

# Bioenergy with Carbon Capture and Storage: Existing and emerging legal principles

Benoit Mayer<sup>1</sup>

## Abstract

The Paris Agreement was largely understood as an implicit recognition of the need for a large-scale deployment of negative emissions technologies, in particular bioenergy with carbon capture and storage (BECCS), as part of an enhanced action on climate change mitigation. Yet, a large-scale deployment of BECCS, if feasible at all, would raise serious concerns relating to the social and environmental impacts of bioenergy, the safety of the transportation and the durability of the storage, as well as more general matters of cost-sharing, burden-sharing and responsibilities on the international plane. Although no international law instrument addresses these concerns specifically, some principles of general international law are relevant. Accordingly, this article identifies existing and emerging principles of general international law of relevance to BECCS and discusses the need for and opportunity of further developments.

## I. Introduction

The concept of geoengineering encompasses very different ideas. Techniques to manage and reflect solar radiations are certainly best left apart, due to the breadth and unpredictability of their unintended consequences, unless our failure to mitigate climate change triggers a horrific runaway climate change scenario. Other ideas, which can be described alternatively as geoengineering or climate change mitigation, are more benign and ought to be considered seriously as part of a broad palette of tools to fight against climate change. Bioenergy with Carbon Capture and Storage (BECCS) is perhaps the best example.

BECCS consists essentially in growing biomass (eg trees) and burning it for energy production, while capturing the carbon dioxide produced through the combustion and storing it permanently in artificial reservoirs – most likely deep geological formations. As such, BECCS appears at the moment as the most realistic large-scale option for carbon dioxide removal with storage in artificial reservoirs.<sup>2</sup> Relying on photosynthesis for the initial capture of carbon dioxide avoids the prohibitive costs and energy consumption associated with direct capture of carbon dioxide from the air (at least in their current stage of development).<sup>3</sup> To this extent, BECCS is akin to more traditional climate change mitigation policies that seek to preserve,

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<sup>1</sup> Benoit Mayer is Assistant Professor, Faculty of Law, The Chinese University of Hong Kong; Managing editor, Chinese Journal of Environmental Law; Author of *The International Law on Climate Change* (Cambridge University Press, 2018); For correspondence: <[bmayer@cuhk.edu.hk](mailto:bmayer@cuhk.edu.hk)>. Research assistance was provided by Wu Lan and Dixon Lai.

<sup>2</sup> See eg Leon Clarke et al, ‘Assessing Transformation Pathways’ in Ottmar Edenhofer et al (eds), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014) 413 and 489; Joeri Rodelj et al, ‘Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development’ in Valérie Masson-Delmotte et al (eds), ‘Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty’ (Cambridge University Press 2018) 93 at 121.

<sup>3</sup> See eg Jennifer Wilcox, Peter C. Psarras and Simona Liguori, ‘Assessment of reasonable opportunities for direct air capture’ (2017) 12:6 *Environmental Research Letters* <https://doi.org/10.1088/1748-9326/aa6de5>; Eloy S. San-Pérez et al., ‘Direct Capture of CO<sub>2</sub> from Ambient Air’ (2016) 116:19 *Chemical Reviews* 11840-11876.

restore or extend forests in order to remove carbon dioxide from the air. Yet, forestry has important limitations in a context of an increasing global competition for the use of lands, in particular because forests have to be maintained over the long-term as a reservoir of carbon dioxide.<sup>4</sup> In contrast to traditional forestry policies, BECCS operates as a process through which the carbon dioxide which has been captured by a forest is then deposited in deep geological underground reservoirs, thus liberating land for other uses – or for another cycle of carbon dioxide removal.<sup>5</sup> Alternative storage options, such as the injection of carbon dioxide in ocean waters, have largely been rejected due to their likely environmental impacts.<sup>6</sup>

The relevance of BECCS as a tool for climate change mitigation has been increasingly recognized in the scientific literature<sup>7</sup> as well as in international negotiations. By adopting the objective of “a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century,”<sup>8</sup> the Parties to the Paris Agreement hinted to the need for large-scale carbon sinks to balance any remaining greenhouse gas emissions. The objective of holding the increase in global average temperature to “well below 2°C above pre-industrial levels,” with efforts towards 1.5°C, could hardly be achieved without some negative emissions technologies (NETs), including some carbon dioxide removal in the agriculture, forestry and other land use (AFOLU) sector, and, as far as feasible, BECCS.<sup>9</sup> As the IPCC noted in its report on a global warming of 1.5°C, BECCS is becoming practically indispensable to the achievement of the goal of the Paris Agreement on climate change mitigation for lack of “significant near-term emissions reductions and measures to lower energy and land demand.”<sup>10</sup>

