Empowering citizens for common concerns:
Sustainable energy, trade and climate change

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***Abstract*— 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 non-economic 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. 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. 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. This paper will show 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.**

Keywords: sustainability; common concern; public goods; climate change; sustainable energy; international trade; citizens.

I. 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"[1] to continue to thrive for years to come.[2] 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.[3]

A related concept—sustainable development—was coined by the Brundtland Commission[4] in a report titled Our Common Future.[5] The concept has three main pillars. First, sustainable development recognizes that part of the environmental challenge is poverty.[6] For example, in certain communities where cooking fuels are unavailable, one needs to cut down a tree to prepare a meal. Second, recognition of the importance of an integrated approach to sustainable development.[7] One of the mandates of the Brundtland Commission was to raise awareness that the various areas (now goals) of sustainable development cannot be addressed in clinical isolation.[8] And third, intergenerational

1. Rockström, J. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity," Stockholm Resilience Centre, Biodiversity and Ecosystem Services, Master Class, Club of Rome General Assembly, 26 October 2009.
2. Stockholm Resilience Centre, "Planetary Boundaries," available at http://www.stockholmresilience.org/research/planetary-boundaries.html.
3. Rockström, J. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity," Stockholm Resilience Centre, Biodiversity and Ecosystem Services, Master Class, Club of Rome General Assembly, 26 October 2009.
4. Formally known as the World Commission on Environment and Development, the Brundtland Commission was created to persuade countries to aim at sustainable development. Report of the World Commission on Environment and Development: Our Common Future, Annex 2 to document A/42/427 available at http://www.un-documents.net/our-common-future.pdf.
5. Report of the World Commission on Environment and Development: Our Common Future, Annex to document A/42/427 available at http://www.un-documents.net/our-common-future.pdf.
6. Idem.
7. Idem.
8. Idem.

DOI: 10.5176/2251-2853_6.1.207

ethics apply to sustainable development.[9] 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[10] 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.[11] This prediction was based on the fact that in 2004 world population was 6.5 billion, and in 2050 is expected to be ten billion.[12] However, new predictions are that world population will be eleven billion by 2050.[13]

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,[14] a project that envisages a resilient "Energy Union"[15] with a forward-looking climate change 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.[16]

Decarbonization[17] is one of the pillars of the European Energy Union because it is a way to achieve both *energy security*[18] and *climate change mitigation*.[19] 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.[20] 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.[21] The disputes between Ukraine and Russia in 2006, 2009, and 2014 had severe consequences for the E.U. economy and its citizens' quality of life.[22] 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

9. Idem.

10. *See generally* the views of Richard Smalley of Rice University, available at http://www3.nd.edu/~pkamat/pdf/energy.pdf, p. 1.

11. *Id.*

12. *Id.*

13. *See* speech by U.K. Foreign Secretary Boris Johnson at Chatham House, London, on 2 December 2016, available at https://www.chathamhouse.org/event/global-britain-uk-foreign-policy-era-brexit.

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," 25.2.2015, COM (2015) 80 final, accessible at http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF.

15. The European Energy Union is an ambitious project aiming at secure, affordable, and climate-friendly energy in the European Union. *See* European Commission, "Energy Union and Climate," available at http://ec.europa.eu/priorities/energy-union-and-climate_en. For an analysis of the goals of the project, see Leal-Arcas, R. *The European Energy Union: The quest for secure, affordable and sustainable energy*, Claeys & Casteels, 2016.

16. 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," 25.2.2015, COM (2015) 80 final, page 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.

18. The International Energy Agency defines energy security as "the uninterrupted availability of energy sources at an affordable price." *See* International Energy Agency, "Energy security," available at https://www.iea.org/topics/energysecurity/. For an analysis of energy security in the context of international trade, see Leal-Arcas, R., Grasso, C. and Alemany Rios, J. *Energy security, trade and the EU: Regional and international perspectives*, Edward Elgar, 2016.

19. *See generally* Leal-Arcas, R. *Climate Change and International Trade*, Edward Elgar, 2013.

20. 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," 25.2.2015, COM (2015) 80 final, accessible at http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF.

21. *Id.*

22. Leal-Arcas, R., Grasso, C. and Alemany Rios, J. *Energy security, trade and the EU: Regional and international perspectives*, Edward Elgar, 2016, p. 1.

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

The 2016 Kigali Amendment[26] to the Montreal Protocol[27] 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 CO2 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 2018.[28] All these developments show that the Paris Agreement and related legal instruments are the start of a process towards decarbonisation 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,[29] an unprecedented refugee crisis,[30] an economic debt crisis,[31] and the recent challenges associated with the United Kingdom's decision to leave the European Union,[32] 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 challenges currently looming over the world, 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.

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23. Despite common belief to the contrary, more people die because of cold weather than hot weather. *See* Norberg, J. *Progress: Ten reasons to look forward to the future*, Oneworld, 2016, p. 120. For instance, almost twice as many U.S. citizens died between 1979 and 2006 from excess cold than from excess heat. *See* Goklany, I. "Deaths and death rates from extreme weather events: 1990-2008," *Journal of American Physicians and Surgeons*, Vol. 14 (4), 2009, pp. 102-9.

24. *See* Article 2(1) of the Paris Agreement on Climate Change, available at https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

[25] Levi, M. "Two Cheers for the Paris Agreement on Climate Change," *Council on Foreign Relations*, 12 December 2015, available at http://blogs.cfr.org/sivaram/2015/12/12/two-cheers-for-the-paris-agreement-on-climate-change/.

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), "committing to cutting the production and consumption of HFCs by more than [eighty] percent over the next thirty years." *See* U.S. Environmental Protection Agency, "Recent international developments under the Montreal Protocol," available at https://www.epa.gov/ozone-layer-protection/recent-international-developments-under-montreal-protocol.

27. Montreal Protocol on Substances that Deplete the Ozone Layer, 26 ILM 1550 (1987). 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.

[28] Dagnet, Y. and Northrop, E. "Crafting the Paris Agreement's Rule Book – Task at COP22," World Resources Institute, available at http://www.wri.org/blog/2016/11/insider-crafting-paris-agreements-rule-book-tasks-cop-22.

29. Yardley, J. "Has Europe Reached the Breaking Point?" The New York Times Magazine, 15 December 2015, available at https://www.nytimes.com/2015/12/20/magazine/has-europe-reached-the-breaking-point.html.

30. *Id.*

31. *Id.*

32. On the United Kingdom leaving the European Union (i.e., "Brexit"), see Leal-Arcas, R. "Three thoughts on Brexit," *Queen Mary School of Law Legal Studies Research Paper 249/2016*, pp. 1-5.

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 challenges, which have affected the European Union and its citizens profoundly, can be resolved through an effective and unified system of energy governance.[33] 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 and other regions, such as the current refugee crisis.

This article 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[34] 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 Table 1). The following Sections explore these indicators in greater detail.

TABLE 1: INDICATORS IN THE TRAGEDY OF THE COMMONS[35]

	Rivalrous	**Non-rivalrous**
Excludable	**Private goods**	**Club goods**
	Food Car House	Cable TV Some social services
Non-excludable	**Common pool resources**	**Public goods**
	Forests Fisheries Wildlife Fossil fuels	Air Law enforcement Public radio Streetlights

After this Introduction, Section II explores the notion of public goods in the broader context of international economic law and governance. Section III examines the notion of common concern, whereas Section IV provides an analysis of the megatrends of the 21st century. Section V explores possible incentives for regional and global cooperation to decarbonize the economy. The Article then concludes in Section VI by saying that the solution to sustainability is to reduce CO2 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 Article 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.

33. For instance, there are proponents that suggest the concept of "energy citizens" to refer to the idea that over 250 million Europeans could produce their own renewable electricity by 2050. *See* Kampman, B., Afman, M. and Blommerde, J. "The potential of energy citizens in the European Union," CE Delft, 2016. This approach suggests that a bottom-up approach to renewable energy generation is desirable. *See* 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 p. 2, COM (2015) 80 final (25 February 2015) (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. Hardin, G. (1968) "The Tragedy of the Commons," *Science*, 162 (3859): 1243-1248.

35. Dale, L. "Multiple scales of sustainability governance," lecture given at the Yale sustainability leadership forum, September 2016, Yale University, New Haven, USA.

II. WHAT ARE PUBLIC GOODS?

A. The Concept

Public goods, also known as "collective consumption goods," are defined by economists as the kind of goods that one individual can consume without reducing the goods' availability to and access by others.[36] For this reason, economists characterize public goods as "non-rivalrous" and "non-excludable."[37] 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.[38] The key to why public goods present a challenge for the private sector lies in the potential for unfettered access to the benefits derived from such goods once they are made available, a phenomenon that is known as the "free rider problem."[39]

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."[40] The prisoner's dilemma represents a situation in which the lack of information impedes collaboration between two parties.[41] 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.[42] In line with this, experts and academics have contended that without a mechanism for *collective action*, public goods are at risk of being under-produced.[43]

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

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36. *See* Brousseau, E. et al. (2012) (eds.) *Global Environmental Commons: Analytical and Political Challenges in Building Governance Mechanisms*, Oxford University Press; Brousseau, E. et al. (2012) (eds) *Reflexive Governance for Global Public Goods*, MIT Press; Kaul, I. (2012) 'Rethinking Public Goods and Global Public Goods', in E. Brousseau, T. Dedeurwaerdere and B. Siebenhüner, *Reflexive Governance for Global Public Goods*, MIT Press, 37–54; Kaul, I. (2012) 'Global Public Goods: Explaining their Underprovision', *Journal of International Economic Law* 15: 729–750.

37. Kaul, Inge, Grunberg, Isabelle, and Marc A. Stern (eds) Global Public Goods. International Cooperation in the 21th century. Published for the United Nations Development Program. New York, Oxford University Press, 1999.

38. Paul A. Samuelson. The Review of Economics and Statistics, Vol. 36, No. 4. (Nov., 1954), pp. 387-389.

39. The free rider problem leads to under-provision 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 Economics, "Public Goods and Market Failure," available at https://www.tutor2u.net/economics/reference/public-goods.

40. *See* Kaul, Grunberg and Stern, *Public Goods: International Cooperation in the 21st Century*, Oxford University Press, 1999, page 7.

41. *See* Kaul, Grunberg and Stern, *Public Goods: International Cooperation in the 21st Century*, Oxford University Press, 1999, page 7. 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. 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. The concept of the prisoner's dilemma was originally framed by Merrill Flood and Melvin Dresher. *See* Stanford Encyclopedia of Philosophy, available at https://plato.stanford.edu/entries/prisoner-dilemma/.

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 agreement to collaborate and contribute for the common good.

43. Kaul, Grunberg and Stern, *Public Goods: International Cooperation in the 21st Century*, Oxford University Press, 1999, at 20.

