (2014).

⁷⁵ *Id.*

⁷⁶ Nancy W. Stauffer, *Moving Away from Fossil Fuel Energy? Not Without Aggressive Policy Action*, ENERGY FUTURES (Dec. 5, 2016), <http://energy.mit.edu/news/moving-away-fossil-fuel-energy-not-without-aggressive-policy-action/>.

⁷⁷ ROBERT L. BRADLEY JR., CAPITALISM AT WORK: BUSINESS, GOVERNMENT AND ENERGY 3 (2009) [hereinafter BRADLEY, CAPITALISM].

⁷⁸ *Id.*

Political capitalism developed as business leaders sought “tariffs, subsidies, entry restrictions, and other species of corporate welfare.”⁷⁹ To garner political support, advocates of political capitalism used arguments such as “aiding an infant business, promoting domestic security, or stabilizing a cyclical industry” to propel the idea.⁸⁰ Meanwhile, the U.S. energy market grew from “the invisible hand of private-property rights and profit-and-loss entrepreneurship, not the visible hand of government ownership and command.”⁸¹ Market forces played a role before business leaders for energy markets, namely Samuel Insull, “lobbied for the regulatory covenant of cost-based (maximum) rates in return for franchise protection (territorial monopolies).”⁸² Looking at these theoretical issues provides a backdrop for understanding the multiplicity of factors that shape the law and policy of advanced biofuels in the urban setting. While advanced biofuels are arguably considered to be renewables, they also impact the environment and social conditions. However, the negative externalities of advanced biofuels are better than those of forest and agriculture-based biofuels.

This Part examined how environmental ethics and the concept of dualism can provide a lens to consider the need for advanced biofuels to decrease economic inequality in the Global South and poor and impoverished communities in the Global North. The hierarchies between nature and human among and between human populations suggests that alternative energy sources are significant in the environmental calculus for energy security and economic justice.⁸³

⁷⁹ *Id.* at 7. “[T]he intellectual class that loudly proclaimed the imperfections and injustices of free-market capitalism was complicit in the growth of political capitalism, which, ironically, created an environment hospitable to the private-sector [U]nintentionally, reformers created a framework that enabled further corporate manipulation.” *Id.* at 8.

⁸⁰ *Id.* at 7.

⁸¹ ROBERT L. BRADLEY, JR., *EDISON TO ENRON: ENERGY MARKETS AND POLITICAL STRATEGIES* 479 (2011) [hereinafter BRADLEY, *EDISON TO ENRON*].

⁸² *Id.*

⁸³ See Paben, *supra* note 74, at 1101; Altvater, *supra* note 73, at 54.

Competing concerns over natural resources influence the availability of and access to energy.⁸⁴ This competition is fueled by capitalistic interests, but not precisely free-market capitalism.⁸⁵ Political capitalism grew from the response to fossil fuel development.⁸⁶ A form of political capitalism will also be used to enhance the development and growth of second-generation biofuels in the coming decades.

The next Part provides an overview of systems in the United States that are working to develop advanced biofuels in urban systems. In addition, rural systems are discussed to improve issues of scale and processing on different platforms as a contrast to urban systems. So, while the growth of biofuels is more likely to occur in population centers, rural areas have historically provided the biomass for biofuel conversion. Assessing both rural and urban systems can provide for optimal solutions in the urban setting for transitioning to a clean energy future.

II. SNAPSHOT OF SUBNATIONAL PROGRAMS

This Part assesses the role of key stakeholders involved in subnational policy related to advanced biofuels (including city officials, regional and local policy makers, the private sector, non-governmental organizations (“NGOs”), and community leaders) to determine whether the current formulations for urban systems can improve biofuel development. As a result, this Part provides suggested

⁸⁴ Lua Kamál Yuille, *Toward a Heterodox Property Law and Economics*, 2 TEX. A&M L. REV. 489, 492 (2015) (examining the deeper tensions caused by how property is defined and how the “violability of property mask deeper vectors of discontent”). As she explains,

[v]alued resources, their control, and their distribution merely constitute the terrain on which a conflict is waged. Whatever its precise definition and scope, properly conceived, property, at its core, represents the conflict between individual liberty and interest, on one hand, and community well-being and equality, on the other. These equally important values or categories are not just non-fungible, but they are incommensurable and, largely, non-aggregative at the margin. That is, in each individual conflict a gain for one is a loss for the other. Where individual liberty wins, the community or equality loses.

Id.

⁸⁵ See BRADLEY, CAPITALISM, *supra* note 77, at 3.

⁸⁶ *Id.* at 7–8.

adjustments to ongoing processes and systems to enhance the development and deployment of advanced biofuels in urban systems. Despite many definitions for the term “clean energy,” the Sierra Club refers to clean energy as “carbon- and pollution-free energy collected from renewable, sustainably harvested sources, such as wind, solar, hydro, tidal, and geothermal, as well as energy efficiency.”⁸⁷ The Sierra Club’s classification “does not include natural gas, nuclear, or any carbon-based energy source.”⁸⁸ In general, “urbanization creates specific challenges pertaining to the management of resources, particularly water and energy, but it also provides opportunities. Surging populations in cities around the world mean that the ever-increasing demand for water and electricity cannot always be met locally.”⁸⁹ Additionally, “[a]ddressing long-term housing requirements in cities also concerns the challenge of supplying water and electricity as part of the planning process.”⁹⁰ Further, the amount of biomass available on the planet is difficult to calculate. “Better remote sensing tools” allow for the global probing of the environment “with unprecedented resolution and specificity.”⁹¹

⁸⁷ SIERRA CLUB, CITIES ARE READY FOR 100% CLEAN ENERGY: 10 CASE STUDIES (2016), https://content.sierraclub.org/creative-archive/sites/content.sierraclub.org/creative-archive/files/pdfs/1352%20RF100%20report%2005_web_08-2016.pdf.

⁸⁸ *Id.*

⁸⁹ WORLD ECONOMIC FORUM, MIGRATION AND ITS IMPACT ON CITIES 128 (2017), <http://lawsdocbox.com/Immigration/68582291-Migration-and-its-impact-on-cities-in-collaboration-with-pwc.html> (discussing key challenges facing cities expanding due to migration); see also Jean-Paul Bouttes et al., *The Three Challenges Facing the Electricity Sector*, YALEGLOBAL ONLINE (Nov. 28, 2011), <https://yaleglobal.yale.edu/content/three-challenges-facing-electricity-sector>.

⁹⁰ WORLD ECONOMIC FORUM, *supra* note 89, at 129. City leaders face concern of the short-term task of providing safe drinking water and electricity for migrants living in slums, informal settlements or camps. *Id.*; see also Sabina Faiz Rashid, *Strategies to Reduce Exclusion Among Populations Living in Urban Slum Settlements in Bangladesh*, 27 J. HEALTH, POPULATION & NUTRITION 574, 577 (2009) (discussing policy challenges to ensuring adequate water and electricity access in urban slum settlements in Bangladesh).

⁹¹ Yinon M. Bar-On et al., *The Biomass Distribution on Earth*, 115 PROC. OF THE NAT’L ACAD. SCI. 6506, 6506 (2018).