Undoubtedly, the implementation of BECCS at a large scale raises numerous concerns. Firstly, as for any geoeengineering technique, reliance on NETs could divert attention from the urgency of decreasing GHG emissions in the first place. BECCS must be construed as a complement, not a substitute, to emission reduction, as the cost of avoiding carbon dioxide emissions is often going to be much lower than the cost of removing it subsequently. Secondly and more specifically, questions arise with the feasibility of deploying BECCS at a pace and a scale sufficient to achieving meaningful carbon dioxide removal at the global level, notwithstanding any technological, land, financial and economic constraints as well as social and ecological concerns.<sup>11</sup>

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<sup>4</sup> See generally Andreas Krause et al., ‘Large uncertainty in carbon uptake potential of land-based climate-change mitigation efforts’ (2018) 24:7 *Global Change Biology* 3025-3038; Ulrich Kreidenweis et al., ‘Afforestation to mitigate climate change: impacts on food prices under consideration of albedo effects’ (2016) 11:8 *Environmental Research Letters* 085001.

<sup>5</sup> See generally Mai Bui et al., ‘Carbon capture and storage (CCS): the way forward’ (2018) 11 *Energy & Environmental Science* 1062-1176.

<sup>6</sup> See in particular OSPAR Convention decision 2007/1 to Prohibit the Storage of Carbon Dioxide Streams in the Water Column or on the Sea-Bed (25-29 June 2007). See generally Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, 7 November 1996, 1046 UNTS 138, art. 4.1.

<sup>7</sup> For a review of the scientific literature, see Jasmin Kemper, ‘Biomass and Carbon Dioxide Capture and Storage: A Review’ (2015) 40 *International Journal of Greenhouse Gas Control* 401.

<sup>8</sup> Paris Agreement (2015), article 4.1.

<sup>9</sup> See Myles R. Allen et al., ‘Summary for Policymakers’ in Masson-Delmotte et al. (n 2) 3 at 16.

<sup>10</sup> Ibid. at 19. See also Mariliis Lehtveer, ‘BECCS in Climate Scenario’ in Mathias Fridahl (ed.), *Bioenergy with Carbon Capture and Storage: From Global Potentials to Domestic Realities* (European Liberal Forum 2018) 6; UNEP, *Emissions Gap Report 2018* (Nairobi, 2018).

<sup>11</sup> Clarke et al. (n 2) at 433 and 485.

In particular, competition could occur between land use for the production of biomass for bioenergy and for food production.<sup>12</sup> Environmental harms could result from reliance on monoculture on large areas of land, the emissions of pollutants during the combustion of biomass, or leakage of carbon dioxide during transportation and storage. And questions will inevitably arise, if BECCS is indeed deployed at a global scale, regarding the distribution of the economic costs, as well as social and environmental impacts, of such activities.

This article presents an overview of the international law applicable to BECCS. The project might appear elusive. There is, to date, no special rule, such as treaty provisions or COP decision, addressing BECCS in any comprehensive way. At most, some legal developments address particular aspects of BECCS – in particular regulation of CDM and REDD+ projects,<sup>13</sup> and the social and environmental safeguards adopted by international funding agencies.<sup>14</sup> However, the premise of this article is that, despite the lack of special rules, some general norms and principles provide at least starting points for the regulation of BECCS. The focus of this article is thus on general international law, in particular in the fields of environmental and human rights protection, and the practice of States in implementing it in the context of BECCS-related activities.

The following sections delve into particular aspects of general international law, namely environmental protection (section 2) and human rights (section 3), before discussing the application of the principle of cooperation and burden-sharing (section 4).

## II. Prohibition of Environmental Harm

States have various general international law obligations to protect the environment, in particular beyond their own jurisdiction.<sup>15</sup> They have the obligation to conduct due diligence in order to ensure that activities conducted within their territory or under their jurisdiction do not cause serious transboundary environmental harm.<sup>16</sup> This principle, which has generally been recognised in cases relating to direct transboundary harm,<sup>17</sup> applies to all areas beyond national jurisdiction<sup>18</sup> and *a fortiori* to global environmental harm, albeit of a diffuse nature, such as climate change.<sup>19</sup> This due diligence obligation requires States to take all reasonable

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<sup>12</sup> David Tilman et al., ‘Beneficial biofuels – the food, energy and environment trilemma’ (2009) 325 *Science* 270; Pete Manning, Gail Taylor and Mick E. Hanley, ‘Bioenergy, Food Production and Biodiversity – An Unlikely Alliance?’ (2015) 7 *Bioenergy* 570; Keith L. Kline et al., ‘Reconciling food security and bioenergy: priorities for action’ (2017) 9 *Bioenergy* 557.

<sup>13</sup> See Decisions 7/CMP.6, ‘Carbon dioxide capture and storage in geological formations as clean development mechanism project activities’ (10-11 December 2010); 10/CMP.7, ‘Modalities and procedures for carbon dioxide capture and storage in geological formations as clean development mechanism project activities’ (9 December 2011).

