

# SUSTAINABILITY, COMMON CONCERN, AND PUBLIC GOODS

RAFAEL LEAL-ARCAS\*

## INTRODUCTION

Sustainability is a necessity for the twenty-first century. Given the urgency of the issue, scientists have proposed concepts such as “planetary boundaries” to define a “safe operating space for humanity”<sup>1</sup> to continue to thrive for years to come.<sup>2</sup> The concept of planetary boundaries is based on scientific research that indicates that, since the Industrial Revolution at the end of the eighteenth century and beginning of the nineteenth century, human activity has gradually become the main driver of global environmental degradation.<sup>3</sup>

A related concept—sustainable development—was coined by the Brundtland Commission<sup>4</sup> in a report titled *Our Common Future*.<sup>5</sup>

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\* Jean Monnet Chaired Professor in E.U. International Economic Law and Professor of Law, Queen Mary University of London (Centre for Commercial Law Studies); Editor-in-Chief, *Renewable Energy Law and Policy Review*. Member, Madrid Bar. Ph.D. 2008, European University Institute; J.S.M. 2002, Stanford Law School; LL.M. 2001, Columbia Law School; M.Phil. 1999, London School of Economics and Political Science; J.D. 1996, Granada University; B.A. 1994, Granada University. Some of the ideas in this Article have benefited from my participation in the first Yale Sustainability Leadership Forum, which took place in September 2016 at Yale University. I am very grateful to all the forum participants for lively discussions on the topic. I also benefited from my stint at Sustainable Energy for All, Washington, D.C. I am grateful to Thomas Schoenbaum, Rachel Kyte, and Jane Ebinger for stimulating discussions. The financial help from two E.U. Horizon 2020 grants is greatly acknowledged: Jean Monnet Chair in E.U. International Economic Law (project number 575061-EPP-1-2016-1-UK-EPPJMO-CHAIR) and the WiseGRID project (number 731205). I am grateful to Mariya Peykova for excellent research assistance.

1. Johan Rockström et al., *Planetary Boundaries: Exploring the Safe Operating Space for Humanity*, 14 *ECOLOGY & SOC'Y* 32, 33 (2009).

2. *Planetary Boundaries Research*, STOCKHOLM RESILIENCE CENTRE, <http://www.stockholmresilience.org/research/planetary-boundaries.html> (last visited July 11, 2017) [<https://perma.cc/HME9-TBNR>].

3. Rockström, *supra* note 1.

4. Formally known as the World Commission on Environment and Development, the Brundtland Commission was created to persuade countries to aim at sustainable development. World Comm'n on Env't & Dev., *Our Common Future*, Annex 2, U.N. Doc. A/42/427 (1987), available at <http://www.un-documents.net/our-common-future.pdf> [<https://perma.cc/KPK5-CH3Y>].

5. *Id.* at 1.

The concept has three main pillars. First, sustainable development recognizes that part of the environmental challenge is poverty.<sup>6</sup> For example, in certain communities where cooking fuels are unavailable, one needs to cut down a tree to prepare a meal. Second, an integrated approach to sustainable development is important.<sup>7</sup> One of the objectives of the Brundtland Commission was to raise awareness that the various areas (now goals) of sustainable development cannot be addressed in clinical isolation.<sup>8</sup> And third, intergenerational ethics apply to sustainable development.<sup>9</sup> Traditionally, a short-term approach to issues has been rewarded, as opposed to a long-term approach.

In 2005, one scholar predicted humanity's top ten problems for the next fifty years<sup>10</sup> as follows: (1) energy, (2) water, (3) food, (4) the environment, (5) poverty, (6) terrorism and war, (7) disease, (8) education, (9) democracy, and (10) population.<sup>11</sup> This prediction was based on the fact that in 2004 the world population was 6.5 billion, and in 2050 it is expected to be ten billion.<sup>12</sup> However, new predictions are that world population will be eleven billion by 2050.<sup>13</sup>

Given that energy is one of humanity's main challenges, in February 2015, the European Commission launched the Framework Strategy for a European Energy Union,<sup>14</sup> a project that envisages a resilient "Energy Union"<sup>15</sup> with a forward-looking climate change

6. *Id.* at Overview, ¶ 8.

7. *Id.* pt. 1, chp. 1, ¶ 42.

8. *Id.* pt. 1, chp. 2, ¶ 10.

9. *Id.* pt. 1, chp. 2, ¶ 76.

10. See generally Prashant V. Kamat, *Energy Challenge and Nanotechnology*, Presentation, 1, <http://www3.nd.edu/~pkamat/pdf/energy.pdf> (last visited July 11, 2017) (referencing humanity's top ten problems for the next 50 years, as identified by Richard Smalley of Rice University) [<https://perma.cc/3SSK-NV5E>].

11. *Id.*

12. *Id.*

13. See Boris Johnson, U.K. Sec'y of State for Foreign and Commonwealth Aff., Speech at Chatham House: Global Britain: UK Foreign Policy in the Era of Brexit, 8 (Dec. 2, 2016), <https://www.chathamhouse.org/event/global-britain-uk-foreign-policy-era-brexite> [<https://perma.cc/HH5K-XSVB>].

14. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*, at 1–4, COM (2015) 80 final (Feb. 25, 2015), [http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC\\_1&format=PDF](http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF) [hereinafter *Energy Union Communication*] [<https://perma.cc/GXR9-CPB2>].

15. *Id.* The European Energy Union is an ambitious project aiming at secure, affordable, and climate-friendly energy in the European Union. See EUROPEAN COMM'N, *Energy Union and Climate*, [http://ec.europa.eu/priorities/energy-union-and-climate\\_en](http://ec.europa.eu/priorities/energy-union-and-climate_en) (last visited May 11, 2017) [<https://perma.cc/AT7P-2ECH>]; see also RAFAEL LEAL-ARCAS, THE EURO-

policy. To achieve greater energy security, sustainability, and competitiveness, the European Commission aims to strengthen and promote solidarity and trust, the full integration of the European market, energy efficiency that will contribute to moderation of demand, the effective decarbonization of the economy, and the promotion of research, innovation, and competitiveness.<sup>16</sup>

Decarbonization<sup>17</sup> is one of the pillars of the European Energy Union because it is a way to achieve both *energy security*<sup>18</sup> and *climate change mitigation*.<sup>19</sup> The latest data indicate that in 2014 the European Union imported fifty-three percent of its energy, which makes it the largest energy importer in the world.<sup>20</sup> In addition, six E.U. member states still depend entirely on a single supplier for their gas imports, which makes them vulnerable to supply shocks.<sup>21</sup> The disputes between Ukraine and Russia in 2006, 2009, and 2014 had consequences for the E.U. economy and its citizens' quality of life.<sup>22</sup> Sudden disruptions of energy supply could cripple the European Union and have devastating consequences.

The decarbonization of the economy through the use of renewable energy sources can lead to greater energy security, as the European Union can decrease its reliance on external energy suppliers. This approach will make the bloc less vulnerable to unexpected disruptions of energy supplies. Finally, decarbonization through renewables could significantly reduce greenhouse gas emissions and contribute to climate change mitigation. The Paris Agreement on Climate Change (Paris Agreement), negotiated in December 2015, sets a goal of keeping global average temperatures below two degrees Celsius above preindustrial levels, as well as pursuing

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PEAN ENERGY UNION: THE QUEST FOR SECURE, AFFORDABLE AND SUSTAINABLE ENERGY (2016) (analyzing the goals of the project) [hereinafter EUROPEAN ENERGY UNION].

16. See Energy Union Communication, *supra* note 14, at 4.

17. Decarbonization refers to the increased use of low-carbon energy sources, such as renewables and nuclear, as well as the act of capping greenhouse gas (GHG) emissions. For the purposes of this Article, decarbonization refers to the transition to a low-carbon economy through the use of renewable energy sources, unless stated otherwise. See EUROPEAN ENERGY UNION, *supra* note 15, at 93–132.

18. The International Energy Agency defines energy security as “the uninterrupted availability of energy sources at an affordable price.” See *Energy Security*, INT’L ENERGY AGENCY, <https://www.iea.org/topics/energysecurity/> (last visited July 11, 2017) [<https://perma.cc/JLR6-E4HQ>]; see also RAFAEL LEAL-ARCAS ET AL., ENERGY SECURITY, TRADE AND THE EU: REGIONAL AND INTERNATIONAL PERSPECTIVES 1 (2016) (analyzing energy security in the context of international trade).

19. EUROPEAN ENERGY UNION, *supra* note 15, at 107. See generally RAFAEL LEAL-ARCAS, CLIMATE CHANGE AND INTERNATIONAL TRADE (2013).

20. See Energy Union Communication, *supra* note 14.

21. *Id.*

22. See LEAL-ARCAS ET AL., *supra* note 18, at 1.

efforts to limit the temperature increase to 1.5 degrees Celsius above preindustrial levels,<sup>23</sup> “recognizing that this would significantly reduce the risks and impacts of climate change.”<sup>24</sup> After its negotiation, it was said that the Paris Agreement was a success,<sup>25</sup> but real success will come once it is implemented and greenhouse gas emissions are reduced.

The 2016 Kigali Amendment<sup>26</sup> to the Montreal Protocol<sup>27</sup> will also serve as a catalyst for climate action. Furthermore, the international community agreed on the establishment of a global market-based measure to offset international aviation CO<sub>2</sub> emissions in late 2016 in the framework of the International Civil Aviation Organization. Moreover, the so-called Paris Agreement rulebook, which will establish the necessary rules to provide guidance to fulfil the ambition of the agreement, is scheduled for adoption in 2018.<sup>28</sup> All these developments show that the Paris Agreement and related legal instruments are the start of a process towards decar-

23. Despite common belief to the contrary, more people die because of cold weather than hot weather. See JOHAN NORBERG, *PROGRESS: TEN REASONS TO LOOK FORWARD TO THE FUTURE* 120 (2016). For instance, almost twice as many U.S. citizens died between 1979 and 2006 from excess cold than from excess heat. See Indur Goklany, *Deaths and Death Rates from Extreme Weather Events: 1990-2008*, 14 J. AM. PHYSICIANS AND SURGEONS 102, 106 (2009).

24. See Paris Agreement art. 2(1), Apr. 22, 2016, <https://treaties.un.org/doc/Publication/UNTS/No%20Volume/54113/Part/I-54113-0800000280458f37.pdf> [<https://perma.cc/UC9R-FS99>].

25. See Michael Levi, *Two Cheers for the Paris Agreement on Climate Change*, COUNCIL ON FOREIGN RELATIONS: ENERGY, SECURITY, & CLIMATE (Dec. 12, 2015), <http://blogs.cfr.org/sivaram/2015/12/12/two-cheers-for-the-paris-agreement-on-climate-change/> [<https://perma.cc/R6JM-9T6R>].

26. In October 2016, in Kigali, Rwanda, 197 countries adopted an amendment to phase down hydrofluorocarbons (HFCs) under the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol), “commit[ing] to cut[ting] the production and consumption of HFCs by more than [eighty] percent over the next [thirty] years.” *Recent International Developments under the Montreal Protocol*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ozone-layer-protection/recent-international-developments-under-montreal-protocol> (last visited July 11, 2017) [<https://perma.cc/UL3P-2C4A>].

27. See Montreal Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, S. Treaty Doc. No. 100-10 (1987), 1522 U.N.T.S. 3. The Montreal Protocol’s objective was to phase out consumption of replaceable chemical products that harmed the ozone layer but entailed profits for the chemical industry. For an analysis of the lessons from the Montreal Protocol for climate change negotiators, see Richard J. Smith, *The Road to a Climate Change Agreement Runs through Montreal*, Peterson Institute for International Economics Policy Brief No. PB10-21 (Aug. 2010), <https://piie.com/publications/policy-briefs/road-climate-change-agreement-runs-through-montreal> [<https://perma.cc/JKV5-VJND>].

28. Yamide Dagnet & Eliza Northrop, *Crafting the Paris Agreement’s Rule Book – Task at COP22*, WORLD RESOURCES INST. (Nov. 7, 2016), <http://www.wri.org/blog/2016/11/in-sider-crafting-paris-agreements-rule-book-tasks-cop-22> [<https://perma.cc/S9RK-ZTN5>].

bonization of the global economy in the second half of the twenty-first century.

Fulfilment of the European Commission's ambitious plan for a resilient Energy Union requires a degree of unity and dedication, as well as enhanced cooperation among member states, both regionally and globally. However, the European Union currently faces serious challenges to its security, sustainability, stability, and ultimately its *legitimacy*. In the wake of raging war on the outskirts of Europe's borders,<sup>29</sup> an unprecedented refugee crisis,<sup>30</sup> an economic debt crisis,<sup>31</sup> and the recent challenges associated with the United Kingdom's decision to leave the European Union,<sup>32</sup> the European Union faces serious integration challenges that threaten not only its legitimacy, but also its very future. This raises two vital questions. First, why would E.U. member states cooperate regionally and globally towards the decarbonization of the economy when they already face serious integration challenges? More importantly, why would E.U. member states concede to speaking with one voice on energy matters when that voice is already fragmented?

This Article demonstrates that despite the notable integration challenges currently looming over the European Union, E.U. member states have numerous economic, legal, and political incentives to cooperate both regionally and globally. Issues such as climate change and energy supply are matters of common concern that require collaboration at the global level. Climate change mitigation is a global public good, which requires collective action by states and concerted efforts at the regional and global level. This Article contends that energy security that is achieved through the use of renewable energy sources is a global public good, the type that requires and enables collective action at the global level.

The changing global landscape of the twenty-first century saw the emergence of new challenges which threaten the economic prosperity of states, the well-being of nations, and the human rights of individuals. This Article takes the view that some of those

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29. Jim Yardley, *Has Europe Reached the Breaking Point?*, N.Y. TIMES (Dec. 15, 2015), <https://www.nytimes.com/2015/12/20/magazine/has-europe-reached-the-breaking-point.html> [https://perma.cc/78TJ-FVEF].

30. *Id.*

31. *Id.*

32. See generally Rafael Leal-Arcas, *Three Thoughts on Brexit*, Queen Mary School of Law Legal Studies Research Paper No. 249/2016 (2016) (describing future trade relations between the United Kingdom and the European Union as well as the impact on the United Kingdom alone).

challenges, which have affected the European Union and its citizens profoundly, can be resolved through an effective and unified system of energy governance.<sup>33</sup> Accordingly, this Article demonstrates that successful decarbonization through regional and global collective action will boost the economy and contribute to the resolution of significant human rights issues and concerns that continue to plague the European Union, such as the current refugee crisis.

After this Introduction, Part I explores the notion of public goods in the broader context of international economic law and governance. Part II examines possible incentives for regional and global cooperation to decarbonize the economy, whereas Part III offers ideas on research, technology, innovation, and spirituality for sustainability. The Article then concludes that the solution to sustainability is to reduce CO<sub>2</sub> emissions by decarbonizing, electrifying, making use of the circular economy (i.e., recycling and reusing products), transferring funds and technology from the West to the rest of the world, shifting the economy to services that do not use products, and sharing best practices. The Conclusion also proposes a future research agenda to fill the knowledge gap on the links between four major global concerns: trade, energy, climate change, and sustainability.

## I. PUBLIC GOODS AND MATTERS OF COMMON CONCERN

This Part deals with public goods such as the climate, common concerns such as climate change, and what constitute megatrends in the twenty-first century. The tragedy of the commons<sup>34</sup> is an economic theory used to explain a situation where there exist shared resources, and self-interest undermines collective public goods. Such a situation raises questions of who pays the costs and who reaps the benefits. The defining features of what engenders the tragedy of the commons are excludability and rivalry (see

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33. For instance, according to one study, by removing regulatory barriers to participating in the production of renewable energy, over 180 million Europeans (so-called “energy citizens”) could produce their own renewable electricity by 2050. See BETTINA KAMPMAN ET AL., *THE POTENTIAL OF ENERGY CITIZENS IN THE EUROPEAN UNION* 5, 18, 20 (2016). This approach suggests that a bottom-up approach to renewable energy generation is desirable. See Energy Union Communication, *supra* note 14, at 2 (stating that the European Commission’s vision is “an Energy Union with citizens at its core, where citizens take ownership of the energy transition”). The Author subscribes to this idea.

34. See generally Garrett Hardin, *The Tragedy of the Commons*, 162 *SCI.* 1243, 1244–45 (1968) (explaining the “tragedy of the commons” concept and providing an example of its application in respect to population growth and issues of environmental pollution).

Table 1). The following Sections explore these indicators in greater detail.

TABLE 1: INDICATORS IN THE TRAGEDY OF THE COMMONS<sup>35</sup>

	<b>Rivalrous</b>	<b>Nonrivalrous</b>
<b>Excludable</b>	<b>Private goods</b>	<b>Club goods</b>
	Food Car House	Cable TV Some social services
<b>Nonexcludable</b>	<b>Common pool resources</b>	<b>Public goods</b>
	Forests Fisheries Wildlife Fossil fuels	Air Law enforcement Public radio Streetlights

### A. What Are Public Goods?

#### 1. The Concept

Public goods, also known as “collective consumption goods,” are defined by economists as the kind of goods that one individual may consume but cannot exclude access to by others.<sup>36</sup> For this reason, economists characterize public goods as “nonrivalrous” and “nonexcludable.”<sup>37</sup> Classic examples of public goods include, inter alia, public water supplies, street lighting, lighthouse protection for ships, and national defense services. Unlike private goods, which are usually excludable and rivalrous, public goods are not generally supplied by the private sector, as they cannot be supplied for a profit.<sup>38</sup> The key to why public goods present a challenge for the private sector lies in the potential for unfettered access to the bene-

35. Lisa Dale, Lecture at Yale University titled Multiple Scales of Sustainability Governance (Sept. 2016) (on file with author).

36. See Ingrid Kaul, *Global Public Goods: Explaining their Underprovision*, 15 J. INT’L ECON. L. 729, 731 (2012); see also GLOBAL ENVIRONMENTAL COMMONS: ANALYTICAL AND POLITICAL CHALLENGES IN BUILDING GOVERNANCE MECHANISMS (Eric Brousseau et al. eds., 2012); REFLEXIVE GOVERNANCE FOR GLOBAL PUBLIC GOODS (Eric Brousseau et al. eds., 2012); Ingrid Kaul, *Rethinking Public Goods and Global Public Goods*, in REFLEXIVE GOVERNANCE FOR GLOBAL PUBLIC GOODS 37, 38 (Eric Brousseau et al. eds., 2012).

37. Inge Kaul et al., *Defining Global Public Goods*, in GLOBAL PUBLIC GOODS: INTERNATIONAL COOPERATION IN THE 21ST CENTURY 2, 2 (Inge Kaul et al. eds., 1999).

38. See Elizabeth Hoffman, *What Goods and Services are Best Provided by the Public Sector and Which are Best Provided by the Private Sector?*, IOWA STATE UNIVERSITY, <https://www.econ.iastate.edu/node/710> (last visited July 11, 2017) [<https://perma.cc/XJA4-PB4E>]. See generally Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STAT. 387, 388–389 (Nov. 1954) (discussing challenges in determining consumption preferences for collective consumption goods).

fits derived from such goods once they are made available, a phenomenon that is known as the “free rider problem.”<sup>39</sup>

Thus, the provision of public goods is usually left to governments, which evaluate the social benefits and costs of supplying public goods, usually implementing them through taxation. Apart from the free rider problem, public goods give rise to what some have referred to as “the prisoner’s dilemma.”<sup>40</sup> The prisoner’s dilemma represents a situation in which the lack of information impedes collaboration between two parties.<sup>41</sup> In the context of supplying public goods, the prisoner’s dilemma could arise where the process is not supported by effective cooperation mechanisms between those who supply the goods and benefit from them, and those who simply benefit as free riders.<sup>42</sup> In line with this, experts

39. The free rider problem leads to underprovision of a good, and thus to market failure. This is so because access to a public good cannot be restricted once it is made available, thus it is difficult to charge people for benefiting from it. See Geoff Riley, *Public Goods and Market Failure*, TUTOR2U: ECONOMICS, <https://www.tutor2u.net/economics/reference/public-goods> (last visited July 11, 2017) [<https://perma.cc/K76N-4J4R>].

40. See *Defining Global Public Goods*, *supra* note 37, at 7–9.

41. *Id.* The authors explain the prisoner’s dilemma using the example of two prisoners who are faced with a choice of denying or confessing to a crime. If one confesses and the other denies, the one who confesses will be granted his freedom, while the other will serve five years in prison. If they both confess, they will both serve a reduced term of three years. If they both deny, they will both serve one year on a lesser charge that can be proven without a confession. As the prisoners are held in separate cells, they cannot communicate and agree on a common story. The authors further describe the prisoner’s dilemma as follows:

Prisoner A quickly realizes that no matter what prisoner B chooses (deny or confess), he is always better off confessing to the crime. If prisoner B denies the crime, prisoner A can get off with no punishment by confessing. If prisoner B confesses, prisoner A faces three years in jail if he also confesses the crime, and five years if he denies it. Thus, prisoner A will confess. Prisoner B, facing identical choices, will also confess. The result: both prisoners will confess to the crime and will each serve three years in jail. The prisoners’ “dilemma” arises from the fact that both would be better off cooperating—by denying the crime—than defecting—by confessing. If they could maintain their silence, they could each serve one year rather than three.

*Id.* (emphasis added). The concept of the prisoner’s dilemma was originally framed by Merrill Flood and Melvin Dresher. See *Prisoner’s Dilemma*, STAN. ENCYCLOPEDIA PHIL., <https://plato.stanford.edu/entries/prisoner-dilemma/> (last updated Aug. 29, 2014) [<https://perma.cc/QQ38-MMRV>].

42. A good example would be where the government provides street lighting. Street lighting is a public good, thus its supply gives rise to the free rider and prisoner’s dilemma problems. The government cannot exclude its citizens from benefiting from the street lighting it provides, as once it is made available, everyone can benefit. In addition, if the government does not communicate to its citizens that without their contribution, the government will not be able to supply street lighting (due to lack of funds and resources), its citizens will make the selfish choice of free riding until lighting is cut off or a cooperation mechanism is established (i.e., agreement to pay taxes). Once the government effectively communicates to its citizens that contributing (by way of taxes) will enable it to keep supplying the street lighting that everyone benefits from, this will give rise to a mutual agree-

and academics have contended that without a mechanism for *collective action*, public goods are at risk of being underproduced.<sup>43</sup>

Finally, even though the list of criteria that define a public good is exhaustive, the list of current public goods is not. Goods that were previously classified as private could later become public, and vice versa. The phenomenon of globalization, technological advancements in recent years, as well as the discovery of new sources of energy, could eventually lead to the reclassification of certain goods and commodities as public, and even the creation of new public goods.

## 2. Global Public Goods

In recent years, the notion of a public good has expanded significantly. In an increasingly globalized world, issues such as poverty, war, climate change, blatant abuses of human rights, and market failures have caused ripple effects across the globe.<sup>44</sup> As a result, a growing number of experts have written about the rise of the “global public good,”<sup>45</sup> a tangible or intangible commodity that benefits the wider public, not just at the national level, but also at the international. For the purposes of this Article, a global public good is a tangible or intangible product, the production and supply of which gives rise to the infamous free rider and prisoner’s dilemma issues. It is nonexcludable and nonrivalrous, and is more or less available worldwide. Consequently, to avoid the underproduction of global public goods, effective mechanisms of collaboration must be established at the global level, including, inter alia,

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ment to collaborate and contribute for the common good. See Séverine Deneulin & Nicholas Townsend, *Public Goods, Global Public Goods and the Common Good*, ESRC Research Group on Wellbeing in Developing Countries, WeD Working Paper No. 18 at 4 (Sept. 2006), <http://www.welldev.org.uk/research/workingpaperpdf/wed18.pdf> [<https://perma.cc/KB8K-K997>].

43. See James B. Stewart & Major Coleman, *The Black Political Economy Paradigm and the Dynamics of Racial Inequality*, in *AFRICAN AMERICANS IN THE U.S. ECONOMY* 121 (Cecilia Conrad et al. eds., 2005).

44. See, for instance, the current situation in parts of the Middle East and sub-Saharan Africa. U.N. Sec’y-Gen., Address to the General Assembly (Sept. 24, 2013), <https://www.un.org/sg/en/content/sg/statement/2013-09-24/secretary-generals-address-general-assembly-delivered-%E2%80%93-bilingual> [<https://perma.cc/W9HY-7ELX>].

45. *Defining Global Public Goods*, *supra* note 37, at 9; see, e.g., Inge Kaul & Raul Mendoza, *What are Global Public Goods?*, NAUTILUS INST. (May 17, 2008), <http://nautilus.org/gps/applied-gps/global-public-goods/what-are-global-public-goods/> [<https://perma.cc/WX4X-SBPZ>]; *Global Public Goods*, GLOBAL POLICY FORUM, <https://www.globalpolicy.org/social-and-economic-policy/global-public-goods-1-101.html> (last visited July 23, 2017) [<https://perma.cc/N84H-UJQ2>].

incentives and effective tools that encourage state-to-state cooperation.

### B. *Matters of Common Concern*

Matters of common concern represent the worries and issues that drive people to cooperate.<sup>46</sup> The principle of cooperation underlies all national and international efforts to find solutions to common problems, reflected in the proliferation of international treaties and institutions. The very concept of the European Union arose out of a need for consolidated efforts to tackle matters of common concern.<sup>47</sup> Issues such as war, climate change, and economic crises are matters of common concern at the global level, as they have far-reaching and devastating effects. Acknowledging this interdependency, states enter into international agreements, transforming mere desire and willingness to cooperate into legally binding obligations.<sup>48</sup> Thus, when it comes to some matters of common concern, states are not simply *encouraged* to cooperate; they are *obliged* to do so, in line with their responsibilities under international law.<sup>49</sup>

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46. See Dinah Shelton, *Common Concern of Humanity*, 1 *Iustum Aequum Salutare* 33, 34–36 (2009) (“What makes a concern a common one . . . [is] the importance of the values at stake. This idea is also implicit in the Martens Clause and in the International Court of Justice’s recognition that *erga omnes* obligations arise by their very nature in view of the importance of the rights involved.”) (internal quotations omitted). Issues of common concern are connected to the recognition of *erga omnes* obligations and the formation of collective compliance institutions and procedures that reinforce the *erga omnes* obligations imposed in the common interest. See DINAH L. SHELTON & ALEXANDRE KISS, *GUIDE TO INT’L ENVTL. L.* 13–15 (2007).

47. See generally *The EU in Brief*, EUROPA, [https://europa.eu/european-union/about-eu/eu-in-brief\\_en](https://europa.eu/european-union/about-eu/eu-in-brief_en) (describing how the European Union was created to foster economic cooperation and to avoid future conflicts in the post-World War II era) [<https://perma.cc/9Z95-XG6F>].

48. For example, the Paris Conference of the Parties, held in December 2015, demonstrated how states could transform the desire to cooperate on common concerns, such as climate change, into a legally binding obligation. See Paris Agreement, *supra* note 24; U.N. Secretary-General, Paris Agreement: Entry into Force, C.N.735.2016.TREATIES-XXVII.7.d (Depositary Notification) (Dec. 12, 2015), <https://treaties.un.org/doc/Publication/CN/2016/CN.735.2016-Eng.pdf> [<https://perma.cc/ASE9-FVH6>]. The Paris Agreement on Climate Change (Paris Agreement) came into force in 2016 after the threshold for entry into force was achieved. See *Paris Agreement – Status of Ratification*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, [http://unfccc.int/paris\\_agreement/items/9444.php](http://unfccc.int/paris_agreement/items/9444.php) (last visited July 11, 2017). It did so in the form of an internationally legally binding instrument, which was signed and ratified, in accordance with Article 21 of the Paris Agreement. Legally, there is no higher level of commitment at the international level. Treaties are the strongest tool available to states to enhance and solidify their international commitments to each other. See Andrew T. Guzman, *The Design of International Agreements*, 16 *EJIL* 579, 597 (2005).