The *Tara* Oceans expedition is among recent efforts at global sampling that are expanding our view and coverage. Continental counterpart efforts, such as the National Ecological Observatory Network in North America, add more finely

Earlier studies of biomass distribution focused on plant systems, but new technology allows for greater accuracy in determining the availability of biomass, increasing the potential for advanced biofuels.⁹²

A. Urban Systems

Nearly thirty (30) states have Renewable Portfolio Standards (“RPS”), including Washington, New Mexico, Montana, Colorado, Oregon, Minnesota, California, Iowa, Nevada, Missouri, New Hampshire, North Carolina, Wisconsin, Arizona, Vermont, Maine, Illinois, Michigan, Connecticut, New Jersey, Pennsylvania, Massachusetts, and New York.⁹³ San Francisco, California, aims to be running on 50% renewable energy by 2020 and 100% renewable energy by 2030, using programs like Fryer to Fuel which converts fast food waste oil into useable fuel sources.⁹⁴ Seattle, Washington, has a garbage to electric Green Fleet Plan.⁹⁵ Chicago, Illinois, has a “Smart Grid” project.⁹⁶ President Trump pulled America out of the Paris

resolved, continent-specific details, affording us more robust descriptions of natural habitats.

Id.

⁹² *See id.* Bar-On, Phillips, and Milo’s research demonstrates that “terrestrial biomass is about two orders of magnitude higher than marine biomass and estimate a total of ≈6 Gt C of marine biota, doubling the previous estimated quantity,” revealing “that the global marine biomass pyramid contains more consumers than producers, thus increasing the scope of previous observations on inverse food pyramids.” *Id.*

⁹³ *State Renewable Portfolio Standards and Goals*, NAT’L CONF. OF ST. LEGIS. (July 20, 2018), <http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx>.

⁹⁴ Lizzie Johnson, *SF’s Green Energy Goal is a Decade Ahead of Target*, S.F. CHRON. (Apr. 19, 2017), <https://www.sfchronicle.com/bayarea/article/SF-green-energy-goal-is-a-decade-ahead-of-11084954.php>; *SFPUC Celebrates 100 Years of Clean Power with Free Sno-Cones*, CLEANPOWERSF (Sept. 5, 2018), <https://www.cleanpowersf.org/news/2018/6/6/pcia-xr935>; URBAN BIOFUELS INITIATIVE FINAL REPORT, ECOLOGY ACTION 25, 29 (2017), <https://19january2017snapshot.epa.gov/www3/region9/waste/biodiesel/docs/fryer-to-fuel-report.pdf>.

⁹⁵ ANDREA PRATT, DEP’T FIN. & ADMIN. SERVICES, FLEET MGMT. DIVISION, A CLEAN AND GREEN FLEET 2 (2014), <http://www.seattle.gov/Documents/Departments/FAS/FleetManagement/2014-Green-Fleet-Action-Plan.pdf>.

⁹⁶ *Smart Grid for a Smart Chicago*, CITY OF CHI., <https://www.cityofchicago.org/city/en/progs/env/smart-grid-for-a-smart-chicago.html> (last visited Aug. 15, 2018).

Agreement, but 292 cities have pledged to commit to the agreement anyway.⁹⁷ The following states have committed to clean energy goals: Massachusetts, California, Oregon, New York, Colorado, Hawaii, Washington, Connecticut, Virginia, and Rhode Island.⁹⁸ Iowa uses corn waste-based gas to keep farmers in competition with big oil; however, this type of biofuel raises concerns about food shortages.⁹⁹ Denver, Colorado, started its biodiesel fleet in 2004 using B20 and, in 2008, started using E85 and Flex-Fuel, in addition to a fleet of electric bucket trucks.¹⁰⁰ Kentucky is in the process of converting most of its fleet to Compressed Natural Gas (“CNG”) and other biodiesel sources.¹⁰¹ These programs show the rise of advanced biofuels in urban systems.

⁹⁷ Sherry Devlin, *Engen Joins 292 ‘Climate Mayors’ Pledging to Implement Paris Accord Locally*, MISSOULA CURRENT (June 12, 2017), <https://www.missoulacurrent.com/outdoors/2017/06/missoula-climate-change-mayors-letter-engen/>.

⁹⁸ Dakin Andone & Nicole Chavez, *US Mayors, Governors Vow to Stick with Paris Accord*, CNN (June 2, 2017, 12:23 AM), <http://www.cnn.com/2017/06/01/us/trump-climate-deal-cities-states-defying/index.html>.

⁹⁹ F. John Hay, *Corn for Biofuel Production*, EXTENSION (Sept. 30, 2015), <http://articles.extension.org/pages/27536/corn-for-biofuel-production>; Rick Santorum, *Cultivating Homegrown Energy Solutions*, WASH. TIMES (May 23, 2017), <http://www.washingtontimes.com/news/2017/may/23/fracking-and-domestic-energy-production>; John C. Tyndall et al., *Corn Stover as a Biofuel Feedstock in Iowa’s Bio-Economy: An Iowa Farmer Survey*, 35 BIOMASS & BIOENERGY 1485, 1486 (2010); Jeff Spross, *America’s First Cellulosic Biofuel Plant to Use Corn Waste Is Open in Iowa*, THINKPROGRESS (Sept. 4, 2014, 5:43 PM), <https://thinkprogress.org/americas-first-cellulosic-biofuel-plant-to-use-corn-waste-is-open-in-iowa-1658bb523644>.

¹⁰⁰ PUB. WORKS FLEET DIV., GREENING DENVER’S FLEET 17, 20, <https://www.denvergov.org/content/dam/denvergov/Portals/705/documents/fleet/Greening%20the%20Fleet%20-%20May%2029%20updates.pdf> (last visited Aug. 17, 2018).

¹⁰¹ *Green Fleet Award Winners*, KY. CLEAN FUELS COALITION, <http://kentuckycleanfuels.org/projects/greenfleets/green-fleet-award-winners/> (last visited Aug. 18, 2018); *Waste Management Unveils \$30M RNG Facility in Louisville, Ky.*, WASTE 360 (June 6, 2018), <https://www.waste360.com/energy/waste-management-unveils-30m-rng-facility-louisville-ky>.

Downstate New York counties joined New York City in its use of biodiesel in home heating oil.¹⁰² “Legislation passed . . . by Assemblyman Steve Englebright (A.6954-A) and Senator Phil Boyle (S.B5422-A) . . . expand[ed] the state’s commitment to renewable energy by requiring heating oil sold in Nassau, Suffolk, and Westchester counties to contain at least five percent biodiesel (B5) by July 1, 2018.”¹⁰³ “‘By using more biodiesel in their heating oil New Yorkers will enjoy cleaner air, reduce harmful emissions, and experience an overall healthier environment,’ said National Biodiesel Board CEO Donnell Rehagen.”¹⁰⁴ A broad coalition of industry and environmental advocates backed the legislation because of the potential for environmental and public health benefits and job creation.¹⁰⁵ “New York City, the largest municipal consumer of heating oil in the country, has already taken advantage of biodiesel’s benefits by instituting a citywide 2 percent biodiesel requirement in October of 2012 that increase[d] to 5 percent.”¹⁰⁶ This five percent (5%) biodiesel blending requirement for the entire New York City Metropolitan Area consists of 70 percent of the state’s heating oil market.¹⁰⁷ Biodiesel comprises used cooking, soybean oil, and animal fat and can be used in current diesel engines without modification.¹⁰⁸

¹⁰² Cody Graham, *Downstate New York Poised to Lead the Way for Cleaner Home Heating*, BIODIESEL (June 23, 2017), <http://biodiesel.org/news/news-display/2017/06/23/downstate-new-york-poised-to-lead-the-way-for-cleaner-home-heating>.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* (“Biodiesel was the first alternative fuel designated as an ‘Advanced Biofuel’ by the U.S. Environmental Protection Agency and has been verified to reduce total greenhouse gas emissions by more than 50 percent compared to petroleum.”).