<sup>14</sup> See eg World Bank, Operational Manual OP 4.12 – Involuntary Resettlement (December 2001); World Bank, Operational Manual OP 4.10 – Indigenous Peoples (July 2005); Asian Development Bank, Operations Manual Bank Policies (October 2013).

<sup>15</sup> See generally Hanqin Xue, *Transboundary Damage in International Law* (Cambridge University Press, 2009).

<sup>16</sup> Stockholm Declaration on the Human Environment (1972), principle 21; Rio Declaration on Environment and Development (1992) principle 2.

<sup>17</sup> See eg *Trail Smelter (U.S. v. Canada)*, Arbitral Award of 11 March 1941m (1949) III UNRIAA 1938, at 1965; ICJ, *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion of 8 July 1996, para. 29; ICJ, *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment of 20 April 2010, para. 101.

<sup>18</sup> See eg *Seabed Disputes Chamber of the International Tribunal for the Law of the Sea, Advisory Opinion on the Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (1 February 2011).

<sup>19</sup> See discussion in Benoit Mayer, ‘The Place of Customary Norms in Climate Law: A Reply to Zahar’ (2018) 8:3-4 *Climate Law* 261, at 266.

steps, though not necessarily to guarantee that no harm occurs.<sup>20</sup> A corollary of this obligation is the precautionary approach, according to which, '[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.'<sup>21</sup> Another corollary is the obligation of States to conduct an Environmental Impact Assessment (EIA) when a project is likely to cause transboundary environmental harm<sup>22</sup> (or, *a fortiori*, global environmental harm).<sup>23</sup>

The prohibition of environmental harm relates to BECCS in two ways.<sup>24</sup> On the one hand, BECCS can be viewed as a one of the ways that States can seek to discharge their obligation to reduce the harm to the global environment caused by greenhouse gas emissions. BECCS could thus be justified if and inasmuch as they are effective in countering climate change. This raises questions relating, for instance, to the impact on net GHG emissions of the process of converting lands (eg tropical forests) into lands dedicated to the industrial production of biomass for bioenergy or to the risk of fugitive carbon dioxide emissions during transportation and storage.<sup>25</sup> When carbon dioxide is stored in deep geological formation, proper monitoring is essential to ensure that no leakage takes place, possibly for a period of about 30 years.<sup>26</sup> Storage in geological deposits under the deep seabed could offer an extra layer of safety as far as the global environment is concerned, as carbon dioxide leaking to the seabed would be trapped there by the water pressure, but storage beyond any State's exclusive territorial jurisdiction may raise other legal questions.

On the other hand, BECCS may also be a source of environmental harm with potential transboundary implications. Large-scale biomass generation with a quest for optimal yield will likely rely on one or a few selected vegetal species, whose large-scale deployment could have far-reaching implications for biological diversity. Massive quantities of freshwater and fertilizers could lead to land and water pollution, with for instance increased risks of coastal eutrophication.<sup>27</sup> Large land conversion could cause significant changes in albedo and

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<sup>20</sup> Benoit Mayer, 'Obligations of conduct in the international law on climate change: A defence' (2018) 27 *Review of European, Comparative & International Environmental Law* 130-140.

<sup>21</sup> Rio Declaration on Environment and Development (1992), principle 15.

<sup>22</sup> *Pulp Mills on the River Uruguay* (n. 17), para. 204; ICJ, *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)* and *Construction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica)*, Judgment of 16 December 2015, para. 104.

<sup>23</sup> See generally Benoit Mayer, 'Climate Assessment as an Emerging Obligation under Customary International Law,' *International and Comparative Law Quarterly* (forthcoming). See also UN Convention on the Law of the Sea (adopted on 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397, arts. 204-206; Protocol on Environmental Protection to the Antarctic Treaty (adopted 4 October 1991, entered into force 14 January 1998) 30 ILM 1455 (1991), art. 8 and Annex I; Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79, art 14(1)(a).

<sup>24</sup> See Robert Amos, 'Bioenergy Carbon Capture and Storage in Global Climate Policy: Examining the Issues' (2016) 10 *Carbon and Climate Law Review* 187, at 191-192.

<sup>25</sup> See generally O.K. Shortall, "'Marginal" land for energy crops: Exploring definitions and embedded assumptions' (2013) 62 *Energy Policy* 19-27; Asbjorn Torvanger, 'Governance of bioenergy with carbon capture and storage (BECCS): accounting, rewarding, and the Paris Agreement' (2019) 19:3 *Climate Policy* 329-341.

<sup>26</sup> See eg R. Stuart Haszeldine, 'Carbon Capture and Storage: How Green can Black Be?' (2009) 325:5948 *Science* 1647-1652, at 1647; Stephen A. Rackley, *Carbon Capture and Storage* (2<sup>nd</sup> ed., Elsevier, 2017), at 489-516.