49. For example, some international treaties have called for cooperation on environmental issues, such as the 1992 U.N. Framework Convention on Climate Change, U.N.

### C. Megatrends of the Twenty-first Century

The scientific community is by now in almost unanimous agreement that the greenhouse gas (GHG) effect is real,<sup>50</sup> and the level of GHG emissions in the atmosphere continues to increase.<sup>51</sup> There are clear policy actions to tackle climate change: mitigation,<sup>52</sup> adaptation,<sup>53</sup> and geoengineering.<sup>54</sup> As a result of the Paris Agreement, and prior to the signing of the Paris Agreement, new avenues to tackle climate change more effectively have emerged, such as the involvement of mayors,<sup>55</sup> governors,<sup>56</sup> and CEOs.<sup>57</sup>

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Framework Convention on Climate Change [UNFCCC], art. 4(1), May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107; the 1992 Convention on Biological Diversity, Convention on Biological Diversity, art. 5, June 5, 1992, 1760 U.N.T.S. 79; and the 1994 Convention to Combat Desertification, U.N. Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, art. 4, June 17, 1994, S. Treaty Doc. No. 104-29, 1954 U.N.T.S. 3. In addition, the International Tribunal on the Law of the Sea issued an order on provisional measures on December 3, 2001, in the *MOX Plant Case (Ireland v. U.K.)*, where it indicated that the duty to cooperate may be legally enforceable. The *MOX Plant Case (Ir. v. U.K.)*, Case No. 10, Order of Dec. 3, 2001, ¶ 89, [https://www.itlos.org/fileadmin/itlos/documents/cases/case\\_no\\_10/Order.03.12.01.E.pdf](https://www.itlos.org/fileadmin/itlos/documents/cases/case_no_10/Order.03.12.01.E.pdf). Ireland had invoked the U.N. Convention on the Law of the Sea (UNCLOS) Article 123, which requires states to cooperate in exercising their rights and performing their duties with regard to enclosed or semi-enclosed seas. *Id.* ¶ 26. The court held that UNCLOS and general international law make the duty to cooperate a fundamental principle for the prevention of marine pollution (in the Author's view, a matter of common concern), and that certain rights arise from it, which the tribunal can enforce by ordering provisional measures. *Id.* ¶ 82.

50. *The 97% Consensus on Global Warming*, SKEPTICAL SCIENCE, <https://www.skepticalscience.com/global-warming-scientific-consensus-intermediate.htm> (last visited July 11, 2017) [<https://perma.cc/LH6P-EMBT>].

51. *Global Greenhouse Gas Emissions Data*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data> (last visited July 11, 2017) [<https://perma.cc/J8UG-TWSM>].

52. For example, by reducing the emissions of GHGs in the atmosphere with the promotion of electric cars or making use of the circular economy. See Global Compass, *The Earth Circle*, ECONOMIST (Jan. 31, 2017), <http://films.economist.com/globalcompass> [<https://perma.cc/PZ9U-W5CE>].

53. For example, by minimizing the damage caused by the effects of climate change; a case in point is using scarce water resources more efficiently. See *Adaptation to Climate Change*, EUROPEAN COMM'N, [https://ec.europa.eu/clima/policies/adaptation\\_en#tab-0-0](https://ec.europa.eu/clima/policies/adaptation_en#tab-0-0) (last visited July 11, 2017) [<https://perma.cc/64DV-EU7S>].

54. For example, by enhancing surface brightness, such as painting roofs white. See *Geoengineering to Combat Global Warming*, U.N. ENV'T PROGRAMME (May 2011), [https://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article\\_id=52](https://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=52) [<https://perma.cc/9FKP-LQ56>].

55. C40 CITIES, <http://www.c40.org/> (last visited July 11, 2017) [<https://perma.cc/J53Q-WNQ9>].

56. REGIONS OF CLIMATE ACTION, <http://regions20.org/> (last visited July 11, 2017) [<https://perma.cc/8EPB-X2QN>].

57. See, e.g., *CEOs from Leading Companies Worth More Than \$2 Trillion Ask COP21 to Secure a Prosperous World*, CLIMATE GROUP (Nov. 23, 2015), <https://www.theclimate>

From this perspective, the Paris Agreement combines the action of both state and non-state actors during the negotiating phase and in its implementation.

The shift to this “bottom-up approach” in the *democratic* (in the true sense of the term, that power remains with the citizens) implementation of climate change mitigation plans—such as creation of the Paris Agreement, which has become the locomotive of climate action—is one of the megatrends of the twenty-first century. Since more than eighty percent of global economic activity takes place in cities<sup>58</sup> and since between sixty and eighty percent of GHG emissions come from cities,<sup>59</sup> this new megatrend of climate action at the city level is very promising. Cities should take climate action because today the majority of the world’s population lives in cities,<sup>60</sup> and this trend to urban migration is on the rise;<sup>61</sup> because they are the main polluters and the main implementers of legislation<sup>62</sup>; and because mayors of cities are pragmatic with global issues such as climate change, poverty, and terrorism.<sup>63</sup> Such issues are also too big for nation-states, and cities arguably offer better governance on these matters.<sup>64</sup> Furthermore, some of the greatest environmental and social challenges come from cities: food, water, waste, infrastructure, transport. Moreover, mayors tend to come

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group.org/news/ceos-leading-companies-worth-more-2-trillion-ask-cop21-secure-prosperous-world [https://perma.cc/4S5U-QM2X].

58. As measured by global Gross Domestic Product (GDP). RICHARD DOBBS ET AL., MCKINSEY GLOBAL INSTITUTE, *URBAN WORLD: MAPPING THE ECONOMIC POWER OF CITIES I* (2011).

59. U.N. ENV’T PROGRAM, *CITIES AND BUILDINGS: UNEP INITIATIVES AND PROJECTS*, at 5, [http://www.oas.org/en/sedi/dsd/Biodiversity/Sustainable\\_Cities/Sustainable\\_Communities/Events/SC%20Course%20Trinidad%202014/ModuleVI/2.%20Cities%20and%20Buildings%20E2%80%93%20UNEP%20DTIE%20Initiatives%20and%20projects\\_hd.pdf](http://www.oas.org/en/sedi/dsd/Biodiversity/Sustainable_Cities/Sustainable_Communities/Events/SC%20Course%20Trinidad%202014/ModuleVI/2.%20Cities%20and%20Buildings%20E2%80%93%20UNEP%20DTIE%20Initiatives%20and%20projects_hd.pdf) [https://perma.cc/QZC9-V8TR].

60. See *World’s Population Increasingly Urban with More than Half Living in Urban Areas*, U.N. DEP’T OF ECON. & SOC. AFFAIRS (July 10, 2014), <http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html> [https://perma.cc/2WLK-6V3M].

61. *Id.* By 2050, 70% of the world’s population is expected to live in cities. See Mark Wilson, *By 2050, 70% of the World’s Population Will Be Urban. Is That a Good Thing?*, CO.DESIGN (Mar. 12, 2012), <https://www.fastcodesign.com/1669244/by-2050-70-of-the-worlds-population-will-be-urban-is-that-a-good-thing> [https://perma.cc/85TT-ASQV].

62. See *REGIONS OF CLIMATE ACTION*, *supra* note 56.

63. *Mayors Get Things Done. Should They Run the World?*, THE GLOBE & MAIL (Mar. 11, 2014), <http://www.theglobeandmail.com/opinion/ideas-lab/should-mayors-lead-the-world/article17275044/> [https://perma.cc/T2H4-FYX5].

64. For further details on the potential of cities to solve global problems locally, see BENJAMIN R. BARBER, *IF MAYORS RULED THE WORLD: DYSFUNCTIONAL NATIONS, RISING CITIES* 5–9, 342 (2013) (arguing that local executives exhibit a nonpartisan and pragmatic style of governance that is lacking in national and international halls of power).

from the cities they govern<sup>65</sup> and therefore have a much higher level of trust than politicians at the national level.<sup>66</sup> All of this means that using cities to mitigate climate change is a promising initiative, so educating citizens and raising awareness become crucial.

Global issue governance at city and local levels is on the rise. Some of these initiatives even go beyond climate action. Examples of such bottom-up structures are: the C40 Mayors Summits;<sup>67</sup> the Compact of Mayors;<sup>68</sup> the Covenant of Mayors for Climate and Energy;<sup>69</sup> the Global Covenant of Mayors for Climate and Energy;<sup>70</sup> RESURBE;<sup>71</sup> the “100 resilient cities” scheme pioneered by the Rockefeller Foundation;<sup>72</sup> United Cities and Local Governments;<sup>73</sup> International Council of Local Environmental Initiatives;<sup>74</sup> CityNet;<sup>75</sup> City Protocol;<sup>76</sup> the United States Conference of Mayors; Habitat III;<sup>77</sup> and the Making Cities Resilient campaign<sup>78</sup> in the

65. *Id.* at 98.

66. *Id.* at 226–27.

67. *See About Us*, C40 CITIES: MAYORS SUMMIT, <https://mayorssummit2016.c40.org/> (last visited July 12, 2017) [<https://perma.cc/7S7Z-VCF3>].

68. *See About*, COMPACT OF MAYORS, <https://www.compactofmayors.org/history> [<https://perma.cc/6YW2-HEWT>] (last visited July 11, 2017).

69. *See About*, COVENANT OF MAYORS FOR CLIMATE & ENERGY, [http://www.covenantofmayors.eu/about/covenant-of-mayors\\_en.html](http://www.covenantofmayors.eu/about/covenant-of-mayors_en.html) (last visited July 16, 2017) [<https://perma.cc/VGQ7-L7GE>]. The idea behind the Covenant is to support local authorities in the implementation of local sustainable energy policies.

70. *See About*, GLOBAL COVENANT OF MAYORS FOR CLIMATE & ENERGY, <https://www.globalcovenantofmayors.org/about/> (last visited July 16, 2017) [<https://perma.cc/VJ79-4UU8>].

71. *See RESURBE*, CÁTEDRO UNESCO, <http://www.unescosost.org/en/project/resurbe/> (last visited July 16, 2017) [<https://perma.cc/V96T-TKX2>].

72. *See About Us*, 100 RESILIENT CITIES, [http://www.100resilientcities.org/about-us#/\\_/](http://www.100resilientcities.org/about-us#/_/) (last visited July 16, 2017) [<https://perma.cc/QY8L-XKJB>].

73. *See About Us*, UNITED CITIES AND LOCAL GOVERNMENTS, <https://www.uclg.org/en/organisation/about> (last visited July 16, 2017) [<https://perma.cc/LB8M-BBKM>].

74. *See About*, INTERNATIONAL COUNCIL OF LOCAL ENVIRONMENTAL INITIATIVES, <http://www.iclei.org/about/who-is-iclei.html> (last visited July 16, 2017) [<https://perma.cc/3KAR-VSL3>].

75. *See About Us*, CITYNET, <http://citynet-ap.org/category/about/> (last visited July 16, 2017) [<https://perma.cc/WT2C-Q4DY>].

76. *See What's City Protocol*, CITY PROTOCOL, <http://cityprotocol.org/whats-city-protocol/our-mission/> (last visited July 16, 2017) [<https://perma.cc/FZ2C-UAC5>].

77. *See About Habitat III*, HABITAT III, <https://habitat3.org/about> (last visited July 16, 2017) [<https://perma.cc/6LU7-5QTU>].

78. *See Making Cities Resilient*, UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION, <https://www.unisdr.org/we/campaign/cities> (last visited July 16, 2017) [<https://perma.cc/NG4P-2FXH>].

framework of the U.N. Office for Disaster Risk Reduction.<sup>79</sup> All of these examples show that, until recently, there has been a legal and policy vacuum at the city level regarding climate action and that city networks for climate deliberation are on the rise. It also means that there is a lot that cities can do even when national governments refuse to act on climate change or other global issues. This could even lead to the creation of a “league of cities,” to quote the American political theorist Benjamin Barber.<sup>80</sup>

Mayors’ and governors’ plans of action for climate change mitigation and adaptation could be emulated in other cities and regions of the world with similar concerns. For instance, the mayor of Rio de Janeiro, Brazil, may have a plan to mitigate climate change that is opportune for Manila, Philippines. To make sure that intercity networks remain coordinated, there have been proposals for the creation of a Global Parliament of Mayors<sup>81</sup> to enable cities to have a stronger voice on global issues and address global priorities more democratically and directly by citizens.<sup>82</sup> The purpose is to democratize globalization or to globalize democracy.<sup>83</sup>

Moving forward, the international community may also consider putting a price on harm-causing.<sup>84</sup> Addressing climate change will require such top-down guidance from intergovernmental decisions and bottom-up implementation of climate change goals through citizens’ participation. For the implementation of any policy, good legislation is key. Incomplete policy is non-implementable policy.

Expanding clean energy choices is also an increasingly popular issue because clean energy is an effective way to decarbonize the economy and it is therefore necessary to find a way to finance it.<sup>85</sup> As a result of clean energy’s popularity, there is an innovation race

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79. *Our Mandate*, UNITED NATIONS OFFICE FOR DISASTER RISK REDUCTION, <https://www.unisdr.org/who-we-are/mandate> (last visited July 16, 2017) [<https://perma.cc/8C5P-5YBG>].

80. BARBER, *supra* note 64, at 22.

81. *See id.* at 22–23, 336–59.

82. *See id.*

83. *See id.*

84. For an example of a recent domestic approach proposed in the United States, see Juliet Eilperin & Chris Mooney, *Senior Republican Statesmen Propose Replacing Obama’s Climate Policies with a Carbon Tax*, WASH. POST (Feb. 8, 2017), [https://www.washingtonpost.com/news/energy-environment/wp/2017/02/07/senior-republican-leaders-propose-replacing-obamas-climate-plans-with-a-carbon-tax/?utm\\_term=.1ceadf0fe007](https://www.washingtonpost.com/news/energy-environment/wp/2017/02/07/senior-republican-leaders-propose-replacing-obamas-climate-plans-with-a-carbon-tax/?utm_term=.1ceadf0fe007) [<https://perma.cc/3C24-ZTDF>].

85. *Renewable Energy Proves Increasingly Popular*, ECONOMIST INTELLIGENCE UNIT: UNITED ARAB EMIRATES (Dec. 30, 2015), <http://country.eiu.com/article.aspx?articleid=1203814104#> [<https://perma.cc/773J-CAJ8>].

across the world.<sup>86</sup> It is necessary to create a policy framework for innovators to be willing to accept failure and not be afraid of making mistakes to encourage continued development.

All of these trends raise the interesting question of how to manage globalization in a sustainability era. Table 2 below offers the main trends of the twenty-first century in a sustainability context.

TABLE 2: MEGATRENDS OF THE TWENTY-FIRST CENTURY<sup>87</sup>

Twentieth Century	Twenty-first Century
Focus of attention was government.	Focus of attention should be business.
Environmental information silos; little attention to economics.	Since <i>vox populi</i> is that economics will always prevail over the environment, it is necessary to have an integrated approach between the environment, energy, and the economy. The international trading system unites the three sectors. <sup>88</sup>
Top-down approach to climate change mitigation through participation of presidents and prime ministers of countries.	Bottom-up approach to climate change mitigation through participation of citizens, mayors, governors, CEOs, and billionaires.
Command and control approach; “polluter pays” principle.	Market mechanisms; economic incentives not to pollute.
Prohibitions.	Problem-solving.
Good consumers were not rewarded.	Reward individuals who solve problems.
Gurus gave prescriptions on how to move forward.	Big data <sup>89</sup> usage for better analysis to inform decisions.
Success was based on money expenditure.	Success is based on outcomes and implementation.
Environmental protection as a moral good.	Price-based approach to punish environmental harm.
Innovation in technology.	Innovation in government and finance.
Limited infrastructure.	Technological revolution: using technology to help with infrastructure.

In January 2017, the U.S. National Intelligence Council (NIC) published its public Global Trends Report titled *Global Trends: The*

86. See ANDREW GRANT & GAIA GRANT, *THE INNOVATION RACE: HOW TO CHANGE A CULTURE TO CHANGE THE GAME* (2016); see also Laurie Guevara-Stone, *35 Years of Bold Steps in the Clean Energy Race: Part I*, ROCKY MOUNTAIN INSTITUTE (May 25, 2017), <https://www.rmi.org/news/35-years-bold-steps-clean-energy-race-part-1/> [<https://perma.cc/2B36-67HS>].

87. This list is based on a “Decalogue” developed by Daniel Esty of Yale University, First Yale Sustainability Leadership Forum, September 2016 at Yale University.

88. For an elaboration of this idea, see *infra* Part II.E.

89. See generally *Enter the Data Economy: EU Policies for a Thriving Data Ecosystem*, EUR. POL. STRATEGY CTR.: EPSC STRATEGIC NOTES (Jan. 11, 2017), [https://ec.europa.eu/epsc/publications/strategic-notes/enter-data-economy\\_en](https://ec.europa.eu/epsc/publications/strategic-notes/enter-data-economy_en) (providing insight into the emerging role of “big data” in driving economic decisions) [<https://perma.cc/XKZ4-FF89>].

*Paradox of Progress*.<sup>90</sup> Through 2035, the NIC noted that the global trends of climate change, the environment, and public health issues “will demand attention.”<sup>91</sup> This Section shows how increased citizen participation can help achieve that required attention.

### 1. Power to the Citizens

As Table 2 above demonstrates, one very promising development in the twenty-first century is the empowerment of citizens on issues of common concern such as climate change, sustainable energy, and international trade. Citizens’ empowerment means that civil society can play an important role in the new challenges of trade diplomacy, such as the integration of noneconomic aspects of trade in trade policy and the inclusion of trade policies in the democratic debate. This approach makes the system of decision making closer to the citizens and therefore less technocratic (see Figure 1 below).

This novel idea of greater citizen participation, engendered by citizens’ empowerment, is a promising way of providing better management of environmental issues and helping achieve the Sustainable Development Goals (SDGs).<sup>92</sup> Moving forward, citizens must contribute to finding more effective ways to obtain sustainable energy, mitigate climate change, and develop a more democratic and transparent trade policy-making process. Figure 1 represents several specific means by which citizens can ostensibly help enhance sustainable energy initiatives, mitigate climate change, and make citizens richer through free and open environmental trade.

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90. NAT’L INTELLIGENCE COUNCIL, *GLOBAL TRENDS: PARADOX OF PROGRESS* (Jan. 2017), <https://www.dni.gov/files/images/globalTrends/documents/GT-Full-Report.pdf> [<https://perma.cc/4KX4-TD94>].

91. *Id.* at 6.

92. See G.A. Res. 70/1, *Transforming Our World: The 2030 Agenda for Sustainable Development* 14–35 (Sept. 25, 2015).

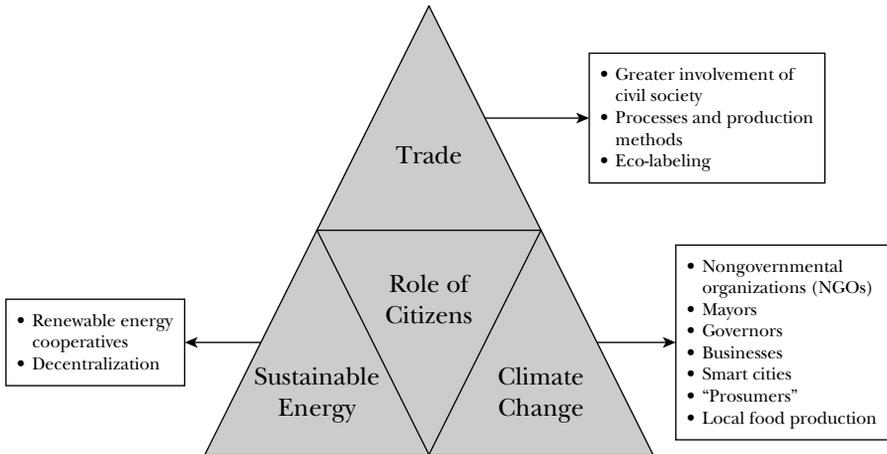


FIGURE 1: CITIZENS' EMPOWERMENT AND SUSTAINABLE DEVELOPMENT GOALS

Citizens' empowerment can be achieved by allowing for more participation in the process of decision making. More broadly, regression analyses show that when society allows free choice, it has a considerable impact on happiness.<sup>93</sup> Since the beginning of the 1980s, democratization, economic development, and increasing social tolerance have all increased citizens' perception that they have free choice, and consequently increased citizen happiness.<sup>94</sup>

## 2. Citizens and Trade (and Climate Change)

Traditionally, governments discuss trade measures and their links with climate change without allowing for citizens' participation.<sup>95</sup> This rather technocratic exercise of mitigating climate change and its links to trade policy has the potential to become more democratic.

Trade will need to be substantially reconceptualized to empower individuals within the international trade framework. If global society wants to emancipate people around the world and benefit from the wealth of transnational insights, perceptions, and resources, society should aim at facilitating access to global knowledge via international trade. Moreover, trade agreements should emphasize and encourage the trade of technological equipment,

93. Ronald Inglehart et al., *Development, Freedom, and Rising Happiness: A Global Perspective (1981-2007)*, 3 PERSP. ON PSYCHOL. SCI. 264, 270 (2008).

94. *Id.* at 279–80.

95. See RAFAEL LEAL-ARCAS, THEORY AND PRACTICE OF EC EXTERNAL TRADE LAW AND POLICY 425–39 (2008); LEAL-ARCAS, *supra* note 19.

smart appliances, and applications that serve to reduce energy consumption and GHG emissions. Furthermore, trade subsidization distorts markets and leads to more GHG emissions than would otherwise result.<sup>96</sup>

Trade places a spotlight on the dynamic shifts that are taking place and will take place globally in the so-called processes and production methods (PPMs) of goods. Consumers increasingly seek information on how the PPMs of the products they buy affect the environment and request ecolabeling as well as labeling and traceability regarding genetically modified organisms.<sup>97</sup> This change in consumer demand will transform the geographies of trade, both spatially and temporally. The importance of new technologies in PPMs is a crucial aspect of this advancement.

International trade agreements could have provisions that empower citizens as consumers to better scrutinize trade agreements. This addition would make trade governance closer to citizens. Close scrutiny is necessary to examine the rules of international trade that need to be amended to reduce the impact of global trade on the environment.<sup>98</sup> In broad terms, trade rules are not guided towards environmental protection as much as they could be.<sup>99</sup>

The ease of proliferation of news and information through the Internet—which provides more transparency and access to infor-

96. See RAFAEL LEAL-ARCAS, ANDREW FILIS & EHAB S. ABU GOSH, *INTERNATIONAL ENERGY GOVERNANCE: SELECTED LEGAL ISSUES* 430–31 (2014). One could make the case that some World Trade Organization (WTO) rules need clarification, especially in the field of subsidies, and ask the question whether trade subsidies should exist if they are for a good purpose, such as a public good like climate change mitigation. *Id.* at 136–37.

97. See OECD, *Processes and Production Methods (PPMs): Conceptual Framework and Considerations on Use of PPM-Based Trade Measures*, 7 (1997), [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD\(97\)137&docLanguage=EN](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(97)137&docLanguage=EN) [<https://perma.cc/MN2L-XHN6>].

98. DANIEL C. ESTY, *GREENING THE GATT: TRADE, ENVIRONMENT, AND THE FUTURE* 225 (1994).

99. See for instance the Preamble to the Agreement Establishing the World Trade Organization, which states:

*Recognizing* that their relations in the field of trade and economic endeavour should be conducted with a view to raising standards of living, ensuring full employment and a large and steadily growing volume of real income and effective demand, and expanding the production of and trade in goods and services, while allowing for the optimal use of the world's resources in accordance with the objective of *sustainable development*, seeking both to protect and preserve the environment and to enhance the means for doing so in a manner consistent with their respective needs and concerns at different levels of economic development . . . . (emphasis added)

Marrakesh Agreement Establishing the World Trade Organization, Apr. 15, 1994, 1867 U.N.T.S. 154 (1994).

mation than ever before—has allowed people to become more aware of trade negotiations and their effects. This increased awareness has resulted in demonstrations against what many citizens consider unfair and detrimental trade agreements that are supposed to benefit ordinary citizens but in reality only benefit a few.<sup>100</sup> Classic examples are the massive demonstrations against the Trans-Pacific Partnership (TPP) in the United States<sup>101</sup> and against the Trans-Atlantic Trade and Investment Partnership (TTIP) in Germany, Austria, and Sweden.<sup>102</sup> These demonstrations occur because citizens widely consider trade to be designed by and for the interest of large transnational corporations, rather than for the needs of the general population.<sup>103</sup> So, reshuffling political procedures by drawing citizens into these processes is necessary, and arguably indispensable. It is, therefore, worth exploring how local and regional governments, such as those of cities or municipalities represented by their mayors, can better represent the interests of their people.

Accountability, efficiency (via more rapid feedback), and transparency are strongest at the governing level closest to citizens. In a post-Westphalian world, neomedievalism<sup>104</sup> may prevail, but the role of the city can be preponderant. The involvement of citizens can be encouraged in different intellectual and cultural ways, such as within civil society's role in liberal Western democracies, within the Asian values context in China,<sup>105</sup> or citizens' empowerment in theocracies. Politically, the principles of subsidiarity, devolution, federal systems, regional schemes, and closer ties between specific cities—not least within the European Union—form the back-

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100. See *Anti-Globalists: Why They're Wrong*, *ECONOMIST* (Oct. 1, 2016), <http://www.economist.com/news/leaders/21707926-globalisations-critics-say-it-benefits-only-elite-fact-less-open-world-would-hurt> [https://perma.cc/95KB-VUFC].

101. See *TPP Signing Sparks Dozens of Protests across US over Biggest Trade Pact*, *RT AM* (Feb. 5, 2016), <https://www.rt.com/usa/331356-tpp-signing-protests-usa/> [https://perma.cc/DZD2-TVL3].

102. Michael Nienaber, *Tens of Thousands Protest in Europe Against Atlantic Free Trade Deals*, *REUTERS* (UK) (Sept. 17, 2016), <http://www.reuters.com/article/us-eu-usa-ttip-idUSKCN11N0H6> [https://perma.cc/ZP4Q-KQNC].

103. For an example of this perspective, see Robert Reich, *Trade Deals Like the TPP Only Benefit the One Percent*, *MOYERS & CO.* (Feb. 21, 2015), <http://billmoyers.com/2015/02/21/trade-deals-boost-top-1-bust-rest/> [https://perma.cc/42FF-2NZ3].

104. "Neomedievalism" is a term often used as a political theory about modern international relations. See Stephen J. Kobrin, *Back to the Future: Neomedievalism and the Postmodern Digital World Economy*, 51 *J. INT'L AFF.* 361 (1998).

105. The "Asian values context" refers to the notion of collectivism, rather than individualistic approaches to society that are more prevalent in Western societies. See generally C.J.W. L. Wee, "Asian Values," *Singapore, and the Third Way: Re-Working Individualism and Collectivism*, 14 *SOJURN: J. SCI. ISSUES IN SOUTHEAST ASIA* 332 (1999).

ground for a rising role for the cities of the world to come together. All these innovative options of governance make decision-making easier and more impactful and aim at a decentralized system of governance.

Lastly, given that citizens' roles in trade are primarily as consumers, for their activities to have an impact on climate change mitigation efforts, consumer activity (i.e., purchases) must be significantly valued within the broader economic dynamic of a country. Table 3 assesses the consumer habits in eight major GHG-emitting states that are also parties to three mega-regional trade agreements (RTAs) (the TPP, TTIP, and the Regional Comprehensive Economic Partnership (RCEP)) to ascertain whether consumer spending is of significant importance such that a change in consumer habits could influence trade patterns in these jurisdictions. Table 3 indicates consumer spending as a percentage of gross domestic product (GDP). The figures are based on the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households.