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ *Id.* While expressing his gratitude for the National Biodiesel Board’s “unwavering support of this vitally important legislative effort,” Kevin Rooney stated

The adoption of a 5 percent minimum biofuel blending requirement for all heating oil sold in the Downstate NY area heralds a new day for our industry. Our goal for the past four years has been to establish ULS-B5 as a uniform standard for cleanliness, efficiency, and environmental compatibility for the heating oil industry; and with the Governor’s expected signature, this goal will soon become a reality[.]

The Appalachian Regional Commission (“ARC”) provided a \$1.5 million grant to New York’s Alfred State College (“ASC”) to support its Biorefinery Development and Commercialization Center (“BDCC”) project to assist private and public partners’ efforts to use wood resources with advanced manufacturing processes.¹⁰⁹ ASC, the State University of New York, universities from other ARC states, as well as private-sector bioenergy and biochemical companies will use the facility.¹¹⁰ ARC and its network, including ASC, will offer support and education to coal-impacted businesses “to enter new markets, diversify their manufacturing base and adapt their workforce.”¹¹¹ “The facility is expected to contribute to the creation of 15 new businesses and help 125 workers gain skills or retain or gain employment.”¹¹²

Other innovative efforts include the first harvest of Cornell Cooperative Extension Marine Program’s pilot Peconic Estuary Seaweed Aquaculture Feasibility Study that is supported by funding from Suffolk County.¹¹³ The pilot initiative was created “to assess the feasibility of a commercial kelp business on Long Island, as well

Id. (quoting Kevin Rooney, CEO, Oil Heat Institute of Long Island).

¹⁰⁹ Erin Voegelé, *ARC Awards \$1.5 Million to Support Biorefinery Center at ASC*, ETHANOL PRODUCER MAG. (June 16, 2017), <http://www.ethanolproducer.com/articles/14435/arc-awards-1-5-million-to-support-biorefinery-center-at-asc>.

The award was part of \$15.7 million in grants made to 18 projects by the APC. The projects aim to help grow the economies in coal-impacted communities in seven Appalachian states. The awards were made through ARC’s Partnerships for Opportunity and Workforce and Economic Revitalization Initiative (POWER), a congressionally funded multi-agency strategy bringing federal resources directly to help communities and regions that have been affected by job losses in coal mining, coal power plant operations, and coal-related supply chain industries due to the changing economics of America’s energy production BDCC is a prototype facility that will develop and commercialize a process that extracts valuable chemical assets from wood and uses them to manufacture basic commodities and advanced materials, energy and biofuels.

Id.

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ Nicole Smith, *First Kelp Crop Harvested in Cornell Pilot Program*, RIVER-HEAD NEWS REV. (June 12, 2017, 6:00 AM), <http://riverheadnewsreview.timesreview.com/2017/06/81357/first-kelp-crop-harvested-cornell-pilot-program/>.

as to eliminate copious amounts of nitrogen in local bodies of water, including both Peconic and Gardiners bays[.]”¹¹⁴ Sugar kelp, a cold-water species, is produced from November to May, but climate change and atmospheric changes will impact the growing cycles.¹¹⁵ In the wild, kelp grows horizontally, but Cornell is growing the crop vertically to test the feasibility of different depths and, as a result, in different bodies of water to assess kelp’s optimal growing conditions.¹¹⁶

In Philadelphia, used cooking oil is helping to produce biofuels.¹¹⁷ A Philadelphia-based business entered into a 10-year agreement with JetBlue Airways to develop a mix of biofuel and jet fuel in a deal striving to limit the airline’s dependence on fossil fuels.¹¹⁸ Another biofuel plant is creating biosolids, including organic fertilizer.¹¹⁹ These types of private public partnerships are key to the success of biofuels in urban areas.

A company in Dallas uses feedstock and waste cooking oil to create biodiesel.¹²⁰ In Dallas, there is a biodiesel plant, which is currently operational, using waste vegetable oil owned by Dallas County Schools.¹²¹ Texas BioTech Inc. also has a biodiesel plant in

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ Rosella LaFevre & Sara Schwartz, *South Philadelphia Recycling Program Feed the Barrel Transforms Used Cooking Oil into Compost and Biofuel*, GRID MAG. (Apr. 14, 2014), <http://www.gridphilly.com/grid-magazine/2014/4/14/south-philadelphia-recycling-program-feed-the-barrel-transfo.html>.

¹¹⁸ Andrew Maykuth, *Philly Firm Signs 10-Year Deal to Provide Biofuel for JetBlue Aircraft*, INQUIRER (Sept. 19, 2016, 6:26 PM), <http://www.philly.com/philly/business/Philly-firm-signs-deal-to-provide-biofuel-for-JetBlue.html>.

¹¹⁹ *Philadelphia Renewable Bio-Fuels Facility Public Opening*, SYNAGRO (May 13, 2014), <http://www.synagro.com/2014/05/13/philadelphia-renewable-bio-fuels-facility-public-opening/>; see *Pennsylvania State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN. (July 19, 2018), <https://www.eia.gov/state/analysis.php?sid=PA>.

¹²⁰ Ron Kotrba, *Spotlight: Here to Serve the Biodiesel Industry*, BIODIESEL MAG. (Aug. 8, 2017), <http://www.biodieselmagazine.com/articles/2516107/spotlight-here-to-serve-the-biodiesel-industry>.

¹²¹ *Dallas County Schools*, BIODIESEL MAG., <http://www.biodieselmagazine.com/plants/view/5068> (last visited Aug. 17, 2018); Shelly Slater, *Used Cooking Oil Fuels Buses, Saving Tax Dollars*, DALLAS NEWS (Aug. 2011), <https://www.dallasnews.com/news/news/2011/08/18/used-cooking-oil-fuels-buses-saving-tax-dollars>.

Dallas, with the capacity of 3 MMgy, which uses waste vegetable oil and soybean oil.¹²² Houston has its own biodiesel plant as well, World Energy Biox Biofuels, which uses vegetable oil waste.¹²³

The Florida cities of Miami, Orlando, and St. Petersburg have consistently sought to create new innovative systems for biofuels from products such as soybean oil. Green Biofuels Miami LLC has a biodiesel plant, with the capacity of 4 MMgy, which utilizes used cooking oil.¹²⁴ St. Petersburg was the first designated Green City in the United States with energy alternative sources such as the Pinellas County Resource Recovery Plant, which transformed waste to energy through the burning of waste and provided electricity for approximately 45,000 homes.¹²⁵ In addition, Florida Biodiesel, Inc. offers consumers and commercial operators biodiesel kits and equipment for the production of biodiesel.¹²⁶ Because of Florida's existing agricultural production, land is available in outlying counties for

¹²² *Texas BioTech Inc.*, BODIESEL MAG., <http://www.biodieselmagazine.com/plants/view/5191> (last visited Aug. 17, 2018).