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.

B. 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.[44] As a result, a growing number of experts have written about the rise of the "global public good,"[45] 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 non-excludable and non-rivalrous, 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, incentives and effective tools that encourage state-to-state cooperation.

III. MATTERS OF COMMON CONCERN

Matters of common concern represent the worries and issues that drive people to cooperate.[46] 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.[47] 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.[48] 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.[49]

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[44] See for instance the current situation in parts of the Middle East and Sub-Saharan Africa. UN Secretary-General, "Secretary-General's address to the General Assembly," 24 September 2013, available at https://www.un.org/sg/en/content/sg/statement/2013-09-24/secretary-generals-address-general-assembly-delivered-%E2%80%93-bilingual.

45. Id. at 9.

46. 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." *See* Shelton, Dinah, '*Common Concern of Humanity*', Iustum Aequum Salutare Vol. 2009/1, 33–40. 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. Kiss, Alexandre, Shelton, Dinah, 'A Guide to International Environmental Law', pages 13-14.

47. *See* 'The EU in brief', available at https://europa.eu/european-union/about-eu/eu-in-brief_en.

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* document officiating the Paris Agreement, available at https://treaties.un.org/doc/Publication/CN/2016/CN.735.2016-Eng.pdf. The Paris Agreement on Climate Change (Paris Agreement) will come into force in 2020. *See* 'Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015', FCCC/CP/2015/10/Add.1, 29 January 2016, available at http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf#page=2. It will do so in the form of an internationally legally binding instrument, which has been signed and ratified. *See* Status of Ratification, available at http://unfccc.int/paris_agreement/items/9444.php. 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* Guzman, Andrew, 'The Design of International Agreements ', The European Journal of International Law Vol. 16 no.4, European Journal of International Law, 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 (Article 4(5)); the Convention on Biological Diversity (Article 20(2)); and the Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (Articles 20 and 21). 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. (Ireland v. United Kingdom) Case No. 10, Order of Dec. 3, 2001, ITLOS Rep. Ireland had invoked the United Nations 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.* 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

IV. MEGATRENDS OF THE TWENTY-FIRST CENTURY

The scientific community is by now in almost unanimous agreement that the greenhouse gas (GHG) effect is real,[50] and the level of GHG emissions in the atmosphere continues to increase.[51] There are clear policy actions to tackle climate change: mitigation, adaptation, and geoengineering. As a result of the Paris Agreement, new avenues to tackle climate change more effectively have emerged, such as the involvement of mayors,[52] governors,[53] and CEOs.[54] 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—a creation of the Paris Agreement, which has become the locomotive of climate action—is one of the megatrends of the twenty-first century. Since eighty percent of global economic activity takes place in cities[55] and since eighty percent of GHG emissions comes from cities,[56] 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,[57] and this trend to urban migration is on the rise;[58] because they are the main polluters and the main implementers of legislation;[59] and because mayors of cities are pragmatic with global issues such as climate change, poverty, and terrorism.[60] Such issues are also too big for nation-states, and cities arguably offer better governance on these matters.[61] Furthermore, some of the greatest environmental and social challenges comes from cities: food, water, waste, infrastructure, transport. Moreover, mayors tend to come from the cities they govern[62] and therefore have a much higher level of trust than politicians at the national level.[63]

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,[64] the Compact of Mayors,[65] the Covenant of Mayors for Climate and Energy,[66] the Global Covenant of Mayors for Climate and Energy,[67] RESURBE,[68] the "100 resilient cities" scheme pioneered by the Rockefeller Foundation,[69] United Cities and Local

common concern), and that certain rights arise from it, which the tribunal can enforce by ordering provisional measures. *Id.* at para. 82.

50. Skeptical Science, available at https://www.skepticalscience.com/global-warming-scientific-consensus-intermediate.htm.

51. US Environmental Protection Agency, "Global greenhouse gas emissions data," available at https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data.

52. C40 Cities, available at http://www.c40.org/.

53. Regions of Climate Action, available at http://regions20.org/.

54. "CEOs from Leading Companies Worth More Than $2 Trillion Ask COP21 to Secure a Prosperous World," The Climate Group, 23 November 2015, available at https://www.theclimategroup.org/news/ceos-leading-companies-worth-more-2-trillion-ask-cop21-secure-prosperous-world.

55. Dobbs, R. *et al*., "Urban world: Mapping the economic power of cities," *McKinsey Global Institute*, 2011.

56. United Nations Environment Program, "Cities and Buildings: UNEP initiatives and projects," p. 5, available at http://www.unep.org/SBCI/pdfs/Cities_and_Buildings-UNEP_DTIE_Initiatives_and_projects_hd.pdf.

57. UN, "World's population increasingly urban with more than half living in urban areas," available at http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html.

58 Id.

59 United Nations Environment Program, "Cities and Buildings: UNEP initiatives and projects," p. 5, available at http://www.unep.org/SBCI/pdfs/Cities_and_Buildings-UNEP_DTIE_Initiatives_and_projects_hd.pdf.

60 "Mayors get things done. Should they run the world?" 11 March 2014, available at http://www.theglobeandmail.com/opinion/ideas-lab/should-mayors-lead-the-world/article17275044/.

61. For further details on the potential of cities to solve global problems locally, see Barber, B. *If Mayors Ruled the World: Dysfunctional nations, rising cities*, Yale University Press, 2013 (arguing that local executives exhibit a nonpartisan and pragmatic style of governance that is lacking in national and international halls of power).

62 Id.

63 Id.

64. Mayors summit, available at https://mayorssummit2016.c40.org/.

65. Compact of Mayors, available at https://www.compactofmayors.org/.

66. Covenant of Mayors for Climate & Energy, available at http://www.covenantofmayors.eu/index_en.html.

67. Global covenant of mayors for climate & energy, available at https://www.compactofmayors.org/globalcovenantofmayors/.

68. RESURBE, available at http://www.unescosost.org/en/project/resurbe/.

69. 100 resilient cities, available at http://www.100resilientcities.org/#/-_/.

Governments,[70] International Council of Local Environmental Initiatives,[71] CityNet,[72] City Protocol,[73] the United States Conference of Mayors, Habitat III,[74] and the Making Cities Resilient campaign[75] in the framework of the U.N. Office for Disaster Risk Reduction.[76] 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.[77]

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[78] to enable cities to have a stronger voice on global issues and address global priorities more democratically and directly by citizens.[79] The purpose is to democratize globalization or to globalize democracy.[80]

Moving forward, the international community may also consider putting a price on harm-causing.[81] 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.[82] As a result of clean energy's popularity, there is an innovation race across the world.[83] 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.

70. The global network of cities, local and regional governments, available at https://www.uclg.org/en.
71. Local governments for sustainability, available at http://www.iclei.org/.
72. Citynet, available at http://citynet-ap.org/.
73. City Protocol, available at http://cityprotocol.org/.
74. Habitat III, available at https://habitat3.org/.
75. United Nations Office for Disaster Risk Reduction, "Making cities resilient," available at https://www.unisdr.org/we/campaign/cities.
76. United Nations Office for Disaster Risk Reduction, available at https://www.unisdr.org/.
77. Barber, B. *If Mayors Ruled the World: Dysfunctional nations, rising cities*, Yale University Press, 2013.
78. Global Parliament of Mayors, available at http://www.globalparliamentofmayors.org/.
79. *See generally* Barber, B. *If Mayors Ruled the World: Dysfunctional nations, rising cities*, Yale University Press, 2013.
80. *Id.*
81. See the proposal of senior Republican statesmen regarding a carbon tax in the United States. Mooney, C. and Eilperin, J. "Senior Republican statesmen propose replacing Obama's climate policies with a carbon tax," The Washington Post, 8 February 2017, available at 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.
82. "Renewable energy proves increasingly popular," The Economist Intelligence Unit, 30 December 2015.
83. Grant, A. and Grant, G. *The Innovation Race: How to change a culture to change the game*, Wiley, 2016.

TABLE 2: THE MEGATRENDS OF THE TWENTY-FIRST CENTURY[84]

Twentieth Century	Twenty-first Century
Focus of attention was government	Focus of attention should be business
Environmental information silos; little attention to economics	Since *vox populi* 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.
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[85] 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 Paradox of Progress.[86] Through 2035, the NIC noted that the global trends of climate change, the environment, and public health issues "will demand [the] attention" of NIC projects.[87] This Section shows how increased citizen participation can help achieve that required attention.

A. 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).[88] 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.

84. This list is based on a "Decalogue" developed by Daniel Esty of Yale University, 1st Yale sustainability leadership forum, September 2016 at Yale University.

85. *See*, e.g., European Political Strategy Centre, "Enter the Data Economy: EU policies for a thriving data ecosystem," Issue 21, 11 January 2017.

86. National Intelligence Council, "Global trends: Paradox of progress," January 2017, available at https://www.dni.gov/files/images/globalTrends/documents/GT-Full-Report.pdf.

87. *Id*, at p. 6.

88. United Nations General Assembly, "Resolution adopted by the General Assembly on 25 September 2015," A/RES/70/1, available at http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

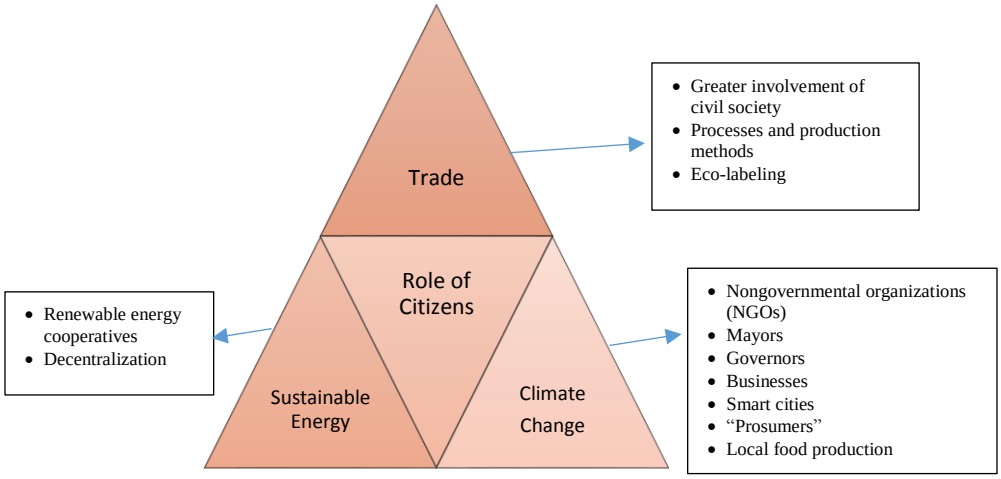

FIGURE 1: CITIZENS' EMPOWERMENT AND SUSTAINABLE DEVELOPMENT GOALS

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.[89] Since the beginning of the 1980s, democratization, economic development, and increasing social tolerance have all increased citizens' perception that they have free choice and therefore greater levels of happiness.[90] In other words, because of citizens' perception that they have free choice, citizens have greater levels of happiness.