<sup>27</sup> See Bonsch, M. et al., 2014: Trade-offs between land and water requirements for largescale bioenergy production. *GCB Bioenergy*, 8(1), 11–24, doi:10.1111/gcbb.12226; Séférian, R., M. Rocher, C. Guivarch, and J. Colin, 2018: Constraints on biomass energy deployment in mitigation pathways: the case of water limitation. *Environmental Research Letters*, 1–32, doi:10.1088/1748-9326/aabcd7; Bodirsky, B.L. et al., 2014: Reactive nitrogen requirements to feed the world in 2050 and potential to mitigate nitrogen pollution. *Nature Communications*, 5, 3858, doi:10.1038/ncomms4858; Paul C. Stoy et al., 'Opportunities and Trade-offs among

evapotranspiration, thus affecting local, regional and possibly global climate conditions.<sup>28</sup> Particular species, if selected, could have other environmental impacts: poplar cultivation, for instance, would result in ground-level ozone pollution.<sup>29</sup> The Parties to the Convention on Biological Diversity have repeatedly expressed their concern about the potential impacts of geoengineering activities.<sup>30</sup> Other environmental concerns include the potential impacts of the transportation of biomass and carbon dioxide, as well as the potential impacts of the discharge (if any) of non-CO<sub>2</sub> byproducts of the combustion of biomass.<sup>31</sup>

All in all, whether BECCS is in compliance or in violation of a State's protection to protect the environment depends on the modalities of implementation of each activity. The conduct of a strategic environmental assessment or an environmental impact assessment should be an opportunity for national authorities to ensure proper understanding of the implications of particular large-scale BECCS projects in a specific ecological context. States should also, undoubtedly, build on each other's experience and finding in designing any BECCS project within their jurisdiction. Emerging global best practices should also be taken into account, including the modalities of implementation of relevant mitigation activities agreed upon by States for the implementation of climate treaties or for the operation of funding agencies. A circulation of best practices and debates may help States to maximize the benefits of BECCS while minimising its drawbacks.

### III. Human Rights Protection

States also have an obligation to respect, protect and fulfill human rights under widely ratified treaties and, arguably, customary international law.<sup>32</sup> In particular, the International Covenant on Economic, Social and Cultural Rights recognises the right of everyone to 'adequate food,'<sup>33</sup> and the UN General Assembly further emphasised the 'inalienable right to be free from hunger

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BECCS and the Food, Water, Energy, Biodiversity, and Social Systems Nexus at Regional Scales' (2018) 68 *BioScience* 100; Willow Hallgren et al., "Climate Impacts of a Large-Scale Biofuels Expansion" (2013) 40 *Geophysical Research Letters* 1624.

<sup>28</sup> G.B. Bonan, 'Forests and climate change: Forcings, feedbacks, and the climate benefits of forests' (2008) 320 *Science* 1444-1449; X. Lee et al., 'Observed increase in local cooling effect of deforestation at higher latitude' (2011) 479 *Nature* 384-387; A.J. Pitman et al., 'Uncertainties in climate responses to past land cover change: First results from the LUCID intercomparison study' (2009) 36 *Geophysical Research Letters* L14814; Ryan M. Bright, Francesco Cherubini and Anders H. Strømman, 'Climate impacts of bioenergy: Inclusion of carbon cycle and albedo dynamics in life cycle impact assessment' (2012) 37 *Environmental Impact Assessment Review* 2-11.

<sup>29</sup> Kirsti Ashworth et al., 'Impact of Biofuel Poplar Cultivation on Ground-Level Ozone and Premature Human Mortality Depends on Cultivar Selection and Planting Location' (2015) 49(14) *Environmental Science and Technology* 8566-8575.

<sup>30</sup> See CBD Decisions X/33, 'Biodiversity and Climate Change' (2010); XI/20, 'Climate-Related Geoengineering' (2012); XIII/14, 'Climate-Related Geoengineering' (2016).

<sup>31</sup> See eg Decision 10/CMP.7 (n 13), Annex, para. 26 (requiring 'comprehensive environmental and socio-economic impact assessments' to 'analyse thoroughly and exhaustively air emissions..., solid waste generation, and water use associated with current CCS technologies'). See also Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide, L 140/114 OJ 5.6.2009, art. 12.1, providing that 'the CO<sub>2</sub> stream shall consist overwhelmingly of carbon dioxide.'

<sup>32</sup> See eg Theodor Meron, *Human Rights and Humanitarian Norms as Customary Law* (Clarendon Press, 1989); Richard B. Lillich, 'The Growing Importance of Customary International Human Rights Law' (1995) 25 *Georgia Journal of International and Comparative Law* 1-30.