TABLE 3: HOUSEHOLD FINAL CONSUMPTION EXPENDITURE<sup>106</sup>

Country	Consumer Spending as Percentage of GDP
China	37.1
United States	68.1
European Union	56.3
India	59.2
Russia	52.1
Indonesia	55.4
Brazil	63.8
Japan	56.6
Canada	57.5
Mexico	67.1

Consumer spending contributes significantly to the GDPs of the countries in Table 3, with the exception of China. So, empowering citizens to be more climate change-conscious in their purchasing habits could spur the growth of “greener” markets in the jurisdictions that are parties to the three mega-RTAs mentioned above by creating high demand for greener goods.

106. *Household Final Consumption Expenditure, Etc. (% of GDP)*, WORLD BANK, [http://data.worldbank.org/indicator/NE.CON.PETC.ZS?end=2015&name\\_desc=false&start=1967&view=chart](http://data.worldbank.org/indicator/NE.CON.PETC.ZS?end=2015&name_desc=false&start=1967&view=chart) (last visited July 16, 2017) [<https://perma.cc/WE3N-Z8JP>].

### 3. Citizens, Climate Change, and Sustainable Energy (and Trade)

The empowerment of citizens is a promising tool for climate change mitigation, but depends upon support from NGOs, mayors and governors representing citizens, smart cities, prosumers, and local food production.<sup>107</sup> The same is true with the enhancement of sustainable energy via renewable energy cooperatives and energy decentralization. The decentralization and localization of energy dependency could potentially lead to a change in the relationship between energy producers and governance institutions, including municipal administrations and city mayors. The Paris Agreement can be characterized as a hybrid global agreement that facilitates these changes within a multipolar world. The global stock-take (Article 14 of the Paris Agreement) will foster new ways of valuing, seeing, and comparing sectors, communities (rich and poor, urban and rural), countries, and regions. This data will inform other agreements as well as policy on resource management (such as ecolabeling and PPMs).

The opportunities ahead are partially the result of technology enabling a decentralization of production and processing of goods—for instance, 3-D printing as opposed to Fordist-style manufacturing—and a dynamic hybridization of services—for instance, the gig economy—away from old hierarchical and linear models towards multilevel and circular ones. The form these will take depends upon how the power dynamics will manifest themselves, including backlash by citizens, corporations, and countries with the most to lose within the existing globalized trade system. This hybridization indicates a recognition that there is no inevitable, single pathway or outcome; rather, that the political economy

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107. “Smart cities” refer to an urban development vision to integrate information and communication technology and Internet-of-things technology in a secure fashion to manage a city’s assets. See Matt Hamblen, *Just What is a Smart City?*, COMPUTERWORLD (Oct. 1, 2015), <http://www.computerworld.com/article/2986403/internet-of-things/just-what-is-a-smart-city.html> [<https://perma.cc/ZX5F-67QF>]. “Prosumers” refer to consumers who are also producers of (renewable) energy and who use energy in a smarter and more efficient manner. See *Electricity Prosumers*, EUROPEAN PARLIAMENT THINK TANK, [http://www.euro-parl.europa.eu/thinktank/en/document.html?reference=EPRS\\_BRI\(2016\)593518](http://www.euro-parl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2016)593518) (last visited July 16, 2017) [<https://perma.cc/W6YM-EXZB>]. And “local food” refers to a movement that aims to connect food producers and food consumers in the same geographic region to develop more self-reliant and resilient food networks; improve local economies; or have an impact on the health, environment, community, or society of a particular place. See *Local Food*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Local\\_food](https://en.wikipedia.org/wiki/Local_food) (last visited July 16, 2017) [<https://perma.cc/4A6L-DWT5>].

within, and between, regional contexts will influence the potential opportunities and outcomes for citizens' engagement.

## II. INCENTIVES FOR REGIONAL AND GLOBAL COOPERATION ON DECARBONIZING THE ECONOMY

Climate change and energy supply issues are matters of common concern that give rise to *erga omnes* obligations, due to the value and importance of the rights involved. The destructive impact of climate change must be mitigated through joint efforts and collective action at the global level. Energy supply issues have become more prevalent in recent years, as states become increasingly conscious of the dangers associated with heavy reliance on traditional energy resources.<sup>108</sup> In a world of growing energy demands,<sup>109</sup> the rising scarcity of traditional energy resources<sup>110</sup> and soaring levels of pollution<sup>111</sup> highlight the urgent need for collective global action to mitigate the negative effects of climate change and ensure global energy security.

### A. *Climate Change Mitigation Is a Global Public Good that Calls for Collaborative Effort*

Climate change mitigation has long been regarded as a public good.<sup>112</sup> "The atmosphere is an international public good, in that all countries benefit from each country's reduction in [GHG] emissions."<sup>113</sup> Climate change mitigation is both nonrivalrous and nonexcludable and, because it is available on a worldwide basis, is a global public good.<sup>114</sup> Accordingly, the reduction of GHG emis-

108. See Rafael Leal-Arcas & Stephen Minas, *Mapping the International and European Governance of Renewable Energy*, 35 Y.B. EUR. L. 621, 647 (2016).

109. See *EIA Projects 48% Increase in World Energy Consumption by 2040*, U.S. ENERGY INFO. ADMIN. (May 12, 2016), <https://www.eia.gov/todayinenergy/detail.php?id=26212> [<https://perma.cc/3GXJ-H7UM>].

110. See *Energy Scarcity*, RESILIENTCITY.ORG, <http://www.resilientcity.org/index.cfm?id=11897> (last visited July 16, 2017) [<https://perma.cc/L9HN-W5GZ>].

111. See, e.g., *Delhi Air Quality Plunges to 'Severe' Category as Pollution Levels Soar*, HINDUSTAN TIMES (Nov. 12, 2016), <http://www.hindustantimes.com/delhi/delhi-air-quality-plunges-to-severe-category-as-pollution-levels-soar/story-5Zwa6MndeqDPf61WgSjYNI.html> [<https://perma.cc/RR9U-KDN6>].

112. See, e.g., Raviva Hasson et al., *Climate Change in a Public Goods Game: Investment Decision in Mitigation Versus Adaptation*, 70 ECOLOGICAL ECON. 331, 331 (2010).

113. See CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF CLIMATE CHANGE 21 (James P. Bruce et al. eds., 1996), [https://www.ipcc.ch/ipccreports/sar/wg\\_III/ipcc\\_sar\\_wg\\_III\\_full\\_report.pdf](https://www.ipcc.ch/ipccreports/sar/wg_III/ipcc_sar_wg_III_full_report.pdf) [<https://perma.cc/N8CF-RA4S>].

114. See *Rethinking Public Goods and Global Public Goods*, *supra* note 36, at 46–47; see also Rafael Leal-Arcas & Stephen Minas, *Mapping the International and European Governance of Renewable Energy*, 35 OXFORD Y.B. EUR. L. 621, 622 (2016).

sions presents the same issues and challenges that are commonly associated with the provision of public goods at the national level, such as the lack of economic incentives, and the infamous free rider and prisoner's dilemma issues.<sup>115</sup> So, from an economic perspective, climate change mitigation requires collaborative effort and collective action.

### B. *Energy Security Through the Lens of a Public Goods Analysis*

Energy security has become a significant issue of concern for the European Union, given the region's precarious energy situation.<sup>116</sup> The traditional concept of energy security focuses on the *continual* availability of energy sources at an affordable price, which so far has been associated with a steady and constant availability and supply of traditional energy resources, such as oil and gas.<sup>117</sup> While it is generally agreed that climate change mitigation, as discussed above, is a global public good,<sup>118</sup> the classification of energy security as a public good has divided experts and academics.<sup>119</sup> The traditional interpretation of a public good cannot be applied to the concept of energy security, as energy security does not fall under the definition of a nonrivalrous and nonexcludable good, as defined by economists.<sup>120</sup> The consumption of traditional sources of energy, such as oil and gas, naturally leads to depletion and excludability; hence energy security in this context cannot be classified as a public good. However, by shifting the focus of global efforts towards the creation of a framework that delivers uninterrupted, secure, affordable, clean, and *sustainable* energy through the use of modern technology, states can achieve global renewable energy security, which is a global public good. So, renewable energy may become the engine to obtain the three attributes of

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115. See CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF CLIMATE CHANGE, *supra* note 113, at 167. The prisoner's dilemma issue presents itself in the context of climate change mitigation when, in the absence of effective cooperation between states, the negative effects of climate change cannot be mitigated. States must exchange information on emission cuts and other areas of specialized knowledge and expertise to effectively mitigate the effects of climate change.

116. See LEAL-ARCAS, *supra* note 15, at 11; LEAL-ARCAS ET AL., *supra* note 18, at 1.

117. See LEAL-ARCAS ET AL., *supra* note 18, at 6–7.

118. See Rafael Leal-Arcas, *Unilateral Trade-Related Climate Change Measures*, 13 J. WORLD INV. & TRADE 875, 892 (2012); see also Leal-Arcas & Minas, *supra* note 114.

119. See, e.g., Christopher A. Simon, *Is Energy a Public Good?*, RENEWABLE ENERGY WORLD (July 2, 2007), <http://www.renewableenergyworld.com/articles/2007/07/is-energy-a-public-good-49201.html> [https://perma.cc/KG9F-8LJ2].

120. A rivalrous good is a good that, once consumed by one consumer, cannot be consumed by other consumers. See DAVID L. WEIMER & AIDAN R. VINING, *POLICY ANALYSIS: CONCEPTS AND PRACTICE* 72 (4th ed. 2005).

sustainable energy in the energy trilemma<sup>121</sup>: namely clean, secure, and affordable energy (see Figure 2).

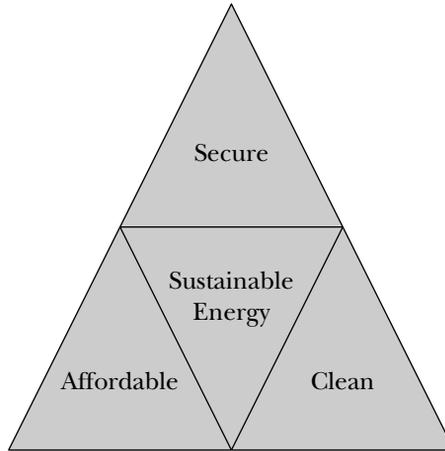


FIGURE 2: THE ATTRIBUTES OF SUSTAINABLE ENERGY IN THE ENERGY TRILEMMA

### 1. Global Renewable Energy Security

The concept of global renewable energy security is rooted in a belief that states—with the help of modern technology—can achieve uninterrupted, secure, clean, sustainable, and affordable<sup>122</sup> energy through the use of renewable energy resources.<sup>123</sup> The concept of global renewable energy security is better understood through examples *A* and *B*, illustrated below.

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121. “The World Energy Council’s definition of energy sustainability is based on three core dimensions—energy security, energy equity, and environmental sustainability. These three goals constitute a ‘trilemma,’ entailing complex interwoven links between public and private actors, governments and regulators, economic and social factors, national resources, environmental concerns, and individual behaviours.” *World Energy Trilemma*, WORLD ENERGY COUNCIL, <https://www.worldenergy.org/work-programme/strategic-insight/assessment-of-energy-climate-change-policy/> (last visited July 16, 2017) [<https://perma.cc/E4H6-C6P7>].

122. Andrew Griffin, *Solar and Wind Power Cheaper than Fossil Fuels for the First Time*, INDEPENDENT (Jan. 4, 2017), <http://www.independent.co.uk/environment/solar-and-wind-power-cheaper-than-fossil-fuels-for-the-first-time-a7509251.html> [<https://perma.cc/6EWX-JWSH>].

123. See generally *Mapping the International and European Governance of Renewable Energy*, *supra* note 108 (reviewing governance structures that govern energy policy and manage energy security).

### a. Example A

State *X* is rich in sunlight, but lacks the technological capacity to process solar energy. State *Y*, on the other hand, possesses the technological capacity to process solar energy, but does not have renewable energy capacity because it is not rich in renewable natural resources such as sunlight. State *X* and state *Y* enter into an agreement whereby state *Y* supplies state *X* with access to the technology it needs to process solar energy and, in turn, state *X* gives state *Y* access to processed renewable energy. As a result, both states *X* and *Y* gain access to uninterrupted, secure, clean, sustainable, and affordable energy.

In the example above, the benefits reaped by states *X* and *Y* also become available to the wider global community, as surplus renewable energy can then be sold to other states.<sup>124</sup> Other states can now gain access to renewable energy generated by states *X* and *Y*, even if those other states do not have the technological capacity to process raw renewable material. Example *B*, below, illustrates this latter condition.

### b. Example B

State *Z*, which is not rich in sunlight,<sup>125</sup> does not have the technological capacity to process raw renewable energy resources such as solar energy. Thus, state *Z* relies on supplies of conventional

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124. Scientists are developing new and effective mechanisms that allow for the storage of different types of renewable energy in times of deficit or surplus in production, and the subsequent transportation of any excesses. See, e.g., Manuel Gotz et al., *Renewable Power-to-Gas: A Technological and Economic Review*, 85 RENEWABLE ENERGY 1371 (2016) (describing a power-to-gas process chain that could be implemented to store renewable energy). Common forms of renewable energy storage include pumped-storage hydroelectric dams, rechargeable batteries, thermal storage (including molten salts that can store and release large amounts of heat energy), compressed air energy storage, flywheels, cryogenic systems, and superconducting magnetic coils. See, e.g., *Energy Storage Technologies*, ENERGY STORAGE ASS'N, <http://energystorage.org/energy-storage/energy-storage-technologies> (last visited July 16, 2017) [<https://perma.cc/W833-XZ9J>]. One way to store and transport renewable energy is through the “power-to-gas” method. Manuel Gotz et al., *Renewable Power-to-Gas: A Technological and Economic Review*, 85 RENEWABLE ENERGY 1371 (2016). The term “power-to-gas” refers to the new technologies that are used for the storage and transport of regenerative energy in the form of methane or hydrogen. *Id.* For example, renewable electric energy can be transformed into storable methane via electrolysis and subsequent methanation. *Id.*

125. Even though all states have access to sunlight, sunlight is not as consistent or easily accessible in all parts of the world. In addition, the amount of energy that can be generated by solar power is unpredictable, as its supply depends on, inter alia, weather conditions. Thus, energy generated by solar power can be produced in excess or deficit and quantities can be quite volatile. One way to resolve issues related to the variability of renewable energy production could be through state-to-state trade in renewable energy.

fossil fuels to meet its energy demands. However, state *Z* can now enter into an agreement with either state *X* or state *Y* to secure its supply of renewable energy through a separate agreement with either or both states.<sup>126</sup>

Example *B* demonstrates just a fraction of the vast potential of renewable energy that can be shared to help meet global energy demands. The model above could be applied to any type of renewable energy resource, such as wind, sunlight, or rain. The agreement between states *X* and *Y* in the example above opens the door for trade in renewable energy at the regional and global level, with endless possibilities for states to engage in bilateral, trilateral, plurilateral, and multilateral arrangements for trade in renewable energy. Such arrangements could lead to increased flows of renewable energy throughout the globe, through the use of various mechanisms such as renewable energy trading platforms or inter-governmental agreements on energy trade.

The gradual proliferation of renewable energy around the world metaphorically resembles a spider web, the center of which connects modern technology and renewable energy sources. This gradual spread of renewable energy across the globe—made possible by modern technology and innovation—will ultimately lead to global renewable energy security.

## 2. Global Renewable Energy Security as a Global Public Good

Rapid changes in technology can alter the categorization of goods, turning previously private goods into public goods, and vice versa. For this reason, this Article suggests that global renewable energy security is a global public good, as it is *nonexcludable*<sup>127</sup> and *nonrivalrous*,<sup>128</sup> and it is available, to a greater or lesser extent, on a

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*See Energy Challenges: Reliability*, EDF ENERGY, <https://www.edfenergy.com/future-energy/challenges/reliability> (last visited July 16, 2017) [<https://perma.cc/5AQF-V536>].

126. Renewable energy trading is a good way for states that do not have renewable energy capacity to secure access to clean, sustainable energy. Directive 2009/28/EC, adopted under the auspices of the European Union's 2020 action plan, encourages states to exchange energy from renewable sources through a combination of domestic production and foreign imports. *See* Directive 2009/28/EC of the European Parliament and of the Council of Apr. 23, 2009 on the Promotion of the Use of Energy from Renewable Sources and Amending and Subsequently Repealing Directives 2001/77/EC and 2003/30/EC, 2009 O.J. (L 140) 16, arts. 1, 6.

127. When global renewable energy security is achieved, no person in the world can be excluded from consuming the available energy, as it becomes freely and widely available.

128. One state's agreement to supply another state with renewable energy does not diminish the overall capacity of renewable energy available, and thus, use by one state does not reduce availability for other states. In addition, where an individual consumes renewa-

worldwide scale. Common issues associated with the provision of public goods—such as the free rider issue and the prisoner’s dilemma—could arise when renewable energy becomes widely and globally available. For example, where a state secures uninterrupted access to sustainable energy, that energy becomes a common good, from which the wider public can freely enjoy benefits. Because of the nonexcludability of global renewable energy security, there is a risk that people will take advantage of the benefits it generates without paying for them.

Finally, achieving global renewable energy security requires collective action and cooperation between the various actors involved in the supply and demand chain. Without effective collaborative mechanisms in place to ensure the free flow of information, technical knowledge, and skills, global renewable energy security cannot be achieved.

### C. *Regional and Global Cooperation on Decarbonizing the Economy Will Contribute to Climate Change Mitigation*

In line with its obligations under the Paris Agreement,<sup>129</sup> the European Union has made a pledge to reduce GHG emissions by at least forty percent by 2030,<sup>130</sup> sixty percent by 2040,<sup>131</sup> and eighty percent below 1990 levels by 2050.<sup>132</sup> The 2030 climate and energy framework also sets two additional targets for the year 2030: achieving at least a twenty-seven percent share of renewable energy, and at least a twenty-seven percent improvement in energy efficiency.<sup>133</sup> A shift away from volatile fossil fuels will ensure that

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ble energy, her consumption does not reduce the availability for other individuals in the same or other states.

129. See Paris Agreement, *supra* note 24.

130. See *2030 Climate and Energy Framework*, EUROPEAN COMM’N, [http://ec.europa.eu/clima/policies/strategies/2030/index\\_en.htm](http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm) (last visited July 16, 2017) [<https://perma.cc/6SLM-VQEL>].

131. See *2050 Low-Carbon Economy*, EUROPEAN COMM’N, [http://ec.europa.eu/clima/policies/strategies/2050/index\\_en.htm](http://ec.europa.eu/clima/policies/strategies/2050/index_en.htm) (last visited July 16, 2017) [<https://perma.cc/3XA3-K298>].

132. *Id.* (“The European Commission is looking at cost-efficient ways to make the European economy more climate-friendly and less energy consuming . . . . The roadmap suggests that, by 2050, the [European Union] should cut its emissions to [eighty percent] below 1990 levels through domestic reductions alone (i.e. rather than relying on international credits). This [goal] is in line with [E.U.] leaders’ commitment to reducing emissions by [eighty to ninety-five percent] by 2050 in the context of similar reductions to be taken by developed countries as a group. To reach this goal, the [European Union] must make continued progress towards a low-carbon society. Clean technologies play an important role.”).

133. See *2030 Climate and Energy Framework*, *supra* note 130.

the European Union reaches its GHG emission targets, and that it introduces a higher share of renewable energy resources into its economy, in line with its 2030 climate and energy framework and its obligations under the Paris Agreement. The effective decarbonization of the economy, however, cannot occur if E.U. member states act in isolation. If the European Union is to reach its target goals by 2030, its member states must cooperate on decarbonizing the economy, both regionally and globally.<sup>134</sup>

Additionally, concerted action is needed in order to tackle poverty and low standards of living, as developing states that still grapple with such issues are less likely to achieve low-carbon economies within the timeframe set under the Paris Agreement. Cooperation between developed and developing states, for example, could lead to the exchange of technology, skills, expert knowledge, and resources. This exchange, in turn, can stimulate economic growth in developing states, and accelerate the process of decarbonization. Otherwise, developing states may be less willing to cut their emissions, as slowing down the process of industrialization could harm their economies. As deep and successful decarbonization requires profound changes to countries' energy and production systems, the only way to achieve this by 2030, or as soon as possible, is through deep collaborative efforts. By establishing solid collaborative mechanisms that encourage the exchange of renewable energy resources and technology,<sup>135</sup> E.U. member states can become the

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134. Article 6 of the Paris Agreement outlines methods by which market mechanisms that were established under the Kyoto Protocol can be developed into mechanisms that allow for the sharing of responsibility for climate action across borders. Paris Agreement, *supra* note 24, art. 6. Article 6 recognizes the potential of cooperation to promote sustainable development and environmental integrity. *Id.*

135. For example, the United Kingdom and France signed a declaration on nuclear energy and cooperation on climate change action in 2014. See Press Release, U.K. Dep't of Energy & Climate, UK and France Sign Declaration on Nuclear Energy and Agree Cooperation on Ambitious Climate Change Action (Jan. 31, 2014), <https://www.gov.uk/government/news/uk-and-france-sign-declaration-on-nuclear-energy-and-agree-cooperation-on-ambitious-climate-change-action> [<https://perma.cc/F3YJ-VVH7>]. The declaration paved the way for, *inter alia*, the successful mitigation of climate change and the development of low-carbon secure electricity, which provides new green jobs and investment. *Id.* In addition, in 2012, the United Kingdom and Iceland signed an agreement to encourage enhanced cooperation between the two states, as well as greater use of interconnectors for the transportation of energy under the sea. See Announcement, U.K. Dep't of Energy & Climate, UK and Iceland Sign Energy Agreement (May 30, 2012), <https://www.gov.uk/government/news/uk-and-iceland-sign-energy-agreement> [<https://perma.cc/E37C-JNQM>]. Further agreements on cooperation on renewables have been signed between, *inter alia*, Denmark and China, and the south-west communities of England and the Channel Islands. See Press Release, Danish Ministry of Energy, Utilities & Climate, China and Denmark Sign New Cooperation Agreement on Energy Efficiency (May 1, 2014), <http://www.efkm.dk/en/news/china-and-denmark-sign-new-cooperation-agreement-on-energy->

driving actors in promoting the development of critical low-carbon technologies and making them commercially available and accessible to both developed and developing states. The establishment of collaborative mechanisms can catalyze the process of decarbonization, allowing the European Union to quickly and effectively honor its international responsibilities and obligations on climate change mitigation.

D. *Regional and Global Efforts Towards Decarbonization Could Contribute to the Resolution of Pressing Economic and Human Rights Issues*

This Section focuses on the importance of sustainable development in the context of economic growth. A good example of sustainable development is improved access to energy. It is a well-known fact that development leads to an increase in the level of per capita energy consumption.<sup>136</sup> Energy security, or access to energy at an affordable price, is a burning issue in a world where, according to the International Energy Agency, in 2014, approximately 1.2 billion people (i.e., sixteen percent of the world population) had no access to electricity.<sup>137</sup> Most of those living without electricity (around ninety-six percent) are in sub-Saharan Africa and developing Asia.<sup>138</sup> Eighty percent of them live in rural areas.<sup>139</sup> Yet, in the case of Africa, the continent receives the least amount of climate finance in the world—around four percent.<sup>140</sup> Controlled energy costs and increased availability will ensure a more efficient use of electricity as well as changes in lifestyle, but would limit economic growth in the developing world. For all

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efficiency [<https://perma.cc/6UF5-PU3J>]; *Channel Islands' Link with South-West England on Marine Power*, BBC NEWS (Dec. 3, 2013), <http://www.bbc.co.uk/news/world-europe-guernsey-25200486> [<https://perma.cc/W43X-7GXC>].

136. *Energy Use (Kg of Oil Equivalent Per Capita)*, THE WORLD BANK (2014), <http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE> (last visited July 16, 2017) (demonstrating how developed nations consume more energy per capita because their citizens have a higher purchasing power, which translates into buying and using goods that consume energy, namely cars, boats, computers, and cell phones, to name but a few) [<https://perma.cc/S3X5-YWP2>].

137. Int'l Energy Agency, WEO 2016 Electricity Access Database, <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/> (last visited July 16, 2017) [<https://perma.cc/MZP7-BU5Z>].

138. *Id.*

139. *Rural Population*, THE WORLD BANK (2014), <http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS> (last visited July 16, 2017) [<https://perma.cc/BXX6-ESPP>].

140. United Nations Climate Change Conference (@COP22), TWITTER (Aug. 31, 2016, 4:10 AM), <https://twitter.com/cop22/status/770941942922350593> [<https://perma.cc/A7NP-4MBP>].

these reasons, the energy future should be sustainable, based on renewable energy.

## 1. The European Union's Human Rights Crisis

Poverty, war, and repression have driven thousands of people to seek refuge in the European Union.<sup>141</sup> A large number of refugees that attempt to cross the European Union's borders risk their lives and those of their loved ones in order to escape poverty and pitiable living conditions, brought about mostly by conflicts, climate change, and environmental degradation.<sup>142</sup> Energy poverty in particular is a serious issue in sub-Saharan Africa.<sup>143</sup> It has led to an increase in migration to the European Union and is regarded by many as a security problem associated with international crime, terrorism, and trafficking,<sup>144</sup> and has in turn contributed to xenophobia and racism in the European Union.<sup>145</sup>

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141. Various reports and articles published in the last ten years demonstrate that there has been a surge in the influx of refugees from the African continent, particularly from sub-Saharan Africa. See *Key Facts: Africa to Europe Migration*, BBC NEWS (July 2, 2007), <http://news.bbc.co.uk/1/hi/world/europe/6228236.stm> [<https://perma.cc/5PM7-5CYW>]. The majority of refugees are forced to seek refuge in European countries due to war, conflict, political upheaval, poverty, and climate change. Isabel Schafer, *Migration to Europe – Is North Africa Europe's Boarder [sic] Guard?* at 1, GERMAN DEV. INST. (June 8, 2015), [https://www.die-gdi.de/uploads/media/German\\_Development\\_Institute\\_Schaefer\\_08.06.2015.pdf](https://www.die-gdi.de/uploads/media/German_Development_Institute_Schaefer_08.06.2015.pdf) [<https://perma.cc/896L-TXB3>]. An increasing number of refugees come from sub-Saharan Africa, a region that suffers from energy poverty and where the negative effects of climate change have driven many to relocate in search of a better future. *Id.*

142. Aryn Baker, *How Climate Change is Behind the Surge of Migrants to Europe*, TIME (Sept. 7, 2015), <http://time.com/4024210/climate-change-migrants/> [<https://perma.cc/D78L-E5U3>].

143. The region has a tremendous energy deficit that is considered by many to be one of the major elements constraining Africa's economic and social development. See Matt Timms, *Energy Poverty Stifles Sub-Saharan Africa's Economic Development*, WORLD FIN. (May 3, 2015), <http://www.worldfinance.com/markets/energy-poverty-stifles-sub-saharan-africas-economic-development> [<https://perma.cc/ZH4M-PBMB>]; see INT'L ENERGY CHARTER, AFRICA AND THE ENERGY CHARTER: THE BOUNTIFUL CONTINENT AND THE ENERGY CONUNDRUM (2015), [http://www.energycharter.org/fileadmin/DocumentsMedia/Infographics/2015\\_Energy\\_Charter\\_And\\_Africa.pdf](http://www.energycharter.org/fileadmin/DocumentsMedia/Infographics/2015_Energy_Charter_And_Africa.pdf) ("According to recent [International Energy Agency] data, less than 300 million Sub-Saharan Africans out of roughly 915 million people living in the region have access to electricity. This means that between [sixty and seventy percent] of Africans are disconnected. In overall terms, there are about 1.2 billion people in the world with no access to electricity, half of whom live in the African continent.") [<https://perma.cc/4LQK-DCNF>].