¹²³ Ron Kotrba, *90 MMgy Houston Biodiesel Plant Begins Operating at Full Capacity*, BODIESEL MAG. (Jan. 20, 2017), <http://www.biodieselmagazine.com/articles/2128469/90-mmgy-houston-biodiesel-plant-begins-operating-at-full-capacity>.

¹²⁴ *Green Biofuels Miami LLC*, <http://www.biodieselmagazine.com/plants/view/5096> (last visited June 26, 2018); see also *About Us*, GREEN BIOFUELS, <http://gbcorp.biz/corporate-profile/> (last visited Sept. 12, 2018).

¹²⁵ *St. Petersburg, Florida: America's First Designated Green City*, CITY OF ST. PETERSBURG, http://www.stpete.org/stpete/Discovery_Presentation.pdf. (last visited Aug. 17, 2018). Other green initiatives include the conversion of all traffic lights to LED's within the next two years, creating sixty-eight percent (68%) of energy savings. *Id.* Another plan includes and increasing use of solar power and converting the Bartow Power Plant to natural gas. *Id.*

¹²⁶ FLORIDA BODIESEL INC., <http://www.floridabiodieselincl.com/> (last visited Aug. 17, 2018) ("Some of its contributions include: the design of a solar powered biodiesel system, an "external heat exchanger" that is used on most plastic tanks biodiesel processors, a "cyclonic mixer" for superior transesterification, a "methanol recovery module" for pressure relied in the biodiesel processors and the "ECA-1 Hypochlorous acid manufacturing cell" that produces 350 gallons of hypochlorous acid every 24 hours.").

biofuel production.¹²⁷ There is similar arable land available for biomass development in other Southeastern U.S. states.¹²⁸ Yet the use of land for fuel instead of food is highly problematic.¹²⁹ Existing energy credits that are seeking to include wood-based biofuels as carbon neutral are also problematic.¹³⁰ Food security and climate change concerns are especially important to consider.¹³¹ The lax system for biofuel credits incentivizes operators to experiment without accounting for the broader environmental and social externalities.¹³²

B. Rural Systems

Having electricity spurs “rural economic activity and increases the quality of services available to meet basic business and domestic needs through improved lighting, labor saving devices, and access to information through TV, radio, and cellular telephones.”¹³³ The opportunity for increased economic development in rural areas from

¹²⁷ Robin Koestoyo, *Researchers Finding Biofuels Fits for Florida*, GROWING PRODUCE (Oct. 24, 2014), <https://www.growingproduce.com/vegetables/researchers-finding-biofuel-fits-for-florida/>.

¹²⁸ See Andrea Nocentini et al., *Biofuel Production and Soil GHG Emissions After Land-Use Change to Switchgrass and Giant Reed in the U.S. Southeast*, 7 FOOD & ENERGY SECURITY e00125 (2018), <https://onlinelibrary.wiley.com/doi/full/10.1002/fes3.125> (noting Southeastern states including Florida, Georgia, South Carolina, and Mississippi as having high “biomass supply potential . . . [and] high land availability too”).

¹²⁹ See Ximing Cai et al., *Land Availability for Biofuel Production*, 45 ENVTL. SCI. TECH. 334, 334 (2011) (discussing the pressure counties experience on land needed for food or other concerns as opposed to growing biomass for fuel).

¹³⁰ See John Upton, *E.U. Loophole Counts Wood Energy as “Carbon Neutral.” It’s Not.*, GRIST (Jan. 1, 2017) <https://grist.org/article/e-u-loophole-counts-wood-energy-as-carbon-neutral-its-not/>.

¹³¹ A test was conducted by New Generation Biofuels Holdings Inc., which produced fuel from biodiesel feedstock. The purpose of the test was to provide data to be used in additional biofuel research. By injecting biofuel in its pure form into the boiler, where it was then co-fired with natural gas in order to compare its efficiency to other technologies currently used. See Ryan C. Christiansen, *Florida Utility Tests New Generation Biofuel*, BIODIESEL MAG. (Mar. 12, 2009), <http://www.biodieselmagazine.com/articles/3333/florida-utility-tests-new-generation-biofuel>.

¹³² See Evan Halper, *Loosely Regulated Market for Biofuel Credits Spurs Speculators and Swindlers*, L.A. TIMES (Mar. 26, 2018, 3:00 AM), <http://www.latimes.com/politics/la-na-pol-fuel-renewables-20180326-story.html> (discussing the vulnerabilities of the underregulated market for biofuel credits).

¹³³ Casillas & Kammen, *supra* note 38, at 1181.

biofuel development, production, and generation is a way to move the economy to maximize agricultural outputs.¹³⁴

The Plains States have expanded new technologies to maximize biofuel production.¹³⁵ Iowa is leading the charge for advanced biofuel production because of its historic role in conventional biofuel production.¹³⁶ Using waste cooking oil, non-edible plants, and plant fiber would be ideal ways to expand these systems in rural areas as well as urban areas. Larger partnerships between urban and rural systems could expand the development of advanced biofuels regionally and nationally. With the highest production in the nation of both corn and ethanol, Iowa can produce four billion gallons of ethanol per year (one-quarter of the nation's ethanol production capacity).¹³⁷

There are 15 operating biofuel facilities in Kansas, which ranks fourth in biomass production, with a combined permitted capacity of over 525 million gallons a year.¹³⁸ The state is "investing in collaborative bioenergy research to bring cellulosic ethanol solutions to the marketplace using non-food sources such as switchgrass, corn fiber and sorghum."¹³⁹ "The State of Kansas offers a diverse portfolio of financial incentives to Kansas businesses and producers engaged in conventional and renewable energy production. State tax credits are available for projects that convert waste heat or biomass

¹³⁴ *Id.*

¹³⁵ *Nebraska's Biodiesel Production Capacity*, OFFICIAL NEB. GOV'T WEBSITE (Oct. 12, 2016), <http://www.neo.ne.gov/statsthtml/138.htm>.

¹³⁶ *See* U.S. DEP'T OF ENERGY, BENEFITS OF BIOFUEL PRODUCTION AND USE IN IOWA (Sept. 2015), https://www.energy.gov/sites/prod/files/2015/10/f27/iowa_biofuels_benefits.pdf (discussing how Iowa's existing biomass infrastructure is being utilized to develop advanced biofuels).