B. Citizens and Trade (and Climate Change)

Traditionally, governments discuss trade measures and their links with climate change without allowing for citizens' participation.[91] 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 re-conceptualized 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, 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.[92]

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 eco-labeling as well as labeling and traceability regarding genetically modified organisms.[93] 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.

89. Inglehart, R., Foa, R., Peterson, C. and Welzel, C. "Development, freedom, and rising happiness: A global perspective (1981-2007)," *Association for Psychological Science*, 3, 4 (2008), pp. 264-285, at 264.

90. Idem.

91 See Leal-Arcas, R. *Theory and Practice of EC External Trade Law and Policy*, Cameron May (2008), pp. 425-439; Leal-Arcas, R. *Climate Change and International Trade*, Edward Elgar Publishing, 2013.

92. One could make the case that some World Trade Organization 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. There is evidence that there is a link between production-related subsidies and environmental harm.

93 Organization for Economic Cooperation and Development, "Processes and Production Methods (PPMs): Conceptual framework and considerations on use of PPM-Based trade measures," p. 7 (1997), available at http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(97)137&docLanguage=En.

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.[94] In broad terms, trade rules are not guided towards environmental protection as much as they could be.

The ease of proliferation of news and information through the Internet—which provides more transparency and access to information 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.[95] Classic examples are the massive demonstrations against the Trans-Pacific Partnership (TPP) in the United States[96] and against the Trans-Atlantic Trade and Investment Partnership (TTIP) in Germany, Austria, France, and the United Kingdom.[97] 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.[98] 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, neo-medievalism[99] 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,[100] 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 background 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 megaregional 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.

94. Esty, D. and Winston, A. *Green to Gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage*, John Wiley & Sons, Inc., 2009; Esty, D. *Greening the GATT: Trade, Environment, and the Future*, Washington, D.C., Peterson Institute for International Economics, 1994.

95. "Why they're wrong," *The Economist*, 1 October 2016.

96. Zeese, K. "TPP signing sparks dozens of protests across US over biggest trade pact," RT, 5 February 2016, available at https://www.rt.com/usa/331356-tpp-signing-protests-usa/.

97. Nienaber, M. "Tens of thousands protest in Europe against Atlantic free trade deals," 17 September 2016, available at http://uk.reuters.com/article/us-eu-usa-ttip-idUKKCN11N0H6.

98. Reich, R. "Trade deals like the TPP only benefit the one percent," Bill Moyers, 21 February 2015, available at http://billmoyers.com/2015/02/21/trade-deals-boost-top-1-bust-rest/.

99. "Neomedievalism" is a term often used as a political theory about modern international relations. *See* Kobrin, S. "Back to the Future: Neomedivalism and the postmodern digital world economy," available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.131.6106&rep=rep1&type=pdf.

100 By this, I mean the notion of collectivism, rather than individualistic approaches to society that are more prevalent in Western societies. See Wee, C.J.W. "'Asian Values,' Singapore, and the Third Way: Re-Working Individualism and Collectivism," Journal of Science Issues in Southeast Asia, Vol. 14, No. 2, (1999), pp. 332-358.

TABLE 3: HOUSEHOLD FINAL CONSUMPTION EXPENDITURE[101]

Country	Consumer Spending as Percentage of GDP
China	37.0
United States	68.1
European Union	56.3
India	59.6
Russia	51.9
Indonesia	55.4
Brazil	63.4
Japan	58.6
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.

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

V. 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

101. The World Bank, "Household final consumption expenditure, etc. (% of GDP)," available at http://data.worldbank.org/indicator/NE.CON.PETC.ZS?end=2015&name_desc=false&start=1967&view=chart.

energy resources.[102] In a world of growing energy demands,[103] the rising scarcity of traditional energy resources[104] and soaring levels of pollution[105] 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.[106] The atmosphere is an international public good in that all countries benefit from each country's reduction of GHG emissions.[107] Climate change mitigation is both non-rivalrous and non-excludable and, because it is available on a worldwide basis, is a global public good.[108] Accordingly, the reduction of GHG emissions 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.[109] 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.[110] The traditional concept of energy security focuses on the *continual* availability of energy sources at an affordable price, which has so far been associated with a steady and constant availability and supply of traditional energy resources, such as oil and gas.[111] While it is generally agreed that climate change mitigation, as discussed above, is a global public good,[112] the classification of energy security as a public good has divided experts and academics.[113] 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 non-rivalrous and non-excludable good, as defined by economists.[114] 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

102. Leal-Arcas, R. and Minas, S. "Mapping the International and European Governance of Renewable Energy," Yearbook of European Law, (Advance access), 2016, pp. 1-46, at p. 27.

103 U.S. Energy Information Administration, "EIA projects 48% increase in world energy consumption by 2040," 12 May 2016, available at https://www.eia.gov/todayinenergy/detail.php?id=26212.

104 ResilientCity.org, "Energy Scarcity," available at http://www.resilientcity.org/index.cfm?id=11897.

105 "Delhi air quality plunges to 'severe' category as pollution levels soar," *Hindustan Times*, 12 November 2016, available at http://www.hindustantimes.com/delhi/delhi-air-quality-plunges-to-severe-category-as-pollution-levels-soar/story-5ZWa6MndeqDPf61WgSjYNI.html.

106 Hasson, R., Lofgren, A., Visser, M. "Climate change in a public goods game: Investment decision in mitigation versus adaptation," *Ecological Economics*, Vol. 70, Issue 2, 2010, pp. 331-338.

107. *See* Bruce, J., Lee, H. and Haites, E. (eds.) Climate Change 1995: Economic and Social Dimensions of Climate Change, page 21, Cambridge University Press, 1996, at https://www.ipcc.ch/ipccreports/sar/wg_III/ipcc_sar_wg_III_full_report.pdf.

108. *See* Kaul, Inge (2012), "Rethinking public goods and global public goods," in Éric Brousseau, Tom Dedeurwaerdere, and Bernd Siebenhüner (eds.), *Reflexive Governance for Global Public Goods.* Cambridge, MS: The MIT Press, pp. 37-54.

109. 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.

110. *See* Leal-Arcas, Rafael, *The European Energy Union: The quest for secure, affordable and sustainable energy* (Claeys & Casteels Publishing 2016), Chapter 1; Leal-Arcas, R., Grasso, C. and Alemany Rios, J. *Energy Security, Trade and the EU: Regional and International Perspectives*, Edward Elgar, 2016.

111. *See* Leal-Arcas, Rafael, *The European Energy Union: The quest for secure, affordable and sustainable energy* (Claeys & Casteels Publishing 2016), Chapter 1.

112. *See* Leal-Arcas, Rafael, "Unilateral Trade-Related Climate Change Measures," *The Journal of World Investment and Trade*, Vol. 13, No. 6, 2012.

113. See e.g., Simon, C. "Is Energy a Public Good?" Renewable Energy World, 2 July 2007, available at http://www.renewableenergyworld.com/articles/2007/07/is-energy-a-public-good-49201.html.

114. A rivalrous good is a good that, once consumed by one consumer, cannot be consumed by other consumers. *See* David L. Weimer and Aidan R. Vining, *Policy Analysis: Concepts and Practice*, Routledge, 4th ed., Pearson: Prentice Hall. p. 72.

is a global public good. So, renewable energy may become the engine to obtain the three attributes of sustainable energy in the energy trilemma:[115] namely clean, secure, and affordable energy (see Figure 2).

115. The World Energy Council's definition of sustainable energy 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." *See* World Energy Council, "World Energy Trilemma," available at https://www.worldenergy.org/work-programme/strategic-insight/assessment-of-energy-climate-change-policy/.

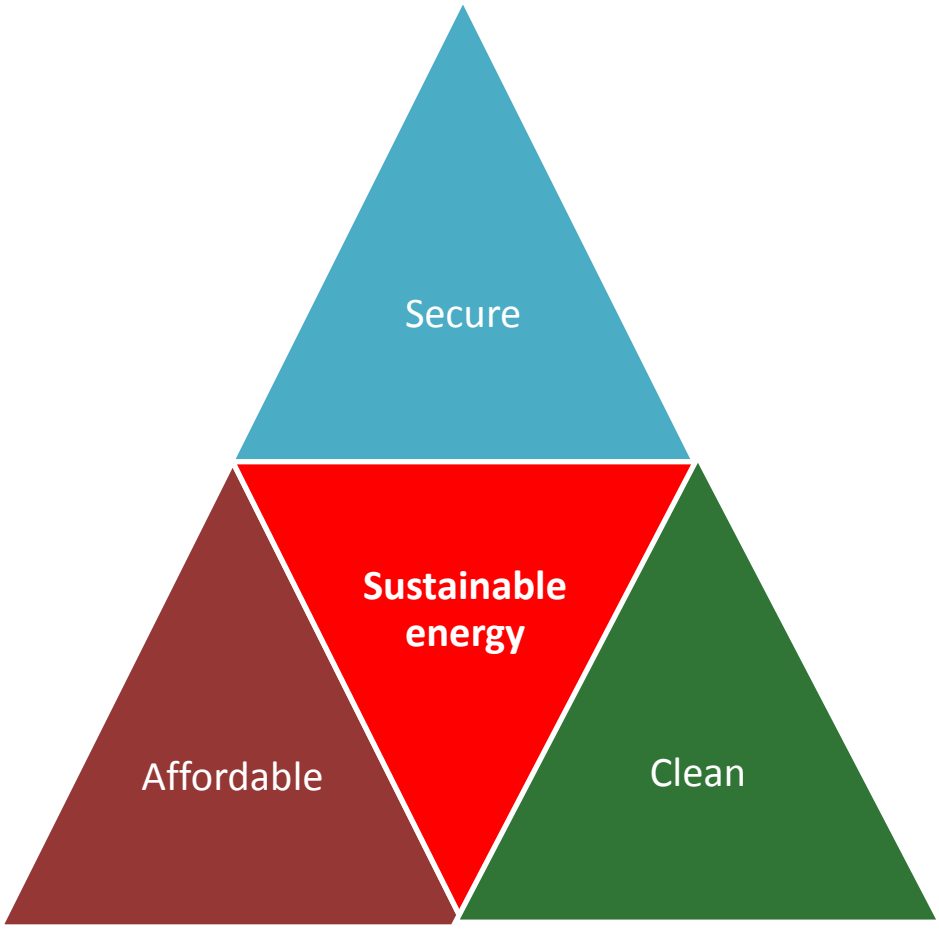

FIGURE 2: THE ATTRIBUTES OF SUSTAINABLE ENERGY IN THE ENERGY TRILEMMA

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 energy through the use of renewable energy resources.[116] The concept of global renewable energy security is better understood through examples *A* and *B*, illustrated below.