<sup>33</sup> International Covenant on Economic, Social and Cultural Rights (1966), art. 11. See also Universal Declaration of Human Rights (1948), article 25.

and malnutrition<sup>34</sup> and ‘to have access to safe and nutritious food.’<sup>35</sup> As interpreted by the Council of the Food and Agriculture Organization (FAO), this right implies that States ‘should take measures to promote and protect the security of land tenure.’<sup>36</sup> Likewise, the right to property was recognised in the Universal Declaration of Human Rights,<sup>37</sup> although it was not systematically included in human rights treaties.<sup>38</sup> It is generally understood that limitations to the right of property are permissible only according to the law, in the public interest and with due compensation. Relatedly, the Declaration on the Rights of Indigenous Peoples suggests that ‘[n]o relocation shall take place without the free, prior and informed consent of the indigenous peoples concerned and after agreement on just and fair compensation and, where possible, with the option of return.’<sup>39</sup> International funding agencies have adopted safeguard policies to ensure that development projects do not infringe disproportionately on the rights of local communities and indigenous peoples, in particular in relation to involuntary resettlement.<sup>40</sup>

Here again, there are ambivalent relations between BECCS and the obligation of States to protect human rights. On the one hand, as the impacts of climate change affect the enjoyment of human rights,<sup>41</sup> BECCS could be viewed as a way for States to protect human rights by mitigating climate change. On the other hand, however, BECCS activities (like other mitigation actions) may have serious impacts on the enjoyment of some rights, including the right to food and water, the right to property, and the rights of Indigenous peoples.

Concerns regarding the impacts of BECCS on human rights relate in part to the use of land and water for biomass generation. In particular, the competing use of arable lands for biomass generation could hinder food production, which may hinder efforts to guarantee proper food supply to all.<sup>42</sup> Likewise, the use of freshwater for biomass production could compete with other uses of freshwater (a human rights concern which overlaps with environmental concerns mentioned above). Other human rights concerns may relate more specifically to the protection of land property, either for its own sake or as an instrument for the realisation of the right to food in countries where subsistence economy prevails. Experience with the promotion of biofuel has revealed the risk that economic incentives for biomass production could lead to land-grabbing in countries with weak land-tenure protection.<sup>43</sup> Land grabbing or the diversion of freshwater resources may also affect Indigenous peoples in various ways. Other potential

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<sup>34</sup> General Assembly resolution 3348 (XXIX), ‘Universal Declaration on the Eradication of Hunger and Malnutrition’ (17 December 1974), para. 1.

<sup>35</sup> Rome Declaration on World Food Security (13 November 1996).

<sup>36</sup> Voluntary Guidelines to support the progressive realization of the right to adequate food in the context of national food security, adopted by the 127<sup>th</sup> Session of the FAO Council (November 2004), guideline 8B. See also Report of the Special Rapporteur on the right to food, Olivier De Schutter, UN Doc A/65/281 (11 August 2010).

<sup>37</sup> Universal Declaration of Human Rights (1948), article 17.

<sup>38</sup> See however regional human rights conventions: (First) Protocol to the Convention for the Protection of Human Rights and Fundamental Freedoms (1952) art 1; American Convention of Human Rights (1969) art. 21.

<sup>39</sup> UN General Assembly resolution 61/295, ‘United Nations Declaration on the Rights of Indigenous People’ (13 September 2007) UN Doc A/Res/61/295, art. 10.

<sup>40</sup> See references above note 14.

<sup>41</sup> See for instance UN Office of the High Commissioner for Human Rights, ‘Understanding Human Rights and Climate Change’ (submission to COP21, 2015), available at <https://www.ohchr.org/Documents/Issues/ClimateChange/COP21.pdf>.

<sup>42</sup> See eg Kate Dooley and Sivan Kartha, ‘Land-based negative emissions: risks for climate mitigation and impacts on sustainable development’ (2018) 18 *International Environmental Agreements: Politics, Law and Economics* 79-98.

<sup>43</sup> See for instance J Arevalo et al., ‘Understanding Bioenergy Conflicts: Case of a Jatropha Project in Kenya's Tana Delta’ (2014) 41 *Land Use Policy* 138.

concerns relate to the transportation and storage of carbon dioxide, in particular the risks that accidental leaks could cause asphyxiation of exposed populations.<sup>44</sup>

Whether a State's BECCS projects are consistent with its obligation to protect human rights eventually depends on the modalities of these projects. The Preamble of the Paris Agreement reaffirms that States must comply with their obligation to protect human rights while taking action to address climate change.<sup>45</sup> Decisions were adopted to address more specific concerns in relation to mitigation action relating to forestry. For instance, afforestation and reforestation project activities proposed under the Clean Development Mechanism (CDM) must rely on analysis of their socio-economic impacts 'on, inter alia, local communities, indigenous peoples, land tenure, local employment, food production, cultural and religious sites, and access to fuelwood and other forest products,'<sup>46</sup> and must be accompanied by 'a description of planned monitoring and remedial measures to address significant impacts.'<sup>47</sup> Likewise, REDD+ projects should, among other things, 'be implemented in the context of sustainable development and reducing poverty'<sup>48</sup> and 'take into account relevant international obligations,' including the rights of indigenous peoples.<sup>49</sup> Jodoin's empirical study of the implementation of REDD+ activities in Indonesia and Tanzania suggests that such projects may be associated with a diffusion of human rights norms in the recipient countries.<sup>50</sup> This, however, was in no small measure thanks to safeguard policies imposed by various funding agencies and civil society scrutiny.