¹³⁷ *Iowa State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN. (Mar. 15, 2018), <https://www.eia.gov/state/analysis.php?sid=IA>. Iowa has less than ten biodiesel plants with a yearly production capacity of more than 350 million gallons (second highest after Texas). *Id.*

¹³⁸ *Kansas Alternative Energy*, KAN. DEP'T OF COM. http://www.kansascommerce.com/DocumentCenter/View/3172/KS_alternative_energy?bidId (last visited Aug. 17, 2018). Abengoa Bioenergy will develop its first commercial-scale hybrid biomass plant in Kansas. *Id.*

¹³⁹ *Id.* ("Other initiatives include the Kansas Bioenergy and Biorefining Center of Innovation, which unites key industry players such as Archer Daniels Midland with the world-class research and development efforts at the University of Kansas and Kansas State University. The Center for Environmentally Beneficial Catalysis at KU is also involved in various research initiatives targeting biomass materials as alternative feedstocks for conversion into biofuels.").

to energy or otherwise offset local power usage via renewable sources.”¹⁴⁰

Vermont has the potential to produce sustainable biofuel to meet up to thirty percent (30%) of its current demand by the year 2025, because biodiesel has been established as a “mainstream” replacement or additive to diesel in order to reduce fossil fuel consumption.¹⁴¹ As an important note, Vermont does not have corn-based ethanol production.¹⁴² Vermont has been seeking out a wide range of advanced biofuels for long-term use and small-scale use. For example, farmers, researchers, and entrepreneurs are building bioenergy alternatives—such as the use of oilseeds (soybean, sunflower, and canola), grass (abandoned pasture), and algae—that are sustainable, cost-effective, and community-focused.¹⁴³

III. SYNERGIES AND RECOMMENDATIONS

The environmental justice dimensions of biofuels are underexplored between the urban and rural; however, they have been discussed in the international context more generally.¹⁴⁴ This Section explores ways to create broader synergies to expand biofuel governance regimes through the existing RFS system and international guidelines for biofuels and crops. The aforementioned background

¹⁴⁰ *Id.* (“Numerous development incentives, including incentive payments, income tax credits, sales tax exemptions, financial assistance for training and property tax exemptions are available to producers, retail dealers and individuals that utilize alternative energy sources.”).

¹⁴¹ *Biofuels*, RENEWABLE ENERGY VT. (July 2014), <http://www.revermont.org/technology/bioenergy/biofuels/>.

¹⁴² *Id.*

¹⁴³ *Local Production for Local Use*, VT. BIOENERGY INITIATIVE, <http://vermontbioenergy.com> (last visited Aug. 17, 2018).

¹⁴⁴ See Hyungtae Kim et al., *Biofuels, Land Use Change, and Greenhouse Gas Emissions: Some Unexplored Variables*, 43 ENVTL. SCI. TECH. 961, 966 (2009); see also Timothy Searchinger et al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change*, 319 SCI. 1238, 1238 (2008); see generally Joseph Fargione et al., *Land Clearing and the Biofuel Carbon Debt*, 319 SCI. 1235 (2008) (discussing the potential greenhouse gas advantages and disadvantages of converting global ecosystems to produce biofuels from various materials).

of urban and rural systems of biofuels and the theoretical underpinning of dual and energy commodification show how political economies can be rebuilt for resiliency.¹⁴⁵

Natural resource scarcity is not a fleeting phenomenon, but a pressing concern for environmental security and human security.¹⁴⁶ Conflict and security expert Rita Floyd addressed concerns about environmental security. “Informed by the idea that the environment is a necessary requirement for human well-being, the question whether or not global environmental issues should be dealt with by those in power can easily be answered with a ‘yes.’”¹⁴⁷ However, there are several different views on securitization and desecuritization and outcomes vary according to several different factors.¹⁴⁸ The same way biofuels vary in terms of their environmental and social impacts and energy outputs, environmental security varies for the different types of biofuels. Advanced biofuels offer greater environmental security outcomes than petroleum.¹⁴⁹ Determining negative environmental externalities and their costs can suffer from methodological shortcomings.¹⁵⁰

Because bioenergy statutes have failed to offer concrete definitions, the Roundtable on Sustainable Biofuels sought to establish an indirect impacts system for the European Union based on food security and land use impacts for carbon emissions.¹⁵¹ The Global Bioenergy Partnership (“GBEP”) was created as international guidance for land management to limit “competition between food and energy biomass cropping [and] has issued a set of indicators for sustainability that include assessments of several potential land use

¹⁴⁵ See *supra* Part II.

¹⁴⁶ Jody M. Endres, *Bioenergy, Resource Scarcity, and the Rising Importance of Land Use Definitions*, 88 N.D. L. REV. 559, 561–62 (2012).

¹⁴⁷ RITA FLOYD, SECURITY AND THE ENVIRONMENT: SECURITISATION THEORY AND U.S. ENVIRONMENTAL SECURITY POLICY 185 (2010) (punctuation corrected).

¹⁴⁸ *Id.* at 174 (describing how Floyd’s case studies of the U.S. environmental security policies under the Clinton and Bush administrations indicate that “not all securitisations are the same, but that securitisations differ in terms of who or what they benefit, ergo in their outcomes” and “desecuritisation does not always lead to politicization, but . . . can lead to depoliticisation instead.”).

¹⁴⁹ Kim et al., *supra* note 144, at 961.

¹⁵⁰ BENJAMIN K. SOVACOOOL & MICHAEL H. DWORKIN, GLOBAL ENERGY JUSTICE 147 (2014).

¹⁵¹ Endres, *supra* note 146, at 569–70.

change impacts, including the extension of agriculture onto currently unused land.”¹⁵² The United Nations Environmental Program (“UNEP”) looks at issues of land degradation related to fertilizers, pesticides, irrigation, and land use.¹⁵³ The United Nations Food and Agricultural Organization (“FAO”) coincides with UNEP’s evaluation based on farming practices, irrigation, deforestation, and industrial activities.¹⁵⁴

In Europe, several governments have ended their “across-the-board biofuel subsidies,” likely because of overstated environmental and economic benefits.¹⁵⁵ Britain, France, Germany, the Netherlands, Switzerland, Australia, and Canada have limited or updated incentives for biofuel growers and/or refiners.¹⁵⁶ The new guidelines mandate that manufacturers and sellers enumerate the net environmental impacts of a biofuel prior to eligibility for subsidies.¹⁵⁷ This idea is at the heart of contention in the United States, where agricultural states are keen to keep all sorts of subsidies even if there are negative impacts to public health and land use. Individuals with concentrated resources and strong ties to influential political groups are able to negotiate better tax and zoning incentives at the expense of the broader population.¹⁵⁸ In turn, communities of color, indigenous

¹⁵² *Id.* at 570–71.

¹⁵³ *Id.* at 571.

¹⁵⁴ *Id.* (“The Food and Agricultural Organization recognizes, however, that not all agricultural practices degrade land, and instead provide valuable phytoremediation, bioremediation, natural regeneration and accelerated natural regeneration, and enrichment planting that can counteract degradation. Thus, the definition of degraded lands used by any bioenergy statute to counteract the negative indirect effects of biomass cropping should also take into account its rehabilitative benefits.”).

¹⁵⁵ Guy R. Knudsen, *Biofuels: The Environmental Downside*, ABA AGRIC. MGMT. COMMITTEE NEWSL., Jan. 2010, at 13, 15 (“For example, the Netherlands recently decided to no longer subsidize the importation of palm oil, a major source of “green” electricity generation, after it was realized that the supplying Asian plantations were largely being created from drained peat lands, with severe environmental consequences.”).