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

[116] See generally Leal-Arcas, R. and Minas, S. "Mapping the international and European governance of renewable energy," *Oxford Yearbook of European Law*, Vol. 35, No. 1, pp. 621-666, 2016

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.[117] 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. This latter condition is illustrated in Example *B* below.

b. Example *B*

State *Z*, which is not rich in sunlight,[118] does not have the technological capacity to process raw renewable energy resources such as solar energy. Thus, state *Z* relies on supplies of conventional 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.[119]

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 intergovernmental 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

117. 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* Manuel Gotz, Jonathan Lefebvre, Friedemann Mors, Amy McDaniel Koch, Frank Graf, Siegfried Bajohr, Rainer Reimert, Thomas Kolb, 'Renewable Power-to-Gas: A technological and economic review', Renewable Energy 85 (2016) 1371-1390 <http://ac.els-cdn.com/S0960148115301610/1-s2.0-S0960148115301610-main.pdf?_tid=e636a4d6-7dcf-11e6-9abc-00000aab0f6c&acdnat=1474224435_246a718737dbfbae9fce393c2ff40717>. 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. *Id*. One way to store and transport renewable energy is through the "power-to-gas" method. *Id.* 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*.

118. 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.

119. 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 April 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, available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN.

good, as it is *non-excludable*[120] and *non-rivalrous*,[121] and it is available, to a greater or lesser extent, on a 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 non-excludability 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,[122] the European Union has made a pledge to reduce GHG emissions by at least forty percent by 2030,[123] sixty percent by 2040,[124] and eighty percent below 1990 levels by 2050.[125] 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.[126] A shift away from volatile fossil fuels will ensure that 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.[127]

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

120. 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.

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

122. Article 10.1 of the Paris Agreement. The Paris Agreement would enter into force when at least fifty-five parties representing at least an estimated fifty-five percent of total GHG emissions join by ratifying, accepting, or approving the agreement, depending on their constitutional framework. Since the threshold was met in late 2016, the Paris Agreement entered into force on November 4, 2016.

123. *See* European Commission, "2030 climate and energy framework," at http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm; INDC submissions, as communicated by Parties, Latvian Presidency of the Council of the European Union, "Submission by Latvia and the European Commission on behalf of the European Union and its Member States," available at http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Latvia/1/LV-03-06-EU%20INDC.pdf.

124. *See* European Commission, '2050 low-carbon economy', at http://ec.europa.eu/clima/policies/strategies/2050/index_en.htm.

125. The European Commission is looking at cost-effective 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. *See* European Commission, '2050 low-carbon economy', at http://ec.europa.eu/clima/policies/strategies/2050/index_en.htm.

126. *See* European Commission, "2030 climate and energy framework," at http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm; INDC submissions, as communicated by Parties, Latvian Presidency of the Council of the European Union, "Submission by Latvia and the European Commission on behalf of the European Union and its Member States," available at http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Latvia/1/LV-03-06-EU%20INDC.pdf.

127. Article 6 of the Paris Agreement outlines the different 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. Article 6 of the Paris Agreement on Climate Change, available at https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf. Article 6 recognizes the potential of cooperation to promote sustainable development and environmental integrity. *Id.*

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,[128] E.U. member states can become the 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.[129] 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 2013, 1.2 billion people (i.e., seventeen percent of the world population) had no access to electricity.[130] Most of those living without electricity (around ninety-five percent) are in sub-Saharan Africa and developing Asia.[131] Eighty percent of them live in rural areas.[132] Yet, in the case of Africa, the continent receives the least amount of climate finance in the world—around four percent.[133] 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 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.[134] A large number of refugees that attempt to cross the European Union's borders risk their lives and those of their loved ones in

128. For example, the United Kingdom and France signed a declaration on nuclear energy and cooperation on climate change action in 2014. *See* "UK and France sign declaration on nuclear energy and agree cooperation on ambitious climate change action," at https://www.gov.uk/government/news/uk-and-france-sign-declaration-on-nuclear-energy-and-agree-cooperation-on-ambitious-climate-change-action. 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* 'UK and Iceland sign energy agreement', at https://www.gov.uk/government/news/uk-and-iceland-sign-energy-agreement. 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* 'China and Denmark sign new cooperation agreement on energy efficiency', 1 May 2014, at http://www.efkm.dk/en/news/china-and-denmark-sign-new-cooperation-agreement-on-energy-efficiency; 'Channel Islands' link with south-west England on marine power', BBC news, 3 December 2013, at http://www.bbc.co.uk/news/world-europe-guernsey-25200486.

129 The World Bank, "Energy use (kg of oil equivalent per capita)," 2014, available at http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE.

130. International Energy Agency, WEO 2015 Electricity Access Database, available at http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/.

131. *Id.*

132. *Id.*

133. Masiyiwa, S. "Climate Finance is Climate Investment," World Economic Forum, 15 November 2016, available at https://www.weforum.org/agenda/2016/11/climate-finance-is-climate-investment/.

134. 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 North and sub-Saharan Africa. *See* 'Key Facts: Africa to Europe Migration', BBC News, 2 July 2007, at http://news.bbc.co.uk/1/hi/world/europe/6228236.stm. The majority of refugees are forced to seek refuge in European countries due to war, conflict, political upheaval, poverty, and climate change. 'Migration to Europe – is North Africa Europe's border guard?', Isabel Schäfer, German Development Institute, The Current Column of 8 June 2015, at https://www.die-gdi.de/uploads/media/German_Development_Institute_Schaefer_08.06.2015.pdfhttps://www.die-gdi.de/uploads/media/German_Development_Institute_Schaefer_08.06.2015.pdf. An increasing number of refugees come from

order to escape poverty and pitiable living conditions, brought about mostly by conflicts, climate change, and environmental degradation.[135] Energy poverty in particular is a serious issue in sub-Saharan Africa.[136] 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,[137] and has in turn contributed to xenophobia and racism in the European Union.[138]

Related to the notion of refugee status is the concept of (economic or climate) migrant status,[139] often related to energy poverty. Demography and economic change 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.[140] 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.[141]

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.[142] 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.[143] Africa will have a birth rate of around 2.7 children per woman by 2060.[144] 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 facilities that would permit the European Union to embrace asylum seekers and meet its obligations

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. Matt Timms, 'Energy poverty stifles sub-Saharan Africa's economic development', World Finance, 3 May 2015, at http://www.worldfinance.com/markets/energy-poverty-stifles-sub-saharan-africas-economic-development.

135. Baker, A. "How climate change is behind the surge of migrants to Europe," *Time*, 7 September 2015, available at http://time.com/4024210/climate-change-migrants/.

136. 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 Finance, 3 May 2015, at http://www.worldfinance.com/markets/energy-poverty-stifles-sub-saharan-africas-economic-development. 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. *See* 'Africa and the Energy Charter: the bountiful continent and the energy conundrum', 2015, at http://www.energycharter.org/fileadmin/DocumentsMedia/Infographics/2015_Energy_Charter_And_Africa.pdf.

137. *See* Marie-Laurence Flahaux, Hein De Haas, 'African migration: trends, patterns, drivers', in 'Comparative Migration Studies', January 2016, at https://comparativemigrationstudies.springeropen.com/articles/10.1186/s40878-015-0015-6.

138. Interestingly, periods of economic progress in the United States and Europe have traditionally been conducive to tolerance and openness because autochthonous populations did not feel that migrants threatened locals' ability to progress economically. *See* Friedman, B. *The Moral Consequences of Growth*, New York: Alfred A. Knopf, 2005. *A contrario*, whenever economic growth was low, racism and discrimination have been on the rise, due to local populations feeling pushed down economically as a result of migrants. *Id.*

139. On the controversial concept of "climate migrants," see Leal-Arcas, R. "On Climate Migration and International Trade," *Vienna Journal on International Constitutional Law*, Vol. 6, Issues 3+4, pp. 410-440, 2012.

140. "Answering for India's 'Missing Girls': Sex-selective abortion in India," *News Record*, 11 February 2014, available at https://www.newsrecord.co/answering-for-indias-missing-girls-sex-selective-abortion-in-india/.

141 See generally Halff, A. et al., (eds.) *Energy Poverty: Global Challenges ad Local Solutions*, Oxford University Press, 2014.

142. *See* 2015 Global Migration Trends Factsheet, at https://publications.iom.int/system/files/pdf/global_migration_trends_2015_factsheet.pdf.

143. *See* Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2010 Revision, https://ourworldindata.org/future-world-population-growth/#note-7.

144. *Id.*

under regional and international human rights instruments.[145] The recent readmission agreement of March 2016 between the European Union and Turkey[146] 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.[147] Many have questioned the legality of the readmission agreement as its implementation may lead to violations of E.U. and international regulations on the treatment and return of refugees.[148]

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.[149] Further, six of the world's ten fastest growing economies over the last decade were found in sub-Saharan Africa.[150] Sustaining the same level of growth, however, will only be possible if supported by a much larger and better-performing energy sector.[151]

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 their commitment to and investment in clean energy, E.U. states such as Denmark, Germany, and Sweden have the capacity to lead the retreat from fossil fuels and initiate the transformation of the global energy sector.[152] Cooperation with, inter alia, African states on the decarbonization of the economy would produce a number of benefits to both Africa and the E.U.

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 dangerous 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

145. The European Union is bound by the Charter of Fundamental Human Rights in the course of implementing E.U. legislation. On December 1, 2009, with the entry into force of the Treaty of Lisbon, the Charter became legally binding on E.U. institutions and on national governments, just like the E.U. 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 implement E.U. law. *See* http://ec.europa.eu/justice/fundamental-rights/charter/index_en.htm. In addition, E.U. member states are also bound by the European Convention of Human Rights, see http://www.coe.int/en/web/human-rights-convention/, and the International Covenant of Civil and Political Rights (ICCPR). All E.U. member states are parties to the ICCPR. *See* http://www.europe.ohchr.org/Documents/Publications/EU_and_International_Law.pdf. Both conventions safeguard the basic human rights of individuals. *See generally id.*

146. *See* 'EU-Turkey Agreement: Questions and Answers', at http://europa.eu/rapid/press-release_MEMO-16-963_en.htm.

147. Human rights have been under attack in Turkey. 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 E.U. bodies of Turkey's human rights record. *See* https://www.amnesty.org/en/countries/europe-and-central-asia/turkey/report-turkey/.

148. 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* Directive 2011/95/EU of the European Parliament and of the Council of 13 December 2011; Articles 32 and 33 of the 1951 Convention Relating to the Status of Refugees.