144. Marie-Laurence Flahaux & Hein De Haas, *African Migration: Trends, Patterns, Drivers*, COMP. MIGRATION STUD., 1, 1–2 (Jan. 2016), <https://comparativemigration-studies.springeropen.com/articles/10.1186/s40878-015-0015-6> [<https://perma.cc/L2UW-8T5F>].

145. Interestingly, periods of economic progress in the United States and Europe have traditionally been conducive to tolerance and openness because autochthonous popula-

Related to the notion of refugee status is the concept of (economic or climate) migrant status,<sup>146</sup> often related to energy poverty. Demographic and economic changes push citizens out of poor and middle-income countries and into developed countries. In India and China, for instance, cultural beliefs, sex-selective abortions, and gendercide have caused an excess of boys and men.<sup>147</sup> Many young men, unable to find wives, have great incentives to migrate. Similarly, migrants pushed out of their countries due to energy poverty turn to Western countries for greater opportunity.<sup>148</sup>

In addition, migration flows into the European Union have increased significantly over the past years due to the volatile security situation in North Africa and parts of the Middle East. For example, studies conducted by the Global Migration Data Analysis Centre indicate that the number of asylum seekers has consistently grown since 2011 and was at a record high as of 2015.<sup>149</sup> Moreover, the United Nations estimates that by 2060, fertility in all regions of the world, except for Africa, will have reached the replacement rate of 2.1 children per woman or below, which was already the case in many Western countries as of 2010.<sup>150</sup> Africa will have a birth rate of around 2.7 children per woman by 2060.<sup>151</sup> Many Africans may be tempted to migrate to wealthier Europe so long as they continue to be the victims of climate change and energy poverty, exacerbated by population growth.

The growing number of refugees seeking asylum in the European Union has brought to light the shortages in resources and

tions did not feel that migrants threatened locals' ability to progress economically. See Benjamin M. Friedman, *THE MORAL CONSEQUENCES OF ECONOMIC GROWTH* 7–9 (2005). *A contrario*, whenever economic growth has been low, racism and discrimination have been on the rise, due to local populations feeling pushed down economically as a result of migrants. *Id.*

146. For a discussion on the controversial concept of “climate migrants,” see generally Rafael Leal-Arcas, *On Climate Migration and International Trade*, 6 VIENNA J. ON INT’L CONST. L. 410 (2012).

147. *Answering for India’s ‘Missing Girls’: Sex-Selective Abortion in India*, RECORD (Feb. 11, 2014), <https://www.newsrecord.co/answering-for-indias-missing-girls-sex-selective-abortion-in-india/> [<https://perma.cc/Ry8Q-DECL>].

148. ANTOINE HALFF ET AL., *ENERGY POVERTY: GLOBAL CHALLENGES AND LOCAL SOLUTIONS* 1 (2014); see also Schafer, *supra* note 141.

149. INT’L ORG. FOR MIGRATION: GLOB. MIGRATION DATA ANALYSIS CTR., 2015 GLOBAL MIGRATION TRENDS FACTSHEET 9 (2017), <http://gmdac.iom.int/global-migration-trends-factsheet> [<https://perma.cc/FK6F-MW5L>].

150. See Max Roser, *Future World Population Growth*, OUR WORLD IN DATA, <https://ourworldindata.org/future-world-population-growth/#note-7> (last visited July 16, 2017) [<https://perma.cc/AZY5-9ZEP>].

151. *Id.*

facilities that would permit the European Union to embrace asylum seekers and meet its obligations under regional and international human rights instruments.<sup>152</sup> The recent readmission agreement of March 2016 between the European Union and Turkey<sup>153</sup> further highlights these shortages in capacity and serves to undermine the credibility of E.U. institutions, because the agreement calls for the return of asylum seekers to Turkey, a state with a dubious human rights record.<sup>154</sup> Many have questioned the legality of the readmission agreement as its implementation may lead to

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152. The European Union is bound by the Charter of Fundamental Human Rights in the course of implementing E.U. legislation. EUROPEAN COMM'N, *EU Charter of Fundamental Rights*, [http://ec.europa.eu/justice/fundamental-rights/charter/index\\_en.htm](http://ec.europa.eu/justice/fundamental-rights/charter/index_en.htm) (last visited July 16, 2017) (“On [December 1, 2009], with the entry into force of the Treaty of Lisbon, the Charter became legally binding on the EU institutions and on national governments, just like the EU Treaties themselves . . . . The provisions of the charter are addressed to: the institutions and bodies of the [European Union] with due regard for the principle of subsidiarity; and the national authorities only when they are implementing EU law.”) [<https://perma.cc/VP6L-DEG9>]. In addition, E.U. member states are also bound by the Convention for the Protection of Human Rights and Fundamental Freedoms, better known as the European Convention on Human Rights, and the International Covenant of Civil and Political Rights (ICCPR). See Convention for the Protection of Human Rights and Fundamental Freedoms, Nov. 4, 1950, 213 U.N.T.S. 221; International Covenant on Civil and Political Rights, Dec. 16, 1966, 999 U.N.T.S. 171; U.N. HIGH COMM’R FOR HUMAN RIGHTS, *THE EU AND INTERNATIONAL HUMAN RIGHTS LAW* 7, 9, [http://www.europe.ohchr.org/Documents/Publications/EU\\_and\\_International\\_Law.pdf](http://www.europe.ohchr.org/Documents/Publications/EU_and_International_Law.pdf) (last visited July 16, 2017) [<https://perma.cc/47H8-F7VB>].

153. See Press Release, European Council, *EU-Turkey Statement, 18 March 2016* (Mar. 18, 2016), <http://www.consilium.europa.eu/en/press/press-releases/2016/03/18-eu-turkey-statement/> [<https://perma.cc/N42M-RXM9>].

154. Human rights have been under attack in Turkey. According to Amnesty International’s 2016/2017 Annual Report:

An attempted coup prompted a massive government crackdown on civil servants and civil society. Those accused of links to the Fethullah Gülen movement were the main target. Over [forty thousand] people were remanded in pretrial detention during six months of emergency rule. There was evidence of torture of detainees in the wake of the coup attempt. Nearly [ninety thousand] civil servants were dismissed; hundreds of media outlets and [nongovernmental organizations] were closed down and journalists, activists, and [members of parliament] were detained. Violations of human rights by security forces continued with impunity, especially in the predominantly Kurdish southeast of the country, where urban populations were held under [twenty-four]-hour curfew. Up to half a million people were displaced in the country. The European Union and Turkey agreed to a migration deal to prevent irregular migration to the [European Union]; this led to the return of hundreds of refugees and asylum seekers and less criticism by EU bodies of Turkey’s human rights record.

*Annual Report: Turkey 2016/2017*, AMNESTY INT’L, <https://www.amnesty.org/en/countries/europe-and-central-asia/turkey/report-turkey/> (last visited July 16, 2017) [<https://perma.cc/H9AV-9ECK>].

violations of E.U. and international regulations on the treatment and return of refugees.<sup>155</sup>

Regional and global cooperation on the decarbonization of the economy could help resolve some of the pressing matters that underpin the current human rights crisis described above. The exchange of technology and renewable energy could stimulate economic growth and alleviate energy poverty in Africa, particularly in states where poverty is more prevalent, such as parts of sub-Saharan Africa. Studies conducted by the International Renewable Energy Agency demonstrate that Africa's economies are currently growing at an average rate of four percent per year.<sup>156</sup> Further, six of the world's ten fastest growing economies over the last decade were found in sub-Saharan Africa.<sup>157</sup> Sustaining the same level of growth, however, will only be possible if supported by a much larger and better-performing energy sector.<sup>158</sup>

As one of the world's major economic powers, the European Union has the capacity and means to invest in research, develop new renewable energy technologies, and encourage innovation. Given its commitment to and investment in clean energy, E.U. states such as Germany may have the capacity to lead the retreat from fossil fuels and initiate the transformation of the global energy sector.<sup>159</sup> Cooperation with, inter alia, African states on the decarbonization of the economy would produce a number of benefits to both Africa and the European Union.

First, such cooperation would facilitate economic growth in the African continent and eradicate energy poverty in sub-Saharan Africa, significantly improving the living conditions of millions of people around the world, including in the European Union. Second, interstate cooperation would reduce the number of economic migrants who travel to the European Union from sub-Saharan Africa: fewer people will feel compelled to undertake the danger-

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155. E.U. and international legislation require that there must be no risk of serious harm and no threat that those returned will be sent to another country that is deemed unsafe. See Council Directive 2011/95, arts. 32–33, 2011 O.J. (L 337) 9 (EU).

156. INT'L RENEWABLE ENERGY AGENCY, AFRICA'S RENEWABLE FUTURE: THE PATH TO SUSTAINABLE GROWTH 5 (2013), [http://www.irena.org/documentdownloads/publications/africa\\_renewable\\_future.pdf](http://www.irena.org/documentdownloads/publications/africa_renewable_future.pdf) [hereinafter AFRICA'S RENEWABLE FUTURE] [<https://perma.cc/CP5X-G9F8>].

157. *Africa's Impressive Growth*, THE ECONOMIST (Jan. 6, 2011), [http://www.economist.com/blogs/dailychart/2011/01/daily\\_chart](http://www.economist.com/blogs/dailychart/2011/01/daily_chart) [<https://perma.cc/8BNP-M3US>].

158. See AFRICA'S RENEWABLE FUTURE, *supra* note 151.

159. See Robert Kunzig, *Germany Could Be a Model for How We'll Get Power in the Future*, NAT'L GEOGRAPHIC (Nov. 2015), <http://www.nationalgeographic.com/magazine/2015/11/germany-renewable-energy-revolution/> [<https://perma.cc/5URH-7UFS>].

ous journey from Africa to Europe. Third, collaborative decarbonization would ensure that the European Union has the capacity to deal with refugees and asylum seekers who enter the European Union to escape persecution and violence due to war and political upheaval. This would remove the current strain on national authorities and reduce the number of refugees that need to be sent away to third countries, such as Turkey.

## 2. Efforts Towards Decarbonization Will Boost the European Union's Economy

Economic growth is one of the core tenets of the European Union and a powerful incentive for regional and global collaboration. Collaboration on the decarbonization of the economy will benefit individual member states and the overall economy of the European Union by proliferating the spread of renewable energy around the globe and ensuring stable and sustainable global economic growth.<sup>160</sup> Enhanced cooperation also ensures that the European Union will make considerable progress in attaining its objectives under the revised E.U. Sustainable Development Strategy (EU SDS),<sup>161</sup> key among which is the attainment of economic

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160. As early as the 1960s and 1970s, there was discussion about the limits to growth and the importance of sustainable growth. See, e.g., PAUL R. EHRLICH, *THE POPULATION BOMB* (Sierra Club rev. ed. 1968); DONELLA H. MEADOWS ET AL., *THE LIMITS TO GROWTH* (1972). More recent works include PAUL SABIN, *THE BET: PAUL EHRLICH, JULIAN SIMON, AND OUR GAMBLE OVER EARTH'S FUTURE* (2013); NAOMI KLEIN, *THIS CHANGES EVERYTHING: CAPITALISM VS. THE CLIMATE* (2014); GRAEME MAXTON & JORGEN RANDERS, *REINVENTING PROSPERITY: MANAGING ECONOMIC GROWTH TO REDUCE UNEMPLOYMENT, INEQUALITY AND CLIMATE CHANGE* (2016).

161. Regional and global cooperation on decarbonization is in line with the European Union's commitment to sustainable development under the E.U. Sustainable Development Strategy (EU SDS). See Council of the European Union, Note from Gen. Secretariat to Delegations, *Review of the EU Sustainable Development Strategy (EU SDS) - Renewed Strategy*, SEC (2006) 10917/06 (June 9, 2006), <http://www.etuc.org/IMG/pdf/st10117.en06.pdf> [<https://perma.cc/9VN4-KBSJ>]. According to the General Secretariat's Note to the delegations:

Sustainable development means that the needs of the present generation should be met without compromising the ability of future generations to meet their own needs. It is an overarching objective of the European Union set out in the [EU SDS], governing all of the [European] Union's policies and activities. It is about safeguarding the earth's capacity to support life in all its diversity and is based on the principles of democracy, gender equality, solidarity, the rule of law, and respect for fundamental rights, including freedom and equal opportunities for all. It aims at the continuous improvement of the quality of life and well-being on Earth for present and future generations. To that end [the EU SDS] promotes a dynamic economy with full employment and a high level of education, health protection, social and territorial cohesion and environmental protection in a peaceful and secure world, respecting cultural diversity.

prosperity through the promotion of “a prosperous, innovative, knowledge-rich, competitive and eco-efficient economy which provides high living standards and full and high-quality employment throughout the European Union.”<sup>162</sup> Collaboration on the establishment of a fossil fuel-free economy will pave the way for improved trade and diplomatic relations between nations, which can, in turn, reduce tariffs for renewable energy-related goods and services in international trade agreements<sup>163</sup>; expand the Energy Charter Treaty’s (ECT) membership; and generate employment.

First, lower tariffs for renewable energy-related goods and services will lead to lower prices for consumers and hence, increased competition. Renewable energy markets will thus soar and make way for new opportunities, increased investment, and economic welfare.<sup>164</sup>

Second, the expansion of the ECT’s<sup>165</sup> membership (for regulation of the energy industry) to countries in the Middle East and North Africa (MENA) region and the Economic Community of West African States will attract investment in the African continent.<sup>166</sup> Collaboration on the decarbonization of the economy—

162. *See id.* at 4.

163. Such an argument is in line with the theory of economic integration, as analyzed by economist Bela Balassa, which contemplated “degrees” of economic integration, with a free trade agreement as a first step towards integration, harmonization of external tariffs as a step further, and common internal regulations as a step even further. *See generally* BELA BALASSA, *THE THEORY OF ECONOMIC INTEGRATION* (1961).

164. As an illustrative analog, reduced costs of photovoltaics in recent years have contributed greatly to solar power becoming increasingly competitive. In particular:

2015 was a record year for renewable energy, with China, Africa, the [United States], Latin America and India in particular driving forward the global energy transition. A photovoltaics boom is [also] forecast for the United States . . . . While China, Japan and the [United States] dominated the photovoltaics markets in 2015, Europe was also able to reach an important expansion milestone. Total photovoltaics output in [Europe] reached the 100-[gigawatt] mark in 2015.

*Solar Market Set to Soar Globally Throughout 2016*, RENEWABLE ENERGY FOCUS (May 10, 2016), <http://www.renewableenergyfocus.com/view/44164/solar-market-set-to-soar-globally-throughout-2016/> [<https://perma.cc/2VRT-YSZ5>].

165. The Energy Charter Treaty (ECT) is an international agreement which aims to provide a “multilateral framework for energy cooperation” based on the principles of “open, competitive markets and sustainable development.” ENERGY CHARTER SECRETARIAT, *THE ENERGY CHARTER TREATY AND RELATED DOCUMENTS: A LEGAL FRAMEWORK FOR INTERNATIONAL ENERGY COOPERATION* 13 (2004).

166. Efforts are already underway to encourage the accession to the ECT of regional organizations such as the Economic Community of West African states, which currently holds observer status. In addition, East African Community (EAC) states such as Burundi, Tanzania, and Uganda have also signed the International Energy Charter 2015, but have not yet acceded to the ECT. States such as, *inter alia*, Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda face a number of drawbacks within their energy sector, such as limited access to electricity, high costs of electricity generation, and, among others,

the exchange of renewable energy resources, technology, and expert knowledge—particularly with states in the MENA region and Africa at large, could lead to stabilization of the energy sectors in these regions<sup>167</sup> and, in turn, facilitate the expansion of ECT membership. This expansion could create reciprocity through technology transfer, while enhancing E.U. energy security by creating an infrastructure that will ultimately boost international, long-distance trade in renewable energy. In addition, it will create a large global renewable energy market where the European Union can compete on a level playing field, and new producers of energy from the MENA region and sub-Saharan Africa can contribute to the energy security of the European Union and the wider global community.

Third, intraregional collaboration on decarbonization will create employment opportunities. Unemployment, and particularly youth unemployment, has been an issue of concern in the European Union.<sup>168</sup> Recent data indicate that 19.750 million adults in the European Union (of whom 15.439 million were in the euro

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overdependence on biomass. In relation to the Middle East and North Africa (MENA) region, even though most MENA states already have observer status with the ECT, accession has not yet taken place. Despite the potential for investment in renewable energy, many international developers, investors, and companies are not clear as to how to enter the market. Acceding to the ECT could help resolve some of these regional issues by attracting investment, opening up energy markets, and encouraging international cooperation. However, full accession to the ECT requires that states are able to abide by universal market-based principles, which may require them to undertake further steps before proceeding. The economies of acceding states are assessed against such principles before accession can take place. See VICTORIA RITAH NALULE, ENERGY CHARTER SECRETARIAT KNOWLEDGE CENTRE, *ENERGY IN THE EAST AFRICAN COMMUNITY: THE ROLE OF THE ENERGY CHARTER TREATY* (2016), [http://www.energycharter.org/fileadmin/DocumentsMedia/Occasional/Energy\\_in\\_the\\_East\\_African\\_Community.pdf](http://www.energycharter.org/fileadmin/DocumentsMedia/Occasional/Energy_in_the_East_African_Community.pdf) [https://perma.cc/Z9H6-3MG4]; CLEAN ENERGY PIPELINE, *THE FUTURE OF RENEWABLE ENERGY IN THE MENA REGION*, <http://www.cleanenergypipeline.com/Resources/CE/ResearchReports/The%20Future%20for%20Renewable%20Energy%20in%20the%20MENA%20Region.pdf> (last visited July 16, 2017) [https://perma.cc/MXW8-9WU8]. For further details, see *Consolidation, Expansion and Outreach*, INT'L ENERGY CHARTER, <http://www.energycharter.org/what-we-do/conexo/overview/> (last visited July 16, 2017) [https://perma.cc/C4YV-ZWCB]; see also *The International Energy Charter*, INT'L ENERGY CHARTER, <http://www.energycharter.org/process/international-energy-charter-2015/overview/> (last visited July 16, 2017) [https://perma.cc/798L-6ENC].

167. Many states in parts of Africa and the MENA region can better address energy-related challenges through the exchange of technology, technical knowledge, and skills. Such exchanges will allow for the introduction of relevant compliance mechanisms that will enable these countries to abide by universal market-based principles, and thus lead to speedier accession to the ECT.

168. See *Unemployment Statistics*, EUROPA: EUROSTAT, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment\\_statistics#Youth\\_unemployment\\_trends](http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics#Youth_unemployment_trends) (last visited July 17, 2017) [https://perma.cc/R3MF-RGAT].

area) were unemployed in February 2017.<sup>169</sup> In addition, in February 2017, 3.905 million young persons (under 25) were unemployed in the European Union, of whom 2.722 million were in the euro area.<sup>170</sup> Regional and global cooperation on the decarbonization of the economy could generate new opportunities for investment and expand the global renewable energy market.<sup>171</sup> Innovation, technological advancement, and research in the field of renewable energy can lead to the creation of new posts and generate employment.

#### E. *How Can the Trading System Help Mitigate Climate Change and Enhance Sustainable Energy?*

This Section explores how trade can help achieve sustainable energy and mitigate climate change. The international community is currently experiencing a grand energy transition,<sup>172</sup> where trade in sustainable energy resources is critical if the international community wishes to move forward cleanly. Sustainable energy is vital for global economic and human development.<sup>173</sup> Shocking news such as the fact that the world's eight richest people have the same level of wealth as the poorest 50% makes one wonder about social sustainability and development.<sup>174</sup> Or to put it differently, in the UK, households in the bottom 10% of the population have a disposable income around 10 times less than that of the top 10%.<sup>175</sup> In the past, efforts to achieve the different dimensions of development—economic, social, and environmental—have tended to be

169. *Id.*

170. *Id.*

171. Indeed, various kinds of innovative actions between the private and public sectors are emerging to mitigate climate change. This is the commitment of Mission 2020. See *About, M2020*, <http://www.mission2020.global/> (last visited July 17, 2017) [<https://perma.cc/F5VF-NXLH>].

172. See generally ROBERT A. HEFNER III, *THE GRAND ENERGY TRANSITION: THE RISE OF ENERGY GASES, SUSTAINABLE LIFE AND GROWTH, AND THE NEXT GREAT ECONOMIC EXPANSION* (2015) (detailing the global economic transition to sustainable energy).

173. See Amie Gaye, *Access to Energy and Human Development*, UNITED NATIONS DEVELOPMENT PROGRAMME, Human Development Report 2007/2008, [http://hdr.undp.org/sites/default/files/gaye\\_amie.pdf](http://hdr.undp.org/sites/default/files/gaye_amie.pdf) (last visited July 17, 2017) [<https://perma.cc/3JL8-EUT5>]; see also *Trade Beyond the Tweet*, BERTELSMANN FOUND., <http://www.bfna.org/publication/bvisual-trade-beyond-the-tweet> (last visited July 17, 2017) (analyzing how major economies are supported by trade) [<https://perma.cc/JES9-G5ZA>].

174. *World's Eight Richest People Have Same Wealth as Poorest 50%*, GUARDIAN (Jan. 15, 2017), <https://www.theguardian.com/global-development/2017/jan/16/worlds-eight-richest-people-have-same-wealth-as-poorest-50> [<https://perma.cc/PGP8-XS9L>].

175. *The Scale of Economic Inequality in the UK*, EQUALITY TRUST, <https://www.equalitytrust.org.uk/scale-economic-inequality-uk> (last visited July 17, 2017) [<https://perma.cc/G8K5-9W8E>].

obstructed by “silo” mentalities, namely sectors not collaborating with each other to have a holistic view of a multifaceted problem.<sup>176</sup>

Today, however, the international community increasingly recognizes the need to take an integrated approach in addressing global development issues.<sup>177</sup> Trade—an area that every country participates in and, to different degrees, benefits from—cuts across almost every aspect of development in its role of reducing poverty, creating jobs,<sup>178</sup> and promoting cross-border cooperation. Trade can play a powerful role in achieving two of humanity’s most urgent needs—namely, sustainable energy and climate change mitigation—yet trade has been overlooked as a platform to address important global agendas.

Trade has caused harm to the environment because the goods that were traded were not environmental goods; namely goods that prevent, reduce or eliminate pollution.<sup>179</sup> Countries can fight climate change by providing a system that creates incentives to trade in environmental goods. Such a system can stimulate the global economy by creating new jobs, innovative companies, and goods that can be building blocks of a sustainable future.

Everyone wants a world that is clean, safe, and prosperous, with no poverty. The answer to many of these issues is a trading system that facilitates the movement of goods and services in a way that

176. *Breaking ‘Silo’ Approach Key in Toppling Barriers to Merging Three Pillars of Sustainable Development, Speaker Tells High-level Political Forum*, U.N. Meetings Coverage ECOSOC/6705 (June 30, 2015), <https://www.un.org/press/en/2015/ecosoc6705.doc.htm> [<https://perma.cc/4YFM-H6DY>].

177. See, e.g., *Sustainable Development Knowledge Platform*, U.N. DEP’T OF ECON. & SOC. AFFAIRS, <https://sustainabledevelopment.un.org/?menu=1300> (identifying the sustainable development goals articulated by the United Nations) [<https://perma.cc/U9QU-APJQ>].

178. Cynthia D. Crain and Dwight R. Lee, *International Trade Creates More and Better Jobs*, NAT’L COUNCIL ON ECON. EDUC. (2015), [http://www.econedlink.org/lessons/docs\\_lessons/575\\_international\\_trade1.pdf](http://www.econedlink.org/lessons/docs_lessons/575_international_trade1.pdf) [<https://perma.cc/4JNP-BXYT>]. In the West-ern world, only thirteen percent of job losses are the result of trade agreements; the remaining eighty-eight percent come from technology and innovation. See Paul Wiseman, *Why Robots, Not Trade, are Behind so Many Factory Job Losses*, AP (Nov. 2, 2016), <https://apnews.com/265cd8fb02fb44a69cf0eaa2063e11d9/mexico-taking-us-factory-jobs-blame-robots-instead> [<https://perma.cc/F48H-ZQS7>].

179. *Is Trade Good or Bad for the Environment?* OECD, <http://www.oecd.org/trade/trade-andenvironment.htm> (last visited July 17, 2017) [<https://perma.cc/4VXK-KTWC>]; see also *Environmental Goods and Services Sector*, EUROPA: EUROSTAT, <http://ec.europa.eu/eurostat/web/environment/environmental-goods-and-services-sector> (last visited July 17, 2017) (“The purpose of environmental goods and services is to prevent, reduce and eliminate pollution and any other form of environmental degradation . . . and to conserve and maintain the stock of natural resources, hence safeguarding against depletion.”) [<https://perma.cc/5R27-B7FH>].

will help achieve a cleaner, sustainable, and richer world. The necessary change in the trading system is possible via the reduction or elimination of tariff and nontariff barriers to environmental goods and services. For instance, there are countries that charge tariffs as high as thirty-five percent on environmental goods.<sup>180</sup> If countries eliminate or reduce technical barriers to trade in environmental goods and services,<sup>181</sup> they would not only help to mitigate climate change, but also provide greater access to sustainable energy and grow the economy through increased trade and jobs.<sup>182</sup> Reducing these barriers will be beneficial to trade, the environment, and sustainable development. Equally, by making use of mega-RTAs with binding provisions on environmental protection, there will be economic growth and mitigation of climate change. In a world where states have built bridges connecting themselves through trade and technology, the production and supply of public goods has far-reaching, global implications.

This Section links trade with climate change and energy security in the context of the green economy. Climate change is one of the biggest challenges humanity faces today.<sup>183</sup> As a result of trade, there is increased social inequality<sup>184</sup> as well as more carbon and other GHG emissions in the atmosphere.<sup>185</sup> That said, thanks to trade, millions of people have come out of poverty in recent years.<sup>186</sup> The international community should conduct more

180. *Environmental Goods Agreement*, OFF. U.S. TRADE REP., <https://ustr.gov/trade-agreements/other-initiatives/environmental-goods-agreement> (last visited July 17, 2017) [<https://perma.cc/P8NX-8Z8T>].

181. For a list of fifty-four environmental goods on which leaders of the Asia-Pacific Economic Cooperation (APEC) member-States have committed to reduce or eliminate tariffs, see *Annex C – APEC List of Environmental Goods*, APEC (Sept. 8, 2012), [http://www.apec.org/Meeting-Papers/Leaders-Declarations/2012/2012\\_aelm/2012\\_aelm\\_annex.C.aspx](http://www.apec.org/Meeting-Papers/Leaders-Declarations/2012/2012_aelm/2012_aelm_annex.C.aspx) [<https://perma.cc/WL98-T5XT>].

182. U.N. ENV'T PROGRAM, GREEN JOBS: TOWARDS DECENT WORK IN A SUSTAINABLE, LOW-CARBON WORLD 3–4, 33–34, 284 (2008), <http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1057&context=intl> [<https://perma.cc/CQ49-62SJ>].

183. See *supra* Part I.

184. Gary Burtless, *Worsening American income: Inequality: Is World Trade to Blame?*, BROOKINGS INST., (Mar. 1, 1996), <https://www.brookings.edu/articles/worsening-american-income-inequality-is-world-trade-to-blame/> [<https://perma.cc/XB8B-KLJG>].