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ See Steve Byas, *Ethanol Supporters Fight to Keep Government Regulations*, NEW AMERICAN (Oct. 4, 2018), <https://www.thenewamerican.com/economy/markets/item/27033-ethanol-supporters-fight-to-keep-government-regulations> (discussing the influence of the ethanol lobby on U.S. government regulations despite being unpopular with the consuming public).

groups, and low-income populations are caught in the fray of a national energy policy to benefit the wealthy and elite biofuel producers and refiners.¹⁵⁹ The geographic middle of America is leading the conversation on biofuels for the consumers of energy, who are located in primarily urban areas near and in coastal communities.¹⁶⁰

Further, biofuels are a prime example of the conflict between sustainable development and the environment. The link between the General Agreement on Tariffs and Trade (“GATT”) and the guiding principles of trade-related sustainable development is deliberate to allow for “a more efficient allocation and use of resources, and contributes to an increase in production and incomes, and therefore to lessening demands on the environment.”¹⁶¹ Aside from regional agreements and guidance for international legal norms, there is no uniform policy for biofuels.¹⁶² This predicament is due to the varied types of biofuels in multiple locations and competing industry and environmental interests.¹⁶³

When the Arab members of the Organization of Petroleum Exporting Countries (“OPEC”) decided to exercise natural resource sovereignty, energy prices in the United States spiked in 1973, leading the quest for alternative energy sources, including renewables.¹⁶⁴ However, price volatilities in the energy markets and microeconomic conditions would lead to mixed results for the renewable energy sector in the 1980s and 1990s.¹⁶⁵ Further, consumers and automakers had less of an appetite for fuel efficiency when oil prices fell, leading to a loss of momentum in the United States energy independence movement.¹⁶⁶ Prior to the headlong fall of the Global

¹⁵⁹ *See id.*

¹⁶⁰ *See supra* Part II.

¹⁶¹ GARY SAMPSON, *THE WTO AND SUSTAINABLE DEVELOPMENT* 23 (2005) (ebook).

¹⁶² Giovanni Sorda et al., *An Overview of Biofuel Policies Across the World*, 38 *ENERGY POL’Y* 6977, 6977 (2010).

¹⁶³ *See generally id.* at 6979–86 (comparing biofuel policies in countries in North America, Europe, Asia, and Australia).

¹⁶⁴ *Energy Crisis (1970s)*, HIST. (Aug. 21, 2018), <https://www.history.com/topics/1970s/energy-crisis>.

¹⁶⁵ *See* Eric Martinot et al., *Renewable Energy Policies and Markets in the United States* 3–5 (Oct. 28, 2014) (unpublished manuscript) http://www.martinot.info/Martinot_et_al_CRS.pdf.

¹⁶⁶ Brad Plumer, *Why Gas Mileage Has Barely Budgeted Since 1980*, WASH. POST (Jan. 5, 2012), <https://www.washingtonpost.com/blogs/ezra-klein/post/>

Financial Collapse of 2008 and in the waning days of his administration, President George W. Bush signed the Energy Independence and Security Act of 2007 (“EISA”)¹⁶⁷ which aims to

move the United States toward greater energy independence and security; increase the production of clean renewable fuels; protect consumers; increase the efficiency of products, buildings, and vehicles; promote research on and deploy greenhouse gas capture and storage options; improve the energy performance of the Federal Government; and increase U.S. energy security, develop renewable fuel production, and improve vehicle fuel economy.¹⁶⁸

Economist Peter Grossman summed up the EISA as “energy independence, largely through an ethanol/biofuel technological panacea, some conservation, and something toward addressing climate change, especially advanced technological carbon capture and a storage program from combustion of coal[.]”¹⁶⁹ EISA was an attempt to do something to counter price volatilities at the advent of the Global Financial Collapse of 2008.¹⁷⁰ Yet as the EISA was enacted, a downward financial spiral led to inflated biofuel prices, which incentivized U.S. oil and gas production and agriculture and forest biofuel development and use.¹⁷¹ EISA was a lost opportunity for advanced biofuels.

Satisfying global transport-sector energy needs while decreasing hydrocarbon consumption necessitates “a combination of greater fuel efficiency and increased use of carbon-free or carbon-neutral

where-did-the-missing-fuel-efficiency-go/2012/01/05/gIQA9UcmcP_blog.html?noredirect=on&utm_term=.33c3a0de16d6.

¹⁶⁷ See generally Energy and Independence Security Act of 2007, 42 U.S.C. §§ 17001–17386 (2018).

¹⁶⁸ *Summary of the Energy Independence and Security Act*, EPA, <https://www.epa.gov/laws-regulations/summary-energy-independence-and-security-act> (last visited Aug. 16, 2018).

¹⁶⁹ PETER GROSSMAN, U.S. ENERGY POLICY AND THE PURSUIT OF FAILURE 309–10 (2013) (ebook).

¹⁷⁰ *Id.* at 307–09.

¹⁷¹ *Id.* at 309; *Alternative Fuels Data Center*, U.S. DEP’T OF ENERGY (June 2018), <https://www.afdc.energy.gov/fuels/prices.html>.

technologies.”¹⁷² Climatologist Michael Mann and geoscientist Lee Kump predict that within one to two decades biofuels could satisfy five to ten percent (5-10%) of the total transport energy demand.¹⁷³ Mann and Kump’s assertions do not fully address the divide between the Global South and the Global North. Even at the most basic level, this difference in natural resources is paramount to assess. The science of climate change is a Global North academic enterprise in contrast to Global South concerns for survival and development.¹⁷⁴ As sociologist Ghassa Hage argues, the “need for excessive exploitation” shows

the social roots of the need to fluctuate between bi-
opower and the fostering of life on one hand, and ne-
cropolitics on the other: it is not just that we have the
ecologically suicidal, and colonially violent, illegal
and discriminatory society on one hand and the eco-
logically sustainable, lawful, egalitarian and demo-
cratic society on the other. It is that the former has to
be continually revisited as the material condition of
possibility of the latter.¹⁷⁵

Neither U.S. environmental policy nor energy policy considers the impact on the Global South in the quest for U.S. energy independence. EISA reinforced the energy reduction goals for federal agencies, as stated in Executive Order 13423, and introduced more

¹⁷² MICHAEL MANN & LEE KUMP, DIRE PREDICTIONS: UNDERSTANDING CLIMATE CHANGE 175 (2015).

¹⁷³ *Id.*

¹⁷⁴ See SAMPSON, *supra* note 161, at 20–21.

¹⁷⁵ GHASSAN HAGE, IS RACISM AN ENVIRONMENTAL THREAT? 58 (2017). Tayyab Mahmud, Athena Mutua, and Francisco Valdes argue that [w]hile contradiction is no surprise in law, these are times of extreme social contradiction driven, in great measure, by unjust acts of law. This corrosive zeitgeist of suppressive contradiction is evidenced across society in myriad everyday ways determined largely by backlash policy and politics. Wealth is up, as is poverty, exacerbating age-old patterns of socio-economic identitarian stratification.

Tayyab Mahmud, Athena Mutua & Francisco Valdes, *Latcrit Praxis @ XX: Toward Equal Justice in Law, Education and Society*, 90 CHI.-KENT L. REV. 361, 362 (2015).

aggressive requirements.¹⁷⁶ Therefore, as indicated in Part II, United States cities bear a greater burden of designing and implementing sustainable biofuels policies in the walls of their municipalities.¹⁷⁷ Cities carry the torch of the United Nations Sustainable Energy for All Initiative.¹⁷⁸ For example, by the end of 2018, London's Square Mile will source 100% of its electricity needs from renewable energy sources, making London one of the world's leading climate and environmentally friendly cities with the use of solar panels and wind and solar farm installations.¹⁷⁹

The United Nations "Sustainable Energy for All" Initiative has a tripartite goal for "1) universal access to modern energy services,

¹⁷⁶ *Summary of the Energy Independence and Security Act*, *supra* note 168 (discussing the three key provisions of the EISA are the Corporate Average Fuel Economy Standards, the Renewable Fuel Standard, and the appliance/lighting efficiency standards). "EPA was committed to developing, implementing, and revising both regulations and voluntary programs under the following subtitles in EISA, among others: Increased Corporate Average Fuel Economy Standards; Federal Vehicle Fleets; Renewable Fuel Standard; Biofuels Infrastructure; and Carbon Capture and Sequestration." *Id.* See also Energy and Independence Security Act of 2007, 42 U.S.C. §§ 17001–17386 (2018).