149. 'Africa's Renewable Future: The Path to Sustainable Growth', International Renewable Energy Agency, page 5, available at http://www.irena.org/documentdownloads/publications/africa_renewable_future.pdf.

150. The Economist, "Africa's impressive growth," 6 January 2011, available at http://www.economist.com/blogs/dailychart/2011/01/daily_chart.

151. *See* 'Africa's Renewable Future: The Path to Sustainable Growth', International Renewable Energy Agency, at http://www.irena.org/documentdownloads/publications/africa_renewable_future.pdf.

152 See Kunzig, R. "Germany could be a model for how we'll get power in the future," *National Geographic*, http://www.nationalgeographic.com/magazine/2015/11/germany-renewable-energy-revolution/.

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.[153] 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),[154] key among which is the attainment of economic 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."[155] 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;[156] 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.[157]

Second, the expansion of the ECT's[158] 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.[159] Collaboration on the decarbonization of the economy—the exchange of renewable energy

153. As early as the 1960s and 1970s, there was discussion about the limits to growth and the importance of sustainable growth. See for instance Ehrlich, P. *The Population Bomb*, Sierra Club, 1968; Meadows, D. *et al*., *The Limits to Growth*, 1972. More recent studies include Sabin, P. *The Bet: Paul Ehrlich, Julian Simon, and our Gamble over Earth's Future*, Yale University Press, 2013; Klein, N. *This Changes Everything: Capitalism vs. the Climate*, Allen Lane, 2014; Maxton, G. and Randers, J. *Reinventing Prosperity: Managing economic growth to reduce unemployment, inequality and climate change*, Greystone Books, 2016.

154. 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, 'Review of the EU Sustainable Development Strategy (EU SDS) − Renewed Strategy', 9 June 2006 <http://www.etuc.org/IMG/pdf/st10117.en06.pdf>. 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. *Id*. 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. *Id.* Its purpose is 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. *Id.* It aims at the continuous improvement of the quality of life and wellbeing on earth for present and future generations. *Id.* 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. *Id.*

155. *See* Council of the European Union, Review of the EU Sustainable Development Strategy (EU SDS) − Renewed Strategy, 9 June 2006, at p. 4 <http://www.etuc.org/IMG/pdf/st10117.en06.pdf>.

156. Such an argument is in line with the 1961 book *The Theory of Economic Integration*, by Bela Balassa, who argued that a free trade agreement is a first step towards economic integration, that harmonizing external tariffs is a step further, and yet a step even further is setting common internal regulations.

157. For example, 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, the United States, Africa, Latin America and India driving forward the global energy transition. A photovoltaics boom is also forecast for the United States. Even though China, Japan and the United States apparently dominated the photovoltaics markets in 2015, Europe was also able to reach an important expansion milestone. The total photovoltaics output in Europe reached the 100-gigawatt mark in 2015. *See* 'Solar market set to soar globally throughout 2016' (Renewable Energy Focus, 10 May 2016) http://www.renewableenergyfocus.com/view/44164/solar-market-set-to-soar-globally-throughout-2016/.

158. 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." *See The Energy Charter Treaty and Related Documents: A Legal Framework for International Energy Cooperation*, Brussels: Energy Charter Secretariat, 2004, p. 13.

159. 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.

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[160] 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.[161] Recent data indicate that 20.448 million adults in the European Union (of whom 15.908 million were in the euro area) were unemployed in October 2016.[162] In addition, in October 2016, 4.169 million young persons (under 25) were unemployed in the European Union, of whom 2.939 million were in the euro area.[163] Regional and global cooperation on the decarbonization of the economy could generate new opportunities for investment and expand the global renewable-energy market.[164] 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,[165] 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.[166] Shocking news such as the fact that the world's eight richest people have the same level of wealth as the poorest 50% make one wonder about social sustainability and development.[167] 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

States such as, inter alia, Burundi, Kenya, 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, 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 in the supply chain 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* 'Energy in the East African Community: The Role of the Energy Charter Treaty', Energy Charter Secretariat Knowledge Centre 2016, Victoria Ritah Nalule, http://www.energycharter.org/fileadmin/DocumentsMedia/Occasional/Energy_in_the_East_African_Community.pdf; 'The Future of Renewable Energy in the MENA region', Clean Energy Pipeline http://www.cleanenergypipeline.com/Resources/CE/ResearchReports/The%20Future%20for%20Renewable%20Energy%20in%20the%20MENA%20Region.pdf.

160. 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.

161. *See* Eurostat, 'Unemployment Statistics' http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics#Youth_unemployment_trends.

162. *Id.*

163. *Id.*

164. 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* M2020, available at http://www.mission2020.global/.

165 See generally Hefner, R. *The Grand Energy Transition: The rise of energy gases, sustainable life and growth, and the next great economic expansion*, John Wiley & Sons, Inc., Hoboken, NJ, USA, 2015.

166. Bertelsmann Foundation has analyzed how major economies are supported by trade. *See* Bertelsmann Foundation, "B/Visual: Trade beyond the Tweet," available at http://www.bfna.org/publication/bvisual-trade-beyond-the-tweet.

167 "World's eight richest people have same wealth as poorest 50%," The Guardian, 16 January 2017, available at https://www.theguardian.com/global-development/2017/jan/16/worlds-eight-richest-people-have-same-wealth-as-poorest-50.

of the top 10%.[168] In the past, efforts to achieve the different dimensions of development—economic, social, and environmental—have tended to work in information silos.[169]

Today, however, the international community increasingly recognizes the need to take an integrated approach in addressing global development issues.[170] 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,[171] 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.[172] 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 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.[173] If countries eliminate or reduce technical barriers to trade in environmental goods and services,[174] 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.[175] 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.[176] 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. As a result of trade, there is increased social inequality as well as more carbon and other GHG emissions in the atmosphere.[177] That said, thanks to trade, millions of people

[168] The Equality Trust, "The Scale of Economic Inequality in the UK," available at https://www.equalitytrust.org.uk/scale-economic-inequality-uk.

[169] United Nations, "Breaking 'silo' approach key in toppling barriers to merging three pillars of sustainable development, speaker tells high-level political forum," 30 June 2015, available at https://www.un.org/press/en/2015/ecosoc6705.doc.htm.

170. United Nations, "Sustainable Development Knowledge Platform," available at https://sustainabledevelopment.un.org/?menu=1300.

171. In the Western world, only twenty percent of job losses are the result of trade agreements; the remaining eighty percent come from technology and innovation. *See* Wiseman, P. "Why robots, not trade, are behind so many factory job losses," The Boston Globe, 2 November 2016, available at https://www.bostonglobe.com/business/2016/11/02/why-robots-not-trade-are-behind-many-factory-job-losses/bfg4Wo9hpr4A5Yc5c81GtM/story.html.

172. "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." *See* Eurostat, "Environmental goods and services sector," available at http://ec.europa.eu/eurostat/web/environment/environmental-goods-and-services-sector.

173. Office of the United States Trade Representative, "Environmental Goods Agreement," available at https://ustr.gov/trade-agreements/other-initiatives/environmental-goods-agreement.

174. For a list of fifty-four environmental goods where leaders of the Asia-Pacific Economic Cooperation (APEC) have committed to reduce or eliminate tariffs, see http://www.apec.org/Meeting-Papers/Leaders-Declarations/2012/2012_aelm/2012_aelm_annexC.aspx.

175. UNEP, "Green Jobs: Towards decent work in a sustainable, low-carbon world," available at http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf.

[176] See for instance OECD "Investing in Climate, Investing in Growth," OECD Publishing, Paris, 2017.

177. Erickson, P. et al., "International trade and global greenhouse gas emissions: Could shifting the location of production bring GHG benefits? Stockholm Environment Institute, Project Report 2013-02, p. 2, 2013, available at https://www.sei-international.org/mediamanager/documents/Publications/SEI-ProjectReport-EricksonP-InternationalTradeAndGlobalGreenhouseGasEmissions-2013.pdf.

have come out of poverty in recent years.[178] The international community should conduct more 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 poverty between 1995 and 2015.[179] Second, due to trade agreements, more people have access to medicines.[180] Third, trade has promoted the protection of human rights. Seventy-five percent of countries use trade agreements to protect human rights.[181]

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.[182] Fossil fuels contribute to climate change and are believed to be finite,[183] which leads to energy insecurity.[184] Renewable energy can help in that it is cleaner than fossil fuels, and also helps towards energy independence, enhancing energy security.[185] Trade law and policy could be used as a vehicle to achieve these goals because trade rules can promote environmental goods and services.[186]

The international community can use trade law as a vehicle not only for climate action and sustainable energy,[187] but for many of the Sustainable Development Goals (SDGs). Currently, the governance of trade and renewable energy

[178] Pethokoukis, J. "700 million humans have moved out of deep poverty in the 21st century. Thanks capitalism," *AEIdeas*, 14 July 2015, available at http://www.aei.org/publication/700-million-humans-have-moved-out-of-deep-poverty-in-the-21st-century-thank-capitalism/.

179. *See* "Towards the end of poverty," The Economist, 1 June 2013.

180. World Health Organization, "Access to AIDS medicines stumbles on trade rules," available at http://www.who.int/bulletin/volumes/84/5/news10506/en/.

181. Aaronson, S.A. "Human Rights," available at http://siteresources.worldbank.org/INTRANETTRADE/Resources/C21.pdf.

182. World Energy Council, "World Energy Council report confirms global abundance of energy resources and exposes myth of peak oil," available at 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/.

183. However, see the views of Charles Mann, who says that "new technology and a little-known energy source suggest that fossil fuels may not be finite. This would be a miracle—and a nightmare." Mann, C. "What if we never run out of oil?" *The Atlantic*, May 2013, available at http://www.theatlantic.com/magazine/archive/2013/05/what-if-we-never-run-out-of-oil/309294/.

184. 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* Simon, J. "When will we run out of oil? Never!" available at http://www.juliansimon.com/writings/Ultimate_Resource/TCHAR11.txt. For example, regarding copper, in 1972 the Club of Rome said that known copper reserves would run out in thirty-six years. According to that prediction, we should have no copper by now. In addition, in 1970 experts predicted that there were reserves of about 280 million metric tons of copper. Since then, the consumption of copper has been almost 480 million metric tons and world copper reserves are now estimated to be 700 million metric tons, more than double the original estimate in 1970. *See* US Geological Survey, *Mineral Commodity Summaries 2015*, Washington, DC: US Geological Survey, 2015, p. 191, available at https://minerals.usgs.gov/minerals/pubs/mcs/2015/mcs2015.pdf.

185. On the governance of renewable energy, see Leal-Arcas, R. and Minas, S. "Mapping the international and European governance of renewable energy," *Oxford Yearbook of European Law*, Vol. 35 (1), (2016), pp. 621-666, doi:10.1093/yel/yew022.