185. STOCKHOLM ENV'T INST., PETER ERICKSON ET AL., INTERNATIONAL TRADE AND GLOBAL GREENHOUSE GAS EMISSIONS: COULD SHIFTING THE LOCATION OF PRODUCTION BRING GHG BENEFITS? 2 (Apr. 2013), <https://www.sei-international.org/mediamanager/documents/Publications/SEI-ProjectReport-EricksonP-InternationalTradeAndGlobalGreenhouseGasEmissions-2013.pdf> [<https://perma.cc/RKA7-UBYZ>].

186. James Pethokoukis, *700 Million Humans Have Moved Out of Deep Poverty in the 21st Century. Thanks Capitalism*, AM. ENTER. INST., (July 14, 2015), <http://www.aei.org/publication/700-million-humans-have-moved-out-of-deep-poverty-in-the-21st-century-thank-capitalism/> [<https://perma.cc/JSQ7-5LZM>].

coherent regulation and policy making so that the potential for trade to positively contribute to the climate action effort can be realized. Such actions would also ensure that climate measures do not distort trade and instead promote an open economic system that contributes to an equitable and inclusive sustainable development. Trade law can make an impact on climate change by helping to decarbonize the global economy. In the past, trade law has been a very powerful instrument for change, as the following three examples show.

First, trade has facilitated poverty reduction. Due to trade agreements, around one billion people came out of extreme poverty between 1990 and 2010.<sup>187</sup> Second, due to trade agreements, more people have access to medicines.<sup>188</sup> Third, trade has promoted the protection of human rights. Seventy percent of countries participate in trade agreements that protect human rights.<sup>189</sup>

If the trading system has been instrumental for the above highly complex issues, why not use trade law as a novel tool to mitigate climate change? The trading system can be a powerful tool to fight climate change, give access to sustainable energy, and make people and countries richer. This could be achieved through greater cooperation between major emitters of GHGs and more trade liberalization on environmental goods and services. Additionally, citizens could have a much greater role in renewable energy services.

Today, eighty percent of the global energy supply comes from fossil fuels.<sup>190</sup> Fossil fuels contribute to climate change and are

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187. See *Towards the End of Poverty*, THE ECONOMIST (June 1, 2013), <http://www.economist.com/news/leaders/21578665-nearly-1-billion-people-have-been-taken-out-extreme-poverty-20-years-world-should-aim> [<https://perma.cc/WHD7-8TZY>].

188. Jacqui Wise, *Access to AIDS Medicines Stumbles on Trade Rules*, 84 BULL. WORLD HEALTH ORG. 342 (May 2006), <http://www.who.int/bulletin/volumes/84/5/news.pdf> [<https://perma.cc/QH9U-6CNW>].

189. Susan Ariel Aaronson, *Human Rights*, THE WORLD BANK 443, 443 <http://siteresources.worldbank.org/INTRANETTRADE/Resources/C21.pdf> (last visited July 17, 2017) [<https://perma.cc/P5KD-KZX8>].

190. *World Energy Council Report Confirms Global Abundance of Energy Resources and Exposes Myth of Peak Oil*, WORLD ENERGY COUNCIL (Oct. 15, 2015), <https://www.worldenergy.org/news-and-media/press-releases/world-energy-council-report-confirms-global-abundance-of-energy-resources-and-exposes-myth-of-peak-oil/> [<https://perma.cc/5ZK6-8LNL>].

believed to be finite,<sup>191</sup> which leads to energy insecurity.<sup>192</sup> Renewable energy can help in that it is cleaner than fossil fuels, and also helps towards energy independence, enhancing energy security.<sup>193</sup> Trade law and policy could be used as a vehicle to achieve these goals because trade rules can promote environmental goods and services.<sup>194</sup>

The international community can use trade law as a vehicle not only for climate action and sustainable energy,<sup>195</sup> but also to achieve many of the Sustainable Development Goals (SDGs). Currently, the governance of trade and renewable energy is fragmented, with many institutions and legal instruments.<sup>196</sup> There is insufficient research on how the trade and renewable energy regimes can cooperate. The global economy stands to achieve three main benefits when cooperative trade law becomes a tool for change: mitigation of climate change, enhanced energy security,<sup>197</sup> and economic growth (see Figure 3).

191. *But see* Charles Mann, *What If We Never Run Out of Oil?*, THE ATLANTIC (May 2013), <http://www.theatlantic.com/magazine/archive/2013/05/what-if-we-never-run-out-of-oil/309294/> (discussing how new technologies may allow scientists to gain access to massive methane-hydrate gas reserves under the ocean floor, potentially “throwing a wrench into efforts to combat climate change” by greatly expanding the pool of accessible fossil fuel resources) [<https://perma.cc/3DPV-PAY8>].

192. Julian Simon questions this statement by arguing that the quantities of natural resources are not limited in the way we think they are. New reserves of natural resources are constantly discovered; others are yet to be discovered; and others are not yet economically viable. *See* Julian Simon, *When Will We Run Out of Oil? Never!*, [http://www.juliansimon.com/writings/Ultimate\\_Resource/TCHAR11.txt](http://www.juliansimon.com/writings/Ultimate_Resource/TCHAR11.txt) (last visited July 17, 2017) [<https://perma.cc/F87R-5BNV>]. An example that might serve to illustrate Simon’s position can be found by comparing predictions concerning copper consumption and dwindling reserves made in the 1970s. “[I]n 1970, identified and undiscovered copper resources were estimated to contain . . . reserves of about 280 million metric tons of copper. Since then, almost 480 million metric tons of copper have been produced worldwide, but world copper reserves in 2014 were estimated to be 700 million metric tons of copper, more than double [the estimate] in 1970.” U.S. DEP’T OF THE INTERIOR & U.S. GEOLOGICAL SURV., MINERAL COMMODITY SUMMARIES 2015, 191 (2015), <https://minerals.usgs.gov/minerals/pubs/mcs/2015/mcs2015.pdf> [<https://perma.cc/F5J5-HFNA>].

193. On the governance of renewable energy, see generally *Mapping the International and European Governance of Renewable Energy*, *supra* note 108, at 621.

194. Some proponents have gone even further to suggest that “trade must be an engine of growth for all.” *See* WTO, IMF and World Bank leaders: “Trade must be an engine of growth for all”, WTO (Oct. 7, 2016), [https://www.wto.org/english/news\\_e/news16\\_e/dgra\\_07oct16\\_e.htm](https://www.wto.org/english/news_e/news16_e/dgra_07oct16_e.htm) [<https://perma.cc/Y8D6-LT8D>].

195. *See, e.g.*, Rafael Leal-Arcas et al., *Renewables, Preferential Trade Agreements and EU Energy Security*, 4 LAWS 472 (2015).

196. *Mapping the International and European Governance of Renewable Energy*, *supra* note 108, at 622.

197. *See* Rafael Leal-Arcas, *How Governing International Trade in Energy Can Enhance EU Energy Security*, 6 RENEWABLE ENERGY L. & POL’Y REV. 202, 215–18 (2015).

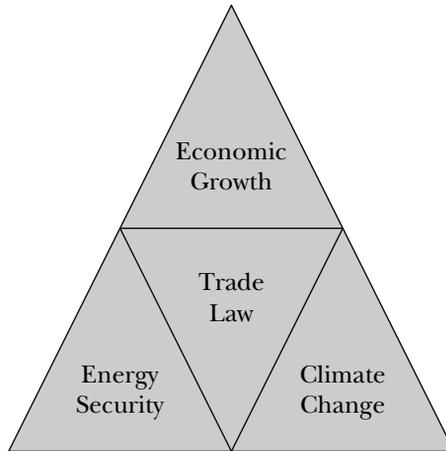


FIGURE 3: THE TRIPLE BENEFIT OF TRADE

There is not enough cooperation or consistency between trade and climate change policies. Greater cooperation between the secretariats of the U.N. Framework Convention on Climate Change (UNFCCC) and the World Trade Organization (WTO) is necessary to fill the gap between the theoretical potential for trade law to help mitigate climate change and getting empirical results. This gap is potentially catalytic because it paves the way for using trade to solve other sustainability challenges. As a result of this knowledge gap, we have missed crucial opportunities for cooperation between trade and climate change.

As Figure 4 depicts, in the 1990s, two major agreements were concluded: one on climate change—the UNFCCC<sup>198</sup>—and one on international trade—the WTO Agreement.<sup>199</sup> The WTO Agreement only briefly mentions in its preamble the importance of sustainable development in the context of international trade.<sup>200</sup> Still, considering that sustainable development is a tenet of the WTO Agreement, the multilateral trading system should be more effective at climate change mitigation and promotion of sustainable energy. The WTO Agreement missed the opportunity for trade law to play a bigger role in mitigating climate change by failing to emphasize this purpose.

198. UNFCCC, *supra* note 49.

199. Marrakesh Agreement Establishing the World Trade Organization, Apr. 15, 1994, 1867 U.N.T.S. 154 (1994).

200. *Id.* pmbl.

From 2008, so-called “twenty-first-century trade agreements”<sup>201</sup> with chapters on sustainable development, started to emerge.<sup>202</sup> However, these chapters are often vague.<sup>203</sup> In 2015, a new global climate agreement came into existence—the Paris Agreement—which fails to mention the term “trade.”<sup>204</sup> These agreements are missed opportunities to cooperate between the trade and climate regimes.

However, the twenty-second session of the Conference of the Parties (COP 22) in Marrakesh<sup>205</sup> made some progress towards deciding how the trading system can help achieve the SDGs. The WTO, the U.N. Conference on Trade and Development (UNCTAD) and the International Trade Center (ITC), in collaboration with the secretariats of the UNFCCC and the International Fund for Agricultural Development, came up with a tool box of trade measures that can help mitigate GHG emissions.<sup>206</sup> These are: reducing costs and deploying key climate technologies quickly to places where they will have the biggest impact; stimulating investment in energy, infrastructure, transport, information tech-

201. This locution refers to trade agreements that touch upon environmental and social issues. It was first used to refer to the Trans-Pacific Partnership. See Everett Rosenfeld, *Who Wins and Loses in '21st Century Trade Agreement'*, CNBC (Nov. 13, 2015), <http://www.cnbc.com/2015/11/13/who-wins-and-loses-in-21st-century-trade-agreement.html> [<https://perma.cc/8PCM-NUCB>].

202. Lorand Bartels, *Social Issues in Regional Trade Agreements: Labour, Environment and Human Rights*, in *BILATERAL AND REGIONAL TRADE AGREEMENTS* (Simon Lester, Bryan Mercurio and Lorand Bartels eds., 2d ed. 2015).

203. See, e.g., Trans-Pacific Partnership, chp. 19, OFF. U.S. TRADE REP., <https://ustr.gov/trade-agreements/free-trade-agreements/trans-pacific-partnership/tpp-full-text> [<https://perma.cc/5HVL-GSUJ>]; see also Laura Puccio and Krisztina Binder, *Trade and sustainable development chapters in CETA 11*, EUROPEAN PARLIAMENT RESEARCH SERVICE (Jan. 2017), [http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/595894/EPRS\\_BRI%282017%29595894\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/595894/EPRS_BRI%282017%29595894_EN.pdf) [<https://perma.cc/GVT8-JMQ4>].

204. See Paris Agreement, *supra* note 24.

205. The Conference of the Parties (COP), described in Article 7 of the U.N. Framework Convention on Climate Change (UNFCCC), is the supreme decision-making body of the UNFCCC which meets on a yearly basis unless the parties decide otherwise. See UNFCCC, *supra* note 49, art. 7. The COP's role is to promote and review the implementation of the UNFCCC. See *id.* It periodically reviews existing commitments in light of the convention's objective, new scientific findings, and the effectiveness of national climate change programs, and can adopt new commitments through amendments and protocols. See *id.* In December 1997, at its third session (COP-3), it adopted the Kyoto Protocol, containing stronger emissions-related commitments for developed countries in the post-2000 period. See Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 214 (1998). In 2015, at COP-21, the Paris Agreement was adopted. See Paris Agreement, *supra* note 24.

206. COP22: *Geneva-Based Agencies Highlight Important Role of Trade in Addressing Climate Change*, U.N. CONF. ON TRADE AND DEV. (Nov. 12, 2016), <http://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1379> [<https://perma.cc/XE92-2QTZ>].

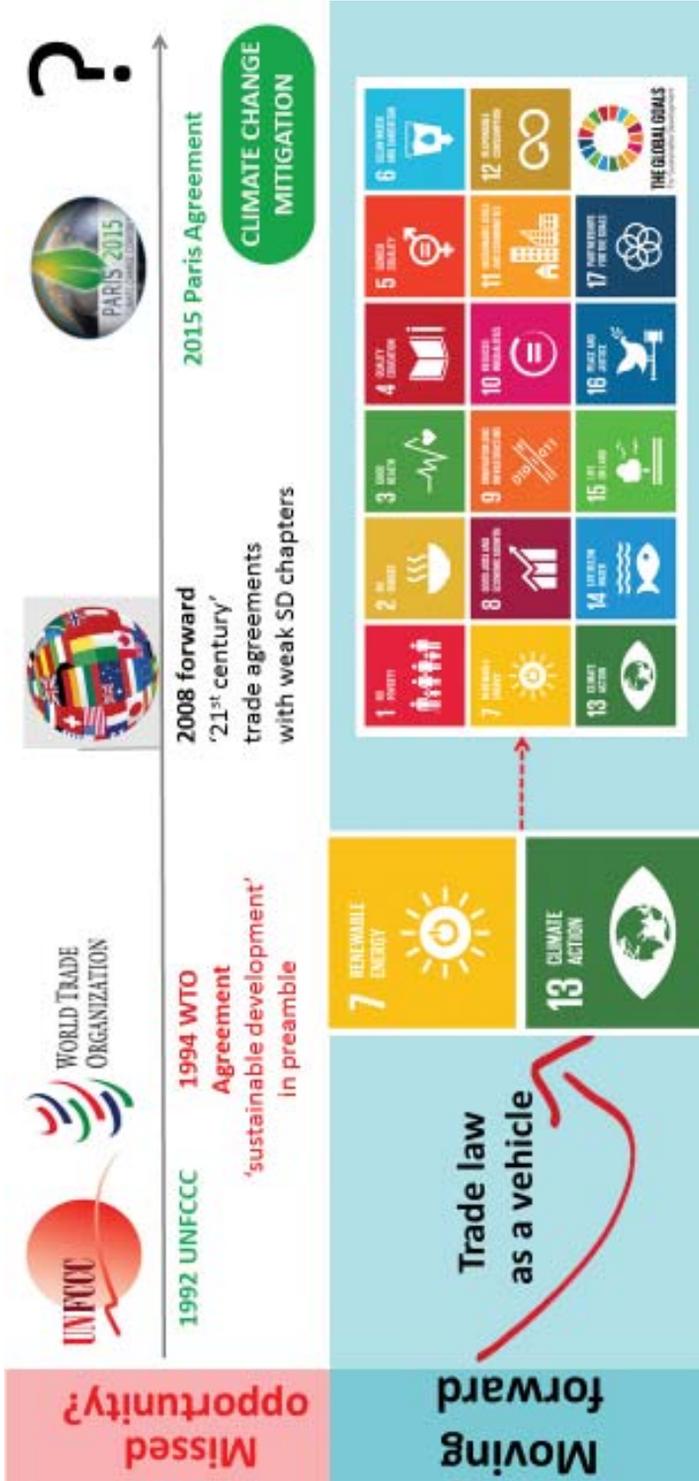


FIGURE 4: FROM INSUFFICIENT COOPERATION TO EFFECTIVE SYNERGIES

nology, and other key sectors of the new climate economy; and fostering competitive markets that encourage individuals, enterprises, and entire industries to learn from past experience, innovate, and do better in the future.<sup>207</sup>

Greater cooperation between the trade and climate regimes will lead to climate change mitigation and energy security. It is encouraging to note that some countries are part of the International Solar Alliance,<sup>208</sup> a group of sunshine countries based between the Tropic of Cancer and the Tropic of Capricorn,<sup>209</sup> where the potential of solar energy is phenomenal. Furthermore, a strong link between energy security and climate change mitigation is the use of renewable energy to diversify energy sources and, therefore, enhance energy security. The use of renewable energy, in turn, is a way to mitigate climate change. Linking all of this to the international trading system as a catalyst will only help mitigate climate change and enhance energy security.

Much is taking place in major developing countries to make this happen. For instance, India plans to reduce its GHG emissions relative to its GDP by thirty-three to thirty-five percent by 2030 from the 2005 level.<sup>210</sup> It intends to do so through policies on the promotion of clean energy, enhancement of energy efficiency, development of less carbon-intensive and more resilient urban centers, as well as the promotion of a sustainable green transportation network.<sup>211</sup> India also pledged to achieve around forty percent of its electric power from non-fossil fuel-based energy resources by 2030 with the help of technology transfer and low-cost international finance from the Green Climate Fund.<sup>212</sup> All of this is largely possible if there is greater cooperation between the trade and climate

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207. *Id.*

208. Key Information About International Solar Alliance, Int'l Solar Alliance (Nov. 30, 2015), <http://isolaralliance.org/projects.html> [<https://perma.cc/Y7LW-ADWK>]. For a list of prospective countries of the International Solar Alliance, see *id.*

209. For a map of the so-called global sunbelt, see *Annual Solar Irradiance, Intermittency and Annual Variations*, GREEN RHINO ENERGY, <http://www.greenrhinoenergy.com/solar/radiation/empiricalevidence.php> (last visited July 17, 2017) [<https://perma.cc/95BK-23EW>].

210. Press Release, GOV'T OF INDIA, *India's Intended Nationally Determined Contribution is Balanced and Comprehensive: Environment Minister*, MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (Oct. 2, 2015), <http://pib.nic.in/newsite/PrintRelease.aspx?relid=128403> [<https://perma.cc/3T5L-3TKY>].

211. *Id.*

212. India, Submission of India's Intended Nationally Determined Contribution to the U.N. Framework Convention on Climate Change, 29 (Oct. 1, 2015), <http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf> [<https://perma.cc/68YU-SG43>].

change regimes because this is an area where far too little attention has been given in global policymaking to make both regimes “mutually consistent, supportive, and reinforcing.”<sup>213</sup> Therefore, identifying the gaps and opportunities for cooperation between these two regimes is crucial to create a new normative framework on how the trading system can help mitigate climate change and enhance energy security.

How can the trading system help? How should the trading system deal with climate change mitigation? Very few trade agreements contain sustainable development chapters. Moreover, hardly any scholarly work exists that can inform practice.<sup>214</sup> Trade agreements can be a vehicle to address common concerns. But if all of the possible outcomes are positive, why are countries and their citizens not reacting to them? Are the trade rules preventing the energy transition? What needs to be changed to make the energy transition happen faster? The following Subsections address these concerns.

### 1. Major Emitters and Mega-Regional Trade Agreements

This Subsection proposes using mega-RTAs to mitigate climate change and enhance sustainable energy. In other words, this Subsection makes the claim that trade agreements can be a tool to promote decarbonization. Changes by just a few major GHG emitters and just three mega-RTAs can make a great contribution towards climate change mitigation and the enhancement of sustainable energy (see Table 4 below). The evidence for this claim is that RTAs have often served as laboratories for covering new disciplines that do not exist in the WTO context.<sup>215</sup> Moreover, RTAs today cover many topics well beyond trade: competition, investment, environmental protection, natural resources, intellectual

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213. JAMES BACCHUS, GLOBAL RULES FOR MUTUALLY SUPPORTIVE AND REINFORCING TRADE AND CLIMATE REGIMES 4 (Int'l Ctr. for Trade and Sustainable Dev. and World Econ. Forum 2016).

214. There is very little scholarship that analyzes how trade agreements can enhance sustainable development, and more specifically climate change mitigation and sustainable energy. See Norman Lee and Colin Kirkpatrick, *Methodologies for Sustainability Impact Assessments of Proposals for New Trade Agreements*, 3 J. ENVTL. ASSESSMENT POLICY MGMT 395 (2001); Rafael Leal-Arcas, *Mega-Regionals and Sustainable Development: The Transatlantic Trade and Investment Partnership and the Trans-Pacific Partnership*, 4 RENEWABLE ENERGY L. POLICY REV. 248 (2015); Rafael Leal-Arcas and Catherine Wilmarth, *Strengthening Sustainable Development through Preferential Trade Agreements*, in ENSURING GOOD GLOBAL GOVERNANCE THROUGH TRADE: EU POLICIES AND APPROACHES 92 (Jan Wouters et al., eds., 2015).

215. For an analysis of the link between regional trade agreements (RTAs) and the WTO, see Rafael Leal-Arcas, *Proliferation of Regional Trade Agreements: Complementing or Supplanting Multilateralism?*, 11 CHI. J. INT'L L. 597, 597–629 (2011).

property rights, labor rights, and so forth.<sup>216</sup> Since most of the contracting parties to these three mega-regional agreements are also the main GHG emitters, and since RTAs have provisions that bind countries to mitigate climate change, then RTAs may potentially become a very effective solution to climate change mitigation.<sup>217</sup> This Subsection first looks at the landscape of trade and climate change governance to identify the contracting parties to the three concluded or ongoing negotiations for mega-RTAs *par excellence* based on their percentage of global GDP and the main emitters of GHGs.

The Regional Comprehensive Economic Partnership (RCEP) is a free-trade agreement (FTA) negotiation that has been developed among sixteen countries in Asia and Oceania: the ten members of the Association of Southeast Asian Nations (ASEAN) (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam) and the six countries with which ASEAN has existing FTAs (Australia, China, India, Japan, South Korea, and New Zealand).<sup>218</sup> In relation to RCEP, these six non-ASEAN countries are known as the ASEAN Free Trade Partners.<sup>219</sup> RCEP countries have a population of more than three billion and a total GDP of around twenty-three trillion dollars, which is about thirty percent of global GDP.<sup>220</sup>

The Trans-Pacific Partnership (TPP) is an almost six thousand-page long FTA concluded among twelve Asia-Pacific nations, namely the United States, Japan, Mexico, Canada, Australia, Malaysia, Chile, Singapore, Peru, Vietnam, New Zealand, and Brunei.<sup>221</sup> It was concluded on October 5, 2015 after several years of secretive

216. See Rafael Leal-Arcas, *Brexit and the Future of UK Trade* (Nov. 25, 2016), <http://www.qmul.ac.uk/media/news/items/hss/190227.html> [<https://perma.cc/AS3M-VPQM>].

217. The same argument applies to sustainable energy. See, e.g., Rafael Leal-Arcas, Valentina Caruso & Raphaela Leupuscek, *Renewables, Preferential Trade Agreements and EU Energy Security*, 4 *Laws* 472, 472-514 (2015).

218. *Regional Comprehensive Economic Partnership (RCEP)*, N.Z. FOREIGN AFF. & TRADE, <https://www.mfat.govt.nz/en/trade/free-trade-agreements/agreements-under-negotiation/rcep/> (last visited July 17, 2017) [<https://perma.cc/KD8W-LRLW>].

219. *Id.*

220. *Id.*

221. *DG Azevedo Congratulates TPP Ministers*, WTO (Oct. 5, 2015), [https://www.wto.org/english/news\\_e/news15\\_e/dgra\\_05oct15\\_e.htm](https://www.wto.org/english/news_e/news15_e/dgra_05oct15_e.htm) [<https://perma.cc/C8D3-7SKM>]; Roger Yu, *TPP, Explained: What is the Trans-Pacific Partnership that President Trump is Withdrawing From?*, USA TODAY (Jan. 23, 2017), <https://www.usatoday.com/story/money/2017/01/23/what-tpp/96949608/> [<https://perma.cc/5T7G-7BSM>].

negotiations.<sup>222</sup> The TPP negotiations were conducted with a level of secrecy not witnessed in any previous trade agreement.<sup>223</sup> Even the U.S. Congress was critical about the opaqueness surrounding it.<sup>224</sup> Only six hundred “cleared advisors” representing corporations and trade blocs were privy to the negotiating process at the expense of the general public and civil society.<sup>225</sup> The TPP represents eleven percent of world population,<sup>226</sup> twenty-six percent of world trade,<sup>227</sup> and nearly forty percent of global GDP.<sup>228</sup> In January 2017, U.S. President Donald Trump signed an executive order for the United States to withdraw from the TPP.<sup>229</sup> For the purposes of this Article, the U.S. withdrawal has only a minor effect since the TPP will go ahead without the United States; moreover, the United States has never been a party to the TPP because the U.S. Congress had not ratified the TPP before the United States’ withdrawal from the trade agreement in January 2017<sup>230</sup> and because the TPP is not yet in force.<sup>231</sup>

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222. *DG Azevedo Congratulates TPP Ministers*, supra note 221; Eric Bradner, *How Secretive is the Trans-Pacific Partnership?*, CNN (June 12, 2015), <http://www.cnn.com/2015/06/11/politics/trade-deal-secrecy-tp/> [<https://perma.cc/X3ED-SD5P>].

223. *Secret Trans-Pacific Partnership Agreement (TPP) - IP Chapter*, WIKILEAKS (Nov. 13, 2013), <https://wikileaks.org/tp/pressrelease.html> [<https://perma.cc/S4VE-QHBP>].

224. See Press Release, *Congressional Democrats Escalate Criticism of Substance, Process of Obama’s First Trade Pact – the Trans-Pacific Partnership*, PUBLIC CITIZEN (June 27, 2012), <http://www.citizen.org/documents/release-congressional-democrats-escalate-criticism-6-27-12.pdf> [<https://perma.cc/SC7B-4PNJ>].

225. See William Mauldin, *U.S Says Not ‘Rushing’ Asia-Pacific Trade Deal*, WALL ST. J. (Sept. 26, 2013), <http://online.wsj.com/news/articles/SB10001424052702303796404579099632713091994> [<https://perma.cc/XFN8-CWTP>].

226. *Trans-Pacific Partnership Agreement*, AUSTL. GOV’T: DEP’T OF FOREIGN AFF. & TRADE (Feb. 7, 2017), <http://dfat.gov.au/trade/agreements/tp/tp/Pages/trans-pacific-partnership-agreement-tp.aspx> [<https://perma.cc/VAD5-XMSQ>].

227. *Id.*

228. This figure represents gross domestic product (GDP) prior to the U.S. withdrawal from the Trans-Pacific Partnership (TPP). See *Overview of the Trans Pacific Partnership*, OFF. OF THE U.S. TRADE REPRESENTATIVE, <https://ustr.gov/tp/overview-of-the-TPP> [<https://perma.cc/9PSE-MVC9>].

229. *Trump Executive Order Pulls Out of TPP Trade Deal*, BBC (Jan. 24, 2017), <http://www.bbc.co.uk/news/world-us-canada-38721056> [<https://perma.cc/Z34R-T44K>].

230. See James McBride, *The Trans-Pacific Partnership and U.S. Trade Policy*, COUNCIL ON FOREIGN RELATIONS (Jan. 31, 2017), <https://www.cfr.org/background/trans-pacific-partnership-and-us-trade-policy> [<https://perma.cc/KBY8-VV5F>]. In legal terms, this means that the United States has never been a party to the agreement. The U.S. president’s authority to withdraw from an international agreement is summarized in RESTATEMENT (THIRD) FOREIGN RELATIONS LAW OF THE UNITED STATES § 339 (AM. LAW INST., 1987). The question has been litigated in the context of withdrawal from a treaty, particularly in the case of *Goldwater v. Carter*, 617 F.2d 697 (D.C. Cir. 1979), which concerned termination of the U.S.-Taiwan Mutual Defense Treaty.

231. Catherine Putz, *TPP: The Ratification Race is On*, DIPLOMAT (Feb. 5, 2016), <http://thediplomat.com/2016/02/tpp-the-ratification-race-is-on/>.

