Joint implementation and forestry projects: conceptual and operational fallacies

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Increased human activity is causing a build-up of greenhouse gases (GHGs) which are thought to contribute to global warming. Climate change is an international environmental concern because the effects of GHG emissions will be felt throughout the world irrespective of their origin. Similarly, mitigation activities undertaken anywhere in the world have the same impact on the global environment.

The Framework Convention on Climate Change, opened for signature in June 1992 during the Rio conference, seeks to address the problem of global warming at the international level. It has received widespread acceptance and has been ratified by 171 states. While the convention does not set out specific emission reduction targets, the recently adopted Kyoto Protocol sets out quantified emission limitation and reduction commitments for OECD countries and countries undergoing the process of economic transition to a market economy (Annex B parties). Annex B parties commit themselves to reduce their overall GHG emissions by at least 5 per cent below 1990 levels between 2008 and 2012.[1] Developing countries do not take on emission limitation or reduction commitments.

In the first part of this article, we analyse the mechanism of joint implementation (JI) generally and in the Climate Change Convention specifically. The second part concentrates on JI projects in the forestry sector. We argue that the carbon sequestration potential of trees on which JI forestry projects are predicated has not been proven. Indeed, in the long term, these projects have a very limited effect on carbon sequestration considering that woody biomass eventually decays or burns. We also argue that JI forestry projects often conflict with local and international environmental priorities. The third part addresses concerns with JI at the international level. It focuses on reordering JI priorities and fitting development concerns in JI.

[1] Article 2 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, adopted at Kyoto, 10 Dec. 1997, UN Doc. FCCC/CP/1997/L.7/Add.1 (preliminary version of 10 Dec. 1997). Annex B of the protocol stipulates the exact percentage reduction for each country.

Joint implementation as a new way of implementing international environmental agreements

Basic parameters

Joint implementation in general Joint implementation is a novel instrument in international law to facilitate the implementation of interstate agreements.[2] It aims at minimizing the overall costs of implementing measures to protect the environment. The main driving force behind JI is thus cost-effectiveness.[3] JI seeks to introduce market principles in the implementation of international agreements. Countries with high costs for meeting environmental obligations can invest funds in other countries that offer low-cost opportunities to fulfil the same objectives.[4] JI consequently has the advantage of bringing about global environmental benefits at the lowest possible cost by exploiting comparative advantage opportunities.[5] It also promotes international cooperation and cooperative arrangements between states and private firms.[6]

Different forms of JI have evolved in international environmental law. In the simplest sense, JI allows parties to act as a group for the purpose of fulfilling their obligations jointly. Under the Montreal Protocol on Substances that Deplete the Ozone Layer, parties which are also members of regional economic integration organizations may aggregate their consumption limits and jointly fulfil the overall commitment.[7] Similarly, under the Kyoto Protocol, parties taking on commitments may jointly fulfil their obligations.[8]

Another form of JI, which has been adopted in several international legal instruments, involves the transfer of entitlements between states. Under the Montreal Protocol, parties with different levels of consumption and production may transfer to one another part of their consumption and production entitlements within limits defined in the protocol.[9] Similarly, the 1994 Sulphur Protocol to the Transboundary Air Pollution Convention provides that states

[2] See e.g. Article 4.1 of the Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, Paris, 17 June 1994, reprinted in *International Legal Materials* 33, 1994, p. 1328 [hereafter Convention to Combat Desertification].

[3] See e.g. Tim Jackson, 'Joint implementation and cost-effectiveness under the Framework Convention on Climate Change', *Energy Policy* 23, 1995, p. 117; Robin Mason, 'Joint implementation and the Second Sulphur Protocol', *Review of European Community and International Environmental Law*, 4, 1995, p. 296.

[4] See e.g. Thomas Heller, *Joint implementation and the path to a climate change regime*. Jean Monnet Chair paper 23 (Florence: Robert Schuman Centre, European University Institute, 1995).

[5] See e.g. David Pearce, 'Joint implementation—a general overview', in Catrinus J. Jepma, ed., *The feasibility of joint implementation* (New Delhi: Development Alternatives, 1995), p. 15.

[6] See e.g. ZhongXiang Zhang, 'Operationalization and priority of joint implementation projects', *Review of International Trade and Development* 32: 6, 1997, p. 280; Peter Usher, 'Costa Rica conference perspectives: a frank exchange on AIJ benefits and concerns', in Kalipada Chatterjee, ed., *Activities implemented jointly to mitigate climate change: developing countries' perspectives* (New Delhi: Development Alternatives, 1997), p. 23.

[7] Article 2.8 of the Protocol on Substances that Deplete the Ozone Layer, Montreal, 16 Sept. 1987, reprinted in Ozone Secretariat UNEP, *Handbook for the international treaties for the protection of the ozone layer*, 4th edn (1996) [hereafter Montreal Protocol].

[8] Articles 3 and 4 of the Kyoto Protocol.