186. 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." 7 October 2016, available at https://www.wto.org/english/news_e/news16_e/dgra_07oct16_e.htm.

187. See, e.g., Leal-Arcas, R., Caruso, V. and Leupuscek, R. "Renewables, preferential trade agreements and EU energy security," *Laws*, Vol. 4, Issue 3, pp. 472-514.

is fragmented, with many institutions and legal instruments.[188] 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,[189] and economic growth (see Figure 3).

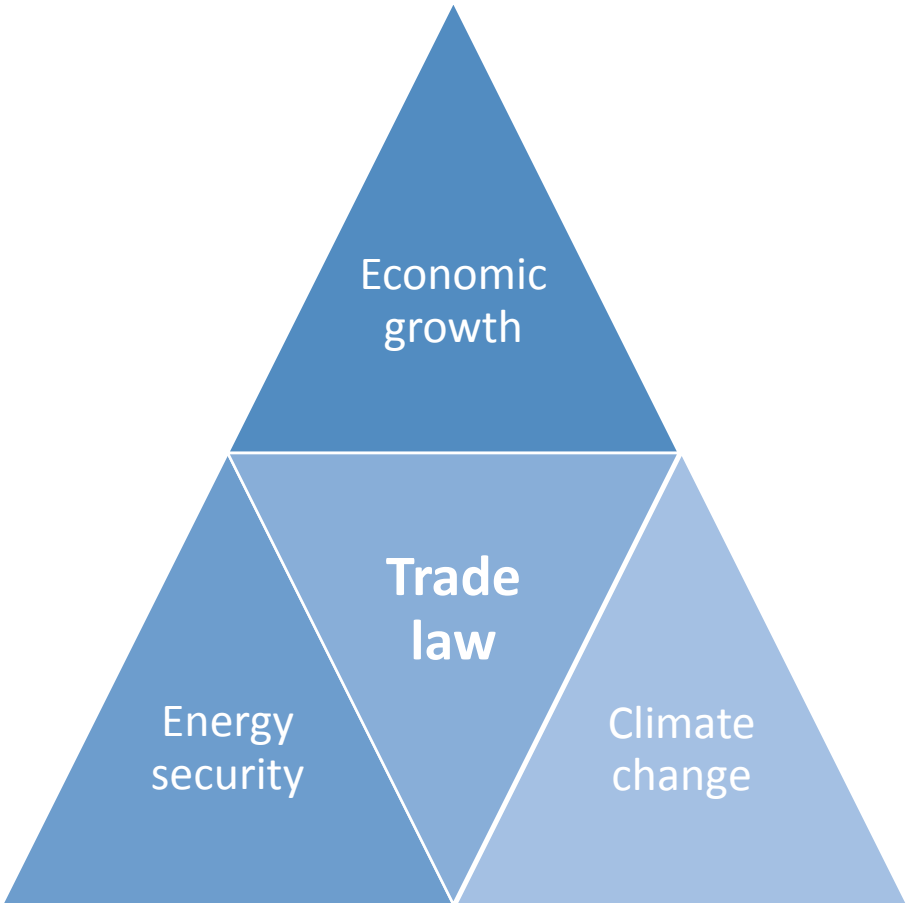

FIGURE 3: THE TRIPLE BENEFIT OF TRADE

There is not enough cooperation or consistency between trade and climate change policies. Greater cooperation between the secretariats of the United Nations 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 below, in the 1990s, two major agreements were concluded: one on climate change—the UNFCCC[190]—and one on international trade—the WTO Agreement.[191] The WTO Agreement only briefly mentions in its preamble the importance of sustainable development in the context of international trade.[192] Still, considering that sustainable development is a tenet of the WTO Agreement, the multilateral trading system should be more

188. Leal-Arcas, R. and Minas, S. "Mapping the international and European governance of renewable energy," *Oxford Yearbook of European Law*, Vol. 35, No. 1, pp. 621-666, 2016.
189. Leal-Arcas, R. "How governing international trade in energy can enhance EU energy security," *Renewable Energy Law and Policy Review*, Vol. 6(3), pp. 202-219, 2015.
190. 1771 UNTS 107 / [1994] ATS 2 / 31 ILM 849 (1992).
191. 1867 U.N.T.S. 14, 33 I.L.M. 1143 (1994).
192. Preamble to the WTO Agreement, 1867 U.N.T.S. 14, 33 I.L.M. 1143 (1994).

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.

From 2008, so-called "twenty-first-century trade agreements"[193] with chapters on sustainable development, started to emerge. However, these chapters are often vague.[194] In 2015, a new global climate agreement came into existence—the Paris Agreement—which fails to mention the term "trade."[195] 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[196] 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.[197] 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 technology, 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.[198]

Figure 4: From insufficient cooperation to effective synergies

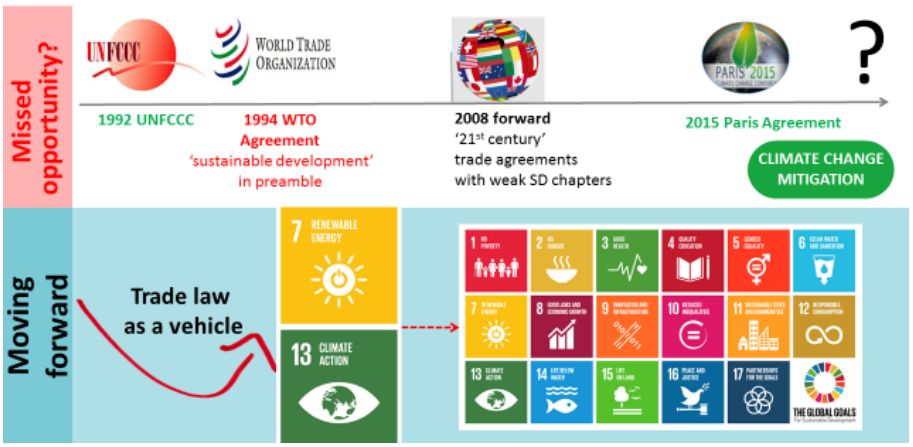

FIGURE 4: FROM INSUFFICIENT COOPERATION TO EFFECTIVE SYNERGIES

193. 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* Rosenfeld, E. "Who wins and loses in '21st century trade agreement'," *CNBC*, 13 November 2015, available at http://www.cnbc.com/2015/11/13/who-wins-and-loses-in-21st-century-trade-agreement.html.

194. See, e.g., the TPP's chapter on Labor.

195. UNFCCC, The Paris Agreement, available at http://unfccc.int/paris_agreement/items/9485.php.

196. The Conference of the Parties (COP), described in Article 7 of the United Nations Framework Convention on Climate Change (UNFCCC), is the supreme decision-making body of the UNFCCC. It comprises the 197 Parties (all 196 member states and the European Union) that have ratified the convention. It held its first session (COP-1) in Berlin in 1995 and meets on a yearly basis unless the parties decide otherwise. *See* Article 7.4 UNFCCC. The COP's role is to promote and review the implementation of the UNFCCC. *See* Article 4.2.b UNFCCC. It periodically reviews existing commitments in light of the convention's objective, new scientific findings, and the effectiveness of national climate change programs. The COP can adopt new commitments through amendments and protocols. 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 UNFCCC, 2303 UNTS 148 / [2008] ATS 2 / 37 ILM 22 (1998). In the 2015, at COP-21, the Paris Agreement was adopted.

197. United Nations Conference on trade and development, "COP22: Geneva-based agencies highlight important role of trade in addressing climate change," available at http://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1379.

198. United Nations Conference on trade and development, "COP22: Geneva-based agencies highlight important role of trade in addressing climate change," available at http://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1379.

Greater cooperation between the trade and climate regimes will lead to climate change mitigation and 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.[199] 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.[200] 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.[201] All of this is largely possible if there is greater cooperation between the trade and climate 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."[202] 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.[203] 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 Section 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.[204] Moreover, RTAs today cover many topics well beyond trade: competition, investment, environmental protection, natural resources, intellectual property rights, labor rights, and so forth.[205] 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.[206] 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

199. Government of India, "India's intended nationally determined contribution is balanced and comprehensive: Environment minister," 2 October 2015, available at http://pib.nic.in/newsite/PrintRelease.aspx?relid=128403.

200. *Id.*

201. "India's intended nationally determined contribution: Working towards climate justice," available at http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf, at p. 29.

202. E15 Group on Measures to Address Climate Change and the Trade System – Policy Options Paper, "Global rules for mutually supportive and reinforcing trade and climate regimes," Geneva: *International Centre for Trade and Sustainable Development and World Economic Forum*, at p. 4, 2016.

203. There is very little scholarship that analyzes how trade agreements can enhance sustainable development, and more specifically climate change mitigation and sustainable energy.

204. For an analysis of the link between regional trade agreements (RTAs) and the World Trade Organization (WTO), see Leal-Arcas, R. "Proliferation of Regional Trade Agreements: Complementing or Supplanting Multilateralism?" *Chicago Journal of International Law*, Vol. 11, No. 2, pp. 597-629, 2011.

205. Leal-Arcas, R. "Climate Change Mitigation from the Bottom Up: Using Preferential Trade Agreements to Promote Climate Change Mitigation," *Carbon and Climate Law Rev*, Vol. 7(1), pp. 34-42, 2013.

206. The same argument applies to sustainable energy. *See*, e.g., R. Leal-Arcas, Valentina Caruso and Raphaela Leupuscek, "Renewables, preferential trade agreements and EU energy security," *Laws*, Vol. 4, Issue 3, pp. 472-514, 2015.

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).[207] In relation to RCEP, these six non-ASEAN countries are known as the ASEAN Free Trade Partners.[208] 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.[209]

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.[210] It was concluded on October 5, 2015, after several years of secretive negotiations.[211] The TPP negotiations were conducted with a level of secrecy not witnessed in any previous trade agreement.[212] Even the U.S. Congress was critical about the opaqueness surrounding it.[213] 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.[214] The TPP represents eleven percent of world population,[215] twenty-six percent of world trade,[216] and nearly forty percent of global GDP.[217] In January 2017, U.S. President Donald Trump signed an executive order for the United States to withdraw from the TPP.[218] 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[219] because the TPP never entered into force.[220]

The Trans-Atlantic Trade and Investment Partnership (TTIP) is a proposed RTA between the United States and the European Union and its member states.[221] The TTIP was first conceived in November 2011, following a U.S.-E.U. summit and the sixth meeting of the Transatlantic Economic Council.[222] 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

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[207] New Zealand Foreign Affairs & Trade, "Regional Comprehensive Economic Partnership (RCEP)," available at https://www.mfat.govt.nz/en/trade/free-trade-agreements/agreements-under-negotiation/rcep/.