The Trans-Atlantic Trade and Investment Partnership (TTIP) is a proposed RTA between the United States and the European Union and its member states.<sup>232</sup> The TTIP was first conceived in November 2011, following a U.S.-E.U. summit and the sixth meeting of the Transatlantic Economic Council.<sup>233</sup> Leaders requested that the U.S.-E.U. High Level Working Group on Jobs and Growth identify “policies and measures to increase U.S.-E.U. trade and investment to support mutually beneficial job creation, economic growth, and international competitiveness.”<sup>234</sup> The High Level Working Group concluded that the development of a comprehensive bilateral trade and investment agreement would provide the most benefits for the parties.<sup>235</sup> The TTIP represents nearly fifty percent of global GDP.<sup>236</sup>

Leaving aside the overlapping membership in these three mega-RTAs (Malaysia, Vietnam, Brunei, Japan, Singapore, Australia, and New Zealand are parties to both RCEP and TPP), the total aggregate of global GDP that the three mega-RTAs represent is around eighty to eighty-five percent.<sup>237</sup> This means that most of global GDP is represented by these three mega-RTAs. Equally, the ten major emitters of GHGs are responsible for about seventy percent of global GHG emissions, out of 196 countries (see Table 4).<sup>238</sup>

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232. *About TTIP*, EUROPEAN COMM’N, <http://ec.europa.eu/trade/policy/in-focus/ttip/about-ttip/> (last updated Apr. 1, 2015) [<https://perma.cc/FZ5T-UWN7>].

233. *Fact Sheet: United States to Negotiate Transatlantic Trade and Investment Partnership with the European Union*, OFF. OF THE U.S. TRADE REPRESENTATIVE (February 13, 2013), <https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2013/february/US-EU-TTIP> [<https://perma.cc/HWM8-5Y55>].

234. U.S.-EUROPEAN UNION HIGH LEVEL WORKING GRP. ON JOBS AND GROWTH, FINAL REPORT 1, (Feb. 11, 2013), [www.ustr.gov/sites/default/files/02132013%20FINAL%20HHLWG%20REPORT.pdf](http://www.ustr.gov/sites/default/files/02132013%20FINAL%20HHLWG%20REPORT.pdf) [hereinafter FINAL REPORT: HIGH LEVEL WORKING GROUP ON JOBS AND GROWTH] (citations omitted) [<https://perma.cc/RJ4H-XW7J>].

235. *Id.*

236. *What You Need to Know About TTIP*, EUR. AM. CHAMBER OF COM.: N.Y., <https://www.eaccny.com/international-business-resources/what-you-need-to-know-about-ttip/> (last visited July 17, 2017) [<https://perma.cc/LX5D-29S2>].

237. This percentage range reflects the author’s estimate. This figure represents GDP prior to the United States’ withdrawal from the TPP. *See id.*; *see also Overview of the Trans Pacific Partnership*, OFF. OF THE U.S. TRADE REPRESENTATIVE, <https://ustr.gov/tpp/overview-of-the-TPP> (last visited July 17, 2017) [<https://perma.cc/R75Q-TFK3>]; *Regional Comprehensive Economic Partnership (RCEP)*, N.Z. FOREIGN AFF. & TRADE, <https://www.mfat.govt.nz/en/trade/free-trade-agreements/agreements-under-negotiation/rcep/> (last visited July 17, 2017) [<https://perma.cc/A358-4YCE>].

238. Johannes Friedrich, Mengpin Ge & Andrew Pickens, *This Interactive Chart Explains World’s Top 10 Emitters, and How They’ve Changed*, WORLD RESOURCES INST. (Apr. 11, 2017), <http://www.wri.org/blog/2017/04/interactive-chart-explains-worlds-top-10-emitters-and-how-theyve-changed>.

TABLE 4: MAJOR GHG EMITTERS AND CONTRACTING PARTIES TO THE THREE MEGA-RTAs

Top 10 GHG Emitters <sup>239</sup> (≈70% of global GHG emissions) <sup>240</sup>	RCEP (ASEAN + 6) (≈30% of global GDP)	TPP (≈40% of global GDP) <sup>241</sup>	TTIP (≈50% of global GDP)
China	✓		
United States			✓
European Union (28 countries)			✓ <sup>242</sup>
India	✓		
Russia			
Indonesia	✓		
Brazil			
Japan	✓	✓	
Canada		✓	
Mexico		✓	
	<i>RCEP parties that are not top 10 GHG emitters: Australia, Brunei, Cambodia, Laos, Malaysia, Myanmar, New Zealand, Philippines, Singapore, South Korea, Thailand, Vietnam</i>	<i>TPP parties that are not top 10 GHG emitters: Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore, Vietnam</i>	

If one analyzes the table above by considering the European Union as a single economic entity and discounting the E.U. member states that are among the ten major economies in the world (i.e., Germany, the United Kingdom, France, and Italy), notably, Indonesia and Mexico are the only two emitters in the top ten that are not among the ten major economies.<sup>243</sup> Indonesia is the only country in the top ten emitters which is not among the top

239. The list takes into account emissions deriving from land use change and forestry.

240. Mengpin Ge et al., *6 Graphs Explain the World's Top 10 Emitters*, WORLD RESOURCES INST. (Nov. 25, 2014), <https://wri.org/blog/2014/11/6-graphs-explain-world%E2%80%99s-top-10-emitters> [<https://perma.cc/9X33-ZAZL>].

241. This figure represents GDP prior to the U.S. withdrawal from the TPP. See *Overview of the Trans Pacific Partnership*, *supra* note 237.

242. The E.U. member states will most likely be part of the Trans-Atlantic Trade and Investment Partnership (TTIP) given that some issues of TTIP are shared competence between the E.U. and its member states. For an analysis of trade agreements between the E.U. and a third party where E.U. member states ended up being a party of trade agreements, see Rafael Leal-Arcas, *THEORY AND PRACTICE OF EC EXTERNAL TRADE LAW AND POLICY* (2008).

243. According to the International Monetary Fund, these are the ten major economies, excluding any E.U. member state and including the European Union as a single entity: the United States, the European Union, China, Japan, India, Brazil, Canada, South Korea, Russia, and Australia. See *Report for Selected Countries and Subjects*, IMF, <http://bit.ly/2dQKeno> (last visited July 17, 2017) [<https://perma.cc/F4SU-YMDR>].

world economies. This means that its levels of GHG emissions are disproportionately high.

In addition to those three mega-RTAs, there are three concluded or ongoing trade initiatives that are worth mentioning regarding the role of international trade in climate change mitigation and sustainable energy. The first, also a mega-RTA, is the Comprehensive Economic and Trade Agreement between Canada and the European Union and its member states (CETA).<sup>244</sup> Since both Canada and the European Union are parties to some of the three mega-RTAs mentioned above (Canada is a party to the TPP, and the European Union to the TTIP), this Article omits CETA from the table above to avoid repetition of the participation of the top GHG emitters in mega-RTAs.<sup>245</sup> The second trade agreement is the Environmental Goods Agreement (EGA), currently under negotiation.<sup>246</sup> The third agreement is the Information Technology Agreement (ITA), which is relevant for trade in clean energy technologies.<sup>247</sup>

CETA was signed in October 2016.<sup>248</sup> Both Canada and the European Union are in the top ten GHG emitters and are among the major economies of the world, and therefore key actors in this area. The parties to CETA agree that economic growth supports their social and environmental goals.<sup>249</sup> CETA has two chapters relevant to the relationship between trade and environmental concerns: Chapter 22 (on trade and sustainable development) and Chapter 24 (on trade and environment).<sup>250</sup> CETA's Chapter 22 recognizes that economic growth, social development, and environmental protection are interconnected. Chapter 24 commits the parties to putting into practice international

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244. *CETA Explained*, EUROPEAN COMM'N, <http://ec.europa.eu/trade/policy/in-focus/ceta/ceta-explained/> (last updated Jan. 24, 2017) [<https://perma.cc/X6FZ-28VZ>].

245. Within the three chosen mega-RTAs, there is repetition in membership. For instance, there are seven TPP signatories that are included in the Regional Comprehensive Economic Partnership (RCEP) negotiations: Australia, Brunei, Japan, Malaysia, New Zealand, Singapore, and Vietnam. *Compare Trans-Pacific Partnership Agreement*, *supra* note 226, with *Regional Comprehensive Economic Partnership (RCEP)*, *supra* note 218.

246. *Environmental Goods Agreement*, WTO, [https://www.wto.org/english/tratop\\_e/envir\\_e/ega\\_e.htm](https://www.wto.org/english/tratop_e/envir_e/ega_e.htm) (last visited July 17, 2017) [<https://perma.cc/8XCX-W86Y>].

247. See World Trade Organization, Ministerial Declaration of 13 December 1996, WTO Doc. WT/MIN(96)/16, 36 I.L.M. 375 (1997).

248. DOMINIC WEBB, HOUSE OF COMMONS LIBRARY, BRIEFING PAPER No. 7492, CETA: THE EU-CANADA FREE TRADE AGREEMENT 5 (2017).

249. See Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union and its Member States, at 3, Jan. 1, 2017, 2017 O.J. (L 11) 23 [hereinafter CETA].

250. CETA arts. 22, 24.9.

environmental agreements.<sup>251</sup> More specifically, Chapter 24 protects the rights of the parties to regulate on environmental matters, requires the parties to enforce their domestic environmental laws, and prevents the parties from relaxing their laws to boost trade.<sup>252</sup>

The EGA is a plurilateral<sup>253</sup> trade agreement currently under negotiation between eighteen WTO Members.<sup>254</sup> Five of the ten major GHG emitters listed in Table 4 above are participating in the EGA.<sup>255</sup> This agreement aims to encourage green growth and sustainable development by liberalizing trade in environmental goods and by reducing or eliminating tariffs in environmental goods<sup>256</sup> such as renewable and clean energy technology.<sup>257</sup> Arguably, a broad liberalization of services could also be beneficial for sustainable development, as would an expansion of the EGA to services trade.<sup>258</sup> Moreover, a great added value of the EGA is that

251. *Id.* art. 24.

252. *CETA Chapter by Chapter*, EUROPEAN COMM'N, <http://ec.europa.eu/trade/policy/in-focus/ceta/ceta-chapter-by-chapter/> (last updated Dec. 16, 2016) [<https://perma.cc/5QZD-CWXG>].

253. A plurilateral approach to trade agreements means that the agreements are optional and not binding on those WTO members who do not engage in them. In the WTO context, multilateral negotiations, as opposed to plurilateral negotiations, imply the participation of all WTO members. The nature of the consequent multilateral agreements from these multilateral negotiations implies that commitments are taken by all the WTO members. The idea behind plurilateral negotiations is to make the WTO deliver again on progressive liberalization. See Rafael Leal-Arcas, *The GATS in the Doha Round: A European Perspective*, in *THE WORLD TRADE ORGANIZATION AND TRADE IN SERVICES* 28 (Kern Alexander & Mads Andenas, eds., 2008).

254. The eighteen WTO members are: Australia, Canada, China, Costa Rica, the European Union, Hong Kong, Iceland, Israel, Japan, South Korea, New Zealand, Norway, Singapore, Switzerland, Liechtenstein, Chinese Taipei (Taiwan), Turkey, and the United States. *Environmental Goods Agreement*, *supra* note 246. All the E.U. member states are represented by the European Union in the negotiations, which means that there is a total of forty-six WTO member states represented in the Environmental Goods Agreement (EGA). *Id.*

255. See *Environmental Goods Agreement*, *supra* note 246.

256. *The Environmental Goods Agreement (EGA): Liberalising Trade in Environmental Goods and Services*, EUROPEAN COMM'N (Sept. 8, 2015), <http://trade.ec.europa.eu/doclib/press/index.cfm?id=1116> [<https://perma.cc/C8A6-RP6Z>].

257. On the link between renewables and the trading system, see Rafael Leal-Arcas & Andrew Filis, *Legal Aspects of the Promotion of Renewable Energy Within the EU and in Relation to the EU's Obligations in the WTO*, 5 *RENEWABLE ENERGY L. & POL'Y REV.* 3, 3–25 (2014); Rafael Leal-Arcas & Andrew Filis, *Certain Legal Aspects of the Multilateral Trade System and the Promotion of Renewable Energy*, in *INTERNATIONAL ECONOMIC LAW AFTER THE GLOBAL CRISIS: A TALE OF FRAGMENTED DISCIPLINES* 482 (C.L. Lim & Bryan Mercurio eds., 2015).

258. Services trade includes, for instance, clean water filtration services and the movement of people via mode four of the General Agreement on Trade in Services. See General Agreement on Trade in Services, April 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1B, 1869 U.N.T.S. 183.

the “benefits of this new agreement will be extended to the entire WTO membership, meaning all WTO members will enjoy improved conditions in the markets of the participants to the EGA.”<sup>259</sup> The extension of these benefits will multilateralize this plurilateral agreement. This agreement is an example of the relevant intersection between international economic law and the SDGs. Such plurilateral agreements could have the potential of most favored nation application and therefore serve as a platform for climate change mitigation worldwide.<sup>260</sup> In sum, once the EGA is in place, it will add traditional products (not just environmental goods), more WTO Members, and nontechnical barriers to trade in environmental services.

Finally, the ITA, whose relevance for trade in clean energy technologies is crucial, was concluded by twenty-nine parties at the Singapore Ministerial Conference in December 1996.<sup>261</sup> Today, there are eighty-two parties to the ITA, which represents ninety-seven percent of international trade in information technology (IT) products.<sup>262</sup> In December 2015, over fifty parties to the agreement concluded an expansion of the ITA, which covers an additional 201 products.<sup>263</sup>

## 2. Regionalism/Plurilateralism Over Multilateralism in Trade and Climate Change

Multilateralism is embodied in international trade agreements. International trade and the rapidly proliferating network of trade agreements have sparked controversy for decades.<sup>264</sup> Agreements are signed when countries cannot solve a problem domestically. For instance, climate change is an area in which countries give up some sovereignty to help solve domestic problems. While some blame trade agreements for exporting jobs, sowing poverty, furthering illegal migration, and stealing national sovereignty, others praise them as lynchpins of growth, pillars of peace, guarantors of security, and engines of globalization.<sup>265</sup> Still others view them as

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259. *Environmental Goods Agreement*, *supra* note 246.

260. See Bryce Baschuk, *Environmental Goods Negotiators Make Incremental Progress*, BLOOMBERG INT’L TRADE DAILY, Sept. 26, 2016.

261. Ministerial Declaration of 13 December 1996, *supra* note 234; *Information Technology Agreement*, WTO, [https://www.wto.org/english/tratop\\_e/inftec\\_e/inftec\\_e.htm](https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm) (last visited July 17, 2017) [<https://perma.cc/VEH5-7QZ3>].

262. *Information Technology Agreement*, *supra* note 261.

263. *Id.*

264. See Leal-Arcas, *supra* note 215.

265. RAFAEL LEAL-ARCAS, INTERNATIONAL TRADE AND INVESTMENT LAW: MULTILATERAL, REGIONAL AND BILATERAL GOVERNANCE 39 (2010).

useful instruments for fostering global trade and investment.<sup>266</sup> Arguably, multilateralism is in crisis, whether in the field of trade, investment,<sup>267</sup> energy governance,<sup>268</sup> or climate change mitigation.<sup>269</sup> In the case of trade negotiations, the Doha Round<sup>270</sup> of trade negotiations at the WTO has clearly reached an impasse.<sup>271</sup> The reason for this crisis is that citizens were absent from the process of decision making. Therefore, in addition to the top-down process, this Article proposes a bottom-up process with greater citizen participation to improve problematic trade agreements.

An alternative method of governance to multilateralism is regionalism, which is a method of economic integration.<sup>272</sup> While multilateralism has its advantages, regionalism as an alternative to multilateral governance has not been fully explored and appropriately tapped when it comes to climate change mitigation and the enhancement of sustainable energy. Regionalism is the form that perhaps best describes the supranationalism of the integration of European states into a community and union<sup>273</sup>: sovereign states bound themselves both legally and politically into a single entity in which national and supranational institutions share governance and answer to a court that protects not only the institutions of the system, but also the rights of the individual citizens.<sup>274</sup> Specifically relating to regional trade, there are at least four main trends identified in RTAs that serve to remedy impasses in multilateral trade:

266. *Id.*

267. *See id.* at 58–63.

268. *See* RAFAEL LEAL-ARCAS, ANDREW FILIS & EHAB S. ABU GOSH, INTERNATIONAL ENERGY GOVERNANCE: SELECTED LEGAL ISSUES 489–94 (2014).

269. *See* RAFAEL LEAL-ARCAS, *supra* note 19, at 291–93.

270. If ultimately successful, the Doha Round, with more than 164 countries at the negotiating table as of January 2017, would be the ninth round since World War II. LEAL-ARCAS, *supra* note 92, at 486. The previous rounds were, in chronological order: Geneva Round (1948), with twenty-three countries; Ancey Round (1949), with thirteen countries; Torquay Round (1951), with thirty-eight countries; Fourth Round (1956), with twenty-six countries; Dillon Round (1962), with twenty-six countries; Kennedy Round (1967), with sixty-two countries; Tokyo Round (1979), with 102 countries; and Uruguay Round (1994), with 123 countries. *See* LEAL-ARCAS, *supra* note 92, at 486–87 n.7.

271. *See* Beginda Pakpahan, *Deadlock in the WTO: What is Next?*, WTO (Oct. 9, 2012), [https://www.wto.org/english/forums\\_e/public\\_forum12\\_e/art\\_pf12\\_e/art19.htm](https://www.wto.org/english/forums_e/public_forum12_e/art_pf12_e/art19.htm) [<https://perma.cc/PZ8X-5XPV>]; Simon Lester, *Is the Doha Round Over? The WTO's Negotiating Agenda for 2016 and Beyond*, CATO INSTITUTE (Feb. 11, 2016), <https://www.cato.org/publications/free-trade-bulletin/doha-round-over-wtos-negotiating-agenda-2016-beyond> [<https://perma.cc/6NUM-DYBQ>].

272. LEAL-ARCAS, *supra* note 265, at 72.

273. RAFAEL LEAL-ARCAS, INTERNATIONAL TRADE AND INVESTMENT LAW: MULTILATERAL, REGIONAL AND BILATERAL GOVERNANCE 72 (2010).

274. *Id.* On supranationalism in the European Union, see Rafael Leal-Arcas, *Theories of Supranationalism in the EU*, 8 J.L. SOC'Y 88, 88-113 (2007).

movement from most favored nation<sup>275</sup>; liberalization to RTAs<sup>276</sup>; a geographical shift to the Asia-Pacific region; and increases in cross-regional RTAs and mega-RTAs.<sup>277</sup>

This Subsection focuses on how mega-RTAs can serve as a platform for climate change mitigation and sustainable energy enhancement. While the multilateral trade system has the potential to help mitigate climate change, amending the WTO rules requires consensus among WTO members.<sup>278</sup> This Subsection tests an alternative means to multilateral trade by which regional trade can facilitate climate change mitigation, namely through mega-RTAs such as the TPP.

From a climate change point of view, it is easier and more manageable to negotiate among a small number of large players than it is among a large number of small players, which explains the creation of climate change clubs<sup>279</sup> or coalitions of the willing.<sup>280</sup> The concept of a climate change club refers to a relatively small number of countries that produce the large majority of GHG emissions.<sup>281</sup> This concept could entail an agreement on technology transfer or on product efficiency standards. The same argument holds true for trade negotiations. The multilateral trading system's

275. The most favored nation treatment is the principle of not discriminating between one's trading partners. See General Agreement on Tariffs and Trade art. I –II, Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 194 [hereinafter GATT]; Agreement on Trade-Related Aspects of Intellectual Property Rights art. 4, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994) [hereinafter TRIPS Agreement].

276. According to GATT Article XXIV, it is possible to deviate from GATT Article I and therefore give preferential treatment to parties to an RTA, provided doing so does not raise barriers to trade for third countries. GATT Article XXIV requires that duties be eliminated on “substantially all the trade” between the parties of a customs union or free trade area, or at least with respect to substantially all the trade in products originating in such territories. Regarding the locution “substantially all the trade,” there is neither an agreed upon definition of the percentage of trade to be covered by a WTO-consistent agreement nor common criteria against which the exclusion of a particular sector from the agreement could be assessed. For more information, see submissions by Australia (TN/RL/W/173/Rev.1 and TN/RL/W/180), European Communities (TN/RL/W/179), China (TN/RL/W/185), and Japan (TN/RL/W/190).

277. For an analysis of the main trends and characteristics of regional trade agreements, in force and under negotiation, see Roberto V. Fiorentino, Luis Verdeja & Christelle Toqueboeuf, *The Changing Landscape of Regional Trade Agreements: 2006 Update*, WTO Secretariat Discussion Paper No. 12 (2007).

278. Marrakesh Agreement Establishing the World Trade Organization art. IX, Apr. 15, 1994, 1867 U.N.T.S. 154 [hereinafter Marrakesh Agreement].

279. Rafael Leal-Arcas, *Top-Down Versus Bottom-Up Approaches for Climate Change Negotiations: An Analysis*, IUP J. OF GOVERNANCE & PUB. POL'Y, December 2011, at 39–41.

280. *Id.*

281. See LEAL-ARCAS, *supra* note 19, at 298–300.

single undertaking<sup>282</sup> is no longer feasible because the WTO has more members than ever—WTO membership is an ongoing process, with more members to come in the near future<sup>283</sup>—and covers increasingly more topics, which, in turn, are more complex than ever, namely trade and climate change or trade-related energy issues.<sup>284</sup> This explains RTA proliferation as the modus operandi for trade liberalization. Trade liberalization means more trade, trade means economic growth, and economic growth means that every country is better off.

When comparing the membership of mega-RTAs with the major GHG emitters in Table 4 above, it becomes clear that eight out of the ten major GHG emitters are contracting parties to at least one of the three mega-RTAs (in the case of Japan, it is a party to the TPP and RCEP).<sup>285</sup> The only two major emitters which are not parties to any of the three mega-RTAs are Brazil and Russia.<sup>286</sup> Two other major GHG emitters (Australia and South Korea), which are not in the top ten major GHG emitters, are contracting parties to at least one of the three mega-RTAs (namely, RCEP and TPP).<sup>287</sup>

Therefore, by having these three mega-RTAs with legally binding provisions on climate change mitigation and low-emissions economy, eight of the ten major GHG emitters could effectively solve most of the climate change problem. Although climate change is a global problem of collective action, mega-RTAs could be an effective way to tackle climate change.

RTAs, and regionalism at large, are a more effective way to combat climate change than multilateralism via the Paris Agreement because the nationally determined contributions to the global response to climate change—Article 3 of the Paris Agreement—are

282. A single undertaking provision is a provision that requires countries to accept all the agreements reached during a round of multilateral trade negotiations as a single package, as opposed to on a case-by-case basis. It effectively means that nothing is agreed until everything is agreed by all parties. See *How the Negotiations Are Organized*, WTO, [https://www.wto.org/english/tratop\\_e/dda\\_e/work\\_organ\\_i\\_e.htm](https://www.wto.org/english/tratop_e/dda_e/work_organ_i_e.htm) (last visited July 17, 2017) [<https://perma.cc/6VVZ-PM4E>].

283. For a list of observer governments, see *Members and Observers*, WTO, [https://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/org6\\_e.htm](https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm) (last visited July 17, 2017) [<https://perma.cc/HG8D-UMKJ>].

284. For a list of trade topics in the WTO, see *WTO Trade Topics*, WTO, [https://www.wto.org/english/tratop\\_e/tratop\\_e.htm](https://www.wto.org/english/tratop_e/tratop_e.htm) (last visited July 18, 2017) [<https://perma.cc/9Y84-S8WT>].

285. See *supra* Table 4.

286. See *supra* Table 4.

287. See *supra* Table 4.

not legally binding under that document.<sup>288</sup> Alternatively, at the regional level, the TPP—the only of the three mega-RTAs par excellence concluded to date—makes climate action legally binding in the form of a commitment to a low-emissions economy.<sup>289</sup> So, one option for the trading system to help mitigate climate change would be via mega-RTAs such as the TPP, and not necessarily via the multilateral (trading/climate change) system. Considering that the United States (which is the only country that, after having signed the agreement, has not ratified the Kyoto Protocol)<sup>290</sup> negotiated and concluded the TPP before President Trump decided to withdraw from it in January 2017, it is significant that the TPP recognizes climate change, albeit not expressly, as a global concern and that transition to a low-emissions economy requires collective action. The U.S. counterproposal of 2014 removed the term “climate change,” substituting it with the locution “low-emissions economy” in the final version.<sup>291</sup> Moreover, it removed any reference to the UNFCCC.<sup>292</sup> Nevertheless, the spirit of decarbonization remains present with the wording “low-emissions economy.”

Furthermore, the Section calls into question the assumption that only (or mainly) multilateralism will solve collective action problems such as climate change. Further, economic regionalism has proven to be more effective than multilateralism at liberalizing trade<sup>293</sup> (and arguably can do the same for climate change mitigation and sustainable energy enhancement) and therefore there is no imperative need for a universal treaty that aims to liberalize trade, mitigate climate change, and enhance sustainable energy. Conversely, if there are merits to multilateralism, then the question is: How can we gradually multilateralize plurilateralism to make it more inclusive in membership? What (economic) incentives would be necessary to make this happen? Would economic incentives for

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288. Article 4(2) of the Paris Agreement reads: “Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve.” Such weak wording does not imply that the nationally determined contributions are legally binding on the parties. Paris Agreement, *supra* note 24, art. 4(2).

289. Trans-Pacific Partnership, *supra* note 193, art. 20.15, ¶¶ 1–2.

290. See generally LEAL-ARCAS, *supra* note 19, chapter 5 (discussing the position of the United States regarding the Kyoto Protocol).

291. See U.S. Counterproposal to the TPP Environment Chapter (Feb. 14, 2014), <http://www.redge.org.pe/sites/default/files/20140218%20biodiversity%20climate%20change%20TPP.pdf> [<https://perma.cc/2C5C-CRZP>].

292. *Id.*

293. See generally LEAL-ARCAS, *supra* note 265, at 84 (discussing the rise and fall of multilateralism and the rise of bilateralism/regionalism).

clean goods and services be acceptable to help mitigate climate change?

Thus, variable geometry,<sup>294</sup> as opposed to a single undertaking approach, seems to be a plausible way to move the multilateral trade agenda forward because the single undertaking approach is too ambitious. The variable geometry approach has the advantage of removing the current frustration at the WTO negotiating table—and at violent protests organized by civil society<sup>295</sup>—about the WTO's slow negotiating pace. Regionalism/plurilateralism moves faster than multilateralism.

Finally, it seems that trade agreements are stricter on environmental protection (see, for instance, the TPP's chapter on environment in relation to a low-emissions economy<sup>296</sup>) than climate change agreements such as the Paris Agreement. That the TPP is legally binding on the reduction of GHG emissions,<sup>297</sup> whereas the Paris Agreement is not,<sup>298</sup> enhances those stricter provisions. It is also notable that even if the Trump administration in the United States decided to withdraw from the Paris Agreement in June 2017,<sup>299</sup> it will take four years to do so, in accordance with Article 28(1) and (2).<sup>300</sup> This situation could be an opportunity for China to lead in the geopolitics of climate change globally,<sup>301</sup> especially because the Paris Agreement is far from offering a dispute settlement mechanism similar to that of the WTO or other multilateral treaties—rendering it to the category of soft law. Nevertheless, and despite the view of the Trump administration on climate change, a group of seventeen Republican members of the U.S. Congress

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294. Variable geometry refers to a situation where some but not all WTO members would conclude trade agreements. See LEAL-ARCAS, *supra* note 19, at 325–26. The benefit of this concept is that those WTO members who wish to undertake deeper integration or trade liberalization may do so irrespective of the unwillingness of other WTO members to go along.

295. See *30 Frames a Second: The WTO in Seattle*, BULLFROG FILMS, <http://www.bullfrogfilms.com/catalog/30fr.html> (last visited July 17, 2017) [<https://perma.cc/8SQP-SU9P>].