[9] Article 2.5 and 2.5. bis of the Montreal Protocol.

can meet their obligations jointly.[10] Rules for the implementation of JI under the Second Sulphur Protocol allow states to reallocate national pollution limits agreed at the time of signing the agreement while not exceeding their aggregate deposition allowances.[11] The Kyoto Protocol also conditionally permits the transfer and acquisition of emission reduction units resulting from climate change mitigation projects among Annex B parties.[12]

Permit trading systems constitute a more developed form of JI whereby a fully fledged market mechanism is established. These are modelled on tradable emission permits, credits and offset schemes that have been put in place in the United States to facilitate compliance with the Clean Air Act.[13] The operation of such a system at the international level requires the setting of legally binding emission standards and criteria for allocating the initial permits, the participation of all parties, the definition of rules and procedures for trading in the permits and the establishment of a clearing house to facilitate the conclusion of transactions.[14] Economists favour this form of JI because of its high degree of decentralization and its perceived ability to achieve environmental standards at the least cost.[15] This is being slowly accepted at the international level and the Kyoto Protocol, for instance, provides the framework for instituting emission trading among Annex B parties.[16]

Finally, JI can also take the form of investment projects whereby countries in which the costs of compliance with environmental standards are high invest in other countries with lower compliance costs to fulfil their own obligations.[17] In this case, JI comprises bilateral or multilateral projects preferably coordinated by an international institution.[18] This is the form that has received recognition in the climate change regime.

[10] See Article 2.7 of the Protocol to the 1979 Convention on Long-range Transboundary Air Pollution on Further Reduction of Sulphur Emissions, Oslo, 14 June 1994, reprinted in *International Legal Materials* 33, 1994, p. 1540.

[11] 'Decision 1997/1 on rules and conditions for joint implementation under the OSLO protocol', Economic Commission for Europe, Executive Body for the Convention on Long-range Transboundary Air Pollution, Report of the 15th session, UN Doc. ECE/EB. AIR/53, annex 1. See also Peter D. Bailey *et al.*, 'Prospects for the joint implementation of sulphur emission reductions in Europe', *Energy Policy* 24, 1996, p. 507.

[12] Article 6 of the Kyoto Protocol.

[13] See Clean Air Act, 42 U.S.C. §§7401 ff (1988). See also Farhana Yamin, 'The use of joint implementation to increase compliance with the Climate Change Convention: international legal and institutional questions', *Review of European Community and international Environmental Law* 2, 1993, p. 348.

[14] See e.g. Tom Tietenberg and David G. Victor, 'Possible administrative structures and procedures for implementing a tradeable entitlement approach to controlling global warming', in *Combating global warming—possible rules, regulations and administrative arrangements for a global market in CO_2 emission entitlements* (UN Doc. UNCTAD/GID/8, 1994) (Geneva: United Nations Conference on Trade and Development). See also Scott Barrett, *United Nations Conference on Trade and Development, The Strategy of Joint Implementation in the Framework Convention on Climate Change* 5 (UN Doc. UNCTAD/GID/10, 1995).

[15] See e.g. Mason, 'Joint implementation and the Second Sulphur Protocol'.

[16] Art. 16 bis of the Kyoto Protocol.

[17] See e.g. Heller, *Joint implementation*. See also Richard B. Stewart *et al.*, *United Nations Conference on Trade and Development: legal issues presented by a pilot international greenhouse gas trading system* (UN Doc. UNCTAD/GDS/GFSB/Misc.1, 1996).

[18] See e.g. Barrett, *strategy of joint implementation*.

Joint implementation in the climate change regime In the Framework Convention on Climate Change, JI is based on Article 4.2(a) which provides that Annex I parties, in contributing to the achievement of the convention's objectives, may implement measures and policies jointly with other parties. No credits accrue from this form of JI, which is referred to as activities implemented jointly (AIJ). The modalities for the implementation of AIJ are not spelt out in the convention itself and criteria for AIJ have been progressively developed by the conference of parties (COP).[19] It constitutes one of the mechanisms for implementing the commitments of developed countries to stabilize GHG concentrations in the atmosphere and involves the carrying out of GHG reduction activities in other parts of the world. The first conference of parties recognized that AIJ should be supplemental and treated as a subsidiary means of achieving the objectives of the convention.[20] It stated that AIJ should be voluntarily carried out, be compatible with and supportive of national environment and development priorities and strategies, contribute to cost-effectiveness in achieving global benefits and have the potential to be conducted in a comprehensive manner covering all relevant sources, sinks and reservoirs of GHGs. Moreover, AIJ is expected to contribute long-term environmental benefits that would not have occurred without these activities.[21] Finally, AIJ financing should be additional to current flows of official development assistance and the financial obligations of developed countries under the Climate Change Convention.[22]