[208] Id.

209. New Zealand Foreign Affairs & Trade, "Regional Comprehensive Economic Partnership (RCEP)," available at https://www.mfat.govt.nz/en/trade/free-trade-agreements/agreements-under-negotiation/rcep/.

[210] WTO, "DG Azevedo congratulates TPP ministers," 5 October 2015, available at https://www.wto.org/english/news_e/news15_e/dgra_05oct15_e.htm.

211. WTO, "DG Azevedo congratulates TPP ministers," 5 October 2015, available at https://www.wto.org/english/news_e/news15_e/dgra_05oct15_e.htm.

212. WikiLeaks, "Secret Trans-Pacific Partnership Agreement (TPP) - IP Chapter," available at https://wikileaks.org/tpp/pressrelease.html.

213. Public Citizen, 'Congressional Democrats Escalate Criticism of Substance, Process of Obama's First Trade Pact – the Trans-Pacific Partnership,' (27 June 2012), available at http://www.citizen.org/documents/release-congressional-democrats-escalate-criticism-6-27-12.pdf.

214. William Mauldin, "U.S Says Not 'Rushing' Asia-Pacific Trade Deal," *The Wall Street Journal*, 26 September 2013, available at http://online.wsj.com/news/articles/SB10001424052702303796404579099632713091994.

215. Australian Government, Department of Foreign Affairs and Trade, "Trans-Pacific Partnership," available at http://dfat.gov.au/trade/agreements/tpp/Pages/trans-pacific-partnership-agreement-tpp.aspx.

216. *Id.*

217. This figure is prior to the U.S. withdrawal from the Trans-Pacific Partnership (TPP). *See* Office of the United States Trade Representative, "Overview of the Trans Pacific Partnership," available at https://ustr.gov/tpp/overview-of-the-TPP.

218. BBC, "Trump executive order pulls out of TPP trade deal," 24 January 2017, available at http://www.bbc.co.uk/news/world-us-canada-38721056. It seems as if President Trump is doing to the global climate change agenda with the Paris Agreement what President Bush Junior did to it with the Kyoto Protocol.

219. The U.S. Congress had not ratified the TPP before the United States' withdrawal from the trade agreement in January 2016. In legal terms, this means that the United States has never been a party to the agreement.

220. The U.S. president's authority to withdraw from an international agreement is summarized in Section 339 of the *Restatement (Third) Foreign Relations Law of the United States*. 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 (1979), which concerned termination of the U.S.-Taiwan Mutual Defense Treaty.

[221] European Commission, "The Transatlantic Trade and Investment Partnership," available at http://ec.europa.eu/trade/policy/in-focus/ttip/index_en.htm.

222. 'Fact Sheet: United States to Negotiate Transatlantic Trade and Investment Partnership with the European Union' (Office of the United States Trade Representative, 13 February 2013) www.ustr.gov/about-us/press-office/fact-sheets/2013/february/US-EU-TTIP.

to support mutually beneficial job creation, economic growth, and international competitiveness."[223] 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.[224] The TTIP represents nearly fifty percent of global GDP.[225]

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.[226] 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).[227]

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

Top 10 GHG Emitters[228] (≈70% of global GHG emissions)	**RCEP (ASEAN + 6)** (≈30% of global GDP)	**TPP** (≈40% of global GDP)[229]	**TTIP** (≈50% of global GDP)
China	✓		
United States			✓
European Union (28 countries)			✓[230]
India	✓		
Russia			
Indonesia	✓		
Brazil			
Japan	✓	✓	
Canada		✓	
Mexico		✓	
	RCEP parties that are not top 10 GHG emitters: Australia, New Zealand, South Korea, Singapore, Thailand, Brunei, Malaysia, Vietnam, Myanmar, Laos, Philippines, Cambodia	*TPP parties that are not top 10 GHG emitters: Australia, New Zealand, Peru, Chile, Malaysia, Singapore, Brunei, Vietnam*	

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

223. 'Final Report: High Level Working Group on Jobs and Growth' 1, (United States-European Union High Level Working Group on Jobs and Growth, 11 February 2013) www.ustr.gov/sites/default/files/02132013%20FINAL%20HLWG%20REPORT.pdf (citations omitted) (hereinafter Final Report: High Level Working Group on Jobs and Growth).

224. *Id.*

225. European American chamber of commerce, New York, "What you need to know about TTIP," available at https://www.eaccny.com/international-business-resources/what-you-need-to-know-about-ttip/.

226. This percentage range reflects the author's estimate. This figure is prior to the United States' withdrawal from the TPP.

227. World Resources Institute, "Top 10 emitters," available at http://www.wri.org/sites/default/files/uploads/top_10_emitters.png.

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

229 This figure is prior to the U.S. withdrawal from the Trans-Pacific Partnership (TPP). *See* Office of the United States Trade Representative, "Overview of the Trans Pacific Partnership," available at https://ustr.gov/tpp/overview-of-the-TPP.

230. The E.U. member states will most likely be part of Trans-Atlantic Trade and Investment Partnership (TTIP).

economies.[231] Indonesia is the only country in the top ten emitters which is not among the top 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).[232] 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.[233] The second trade agreement is the Environmental Goods Agreement (EGA), currently under negotiation.[234] The third agreement is the Information Technology Agreement (ITA), which is relevant for trade in clean energy technologies.[235]

CETA was signed in October 2016.[236] Both Canada and the European Union are in the top ten GHG emitters and are among the major economies of the word, and therefore key actors in this area. The parties to CETA agree that economic growth supports their social and environmental goals.[237] 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).[238] 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 environmental agreements.[239] More specifically, Chapter 24 protects the rights of the parties to regulate on environmental matters, requires the parties to enforce its domestic environmental laws, and prevents the parties from relaxing their laws to boost trade.[240]

The EGA is a plurilateral[241] trade agreement currently under negotiation between eighteen WTO Members.[242] Five of the ten major GHG emitters listed in Table 4 above are participating in the EGA.[243] This agreement aims to encourage green growth and sustainable development by liberalizing trade in environmental goods and by reducing

231. 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* International Monetary Fund, "Report for selected countries and subjects," available at http://bit.ly/2dQKeno.

232. Council of the European Union, "Comprehensive Economic and Trade Agreement between Canada, of the one part, and the European Union and its Member States, of the other part," 14 September 2016, http://data.consilium.europa.eu/doc/document/ST-10973-2016-INIT/en/pdf.

233. 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, New Zealand, Japan, Brunei, Malaysia, Singapore, and Vietnam.

234. World Trade Organization, "Environmental Goods Agreement" https://www.wto.org/english/tratop_e/envir_e/ega_e.htm.

235 https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm.

236 Webb, D. "CETA: The EU-Canada free trade agreement," House of Commons Briefing Paper Number 7492, p. 5, February 2017.

237 See generally Webb, D. "CETA: The EU-Canada free trade agreement," House of Commons Briefing Paper Number 7492, February 2017.

238. Article 24.9 of the Comprehensive Economic and Trade Agreement between Canada and the European Union specifically refers to "Trade favouring environmental protection."

239 CETA, Chapter 24.

240. European Commission, "CETA chapter by chapter," available at http://ec.europa.eu/trade/policy/in-focus/ceta/ceta-chapter-by-chapter/.

241. 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.

242. 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. 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).

243. *Supra* note 234.

or eliminating tariffs in environmental goods,[244] such as renewable and clean energy technology.[245] Arguably, a broad liberalization of services could also be beneficial for sustainable development, as would an expansion of the EGA to services trade.[246] Moreover, a great added value of the EGA is that 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."[247] 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.[248] In sum, once the EGA is in place, it will add traditional products (not just environmental goods), more WTO Members, and non-technical 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.[249] Today, there are eighty-two parties to the ITA, which represents ninety-seven percent of international trade in information technology (IT) products.[250] In December 2015, over fifty parties to the agreement concluded an expansion of the ITA, which covers an additional 201 products.[251]

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.[252] Agreements are signed when countries cannot solve a problem domestically. For instance, climate change. Here is where 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.[253] Still others view them as useful instruments for fostering global trade and investment.[254] Arguably, multilateralism is in crisis, whether in the field of trade, investment,[255] energy governance,[256] or climate change mitigation.[257] In the case of trade negotiations, the Doha Round[258] of trade negotiations at the WTO has clearly

244. 'Joint statement regarding the launch of the Environmental Goods Agreement negotiations', available at http://eeas.europa.eu/delegations/wto/documents/press_corner/final_joint_statement_green_goods_8_july_2014.pdf.

245. On the link between renewables and the trading system, see Leal-Arcas, R. and Filis, A. 'Legal Aspects of the Promotion of Renewable Energy Within the EU and in Relation to the EU's Obligations in the WTO', (2014) 5(1) *Renewable Energy Law and Policy Review* 3–25; Leal-Arcas, R. and Filis, A. 'Certain Legal Aspects of the Multilateral Trade System and the Promotion of Renewable Energy', in Lim, C.L. and Mercurio, B. (eds.) *International Economic Law after the Global Crisis: A Tale of Fragmented Disciplines*, Cambridge University Press, pp. 482-518, 2015.

246. 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.

247. World Trade Organization, "Environmental Goods Agreement (EGA)," available at https://www.wto.org/english/tratop_e/envir_e/ega_e.htm.

248. Baschuk, B. "Environmental Goods Negotiators Make Incremental Progress," *International Trade Daily*, 26 September 2016.

249 https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm.

250 Id.

251. World Trade Organization, 'Information Technology Agreement,' available at https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm.

252. Leal-Arcas, R. "Proliferation of Regional Trade Agreements: Complementing or Supplanting Multilateralism?" *Chicago Journal of International Law*, Vol. 11, No. 2, pp. 597-629, 2011.

253. Leal-Arcas, R., International Trade and Investment Law: Multilateral, Regional and Bilateral Governance, Edward Elgar, 2010, p. 39.

254. *Id.*

255. *See* for instance Leal-Arcas, R., International Trade and Investment Law: Multilateral, Regional and Bilateral Governance, Edward Elgar, 2010.

256. *See* for instance Leal-Arcas, R., Filis, A. and Abu Gosh, E. *International Energy Governance: Selected Legal Issues*, Edward Elgar, 2014.

257. *See* for instance Leal-Arcas, R., *Climate Change and International Trade*, Edward Elgar, 2013.