¹⁷⁷ See *supra* Part II.

¹⁷⁸ See *About Us*, SUSTAINABLE ENERGY FOR ALL, <https://www.seforall.org/about-us> (last visited Sept. 12, 2018).

¹⁷⁹ Joshua S. Hill, *City of London to Source 100% Renewable Electricity for Square Mile*, CLEAN TECHNICA (June 15, 2018), <https://cleantechnica.com/2018/06/15/city-of-london-to-source-100-renewable-electricity-for-square-mile/>. Clean Technica reports that

the Greater London area has been one of the leading forces for change in the world, implementing countless policy changes covering a broad range of issues such as electric vehicles, more green spaces, and clean energy. New electric taxi's and buses are commonplace across the city and the city's Mayor, Sadiq Khan, announced [in December 2017] his intention to expand the Ultra-Low Emission Zone to include London-wide buses, coaches, and lorries, as well as expanding the Zone to include North and South circular roads for all vehicles. Mayor Khan is also pioneering efforts to make London the world's first National Park City with plans to increase the number of trees and green infrastructure around the city.

Id.

2) doubled rates of energy efficiency, and 3) doubled shares of renewable energy in the global energy mix”—all by 2030.¹⁸⁰ This determined momentum for renewables is driven by fears of climate change and long term aspirations for sustainable energy.¹⁸¹ Marc Tizoc Gonzalez terms the broader understanding of the socio-legal struggle as *lagran lucha* (the great struggle).¹⁸² The Sustainable Energy for All Initiative is just one way in which smaller actors can “transcend the current nation state” to effectuate sustainable development. Former UN Secretary-General Ban Ki-moon promotes the push for sustainable energy enterprises, while the Sustainable Energy for All Initiative realizes the central role energy plays in development.¹⁸³ The struggle for Sustainable Energy for All is a global concern. The entire world needs energy to sustain itself.

The transformative resource potential of biomass is considerable in various forms, including “conver[sion] to liquid biofuel for transport, us[age] to power electric vehicles, or combust[ion] to pro-

¹⁸⁰ Nadia B. Ahmad, “Turn on the Lights”—Sustainable Energy Investment and Regulatory Policy: Charting the Hydrokinetic Path for Pakistan, 5 WASH. & LEE J. ENERGY, CLIMATE & ENV’T 165, 217 (2013) [hereinafter Ahmad, “Turn on the Lights”] (discussing U.N. Secretary-General, *A Vision Statement by Ban Ki-moon: Sustainable Energy for All*, SUSTAINABLE ENERGY FOR ALL (Nov. 2011), https://www.seforall.org/sites/default/files/1/2014/02/SG_Sustainable_Energy_for_All_vision.pdf) (Ki-moon states the need for proper incentives, including supportive policy, legal, and institutional frameworks as well as public-sector engagement, public-private partnerships, sustainability policies, elimination of fossil fuel subsidies, and support for sustainable energy industries and their entrepreneurs).

¹⁸¹ Ahmad, “Turn on the Lights,” *supra* note 180, at 217.

¹⁸² Marc-Tizoc Gonzalez, *Critical Ethnic Legal Histories: Unearthing the Interracial Justice of Filipino American Agriculture Labor Organizing*, 3 U.C. IRVINE L. REV. 991, 1012 (2013) (discussing how “[r]esearching and writing critical ethnic legal histories can promote the understanding that our pasts are not merely multicolored: rather, our diverse heritages wind through centuries of socio-legal struggle, which transcend the current nation state.”).

¹⁸³ *Id.*

duce heat and power for a variety of industrial, residential and commercial applications.”¹⁸⁴ The potential to boost fuel and food potential simultaneously exists through biofuels from agricultural residues, food waste, forest cultivation, and algae¹⁸⁵:

Multiplying the tons of each crop in each country by tons of harvest and processing residue per ton of crop, some 161 EJ of agricultural residue was generated worldwide in 2010. Taking 25% to 50% of harvest residue and 90% of processing residue, 55 to 90 EJ could have been used. With projected growth in food supply, assuming that the mix of crops is constant, available agricultural residue could reach 79 to 128 EJ by 2050.¹⁸⁶

Food waste occurs in losses in agricultural production, postharvest handling and storage, processing and packaging, retail distribution, and consumption.¹⁸⁷ Available data shows that the total percentage and tonnage of lost or wasted food can be determined for each food group, indicating that “442 million Mha [hectares] of land could be freed up in 2050 by eliminating losses and waste from crops directly consumed as food, and another 340 Mha could be made available by eliminating losses and waste of meat and dairy products.”¹⁸⁸ “Extension services and capacity building could help improve harvesting techniques, local health regulations could require better packag-

¹⁸⁴ *Boosting Biofuels: Sustainable Paths to Energy Security*, IRENA, 1, 8 (2016), <http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=1721>.

¹⁸⁵ *See id.* at 5; Jeffrey Skeer & Shunichi Nakada, *Potential for Biomass and Biofuel through Sustainable Intensification of Agriculture and Reduction of Food Losses and Waste*, 7 NAT. RESOURCES 23, 23 (2016), http://file.scirp.org/pdf/NR_201601141443170.pdf.

¹⁸⁶ Skeer & Nakada, *supra* note 185, at 24; *SAVE FOOD: Global Initiative on Food Loss and Waste Reduction*, FOOD AND AGRIC. ORG. OF THE UNITED NATIONS, <http://www.fao.org/3/a-i4068e.pdf> (last visited Aug. 17, 2018); *see generally* Edward M.W. Smeets et al., *A Bottom-Up Assessment and Review of Global Bio-energy Potentials to 2050*, PROGRESS IN ENERGY AND COMBUSTION SCI. 88–91 (2007).

¹⁸⁷ JENNY GUSTAVSSON ET AL., FOOD AND AGRIC. ORG. OF THE UNITED NATIONS, *GLOBAL FOOD LOSSES AND FOOD WASTE 2* (2011).

¹⁸⁸ *Boosting Biofuels*, *supra* note 184, at 18.

ing, and development assistance could help build better infrastructure.”¹⁸⁹ Additionally, “wood harvest residues [, which] include twigs, branches, tops, and stumps” remaining from logging trees, can be used as biofuel resources.¹⁹⁰ “[C]ollecting a quarter of harvest residues and three quarters of process residues and waste” could be obtained to produce 30 EJ of bioenergy.¹⁹¹ Finally, costs associated with algae biofuels can improve with advancements in technology and market changes, which will be further enhanced by the use of algae for the treatment of wastewater, remediation of contaminated ponds and streams, and carbon capture.¹⁹² Approximately 90 EJ of oil could be harvested from algae curated in open ponds and arid land filled with saltwater.¹⁹³

The International Renewable Energy Agency (“IRENA”) is a UN-affiliated organization established in 2009 to support countries in their transition to a sustainable energy future that serves as the principal platform for international cooperation and a

repository of policy, technology, resource and financial knowledge of renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar, and wind energy, in the pursuit of sustainable development, energy access, energy security, and low-carbon economic growth and prosperity.¹⁹⁴

The energy sector is undergoing some of its most transformative changes since the Industrial Revolution.¹⁹⁵ The changing landscape

¹⁸⁹ Skeer & Nakada, *supra* note 185.