296. Compare Trans-Pacific Partnership, *supra* note 193, art. 20.15, with Paris Agreement, *supra* note 24, art. 4(2).

297. Trans-Pacific Partnership, *supra* note 193, art. 20.15, ¶ 2.

298. Paris Agreement, *supra* note 24, art. 6(4).

299. UNFCCC Statement on the US Decision to Withdraw from the Paris Agreement, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (June 1, 2017), <http://newsroom.unfccc.int/unfccc-newsroom/unfccc-statement-on-the-us-decision-to-withdraw-from-paris-agreement> [<https://perma.cc/5EC2-EPFD>].

300. Paris Agreement, *supra* note 24, art. 28(1)–(2).

301. China's performance will be crucial when deciding whether climate change mitigation will be successful.

signed a resolution in March 2017 to seek economically viable ways to fight climate change.<sup>302</sup>

### 3. Coherence Between Trade and Climate Change Actions

Two fora seem the most appropriate for creating coherence between trade and climate change policies. First, the establishment of the WTO incorporated the creation of its Committee on Trade and Environment (CTE).<sup>303</sup> The goal of the CTE is to identify and understand the relationship between trade and the environment to promote “sustainable development.”<sup>304</sup> The other forum for discussion of trade measures and their links with climate change is the UNFCCC’s response measures forum.<sup>305</sup> To avoid the proliferation of climate measures that adversely impact international production and trade, Article 3.5 of the UNFCCC states explicitly that “[m]easures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.”<sup>306</sup> Interestingly, Article 3.5 of the UNFCCC reads conceptually along the same lines as the chapeau of GATT Article XX.

Moreover, some of the WTO agreements under Annex 1 contain provisions that recognize the right of WTO Members to regulate the protection of human, animal, and plant life or health, or the environment.<sup>307</sup> In addition, the Doha Round encompasses specific negotiations concerning various aspects of trade and the environment which emphasize the increase in environmental values in

302. Emily Flitter, *17 House Republicans Just Signed a Resolution Committing to Fight Climate Change*, REUTERS (Mar. 15, 2017, 10:58 AM), <http://www.businessinsider.com/r-group-of-17-republicans-sign-us-house-resolution-to-fight-climate-change-2017-3> [<https://perma.cc/C8T8-XSUV>].

303. See *The Committee on Trade and Environment* (‘Regular’ CTE), WTO, [https://www.wto.org/english/tratop\\_e/envir\\_e/wrk\\_committee\\_e.htm](https://www.wto.org/english/tratop_e/envir_e/wrk_committee_e.htm) (last visited July 17, 2017) [<https://perma.cc/7ZXP-PGGB>].

304. *Id.*

305. *Impact of the Implementation of Response Measures*, UNFCCC, [http://unfccc.int/cooperation\\_support/response\\_measures/items/4908.php](http://unfccc.int/cooperation_support/response_measures/items/4908.php) (last visited July 17, 2017) [<https://perma.cc/R9HT-M9BV>].

306. UNFCCC, *supra* note 49, art. 3(5).

307. See Agreement of the Application of Sanitary and Phytosanitary Measures art. 2, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1, 1867 U.N.T.S. 493; Agreement on Technical Barriers to Trade art. 2, April 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1, 1868 U.N.T.S. 120; General Agreement on Trade in Services art. XIV, April 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1B, 1869 U.N.T.S. 183.

the trade sphere.<sup>308</sup> Overall, the WTO seeks to ensure that environmental policies are not barriers to trade liberalization and that trade policies are not an obstruction to environmental protection.<sup>309</sup> However, all the changes that have occurred during the WTO era have not substantially influenced the ongoing interaction between trade and climate change.<sup>310</sup>

The concept of using the trading system to mitigate climate change and enhance energy security would transform the global understanding of trade in the context of environmental protection. It would shift the current paradigm to conceiving of trade as a tool for environmental protection.

Reducing carbon dioxide (CO<sub>2</sub>) without reducing economic growth or energy security is possible thanks to coherence between trade and climate change regulation and policy. For instance, as pro-globalization scholar Johan Norberg points out, it is possible to develop more efficient production processes, construction that is less energy-consuming, and new sources of energy that are cleaner than using CO<sub>2</sub>.<sup>311</sup> Despite the high levels of CO<sub>2</sub> in the United States, thanks to technology, the United States has been able to emit three times less CO<sub>2</sub> than it would have if its technology had been kept at the 1900 level.<sup>312</sup>

It is important to recognize that, in the relationship between WTO rules and multilateral environmental rules, environmental rules should be drafted in a manner that is not in conflict with WTO law. Whenever a conflict between the two disciplines arises, clarification of WTO rules should be made in a manner that puts the environment first.

### III. INNOVATION, RESEARCH, TECHNOLOGY, AND SPIRITUALITY

Businesses have taken on a leadership role in climate change mitigation,<sup>313</sup> and cities all over the world produce innovative strat-

308. For further explanation regarding negotiations on trade and environment under the Doha Round, see *An Introduction to Trade and Environment in the WTO*, WTO, [http://www.wto.org/english/tratop\\_e/envir\\_e/envt\\_intro\\_e.htm](http://www.wto.org/english/tratop_e/envir_e/envt_intro_e.htm) (last visited July 17, 2017) [<https://perma.cc/EH57-K8TF>].

309. *Trade and Environment*, WTO, [https://www.wto.org/english/tratop\\_e/envir\\_e/envir\\_e.htm](https://www.wto.org/english/tratop_e/envir_e/envir_e.htm) (last visited July 17, 2017) [<https://perma.cc/WCZ7-5C64>].

310. See LEAL-ARCAS, *supra* note 19, ch. 2–3.

311. NORBERG, *supra* note 23, at 120.

312. See *id.*

313. See *Sub-Saharan Africa's First Light-Rail Train*, SUSTANIA, <http://solutions.sustainia.me/solutions/sub-saharan-africas-first-light-rail-train/> (last visited July 18, 2017) [<https://perma.cc/H56K-EEAU>].

egies for advancing solutions to climate change.<sup>314</sup> This Part explores the various challenges and opportunities in sustainability, the options for a cleaner future, the remarkable potential contribution of sustainable companies, and the links between sustainability and spirituality.

### A. *Challenges Ahead, but the Future Is Bright*<sup>315</sup>

The quest for sustainable technology is one of Europe's current challenges. Technologies, research, and innovation are anticipated to have growing importance in Europe's pursuit of energy security.<sup>316</sup> The European Union remains a global leader in terms of innovation and renewable energy,<sup>317</sup> but this status will be at risk unless the role of technologies, research, and innovation is increased.<sup>318</sup> The promotion of new technologies should underlie the European Energy Union's governance.

The main challenge in the field of innovation lies in the necessity to fuse the European Union's and its member states' research programs. An integrated approach is required to complement efforts and reinforce ties between research and industry, thereby easing the emergence of new technologies in the European internal market.<sup>319</sup> Shared networks are expected to hasten and intensify the interplay of information between individuals and companies across the globe.<sup>320</sup>

Similarly, the increasing importance of digital energy<sup>321</sup> will require an equivalent innovation impulsion in the field of cybersecurity to protect the system from cyber-attacks. Indeed, an unbounded revolution in the digital exchange of information would make cyber-systems worldwide prone to new threats as digital instruments and shared networks ease intrusions into private

314. *Explore 100 City Solutions for a Greener and Fairer Future*, SUSTAINIA, <http://solutions.sustainia.me/cities/> (last visited July 18, 2017) [<https://perma.cc/2J38-NG3L>].

315. See generally LEAL-ARCAS, *supra* note 15, at 27–117 (some of the ideas for this section draw from this source, such as the importance of technologies, research, and innovation in the pursuit of energy security).

316. LEAL-ARCAS, GRASSO & ALEMANY RIOS, *supra* note 18, at 436.

317. See Leal-Arcas & Minas, *supra* note 104, at 650–665.

318. Energy Union Communication, *supra* note 14, at 3.

319. *Id.* at 16.

320. LEAL-ARCAS, GRASSO & ALEMANY RIOS, *supra* note 18, at 436.

321. Alex Molinaroli, *What Does Digital Mean for the Future of Energy?* WORLD ECON. F. (Mar. 2, 2016), <https://www.weforum.org/agenda/2016/03/perspective-distributed-digital-and-demand-side-energy-technology-implications-for-energy-security/> [<https://perma.cc/95EZ-PZBJ>].

life.<sup>322</sup> Therefore, the pace of innovation should be rationalized to ensure the effective safeguard of private life.

Horizon 2020 will be the European Union's principal financial means of promoting energy research and innovation in the coming years.<sup>323</sup> Measures in this particular aspect of E.U. energy policy will revolve around the Strategic Energy Technology (SET) Plan.<sup>324</sup> The SET Plan aims to foster research and development in both existing and new generations of low-carbon technologies.<sup>325</sup>

To start with, the Energy Union promises an updated SET Plan and a strategic transport research and innovation agenda, thereby expediting energy system transformation.<sup>326</sup> The Energy Union's proposal charts four goals in the area of innovation: making the European Union the world leader in developing the next generation of renewable energy technologies<sup>327</sup>; easing the participation of consumers in the energy transition<sup>328</sup>; ensuring effective energy systems<sup>329</sup>; and developing more sustainable transport systems that employ large-scale innovative technologies.<sup>330</sup>

Relatedly, another promising advancement is the Energy Union's commitment to phase out environmentally harmful subsidies altogether.<sup>331</sup> Continuing to fund fossil fuels within Europe would be counterproductive, not only in light of the European Union's ambitious energy and climate goals,<sup>332</sup> but also in that it

322. SAMI ANDOURA & JEAN-ARNOLD VINOIS, FROM THE EUROPEAN ENERGY COMMUNITY TO THE ENERGY UNION: A POLICY PROPOSAL FOR THE SHORT AND THE LONG TERM 125, 136 (2015).

323. Horizon 2020 is the largest E.U. research and innovation program to date. The scheme holds €80 billion to deploy over the period 2014–2020, of which €6.6 billion will be specifically devoted to energy. See *What is Horizon 2020?*, EUROPEAN COMM'N, <https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020> (last visited July 18, 2017) [<https://perma.cc/MRE8-MJNC>].

324. The European Strategic Energy Technology (SET) Plan will sustain the Energy Union's pillar on technologies, research, and innovation. It outlines the long-term energy research and innovation agenda for Europe by setting strategic objectives for the future. See *The European Strategic Energy Technology Plan (SET-Plan)*, EUROPEAN COMM'N, [http://ec.europa.eu/research/energy/eu/index\\_en.cfm?pg=policy-set-plan](http://ec.europa.eu/research/energy/eu/index_en.cfm?pg=policy-set-plan) (last updated Dec. 13, 2016) [<https://perma.cc/D3NK-WLND>].

325. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Investing in the Development of Low Carbon Technologies (SET-Plan)*, at 2–3, COM (2009) 519 final (Oct. 7, 2009).

326. Energy Union Communication, *supra* note 14, at 16 n.28.

327. *Id.* at 16.

328. *Id.*

329. *Id.*

330. *Id.*

331. *Id.* at 10.

332. The leaders of the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) have the ambition to phase out fossil fuel emissions in the

would delay the arrival of new technologies. Therefore, redirecting these subsidies to support low-carbon technologies and digital energy innovation represents a sensible change of course.

Beyond the E.U. context, there is a new initiative of visionary billionaires determined to provide energy that is reliable, affordable, and carbonless. The initiative is called Breakthrough Energy Coalition.<sup>333</sup> The Energy Union could and should join forces with this coalition—which is currently working with a growing group of visionary countries—towards joint research to ensure that the group’s vision becomes a reality.<sup>334</sup> Yet another initiative called Mission Innovation<sup>335</sup> brings together a group of twenty-two countries and the E.U.<sup>336</sup> that aim to reinvigorate and accelerate clean energy innovation throughout the world to make clean energy affordable for all by doubling investment on clean energy research and development over five years.<sup>337</sup> The Energy Union should also join forces with this initiative.<sup>338</sup> The benefits and possible outcomes for the European Union of joining such coalitions will only accelerate Europe’s decarbonization ambitions.

Already, clean energy innovation has enjoyed success, thus there are reasons to be optimistic about further climate change mitigation because the options for the future are abundant. Wind turbines and solar panels are proliferating across China, Europe,

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twenty-first century. See Pilita Clark & Stefan Wagstyl, *G7 Leaders Agree to Phase Out Fossil Fuels*, FIN. TIMES (June 8, 2015), <https://www.ft.com/content/ec2c365a-0ddf-11e5-aa7b-00144feabdc0> [<https://perma.cc/6LVZ-7MG8>].

333. To access their principles, see *Reliable, affordable Energy for the World*, BREAKTHROUGH ENERGY, <http://www.breakthroughenergycoalition.com/en/index.html> (last visited July 18, 2017) [<https://perma.cc/2J7T-LS2J>].

334. The Breakthrough Energy Coalition defines itself as follows: “We are a partnership committed to broad investment in new energy technologies from public and private sources. We invest our own capital as well as working with over [twenty] countries around the world who have committed to significantly increase their investments in the basic research that leads to breakthrough innovations.” See *Who We Are*, BREAKTHROUGH ENERGY, <http://www.b-t.energy/coalition/who-we-are/> (last visited July 18, 2017) [<https://perma.cc/DMT9-7K6K>].

335. *Accelerating the Clean Energy Revolution*, MISSION INNOVATION, <http://mission-innovation.net/> (last visited July 18, 2017) [<https://perma.cc/2BWV-4Y6Y>].

336. *Member Participation*, MISSION INNOVATION, <http://mission-innovation.net/countries/> (last visited July 18, 2017) [<https://perma.cc/39BM-GH74>].

337. *The Goal*, MISSION INNOVATION, <http://mission-innovation.net/the-goal/> (last visited July 18, 2017) [<https://perma.cc/DX4Y-6UNC>].

338. Efforts to do so on the part of the European Union and other Organization for Economic Co-operation and Development (OECD) partners are already visible. See *The EU and Other OECD Partners Agree on Trade Measures Supporting Cleaner Energy*, EUROPEAN COMM’N (Nov. 18, 2015), <http://trade.ec.europa.eu/doclib/press/index.cfm?id=1401> [<https://perma.cc/G2UN-YGL5>].

India,<sup>339</sup> and the United States.<sup>340</sup> Wind power projects on a massive scale are underway in the North Sea,<sup>341</sup> as are projects to bring solar energy produced in the Sahara Desert to southern Europe.<sup>342</sup> An increasing number of developing countries are investing in renewable energy out of their own initiative, not because they are legally bound to do so.<sup>343</sup> There are positive examples of countries that have climate change laws in place (on GHG emissions reduction) even if they are not a party to the U.N. Framework Convention on Climate Change (e.g., Taiwan<sup>344</sup>) or an Annex I country<sup>345</sup> (e.g., Mexico<sup>346</sup>).

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339. See, e.g., Varun Sivaram, Gireesh Shrimali, & Dan Reicher, *Research for the Sun: How India's Audacious Solar Ambitions Could Make or Break its Climate Commitments*, STAN. STEYER-TAYLOR CTR. FOR ENERGY POL'Y & FIN. (Dec. 8, 2015), <https://www-cdn.law.stanford.edu/wp-content/uploads/2015/12/Reach-for-the-Sun-High-Resolution-Version.pdf> [<https://perma.cc/6R7N-5MR2>]. See also *A New Dawn in Renewable Energy*, GOV'T OF INDIA PRESS INFO. BUREAU (Dec. 18, 2016), <http://pib.nic.in/newsite/PrintRelease.aspx?relid=155612> [<https://perma.cc/2QQB-4C74>]; Pilita Clark, *The Big Green Bang: How Renewable Energy Became Unstoppable*, FIN. TIMES (May 18, 2017), <https://www.ft.com/content/44ed7e90-3960-11e7-ac89-b01cc67cfeec?mhq5j=E2> [<https://perma.cc/FZ4R-FT29>].

340. Karl Mathiesen, *What is Holding Back the Growth of Solar Power?*, THE GUARDIAN (Jan. 31, 2016), <https://www.theguardian.com/sustainable-business/2016/jan/31/solar-power-what-is-holding-back-growth-clean-energy> [<https://perma.cc/82VV-HF4Q>].

341. See Chris Lo, *Offshore Wind Turbines: In Search of the Next Generation*, POWER TECH. (June 19, 2012), <http://www.power-technology.com/features/featureoffshore-wind-turbines-search-next-generation-renewable/> [<https://perma.cc/H4VZ-RYFA>].

342. Morocco is currently building one of the largest solar plants in the world and hopes to export power to Europe in the future. See *Nuclear Power in the Middle East: Wasting Energy*, THE ECONOMIST (Nov. 28, 2015), <http://www.economist.com/news/middle-east-and-africa/21679090-egypt-and-others-alternatives-nuclear-power-hold-more-promise-why-more> [<https://perma.cc/U57G-YWE8>].

343. See Ian Johnston, *Developing World Invests More in Renewable Energy Than Rich Countries for First Time, New Study Says*, THE INDEPENDENT (May 31, 2016), <http://www.independent.co.uk/environment/climate-change/renewable-energy-investment-developed-world-developing-world-ren21-report-a7058436.html> [<https://perma.cc/KFX2-G3R6>].

344. For a list of countries that are a party to the UNFCCC, see *List of Non-Annex I Parties to the Convention*, UNFCCC, [http://unfccc.int/parties\\_and\\_observers/parties/non\\_annex\\_i/items/2833.php](http://unfccc.int/parties_and_observers/parties/non_annex_i/items/2833.php) (last visited July 18, 2017) [<https://perma.cc/JL3U-Q3T3>]; *List of Annex I Parties to the Convention*, UNFCCC, [http://unfccc.int/parties\\_and\\_observers/items/2704.php](http://unfccc.int/parties_and_observers/items/2704.php) (last visited July 18, 2017) (noting that Taiwan is absent from both lists) [<https://perma.cc/G9ZE-5654>]; see also Greenhouse Gas Reduction and Management Act, GOV'T OF REP. OF CHINA (July 1, 2015), <https://www.epa.gov.tw/public/Data/511181640271.pdf> [<https://perma.cc/Z6AQ-6ZM5>].

345. Annex I countries are developed countries and those countries in transition to a market economy. According to the Kyoto Protocol, they are legally bound to reduce their emissions of GHGs. See *Parties & Observers*, UNFCCC, [http://unfccc.int/parties\\_and\\_observers/items/2704.php](http://unfccc.int/parties_and_observers/items/2704.php) (last visited July 18, 2017) [<https://perma.cc/4G5W-G8TJ>]; Kyoto Protocol, *supra* note 195, art. 2–3.

346. For a list of Annex I countries, see *List of Annex I Parties to the Convention*, *supra* note 344 (noting that Mexico is absent from the list).

However, challenges remain for states with fewer resources. It is now evident that technology and wealth are not just compatible with a green future; they are a precondition to environmental sustainability. As Johan Norberg notes, we also know that the alarmist rhetoric of the 1960s and 1970s that envisaged a catastrophic future was not scientifically sound and turned out to be factually wrong when predicting a world without forests, with acid rain, and requiring people to use surgical masks to protect themselves from pollution.<sup>347</sup> In the words of the Pilot 2006 Environmental Performance Index, “Wealth emerges as a major determinant of environmental performance.”<sup>348</sup> In other words, according to the study, the richer the country, the more it had done to clean the environment, largely due to its economic might and technological progress. One extraordinary example of how technological progress in wealthier nations has contributed to environmental protection is the modern car, which in motion emits less CO<sub>2</sub> than a 1970s car did parked (as a result of gasoline vapor leakage).<sup>349</sup> Therefore, it is the lack of new technology and affluence in poor countries that creates those states’ worst environmental problems.

But the outlook for these less affluent countries—indeed, for all countries—continues to improve. Life expectancy at birth between 1770 and the end of the nineteenth century was only around thirty years;<sup>350</sup> world GDP per capita until 1900 was just around US\$1,000, based on the value of the U.S. dollar in 1990;<sup>351</sup> and the level of illiteracy in the early nineteenth century was around eighty-five percent of the world population.<sup>352</sup> As a result, the international community did not have the incentive or ability to deal with environmental protection effectively. Today, however, life expectancy at birth is seventy years and, in some developed countries, it is rising to eighty-five years;<sup>353</sup> world GDP per capita

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347. NORBERG, *supra* note 23, at 109.

348. Pilot 2006 Environmental Performance Index, YALE CTR. FOR ENVTL. LAW AND POLICY, at 4, [http://archive.epi.yale.edu/files/2006\\_pilot\\_epi\\_summary\\_for\\_policymakers.pdf](http://archive.epi.yale.edu/files/2006_pilot_epi_summary_for_policymakers.pdf) (last visited July 18, 2017) [<https://perma.cc/F932-79AK>].

349. Lance Ealey & Glenn Mercer, *Tomorrow’s Cars, Today’s Engines*, EURACTIV (Oct. 8, 2002), <https://www.euractiv.com/section/transport/opinion/tomorrow-s-cars-today-s-engines/> (last updated Mar. 10, 2017) [<https://perma.cc/R9ZV-6LUZ>].

350. Max Roser, *Life Expectancy*, OUR WORLD IN DATA, <https://ourworldindata.org/life-expectancy/> (last visited July 18, 2017) [<https://perma.cc/QP38-3Z8T>].

351. See ANGUS MADDISON, *THE WORLD ECONOMY: HISTORICAL STATISTICS* 262 (2003).

352. See Bas van Leeuwen & Jieli van Leeuwen-Li, *Education Since 1820, in HOW WAS LIFE? GLOBAL WELL-BEING SINCE 1820*, 87, 94 (2014).

353. *World Health Statistics 2016: Monitoring Health for the SDGs*, WHO, [http://www.who.int/gho/publications/world\\_health\\_statistics/2016/en/](http://www.who.int/gho/publications/world_health_statistics/2016/en/) (last visited July 18, 2017) [<https://perma.cc/CSE3-QZUV>].

has risen to about US\$8,000, based on 1990 US dollars;<sup>354</sup> and illiteracy has gone down to just ten percent of the world population.<sup>355</sup> Additionally, levels of undernourishment between 1945 and 2015 have drastically decreased from fifty percent of the world population to just above ten percent in 2015,<sup>356</sup> and poor countries today have lower poverty rates than the richest countries did in the early nineteenth century.<sup>357</sup> These are all excellent trends and great achievements. The prognosis is equally excellent: in 2107, to live past 100 years of age will no longer be rare; rather, it will be the norm in at least 39 countries.<sup>358</sup> The way to achieve this is to keep investing in a cleaner future, aimed at developing alternative and cheaper energy.

### B. *Betting on a Cleaner Future*<sup>359</sup>

Moving forward requires creating a new energy future, accepting that we may never run out of fossil fuels (otherwise, there would be no life on earth).<sup>360</sup> To get there, societies need to change their energy supplies and control CO<sub>2</sub> emissions.<sup>361</sup> It is a well-known fact that the use of energy impacts the environment. Both energy and the environment are global issues. As stated by energy

354. See Maddison, *supra* note 351.

355. See van Leeuwen & van Leeuwen-Li, *supra* note 352.

356. *The State of Food and Agriculture: 1947*, FOOD AND AGRIC. ORG. OF THE UNITED NATIONS (Aug. 25, 1947), <http://www.fao.org/docrep/016/ap635e/ap635e.pdf> [<https://perma.cc/2DDS-PU8F>]; *The State of Food and Agriculture in Brief: 2015*, FOOD AND AGRIC. ORG. OF THE UNITED NATIONS (2015), <http://www.fao.org/3/a-i4671e.pdf> [<https://perma.cc/VE9G-JGDQ>].

357. Martin Ravallion, *Poverty in the Rich World When it was Not Nearly so Rich*, CTR. FOR GLOBAL DEV.: BLOGS (May 28, 2014), <http://www.cgdev.org/blog/poverty-rich-world-when-it-was-not-nearly-so-rich> [<https://perma.cc/R4MF-N7DB>].

358. HUMAN MORTALITY DATABASE, <http://www.mortality.org/> (last visited July 18, 2017) [<https://perma.cc/QA9V-K3L8>].

359. See Gary Brudvig, Lecture at Yale University titled Spurring Innovation (Sept. 22, 2016).

360. On that note, former U.S. Secretary of Energy Steven Chu once famously wrote that “the Stone Age did not end because we ran out of stones; we transitioned to better solutions.” *Letter from Secretary Steven Chu to Energy Department Employees*, ENERGY.GOV (Feb. 1, 2013, 11:00 AM), <http://energy.gov/articles/letter-secretary-steven-chu-energy-department-employees> [<https://perma.cc/7399-QPP3>]. By the same token, this Author suggests that we should not need to wait until we run out of fossil fuels to make the transition to sustainable energy.

361. See, for instance, the views of Ron Oxburgh, chairman of Shell, in 2004: “Sequestration is difficult, but if we don’t have sequestration then I see very little hope for the world.” He then added, “No one can be comfortable at the prospect of continuing to pump out the amounts of carbon dioxide that we are at present . . . with consequences that we really can’t predict but [that] are probably not good.” *Shell Boss Fears for the Planet*, BBC NEWS (June 17, 2004), <http://news.bbc.co.uk/1/hi/uk/3814607.stm> [<https://perma.cc/3U2E-XW3V>].

researcher Tom Meyer, we may not speak the same language or share the same culture, but we breathe the same air.<sup>362</sup>

It will be necessary to utilize all energy options: clean coal, oil shale combined with CO<sub>2</sub> sequestration, nuclear energy, hydrogen and fuel cells, renewable energy (whether wind, solar, geothermal, or biomass), inter alia. In this respect, as President Barack Obama said in 2010, “An America run solely on fossil fuels should not be the vision we have for our children and grandchildren.”<sup>363</sup> He then added:

[T]he only way the transition to clean energy will ultimately succeed is if the private sector is fully invested in this future, if capital comes off the sidelines and the ingenuity of our entrepreneurs is unleashed. And the only way to do that is by finally putting a price on carbon pollution.<sup>364</sup>

However, putting a price on carbon, so that people pay for their CO<sub>2</sub> emissions, will affect the poor the most negatively, and not the rich who, incidentally, are the ones to blame the most for the causes of climate change.<sup>365</sup>

Renewable energy can contribute meaningfully to the reduction in fossil fuel use. For instance, solar energy could become cheaper thanks to new materials and assembly technologies.<sup>366</sup> At present, solar power remains expensive compared to fossil fuels as a source of energy.<sup>367</sup> For example, if one were to invest US\$10 billion in burning gas to power a region, one could help lift ninety million people out of poverty and darkness. If, however, one were to spend the same amount on renewable energy, one could only help twenty to thirty million people. This means that, in this hypothetical, sixty million people would remain in poverty and darkness.<sup>368</sup>

362. Thomas Meyer, Lecture at the University of North Carolina titled *Our Energy Future: What are the Technology Challenges of the 21st century?* (Mar. 2, 2006).

363. See President Barack Obama, *Remarks on the Economy at Carnegie Mellon University*, THE WHITE HOUSE (June 2, 2010), <https://www.whitehouse.gov/the-press-office/remarks-president-economy-carnegie-mellon-university> [<https://perma.cc/25LF-59EF>].

364. *Id.*

365. Sophie Yeo, *Who's to Blame for Climate Change?*, CLIMATE HOME (Nov. 17, 2014, 10:20 AM), available at <http://www.climatechangenews.com/2014/11/17/whos-to-blame-for-climate-change/> [<https://perma.cc/5UCR-EJP5>].

366. *Climate Change: Clear Thinking Needed*, THE ECONOMIST (Nov. 28, 2015), <http://www.economist.com/news/leaders/21679193-global-warming-cannot-be-dealt-using-todays-tools-and-mindsets-so-create-some-new> [<https://perma.cc/ZW6L-K9TA>].