258. 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. The previous rounds were, in chronological order: Geneva Round (1948), with 23 countries;

reached an impasse.[259] 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.[260] 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[261]: 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.[262] Specifically relating to regional trade, there are at least four main trends identified in RTAs that serve to remedy impasses in multilateral trade: movement from most-favored nation[263] liberalization to RTAs;[264] a geographical shift to the Asia-Pacific region; and increases in cross-regional RTAs and mega-RTAs.[265]

This sub-section 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.[266] This sub-section 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 or coalitions of the willing.[267] The concept of a climate change club refers to a relatively small number of countries that produce the large majority of GHG emissions.[268] 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

Annecy Round (1949), with 13 countries; Torquay Round (1951), with 38 countries; Fourth Round (1956), with 26 countries; Dillon Round (1962), with 26 countries; Kennedy Round (1967), with 62 countries; Tokyo Round (1979), with 102 countries; and Uruguay Round (1994), with 123 countries. See Leal-Arcas, R. (2008a) *Theory and Practice of EC External Trade Law and Policy*, London: Cameron May, pp. 486–7.

259 Pakpahan, B., "Deadlock in the WTO: What is next?" available at https://www.wto.org/english/forums_e/public_forum12_e/art_pf12_e/art19.htm.

260. Leal-Arcas, R., International Trade and Investment Law: Multilateral, Regional and Bilateral Governance, Edward Elgar, 2010, p. 72.

261. Börzel, T. "Europeanization: How the European Union Interacts with its Member States," in Bulmer, S. and Lesquene, C. (eds.), *The Member States of the European Union*, Oxford: Oxford University Press, pp. 45-76, 2005; Sedelmeier, U. "Europeanisation in New Member and Candidate States," *Living Reviews in European Governance* 1(3), 2006, available at http://www.livingreviews.org/lreg-2006-3.

262. On supranationalism in the European Union, see Leal-Arcas, R. "Theories of Supranationalism in the EU," *Journal of Law in Society*, Vol. 8.1, 2007, pp. 88-113.

263. The most favored nation treatment is the principle of not discriminating between one's trading partners. *See* GATT Article I; GATS Article II; TRIPs Article 4.

264. According to General Agreement on Tariffs and Trade (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 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).

265. For an analysis of the main trends and characteristics of regional trade agreements, in force and under negotiation, see R. Fiorentino, L. Verdeja and C. Toqueboeuf, "The Changing Landscape of Regional Trade Agreements: 2006 Update" WTO Discussion Paper No. 12 (2007).

266. Article IX, WTO Agreement.

267. Leal-Arcas, R. "Top-down versus Bottom-up Approaches for Climate Change Negotiations: An Analysis," *The IUP Journal of Governance and Public Policy*, Vol. 6, No. 4, pp. 7-52, December 2011.

268 For further details, see Leal-Arcas, R. *Climate Change and International Trade*, Edward Elgar Publishing, 2013, Chapter 6.

single undertaking[269] 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[270]—and covers increasingly more topics, which, in turn, are more complex than ever, namely trade and climate change or trade-related energy issues.[271] 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).[272] The only two major emitters which are not parties to any of the three mega-RTAs are Brazil and Russia.[273] 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).[274]

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 not legally binding under that document.[275] 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.[276] 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 has not ratified the Kyoto Protocol)[277] negotiated and concluded the TPP before President Trump decided to withdraw from it, 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.[278] Moreover, it removed any reference to the UNFCCC.[279] 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[280] (and arguably can do the same for climate change mitigation and

269. 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* WTO, "How the negotiations are organized," available at https://www.wto.org/english/tratop_e/dda_e/work_organi_e.htm.

270. For a list of observer governments, see https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm.

271. For a list of trade topics in the WTO, see WTO, "WTO trade topics," available at https://www.wto.org/english/tratop_e/tratop_e.htm.

272. *See supra* Table 4.

273. *See supra* Table 4.

274. *See supra* Table 4.

275. 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.

276. Articles 20.15(1) and (2) of the TPP.

277. On the position of the United States regarding the Kyoto Protocol, see generally Leal-Arcas, R. *Climate Change and International Trade*, Edward Elgar, Chapter 5, 2013.

278. See U.S. counterproposal to the TPP Environment Chapter (14 February, 2014), available at http://www.redge.org.pe/sites/default/files/20140218%20biodiversity%20climate%20change%20TPP.pdf.

279. *Id.*

280 Leal-Arcas, R. *International Trade and Investment Law: Multilateral, Regional and Bilateral Governance*, Edward Elgar Publishing, 2010, Chapters 3 and 4.

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 them more inclusive in membership? What (economic) incentives would be necessary to make this happen? Would economic incentives for clean goods and services be acceptable to help mitigate climate change?

Thus, variable geometry,[281] 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[282]—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[283]) than climate change agreements such as the Paris Agreement. That the TPP is legally binding on the reduction of GHG emissions,[284] whereas the Paris Agreement is not,[285] 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,[286] it will take four years to do so, in accordance with Article 28(1) and (2).[287] This situation could be an opportunity for China to lead in the geopolitics of climate change globally,[288] 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 had signed a resolution in March 2017 to seek economically viable ways to fight climate change.[289]

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).[290] The goal of the CTE is to identify and understand the relationship between trade and the environment to promote "sustainable development."[291] The other forum for discussion of trade measures and their links with climate change is the UNFCCC's response measures forum.[292] 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."[293] Interestingly, Article 3.5 of the UNFCCC reads conceptually along the same lines as the chapeau of GATT Article XX.

281. Variable geometry refers to a situation where some but not all WTO members would conclude trade agreements. 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.

282. Bullfrog Films, "30 Frames a second: The WTO in Seattle," available at http://www.bullfrogfilms.com/catalog/30fr.html.

283 See TPP, Chapter 20, Article 20.15.

284. Article 20.15, para. 2, TPP.

285. Article 6.4, Paris Agreement.

286 United Nations Framework Convention on Climate Change, "UNFCCC Statement on the US Decision to Withdraw from the Paris Agreement," 1 June 2017, available at http://newsroom.unfccc.int/unfccc-newsroom/unfccc-statement-on-the-us-decision-to-withdraw-from-paris-agreement.

287. Article 28, para. 1-2, TPP.

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

289 "Group of 17 Republicans sign US House resolution to fight climate change," CNBC, 15 March 2017, available at http://www.cnbc.com/2017/03/15/group-of-17-republicans-sign-us-house-resolution-to-fight-climate-change.html.

290. *See* the Committee on Trade and Environment (CTE), available at http://www.wto.org/english/tratop_e/envir_e/wrk_committee_e.htm.

291. *Id.*

292. UNFCCC, "Impact of the implementation of response measures," available at http://unfccc.int/cooperation_support/response_measures/items/4908.php.

293. UNFCC Article 3.5.

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.[294] In addition, the Doha Round encompasses specific negotiations concerning various aspects of trade and the environment which emphasize the increase in environmental values in the trade sphere.[295] 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.[296] However, all the changes that have occurred during the WTO era have not substantially influenced the ongoing interaction between trade and climate change.[297]

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_2) 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_2.[298] Despite the high levels of CO_2 in the United States, thanks to technology, the United States has been able to emit three times less CO_2 than it would have if its technology had been kept at the 1900 level.[299]

VI. CONCLUSION

In the nineteenth century, coal was the main natural resource used for energy generation;[300] in the twentieth century, it was oil.[301] 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.[302] 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 makes little sense to move to, say, solar energy.[303]

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.[304] 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

294. *See* the Agreement of the Application of Sanitary and Phytosanitary Measures, 15 April 1994; The Agreement on Technical Barriers to Trade, 15 April 1994; General Agreement on Trade in Services, 15 April 1994, Marrakesh Agreement Establishing the World Trade Organization (WTO Agreement), Annex 1B, 1869 UNTS. 183.

295. For further explanation regarding negotiations on trade and environment under the Doha Round, see World Trade Organization, "An introduction to trade and environment in the WTO," available at http://www.wto.org/english/tratop_e/envir_e/envt_intro_e.htm.

296. WTO, "Trade and environment," available at https://www.wto.org/english/tratop_e/envir_e/envir_e.htm.

297. Leal-Arcas, R. *Climate Change and International Trade*, Edward Elgar, 2013, chapters 2-3.

298. Norberg, J. *Progress: Ten Reasons to Look Forward to the Future*, Oneworld Publications, 2016, p. 123.

299. *Id.*

300. Mitsubishi Heavy Industries, "History of Fossil Fuels Usage since the Industrial Revolution," available at https://www.mhi-global.com/discover/earth/issue/history/history.html.

301. "Evolution of energy sources," available at https://people.hofstra.edu/geotrans/eng/ch8en/conc8en/evolenergy.html.

302. "Are fossil fuel companies using IEA report to talk up demand?" available at https://www.theguardian.com/environment/2015/oct/23/are-fossil-fuel-companies-using-iea-reports-to-talk-up-demand.

303. Shahan, Z. "Advantages & Disadvantages of Solar Power," *Clean Technica*, 8 October 2013, available at https://cleantechnica.com/2013/10/08/advantages-disadvantages-solar-power/.

304. "Natural gas, the cleanest or les dirty fossil fuel," Energy News, 19 September 2016, available at http://www.energynews.es/english/natural-gas-the-cleanest-or-less-dirty-fossil-fuel/.

necessary in the future.[305] 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_2 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 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[306] and obligations under the European Union's Sustainable Development Strategy.[307] 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."[308] 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.[309]

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."[310] 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.[311] 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, access to 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

305. Haszeldine, R. S. "Carbon Capture and Storage: How Green Can Black Be?" *Science*, Vol. 325, Issue 5948, pp. 1647-1652.

306. Article 4.4, Paris Agreement.

307. Communication from the Commission, "A sustainable Europe for a better world: A European Union strategy for Sustainable Development," COM(2001)264 final.

308. IPCC (2012), "Special Report on Renewable Energy Sources and Climate Change Mitigation," Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 17-18.

309. *See generally* IPCC 'Renewable Energy Sources and Climate Change Mitigation,' Summary for policymakers, available at https://www.ipcc.ch/pdf/special-reports/srren/SRREN_Full_Report.pdf.

310. Harari, Y.N. *Homo Deus: A Brief History of Tomorrow*, Harvill Secker, 2016.

311 Hyner, C. "A leading cause of everything: One industry that is destroying our planet and our ability to thrive on it," 23 October 2015, available at https://gelr.org/2015/10/23/a-leading-cause-of-everything-one-industry-that-is-destroying-our-planet-and-our-ability-to-thrive-on-it-georgetown-environmental-law-review/.

(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?

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.[312] And providing concessional financing for CO_2 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 see the light. 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.

ACKNOWLEDGMENT

The financial help from two EU Horizon 2020 grants is greatly acknowledged: Jean Monnet Chair in EU International Economic Law (project number 575061-EPP-1-2016-1-UK-EPPJMO-CHAIR) and the WiseGRID project (number 731205).

312. Superior Court of Justice, Recurso Especial No. REsp 883.656/RS, Rel. Herman Benjamin, available at http://www.planetaverde.org/arquivos/biblioteca/arquivo_20131123195922_9398.pdf.