#### IV. Cooperation and Burden-Sharing

Besides the obligations to prevent transboundary environmental harm and to protect human rights, States have widely accepted a general duty of international cooperation<sup>51</sup> applicable towards both the protection of human rights<sup>52</sup> and of the environment.<sup>53</sup> In particular, the UNFCCC acknowledged 'that the global nature of climate change calls for the widest possible cooperation by all countries.'<sup>54</sup> Accordingly, States have agreed to various forms of cooperative action, including financial support,<sup>55</sup> transfer of technology<sup>56</sup> and capacity

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<sup>44</sup> See eg Andrzej Witkowski et al., *Advances in Carbon Dioxide Compression and Pipeline Transportation Processes* (Springer, 2015).

<sup>45</sup> See Paris Agreement, Preamble, 12<sup>th</sup> recital. See also decision 1/CP.16, 'The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention' (10-11 December 2010) para. 8.

<sup>46</sup> Decision 5/CMP.1, 'Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol' (2005), Annex, Appendix B, para. 2(k)(i).

<sup>47</sup> *Ibid.* para. 2(l).

<sup>48</sup> Decision 1/CP.16 (n 45), annex I, para. 1(g).

<sup>49</sup> *Ibid.*, annex I, para. 2(c). See also para. 72.

<sup>50</sup> Sébastien Jodoin, 'Forest Preservation in a Changing Climate: REDD+ and Indigenous and Community Rights in Indonesia and Tanzania' (Cambridge University Press, 2017).

<sup>51</sup> See eg Charter of the United Nations (1945), art. 1(3).

<sup>52</sup> See eg Universal Declaration of Human Rights (1948), art. 22; International Covenant on Economic, Social and Cultural Rights (1966), art. 2(1); International Covenant on Civil and Political rights (1966), art. 1(2).

<sup>53</sup> See eg Rio Declaration on Environment and Development (1992), principle 7; Report by the UN Secretary General, 'Gaps in international environmental law and environment-related instruments: towards a global pact for the environment,' UN Doc. A/73/419 (30 November 2018) paras. 1, 16-17.

<sup>54</sup> UNFCCC, preamble, recital 7.

<sup>55</sup> See eg UNFCCC, art. 4(3); Paris Agreement, art. 9.

<sup>56</sup> See eg UNFCCC, art. 4(5); Paris Agreement art. 10.

building,<sup>57</sup> as well as the international transfer of mitigation outcomes,<sup>58</sup> in addition to purely domestic policies and measures on climate change mitigation. Cooperation is to be guided by the principle of common but differentiated responsibilities and respective capabilities, with developed States taking the lead.<sup>59</sup>

On the other hand, States have also reaffirmed ‘the principle of sovereignty of States in international cooperation to address climate change’<sup>60</sup> and the demand that climate action be ‘country-driven,’<sup>61</sup> thus reflecting the voluntary nature of any particular form of cooperation.<sup>62</sup> They have emphasised, for instance, that mitigation action in the forest sector must be undertaken ‘in accordance with national development priorities, objectives and circumstances and capabilities.’<sup>63</sup> Thus, while every State has the obligation to cooperate in climate change mitigation, no State appears to have an obligation to opt for any specific policy or measure.

If supported by the international transfer of mitigation outcomes (eg under article 6 of the Paris Agreement), there is a risk that the environmental and social impacts of BECCS activities will disproportionately occur in developing countries. This is because costs of land and labour are often cheaper in developing countries, while environmental and social standards are typically less stringent than in wealthier countries. Thus, as the IPCC notes, ‘[m]odels universally project that the majority of biomass supply for bioenergy and bioenergy consumption will occur in developing and transitional economies.’<sup>64</sup> Some BECCS projects may benefit from international funding for the purpose of international transfer of mitigation outcomes, while other BECCS projects may simply aim at balancing domestic GHG emissions. While such projects will involve substantial international or domestic financial transfers, it is unclear whether these would truly benefit the poorer segments of the world’s populations, who are likely to be most affected by the social and environmental impacts of large-scale BECCS activities. A well-established literature on the resource-curse theory shows that countries with natural resources may perform badly, in particular in countries with weak institutions, where revenues end up benefiting only to a tiny national governing elite.<sup>65</sup>

Weak institutions in developing countries mean that a global deployment of BECCS would likely result in an unequitable distribution of the costs and impacts to the detriment of developing countries. Land-use, ecological degradation and land-grabbing, among others, are far more likely to affect populations in developing countries than in developed countries. Safeguard measures could address this concern only if national or international institutions in charge of enforcing them can be relied upon, but such institutions may be more interested in

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<sup>57</sup> See eg UNFCCC, art. 11.