367. Barbara Hollingsworth, *Study: Despite Subsidies, Solar Power More Expensive*, CNS NEWS (Oct. 19, 2016, 10:40 AM), <http://www.cnsnews.com/news/article/barbara-hollingsworth/study-solar-power-remains-considerably-more-expensive-electricity> [<https://perma.cc/8U8U-XSRW>].

368. TODD MOSS & BENJAMIN LEO, CTR. FOR GLOB. DEV., *MAXIMIZING ACCESS TO ENERGY: ESTIMATES OF ACCESS AND GENERATION FOR THE OVERSEAS PRIVATE INVESTMENT CORPORA-*

But the potential of solar energy is phenomenal; solar energy today is only around one percent of global energy.<sup>369</sup> One hour of sun can generate energy for the whole earth for an entire year,<sup>370</sup> and “we could power the entire world if we covered less than [three] percent of the Sahara Desert with solar panels.”<sup>371</sup>

New developments in solar energy show a promising future. Graphene, a new material created in 2004 at the University of Manchester, is very thin and flexible, only one carbon atom thick.<sup>372</sup> It is also very strong and conducts electricity and heat very efficiently.<sup>373</sup> Graphene could radically change the economics of solar power because most solar cells today utilize expensive indium,<sup>374</sup> whereas carbon atoms are abundant. If graphene is found to be a successful replacement for indium, potentially anything could be turned into a solar power station in the future.

Other interesting developments abound. Researchers are developing new ways to make appliances more intelligent.<sup>375</sup> A pan-European project called WiseGRID is working on how to effectively place citizens at the center of the transformation of the electricity grid by allowing greater citizen participation and, by doing so, moving towards energy democracy.<sup>376</sup> Others are contemplating solar power in space,<sup>377</sup> where nothing blocks the sun: a microwave transmitter would send energy to areas on earth that need it.<sup>378</sup> The energy internet, where producers and consumers can place

TION'S PORTFOLIO 2 (2014), [http://www.cgdev.org/sites/default/files/maximizing-access-energy-opic\\_1.pdf](http://www.cgdev.org/sites/default/files/maximizing-access-energy-opic_1.pdf) [<https://perma.cc/G24X-63BC>].

369. *Solar Frontiers*, THE ECONOMIST (Dec. 1, 2015), <https://www.youtube.com/watch?v=4-m9OR9vcaM> [<https://perma.cc/6SEN-8CDM>].

370. *Id.*

371. *See Global Lessons: The GPS Road Map for Powering America*, CNN TRANSCRIPTS (Oct. 21, 2012), <http://transcripts.cnn.com/TRANSCRIPTS/1210/21/cp.01.html> [<https://perma.cc/236N-FCA5>].

372. “In simple terms, graphene[ ] is a thin layer of pure carbon; it is a single, tightly packed layer of carbon atoms that are bonded together in a hexagonal honeycomb lattice.” Jesus de La Fuente, *Graphene – What Is It?*, Graphenea, <http://www.graphenea.com/pages/graphene#.WfXPSIOLQ2w> (last visited July 18, 2017) [<https://perma.cc/YA3C-KYZX>].

373. *Id.*

374. Indium is “a silvery malleable fusible chiefly trivalent metallic element that occurs especially in sphalerite ores and is used especially as a plating material, in alloys, and in electronics.” *Definition of indium*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/indium> (last visited July 18, 2017) [<https://perma.cc/D6E9-GWSY>].

375. *About WiseGRID*, WISEGRID, <http://www.wisegrid.eu/> (last visited July 18, 2017) [<https://perma.cc/CGM8-F2WK>].

376. *Id.*

377. *Space Solar Power*, NAT'L SPACE SOC'Y, <http://www.nss.org/settlement/ssp/> (last visited July 18, 2017) [<https://perma.cc/KT8A-MVZW>].

378. *See id.*

information and power into the network, could help solve the renewable energy storage issue for wind and solar power because unused energy could be stored in cars and homes.<sup>379</sup> There are also scientists trying to remove surplus CO<sub>2</sub> from the air.<sup>380</sup> This process has the potential to reverse global warming and is part of the broader notion of geoengineering.<sup>381</sup>

The advantages of solar energy are that it is limitless,<sup>382</sup> essentially free (albeit not its technology),<sup>383</sup> widely dispersed,<sup>384</sup> and has a low environmental impact.<sup>385</sup> One great disadvantage, however, is that it is not a constant supply of energy, since the sun does not always shine. So, countries will need better ways to store and trade renewable energy via large megagrids, which is the key issue in solar energy implementation<sup>386</sup> and implicates the importance of international cooperation. Equally, carbon sequestration is important because countries are not going to stop burning carbon in the near future. Geoengineering could be further developed to mitigate climate change.<sup>387</sup> The greatest result of investing in low-carbon technologies will be becoming increasingly energy independent. Therefore, more research and development spending on energy technologies would be necessary to decarbonize the economy.

379. An Internet for energy interconnects the energy network with the Internet, allowing units of energy (locally generated, stored, and forwarded) to be dispatched when and where it is needed. *Internet of Energy for Electric Mobility*, INTERNET OF ENERGY, <http://www.artemis-ioe.eu/> (last visited July 18, 2017) [<https://perma.cc/E8PU-6Q4T>].

380. See *Carbon & Tree Facts*, ARBOR ENVIRONMENTAL ALLIANCE, <http://www.arborenvironmentalalliance.com/carbon-tree-facts.asp> (last visited July 18, 2017) [<https://perma.cc/2VG8-DTFU>].

381. Rafael Leal-Arcas & Andrew Filis-Yeloghotis, *Geoengineering a Future for Humankind: Some Technical and Ethical Considerations*, 6 CARBON & CLIMATE L. REV. 128, 128–30 (2012).

382. For an overview of the world's total primary solar energy supply, see Matthias Loster, *Total Primary Energy Supply – From Sunlight*, EZ2C, [http://www.ez2c.de/ml/solar\\_land\\_area/](http://www.ez2c.de/ml/solar_land_area/) (last visited July 18, 2017) [<https://perma.cc/GP3E-PYBN>].

383. D. YOGI GOSWAMI, FRANK KREITH & JAN F. KREIDER, *PRINCIPLES OF SOLAR ENGINEERING* 11 (2d ed. 1999).

384. *Solar Panels*, ALTERNATIVE ENERGY PRIMER, <http://www.alternativeenergyprimer.com/Solar-Panels.html> (last visited July 18, 2017) [<https://perma.cc/W4TF-VY8S>].

385. See Vikram Aggarwal, *What is the Environmental Impact of Solar Energy?*, MOTHER EARTH NEWS (Dec. 2, 2015, 8:55 AM), <http://www.motherearthnews.com/renewable-energy/what-is-the-environmental-impact-of-solar-energy-zbcz1512> [<https://perma.cc/Z8YC-RVCU>].

386. See DAVID PICKUP ET AL., SOLAR TRADE ASSOCIATION, *SOLAR + STORAGE = OPPORTUNITIES* 3–6 (2016), <http://www.solar-trade.org.uk/wp-content/uploads/2016/05/Solar-storage-Opportunities-The-STAs-Position-Paper-on-Energy-Storage.pdf> [<https://perma.cc/Z9K4-TNDE>].

387. Leal-Arcas & Filis-Yeloghotis, *supra* note 381.

Shifting subsidies from fossil fuels to renewable energy is a promising policy towards clean energy support. States could provide incentives to move to renewable energy, especially in warm countries. However, there needs to be public support in the transition to a clean economy: if cleaning the environment comes at the cost of higher unemployment, no democracy will accept that. Moreover, most people are interested in short-term local issues and solutions, not long-term global problems. However, it is in everyone's interest to provide the developing world with the best technology, to minimize dirty carbon technology.

The bottom line is that future climate policies must not obstruct the path to wealth creation and technology innovation, which will benefit both developing and developed countries by improving quality of life and the environment.

### C. *Sustainable Companies*<sup>388</sup>

Three factors are necessary to reach sustainability: investors, technology, and policy.<sup>389</sup> Moreover, energy, transportation, and agriculture are crucial industries to build a sustainable future since they represent around sixty percent of GHG emissions.<sup>390</sup> Yet, the leaders in these industries<sup>391</sup> have been around for over 100 years and still their innovation record is irregular. In that same time period, the computer and IT industries have been remarkably innovative: computers have been transformed from mainframes to tablets; in telecommunications, phones have been transformed from landlines to smartphones. Soon there will be over six billion smartphones in circulation.<sup>392</sup> The owners of these smartphones will each have more computer power in their hands than the

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388. See Nancy Pfund, Lecture at Yale University titled *Creating the Sustainable Companies of the 21st Century*, Sept. 22, 2016.

389. For further details on sustainable companies, see ESTY & WINSTON, *supra* note 95.

390. See *Sources of Greenhouse Gas Emissions*, EPA, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions> (last visited July 18, 2017) [<https://perma.cc/8U54-CZLZ>]; see also IPCC, 5TH ASSESSMENT REPORT, WORKING GROUP III (2014), [http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc\\_wg3\\_ar5\\_full.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf) [<https://perma.cc/8K8L-FJCR>].

391. The leaders of these industries include, for instance, John Deere since 1837, General Electric since 1892, Ford since 1903, and General Motors since 1908. See Nancy Pfund, Lecture at Yale University titled *Creating the Sustainable Companies of the 21st Century*, Sept. 22, 2016.

392. Ingrid Lunden, *6.1B Smartphone Users Globally by 2020, Overtaking Basic Fixed Phone Subscriptions*, TECH CRUNCH (June 2, 2015), <https://techcrunch.com/2015/06/02/6-1b-smartphone-users-globally-by-2020-overtaking-basic-fixed-phone-subscriptions/> [<https://perma.cc/B9UN-BVDN>].

supercomputers of the 1960s, enabling them to have access to all the world's knowledge.<sup>393</sup>

There are positive future commitments by technology companies such as Google, which plans to buy only renewable energy in 2017 "to match the entire needs of all its data centres and offices around the world."<sup>394</sup> In this innovation cycle, the energy, transportation, and agriculture sectors are starting to catch up. In the energy sector, there are projects for fully integrated microgrids to replace centralized fossil fuel plants (such as coal plants).<sup>395</sup> In transportation, autonomous and connected cars are replacing gas-powered cars.<sup>396</sup> In agriculture, data-driven technology is replacing mechanical tools.<sup>397</sup> Equally importantly, renewable energy is employing many people in the energy sector.<sup>398</sup>

Interestingly, these three sectors are adopting many of the same themes of innovation as the computer and IT sectors. The principles on which twenty-first century companies will be built are transparency, decentralization, cost reduction, personalization, and convenience, among others. Regarding energy, the demand is for energy that is cheaper, greener, more reliable, and more functional.<sup>399</sup> In the case of cars, thanks to technology, these principles manifest in vehicles that are electrified, autonomous, and mini-mized through the social tendency toward ride-sharing. Customers are asking for cars that are cheaper, greener, and safer.<sup>400</sup> As for

393. NORBERG, *supra* note 23, at 200.

394. Richard Waters, *Google to Buy Only Renewable Energy for Operations in 2017*, FIN. TIMES (Dec. 6, 2016), <https://www.ft.com/content/6794d2f0-bb6a-11e6-8b45-b8b81dd5d080?emailid=55ccb875090bff0300e78b63&segmentId=3d08be62-315f-7330-5bbd-af33dc531ac> [https://perma.cc/4TUM-28LP].

395. Justin Guay, *World Bank Abandons Coal, Green Light for Clean Micro-Grids*, RENEWECONOMY (July 14, 2013), <http://reneweconomy.com.au/world-bank-abandons-coal-green-light-for-clean-micro-grids-59247/> [https://perma.cc/T9CG-2YRX].

396. Richard Viereckl et al., *Connected Car Report 2016: Opportunities, Risk, and Turmoil on the Road to Autonomous Vehicles*, STRATEGY& (Sept. 28, 2016), <http://www.strategyand.pwc.com/reports/connected-car-2016-study> [https://perma.cc/R9X3-54RG].

397. See Katherine Noyes, *Cropping Up on Every Farm: Big Data Technology*, FORTUNE (May 30, 2014), <http://fortune.com/2014/05/30/cropping-up-on-every-farm-big-data-technology/> [https://perma.cc/2SKY-T2H2].

398. See, e.g., Bill Spindle & Rebecca Smith, *Which State is a Big Renewable Energy Pioneer? Texas*, WALL ST. J. (Aug. 29, 2016), <http://www.wsj.com/articles/which-state-is-a-big-renewable-energy-pioneer-texas-1472414098> (describing the case of Texas, where more than 100,000 people are employed in that sector) [https://perma.cc/C9K6-LV9E].

399. See, e.g., Pilita Clark, *Aggreko Buys Energy Storage Technology Specialist*, FINANCIAL TIMES, July 3, 2017, <https://www.ft.com/content/086fe32e-6014-11e7-8814-0ac7eb84e5f1?mhq5j=E2> [https://perma.cc/C7MS-2QJS].

400. See Jack Stewart, *Tesla's Cars Have Driven 140M Miles on Autopilot. Here's How*, WIRED (Aug. 17, 2016, 8:00 AM), <https://www.wired.com/2016/08/how-tesla-autopilot-works/> [https://perma.cc/32TD-PPNZ]; *Google Self-Driving Car Project*, WAYMO, <https://>

agriculture, there is a demand for it to be cheaper, greener, with more choice and more farmer independence.<sup>401</sup> Thus, there are clear market opportunities for these three industries. The question is how to help build these companies of the twenty-first century in the energy, transportation, and agricultural sectors.<sup>402</sup>

In 2017, a taskforce on carbon disclosure delivered recommendations<sup>403</sup> to the G20<sup>404</sup> and the Financial Stability Board,<sup>405</sup> a forum of global regulators. The purpose is to create a voluntary framework to allow companies to report their exposure to climate risks.<sup>406</sup> By creating such a framework, the market will be able to “go green” more efficiently due to smarter and more efficient allocation of capital.<sup>407</sup> Because business is the engine of growth and job creation, it is important that they decarbonize to achieve a sustainable future.

#### D. *Sustainability and Spirituality*<sup>408</sup>

Contemporary society is the first human community to face a comprehensive crisis, threatening ecosystems and species on a global scale.<sup>409</sup> To paraphrase cultural historian and scholar

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[www.google.com/selfdrivingcar/](http://www.google.com/selfdrivingcar/) (last visited July 18, 2017) [<https://perma.cc/7L7H-MJ7E>]; Andrew J. Hawkins, *Uber Just Completed Its Two-Billionth Trip*, THE VERGE (Jul. 18, 2016, 11:00 AM), <http://www.theverge.com/2016/7/18/12211710/uber-two-billion-trip-announced-kalanick-china-didi> [<https://perma.cc/586A-6K7P>].

401. Examples of twenty-first century agriculture companies are Blue River Technology, Apeel Sciences, Farmers Business Network, and Planet. See, e.g., BLUE RIVER TECHNOLOGY, <http://www.bluerivert.com/> (last visited July 18, 2017) [<https://perma.cc/F3WP-FYSS>].

402. For an overview of how to revitalize business models to win the clean energy race, see AMORY B. LOVINS, *REINVENTING FIRE: BOLD BUSINESS SOLUTIONS FOR THE NEW ENERGY ERA* (2013).

403. *Task Force Publishes Recommendations on Climate-Related Financial Disclosures*, FIN. STABILITY BOARD (June 29, 2017), <http://www.fsb.org/2017/06/task-force-publishes-recommendations-on-climate-related-financial-disclosures/> [<https://perma.cc/CA4G-C35Z>].

404. *G20 Germany 2017*, FED. GOV'T OF GERMANY, [https://www.g20.org/Webs/G20/EN/Home/home\\_node.html](https://www.g20.org/Webs/G20/EN/Home/home_node.html) (last visited July 18, 2017).

405. FIN. STABILITY BOARD, <http://www.fsb.org/> (last visited July 18, 2017).

406. See TASK FORCE ON CLIMATE-RELATED FIN. DISCLOSURES, *RECOMMENDATIONS OF THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES ii-v* (2016), <https://www.fsb-tcfd.org/wp-content/uploads/2016/12/TCFD-Recommendations-Report-A4-14-Dec-2016.pdf>.

407. For more details on how sustainable development is changing business leadership, see BUS. & SUSTAINABLE DEV. COMM'N, *BETTER BUSINESS BETTER WORLD* (2017), <http://report.businesscommission.org/uploads/BetterBiz-BetterWorld.pdf>.

408. See Tucker, M. “Sustainability and Spirituality,” lecture given at the Yale sustainability leadership forum, September 2016, Yale University, New Haven, USA.

409. See *Our Common Future, From One Earth to One World*, Rep. of the World Comm. on Env't & Dev. on Its Forty-Second Session, U.N. Doc. A/42/427, annex, ¶ 11 (1987).

Thomas Berry, we have ethics for homicide, suicide, and genocide, but not for biocide or geocide.<sup>410</sup> While this is largely true,<sup>411</sup> since 2015 the international community officially committed to the SDGs as a roadmap for a sustainable future.<sup>412</sup>

Well-known obstacles make sustainability a challenge: population growth, increased consumption, urbanization, alienation from land, climate change, biodiversity loss, to name but a few. In addition to the means discussed throughout this Article, additional ways to reach sustainability include social and cultural changes such as greater reverence for the earth community, respect for species, restraint in the use of natural resources, redistribution of technology and aid, responsibility for the future of the planet, and restoration of ecosystems and the human spirit.

Two foundational socio-cultural *principles* may serve as roadmaps to achieve sustainability. First, acknowledgement of the intrinsic value of nature, the idea that nature is a source, not a resource, and acceptance of environmental degradation as an ethical issue. Second, honoring humans through awareness of environmental rights for present and future generations and the notion of distributive justice as part of our environmental responsibilities.

In the context of sustainability and spirituality, then, two socio-cultural *strategies* emerge to tackle the challenge of a sustainable future. First, society must think consequentially, both short- and long-term; and second, society must integrate solutions in the context of energy and technology via renewable energy and technology transfer.<sup>413</sup>

Finally, two interrelated *tactics* may achieve a way forward in the context of sustainability and spirituality: ensuring restraint on

410. David Schenck, *The Great Teaching Work of Thomas Berry*, CTR. FOR HUMANS & NATURE, <http://www.humansandnature.org/the-great-teaching-work-of-thomas-berry> (last visited May 31, 2017). One's behavior and attitudes are shaped by world views, values, and spirituality derived from world religions, environmental ethics, biophilia, humanitarian and secular values, and the arts. See, e.g., JOHN GRIM & MARY EVELYN TUCKER, *ECOLOGICAL AND RELIGION* 1–12 (2014); BRIAN THOMAS SWIMME & MARY EVELYN TUCKER, *JOURNEY OF THE UNIVERSE* 103–19 (2011).

411. One exception is that of Tajikistan, whose criminal code stipulates in Article 399 (on biocide) the following: "Using of nuclear, neutron, chemical, biological (bacteriological), climatic or other kind of mass destruction weapons with the intent of destruction of people and environment is punishable by imprisonment for a period of [fifteen] to [twenty] years, or death penalty." Criminal Code of the Republic of Tajikistan, art. 399 (unofficial).

412. *Sustainable Development Goals*, UN, <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (last visited July 18, 2017).

413. See TRIPS Agreement, *supra* note 275, art. 66(2).

global consumption and population growth, and creating law in the context of global governance and global ethics.

#### IV. CONCLUSION AND A FUTURE RESEARCH AGENDA

In the nineteenth century, coal was the main natural resource used for energy generation;<sup>414</sup> in the twentieth century, it was oil.<sup>415</sup> In the twenty-first century, the expectation is that it will be renewable energy, although industries still use large amounts of coal for energy production and coal may remain the most used fossil fuel for years to come.<sup>416</sup> That said, businesses are increasingly interested in becoming more environmentally aware. Renewable energy is currently not cost-competitive compared to fossil fuels, so much so that, economically, it might make little sense to move to, say, solar energy.<sup>417</sup>

Following the title of the famous novel *What Is to Be Done?* by Nikolai Chernyshevsky, a balance must be struck between fossil fuels and renewables, and carbon needs to be challenged. A credible solution for the energy mix is combining renewable energy with natural gas because generating energy based solely on renewables is not yet feasible—for many of the reasons explored herein—and because natural gas is the least destructive of all the fossil fuels.<sup>418</sup> Moreover, decarbonization is possible not only via renewable energy—for which investing in innovation will be necessary—but also by decarbonizing fossil fuels, namely through carbon capture and storage, which will be necessary in the future.<sup>419</sup> In the future, the goal is that renewable energy will shift from being a complement to a substitute for fossil fuels.

The solution is to reduce CO<sub>2</sub> emissions by decarbonizing, electrifying, making use of the circular economy (i.e., recycling and

414. *History of Fossil Fuels Usage Since the Industrial Revolution*, MITSUBISHI HEAVY INDUSTRIES, <https://www.mhi-global.com/discover/earth/issue/history/history.html> (last visited July 18, 2017).

415. Dr. Jean-Paul Rodrigue, *Evolution of Energy Sources*, THE GEOGRAPHY OF TRANSPORT SYSTEMS, <https://people.hofstra.edu/geotrans/eng/ch8en/conc8en/evolenergy.html> (last visited July 18, 2017).

416. *Are Fossil Fuel Companies Using IEA Report To Talk Up Demand?*, THE GUARDIAN (Oct. 25, 2015), <https://www.theguardian.com/environment/2015/oct/23/are-fossil-fuel-companies-using-iea-reports-to-talk-up-demand>.

417. *But see* Zachary Shahan, *Advantages & Disadvantages of Solar Power*, CLEAN TECHNICA (Oct. 8, 2013), <https://cleantechnica.com/2013/10/08/advantages-disadvantages-solar-power/>.

418. *Natural Gas, the Cleanest or Less Dirty Fossil Fuel*, ENERGY NEWS (Sept. 19, 2016), <http://www.energynews.es/english/natural-gas-the-cleanest-or-less-dirty-fossil-fuel/>.

419. R. Stuart Haszeldine, *Carbon Capture and Storage: How Green Can Black Be?*, 325 SCIENCE 1647, 1647–52 (2009).

reusing products), transferring funds and technology from the West to the rest of the world, shifting the economy to services that do not use products, and sharing best practices. The concept of a circular economy is also an opportunity for innovation. Through effective regional and global collaboration on the decarbonization of the economy, the European Union (and the rest of the world) can pave the way for a sustainable and secure future for generations to come. Cooperation on renewable energy will enable E.U. member states to reduce their GHG emissions, in line with their commitments under the Paris Agreement<sup>420</sup> and obligations under the European Union's Sustainable Development Strategy.<sup>421</sup> By enhancing sustainable energy, the European Union and the international community are mitigating climate change. In addition, effective cooperation will culminate in the spread of global renewable energy security, a global public good that can only be supplied through collective efforts. Among other issues, regional and global cooperation on decarbonization will enable the European Union to tackle some of the most pressing human rights issues in the region, boost the economy by encouraging investment, and generate employment.

It is possible to achieve global renewable energy security. In 2011, the Intergovernmental Panel on Climate Change (IPCC) argued that "as infrastructure and energy systems develop, in spite of the complexities, there are few, if any, fundamental technological limits to integrating a portfolio of renewable energy technologies to meet a majority share of total energy demand in locations where suitable renewable resources exist or can be supplied."<sup>422</sup> The IPCC has further said that if governments are supportive, and the full complement of renewable energy technologies are deployed, renewable energy supply could account for almost eighty percent of the world's energy use within forty years, namely by 2050.<sup>423</sup>

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420. Paris Agreement, *supra* note 24, art. 4(4).

421. *Commission Proposal to the Gothenburg European Council, A Sustainable Europe For a Better World: A European Union Strategy for Sustainable Development*, COM (2001) 264 final.

422. Intergovernmental Panel on Climate Change, *Special Report on Renewable Energy Sources and Climate Change Mitigation*, at 17–18 (2012), [https://www.ipcc.ch/pdf/special-reports/srren/SRREN\\_FD\\_SPM\\_final.pdf](https://www.ipcc.ch/pdf/special-reports/srren/SRREN_FD_SPM_final.pdf).

423. See *Renewable Energy Can Power the World, Says Landmark IPCC Study*, GUARDIAN (May 9, 2011), <https://www.theguardian.com/environment/2011/may/09/ipcc-renewable-energy-power-world> (citing the Special Report on Renewable Energy Sources and Climate Change Mitigation, of the Intergovernmental Panel on Climate Change, finalized in 2011).

This is an era of changes and challenges. Historian Yuval Harari notes that “for the first time in history, more people die today from eating too much than from eating too little; more people die from old age than from infectious diseases; and more people commit suicide than are killed by soldiers, terrorists and criminals combined.”<sup>424</sup> The challenge of the third millennium will be a sustainable future, where common people understand common concerns and public goods are taken seriously. Conservation is the biggest source of GHG emissions reduction.<sup>425</sup> The challenge is not technological (with the exception of carbon capture and storage), nor is it financial; it is political, namely lack of political will to cooperate internationally to solve such issues. The challenge is therefore that we are asking countries to do something internationally that they do not agree to do domestically.

There is a knowledge gap on the links between four major global concerns: trade, energy, climate change, and sustainability. Each one of them has its own culture; for instance, both trade and climate are similar in that they are global in scope, but they differ in institutional structure and governance in that trade is more developed due to its dispute settlement system, which is absent in climate change, whereas the climate regime operates more with persuasion than punishment. From this point of view, the trade regime is exclusive because punishment will take place if one is not in compliance with regulations. With the threat of climate change looming, and energy increasingly important to all aspects of human and economic development, learning more about these links is extremely timely. Specifically, it is necessary to do more research into the use of trade as a tool to achieve sustainable energy and therefore reduce poverty, while also addressing climate change.

An open trading system in all its three aspects (political, legal, and economic) is crucial for sustainable development to take shape. Pending questions remain, such as: What can citizens do to be more empowered in inter-state trade agreements? How should future trade and environmental agreements be designed to be socially acceptable and more inclusive of civil society? How can trade agreements be modernized to help climate change? How can we reach social sustainability?

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424. YUVAL N. HARARI, *HOMO DEUS: A BRIEF HISTORY OF TOMORROW* (2016).

425. See Gary Brudvig, Lecture at Yale University titled *Spurring Innovation* (Sept. 22, 2016).

Politically, taking the Paris Agreement forward with its implementation is imperative to make sure no one is left behind, given that the Paris Agreement is as much about economic and social transformation as it is about climate change. The concept of *in dubio pro natura*, advocated by Brazil's National High Court Justice Antonio Benjamin, is the strongest legal form of environmental protection.<sup>426</sup> And providing concessional financing for CO<sub>2</sub> to incentivize countries to decarbonize their economies would assist in the transition to clean energy. Equally important is to study the pivotal role that cities will play in becoming new platforms to help mitigate climate change and use sustainable energy more effectively. In terms of new approaches to governance resulting from the Paris Agreement, there is renewed focus on mayors and citizens acting at the center of analysis for climate change mitigation and sustainable energy. To that, one should add that young people believe in sustainability, which means that, moving forward, transformation of our way of life to a more sustainable one will prevail. Making use of such innovative methodologies will bridge an important knowledge gap and, in doing so, open the door to an entirely new research agenda.

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426. Superior Court of Justice (Brazil), Recurso Especial No. REsp 883.656/RS, Rel. Herman Benjamin, available at [http://www.planetaverde.org/arquivos/biblioteca/arquivo\\_20131123195922\\_9398.pdf](http://www.planetaverde.org/arquivos/biblioteca/arquivo_20131123195922_9398.pdf) [<https://perma.cc/CL9D-5GF2>].