¹⁹⁰ *Boosting Biofuels*, *supra* note 184, at 22.

¹⁹¹ *Id.*

¹⁹² *Id.* at 27.

¹⁹³ Anouk Florentinus et al., *Worldwide Potential of Aquatic Biomass*, ECOFYS (Mar. 2014), <https://www.ecofys.com/files/files/ecofys-2008-worldwide-potential-of-aquatic-biomass-revision-2014.pdf>.

¹⁹⁴ MASDAR INST. OF SCI. AND TECH. & INT’L RENEWABLE ENERGY AGENCY, RENEWABLE ENERGY PROSPECTS: UNITED ARAB EMIRATES, at i (2015) http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_REmap_UAE_report_2015.pdf [hereinafter RENEWABLE ENERGY PROSPECTS].

¹⁹⁵ See Malcolm Keay, *Energy: The Long View*, Oxford J. for Energy Stud., Oct. 2007, at 1, 28–29 (discussing trends and changes in the energy sector since

of energy policy, climate agenda, and business model modifications ramped up energy technology and provides the energy sector a unique moment to decarbonize. IRENA's vision is not short of ambition. IRENA's REmap 2030 is a global roadmap for doubling the share of renewable energy mix by 2030.¹⁹⁶ There are hopes that this can be achieved with higher renewable energy uptake, increased access to modern energy services, and improvements in energy services.¹⁹⁷

CONCLUSION

So many of our dreams at first seem impossible, then they seem improbable, and then, when we summon the will, they soon become inevitable. If we can conquer outer space, we can conquer inner space, too.

— Christopher Reeve¹⁹⁸

the Industrial Revolution). “It is not just the fuels themselves which have changed fundamentally over time; it is also the energy services being provided. The trend involves not just an increasing demand for familiar services but the development (and rapid growth) of new services, many of them previously unknown.” *Id.* at 29.

¹⁹⁶ RENEWABLE ENERGY PROSPECTS, *supra* note 194, at iii.

¹⁹⁷ *See id.* at 1–2 (describing the report's finding of the “potential for higher renewable energy uptake in a variety of countries and markets,” and advances in energy technology); IRENA, REMAP 2030 FULL REPORT 1 (2014) http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/IRENA_REmap_Report_June_2014.pdf (noting “universal access to modern energy services” as an objective of Sustainable Energy for All and IRENA); *see also* Tyler Hamilton, *After Paris, It's Finally Time for Canada to Join IRENA*, CLEAN BREAK (Jan. 14, 2016), <http://www.cleanbreak.ca/2016/01/14/after-paris-its-time-for-canada-to-finally-join-irena/> (discussing IRENA's establishment to promote awareness and growth of renewable energy technology on a global stage and the idea for IRENA as a “counter-balance to existing agencies that have long represented the fossil fuel and nuclear industries.”). While the idea IRENA is based upon was formulated in 1981, another quarter century would be needed to gain political traction for the agency. *Id.* “By 2016, 145 countries have officially joined IRENA and another 30 are in the process of becoming members. That would bring the total to 175. By comparison, the 42-year-old International Energy Agency has only 29 members, while the 59-year-old International Atomic Energy Agency has 167 members.” *Id.*

¹⁹⁸ CHRISTOPHER REEVE, NOTHING IS IMPOSSIBLE: REFLECTIONS ON A NEW LIFE 84 (2002).

Christopher Reeve, the actor who portrayed the character Superman, made these remarks in his autobiography.¹⁹⁹ The exact location of Superman's Metropolis is somewhat of mystery. Some have speculated that Metropolis is Chicago and Gotham City is New York.²⁰⁰ Comic book writers Frank Miller and John Byrne have said, "Metropolis is New York by day; Gotham City is New York by night."²⁰¹ Others have turned to evidence of a map in a DC Comic Book stating that Metropolis is Delaware and Gotham City is New Jersey.²⁰² Regardless of where Metropolis may actually be located, the idea of a metropolitan city with clean air and clean water are part of the lore of Metropolis.

The clean energy systems of the city of the future, of Metropolis, will produce energy efficiency and will use advanced biofuels to make the transition to electrification through wind and solar power. The current political climate nationally in the United States overlooks the transformative potential of renewables. If the rest of the world is racing ahead in pursuit of advanced renewable technologies, the United States, which considers itself the leader of the free world, must also take the helm in renewable energy technology. Metropolis balances its energy needs for its citizens with its food security considerations.²⁰³ Biofuels are needed for the transition to a clean energy future. Currently, biofuels account for approximately

¹⁹⁹ *Id.*

²⁰⁰ See, e.g., Bat-Archivist, *Where Is Superman's Metropolis?*, GOTHAM ARCHIVES, <http://batmangothamcity.net/where-is-supermans-metropolis/> (last visited Sept. 7, 2018) (noting the author's belief that Metropolis is Chicago and Gotham City is New York).

²⁰¹ Barry Popik, *Metropolis is New York by Day; Gotham City is New York by Night*, BIG APPLE (Mar. 28, 2008), https://www.barrypopik.com/index.php/new_york_city/entry/metropolis_is_new_york_by_day_gotham_city_is_new_york_by_night/.

²⁰² See *Gotham City in New Jersey? Metropolis in Delaware?*, DIVERSE TECH GEEK (Oct. 7, 2013), <https://www.diversetechgeek.com/2013/10/07/gotham-city-new-jersey-metropolis-delaware/>.

²⁰³ See GOV'T OFFICE FOR SCI., *THE FUTURE OF FOOD AND FARMING: CHALLENGES AND CHOICES FOR GLOBAL SUSTAINABILITY* 37 (2011), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/288329/11-546-future-of-food-and-farming-report.pdf ("Food production and the food system must assume a much higher priority in political agendas across the world. To address the unprecedented challenges that lie ahead the food system needs to change more radically in the coming decades than ever before, including during the Industrial and Green Revolutions.").

ten percent of energy.²⁰⁴ For a clean energy future, that amount will have to be closer to fifty percent as we scale up use of wind and solar power.²⁰⁵

²⁰⁴ Susanne Retka Shill, *IEA Task40: Biomass Provides 10 Percent of Global Energy Use*, ETHANOL PRODUCER MAG. (Sept. 19, 2013), <http://www.ethanolproducer.com/articles/10250/iea-task40-biomass-provides-10-percent-of-global-energy-use>.

²⁰⁵ See Thomas Foust & Matthew Yung, *Advanced Biofuels: Weaning Clean Energy Off Corn*, ASME (Mar. 2011), <https://www.asme.org/engineering-topics/articles/renewable-energy/advanced-biofuels-weaning-clean-energy-off-corn>.