<sup>58</sup> See in particular Kyoto Protocol, art. 12; Paris Agreement, art. 6.

<sup>59</sup> See eg UNFCCC, art. 3(1); Paris Agreement, art. 2(2).

<sup>60</sup> UNFCCC, preamble, recital 10.

<sup>61</sup> Decision 11/CP.1, ‘Initial guidance on policies, programme priorities and eligibility criteria to the operating entity or entities of the financial mechanism’ (7 April 1995) in FCCC/CP/1995/7/Add.1, para. 1(a)(ii); Decision -/CMA.1, ‘Matters relating to Article 14 of the Paris Agreement and paragraphs 99–101 of decision 1/CP.21’ (2015), paras. 2 and 10.

<sup>62</sup> See also UNFCCC art. 3(3), which provides that ‘[e]fforts to address climate change *may* be carried out cooperatively by interested Parties.’

<sup>63</sup> Decision 1/CP.16 (n 45), Appendix I, para. 1(e). See also *ibid*, para. 1(c).

<sup>64</sup> Clarke et al. (n 2) at 448. See also Steven K. Rose et al., ‘Bioenergy in energy transformation and climate management’ (2014) 123 *Climatic Change* 477-493; Glen P. Peters and Oliver Geden, ‘Catalysing a political shift from low to negative carbon’ (2017) 7 *Nature Climate Change* 619-621.

<sup>65</sup> See generally Jeffrey D. Sachs and Andrew M. Warner, ‘The curse of natural resources’ (2001) 45:4-6 *European Economic Review* 827-839; Halvor Mehlum, Karl Meone and Ragnar Torvik, ‘Institutions and the Resource Curse’ (2006) 116 *The Economic Journal* 1-20.



promoting BECCS rather than protecting local stakeholders. Public oversight and an independent judiciary could play a role in some countries, but they may not be effective everywhere. International financial support to BECCS would naturally follow the path of least resistance, thus flowing into the countries whose institutions are least able to protect the human rights of stakeholders and the environment.

## V. Beyond Existing Principles

The principles of general international law discussed in previous sections are relevant starting points to think about how BECCS should be undertaken. General international environmental and human rights law provide important bases for national legislations and regulations on BECCS projects. Concerns arise with regard to potential environmental impacts, some of which may unfold in a transboundary context, as well as human rights implications of BECCS activities, but these concerns could, in principle, be addressed by national authorities. At most, an official forum for the exchange of experience and the documentation of good practices could help States find effective ways to address common concerns.

By contrast, concerns relating to cooperation and burden-sharing cannot be addressed by national authorities alone. Lower costs will most likely drive BECCS projects mostly in developing countries.<sup>66</sup> The resource curse theory suggests that States with weak institutions do not benefit from rents relating to the exploitation of natural resources; these rents tend, instead, to bring corruption and hinder national development.<sup>67</sup> International and national authorities with an interest in disbursing large funds in support of BECCS projects would have a strong incentive to look the other way when such projects happen to affect the rights of local stakeholders or to cause disproportionate environmental impacts. This, in turn, would hinder national implementation of general international environmental and human rights law. The result would be that BECCS activities would disproportionately affect developing countries and their populations. This result would be contrary to the principle of common but differentiated responsibilities and respective capabilities<sup>68</sup> and to the notion of equity,<sup>69</sup> while also going against the (half-tone) recognition of the historical responsibility of developed country for disproportionate greenhouse gas emissions.<sup>70</sup> This issue of burden-sharing justifies the development of international governance. Rich countries that will rely on the implementation of BECCS projects at the lowest cost in the developing world must not look the other way when local stakeholders are adversely affected as a result of these projects.

Thus, steps should be taken to avoid that the large-scale deployment of BECCS, if it occurs, is to the detriment of developing countries already most affected by the impacts of climate change, while being least responsible for it. A treaty on BECCS may be something to be considered on the long-term, although this would require significant political support by a critical number of States. A more realistic option, at least as a first step, would be the development of authoritative interpretations of existing law – including the principles discussed in the sections above – and institutional developments to promote compliance, in particular, with burden-sharing principles. A decision of the Conference of the Parties to the UNFCCC (COP) or of the Meeting of the Parties to the Paris Agreement (CMA) could certainly promote consistency with general

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<sup>66</sup> See *supra* note 64.

<sup>67</sup> See Jeffrey D. Sachs and Andrew M. Warner, ‘The curse of natural resources’ (2001) 45:4-6 *European Economic Review* 827-839.

<sup>68</sup> See references *supra* note 59.

<sup>69</sup> See eg UNFCCC art. 3(1); Paris Agreement, art. 2(2).

<sup>70</sup> See eg decision 1/CP.16 (n 45), second recital above para. 36.

international law principles in any BECCS projects. Some relevant rules could be developed by the ‘Supervisory Body’ whose establishment is currently contemplated to implement the Article 6 mechanism of the Paris Agreement for the international transfer of mitigation outcomes.<sup>71</sup>

These rules should apply to BECCS projects whether they are implemented in a purely domestic context (eg as part of the domestic measures a State must pursue to achieve its NDC)<sup>72</sup> or for the international transfer of mitigation outcomes. The international transfer of mitigation outcomes in relation to BECCS should be authorised because it is essential in order to ensure cooperation between countries with financial capacities, biomass production capacities and carbon dioxide storage capacities. Nevertheless, developed countries with higher financial capacities should be encouraged to implement some biomass production and carbon dioxide storage activities domestically in order to develop relevant technologies, to raise domestic awareness, and (albeit to a limited extent) to promote a fair distribution of the unintended consequences of such projects

These rules should first of all ensure the integrity of negative emissions resulting from BECCS projects through robust methodologies and verification processes. Accounting for net negative emissions from BECCS is unlikely to be a simple task as such projects involve positive GHG emissions at various stages, including land-use emissions that are notoriously difficult to estimate.<sup>73</sup> The experience with the CDM and Joint Implementation under the Kyoto Protocol shows that methodological flaws quickly exploited by unscrupulous economic actors may significantly reduce the integrity of the international transfer of mitigation outcomes.<sup>74</sup> To account for such unavoidable methodological issues, it is important that a rate of discount be applied when a State reports internationally transferred mitigation outcomes for the fulfilment of its nationally determined contribution.<sup>75</sup>

Such rules should also contain, or refer to, safeguard policies to ensure that BECCS activities are not implemented to the detriment of local stakeholders with little political power. These safeguard policies should ensure among others that the projects do not rely any expropriation without proper compensation, that the principle of free, prior and informed consent is respected when displacing indigenous populations, and more generally that all reasonable steps are implemented in order to minimize adverse impacts on human rights and on the environment. More specifically, these safeguard policies should ensure that the revenues provided for negative emissions benefit to those stakeholders who will be affected by the adverse impacts that will inevitably arise from BECCS activities.

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<sup>71</sup> See SBSTA 49, ‘Draft CMA decision containing the rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement’ (version 2 of 8 December 10:00 hrs), available at [https://unfccc.int/sites/default/files/resource/SBSTA49\\_11b\\_DT\\_v2.pdf](https://unfccc.int/sites/default/files/resource/SBSTA49_11b_DT_v2.pdf), para. 2. See generally Matthias Honegger and David Reiner, ‘The political economy of negative emissions technologies: consequences for international policy design’ (2018) 18:3 *Climate Policy* 306-321.

<sup>72</sup> See Paris Agreement, art. 4.2.

<sup>73</sup> See eg Francesco N. Tubiello et al., ‘The Contribution of Agriculture, Forestry and other Land Use activities to Global Warming, 1990–2012’ (2015) 21:7 *Global Change Biology* 2655-2660.

<sup>74</sup> See eg Peter Erickson et al., ‘Net climate change mitigation of the Clean Development Mechanism’ (2014) 72 *Energy Policy* 146-154; Lambert Schneider and Anja Kollmuss, ‘Perverse effects of carbon markets on HFC-23 and SF6 abatement projects in Russia’ (2015) 5 *Nature Climate Change* 1061-1063.

<sup>75</sup> See ‘Draft CMA decision containing the rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement’ (n 71), Annex, paras. 50, 59-60

Institutional arrangements should also be made to ensure compliance with these rules. At present, the Parties to the UNFCCC and the Paris Agreement bear the main responsibility to establish an effective system for the monitoring, reporting and verification of domestic greenhouse gas emissions.<sup>76</sup> Ex post international review by technical experts<sup>77</sup> provides only a weak political impetus for compliance. This regime may not be sufficient to avoid an implementation of BECCS projects to the detriment of the world's most vulnerable populations if developing countries with weak institutions are provided considerable economic incentive to implement such projects. Rather than an ex post review of compliance, it would be desirable for the COP or CMA to establish an international regime of prior accreditation and continuing monitoring to ensure compliance with burden-sharing principles in case of a large-scale deployment of BECCS. Compliance with this regime could be controlled by a committee established by the COP or CMA, or it could be entrusted with several designated UN regional commissions (eg UNECE) and regional organisations (eg African Union) with experience and expertise in climate change mitigation, environmental protection, human rights and development issues.

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<sup>76</sup> See in particular UNFCCC, art. 12(1)(a); Decision 24/CP.19, 'Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention' (22 November 2013); Paris Agreement, art. 13(7)(a).

<sup>77</sup> See Decision 13/CP.20, 'Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention' (12 December 2014), Annex, parts I, II, III, and V; Decision 2/CP.17, 'Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention' (11 December 2011), Annexes II and IV; Paris Agreement, art. 13(11); decision -/CMA.1, 'Modalities, Procedures and Guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement,' FCCC/CP/2018/L.23 (2018), Annex, parts VII and VIII.