The criteria laid out by the COP must be read in conjunction with other provisions of the convention since AIJ is specifically designed as an implementation mechanism for the convention. AIJ should therefore conform with the imperatives of the convention, including the affirmation in the preamble of the need for policies taken under the convention to take into account the priority needs of developing countries, such as the eradication of poverty.[23]

Currently, AIJ in the context of the Climate Change Convention only involves bilateral projects, which take various forms. The first broad category of activities concentrates on GHG emission reduction through increased energy efficiency. This is achieved by, for instance, reducing biomass burning through

[19] See e.g. Decision 5/CP.1, Activities implemented jointly under the pilot phase, in *Report of the conference of the parties on its first session*, Framework Convention on Climate Change, Conference of the Parties, First Sess., Berlin 28 Mar.–7 Apr. 1995, UN Doc. FCCC/CP/1995/7/Add.1 [hereafter AIJ Decision].

[20] Preamble § (c) of the AIJ Decision. See also Usher, 'Costa Rica conference perspectives'; Hari Sharan *et al.*, Swiss Federal Office of Environment, Forests and Landscape, 'Activities Implemented Jointly (AIJ): a review of international activities and a study of policies and strategies for a Swiss pilot phase programme' (discussion paper, on file with the authors, March 1997) [hereafter Swiss Report], stating that there have been calls by developing countries to limit the total credit that a sponsoring country can obtain under AIJ to a percentage of the total CO_2 reduction commitment and that this limit should be fixed at between 25 and 50 per cent.

[21] Para. 1 of the AIJ Decision.

[22] Article 4.3 of the Framework Convention on Climate Change, New York, 9 May 1992, reprinted in *International Legal Materials* 31, 1992, p. 849 [hereafter Climate Change Convention]; para. 1.e of the AIJ Decision.

[23] Para. 21 of the Preamble of the Climate Change Convention.

providing efficient cooking stoves, brick or charcoal kilns, or developing clean fuels such as biogas.[24] Other ways include upgrading technologies to save oil and electricity, for instance, by substituting natural gas for coal,[25] and reducing methane emissions from industrial operations, paddy fields and ruminant digestion.[26] The second category stresses the enhancement of GHG sinks and reservoirs through forestry projects focusing on the promotion of reforestation and/or afforestation.[27] The goals of these projects include the preservation of existing forests, the rehabilitation of degraded forests and afforestation.[28] Until now, significant attention has been devoted to forestry projects because they are apparently the cheapest mitigation option available.[29] While only six of the 39 projects endorsed by the designated national authorities are in the forestry sector, they account for 57 per cent of the total abatement impact.[30]

The Kyoto Protocol proposes to establish a clean development mechanism (CDM) to facilitate joint emission reduction projects between Annex B parties and developing countries. The CDM seeks to assist both developing countries in realizing sustainable development and Annex B parties in complying with their commitments.[31] The most significant departure from JI as currently implemented is that the new regime will involve crediting certified emission reductions accruing from JI projects to Annex B parties.[32] Apart from this new form of JI, the protocol also allows emission trading among Annex B parties whose modalities will be defined by the COP.[33]

JI can in principle be a useful instrument in implementing the Climate Change Convention and has the potential to benefit both the investor and the host country. It can, for instance, reduce the overall costs of implementing measures to protect the global environment. It is also attractive to developed countries and investors since it reduces their costs of compliance with the convention while enhancing access to markets in other countries. Other benefits include lower costs of environmentally sound technologies due to faster

[24] See e.g. Roberto Schaeffer, 'Alcohol fuel and sugarcane bagasse as substitutes for fossil fuels in Brazil', *Development Alternatives Newsletter* 7: 2, 1997, p. 12.

[25] See e.g. 'City of Decin: fuel-switching for district heating', in US Initiative on Joint Implementation, *Activities implemented jointly: first report to the secretariat of the United Nations Framework Convention on Climate Change* (1996), p. 90 [hereafter USIJI report].

[26] See e.g. D. D. Joshi *et al.*, 'Improving dairy efficiency and reducing methane production in Nepal', in Kalipada Chatterjee, ed., *Activities implemented jointly to mitigate climate change*, p. 226.

[27] Hereafter, the term afforestation is used to include natural regrowth, reforestation of forests, agroforestry and multiple land uses which include trees and the establishment of new forests. See also W. Neil Adger and Katrina Brown, *Land use and the causes of global warming* (Chichester: John Wiley, 1994).

[28] See e.g. Jyoti K. Parikh, 'North–South cooperation for joint implementation', in Jyoti K. Parikh *et al.*, eds, *Climate change and North–South cooperation—Indo-Canadian cooperation in joint implementation* (New Delhi: Tata McGraw-Hill, 1997), p. 192. For an example on afforestation, see 'Biodiversifix project', in USIJI report, p. 43.

[29] See e.g. Zhang, 'Operationalization and priority of joint implementation projects'.

[30] See 'Activities implemented jointly under the pilot phase', Subsidiary Body for Scientific and Technological Advice, Seventh Sess., 20–29 Oct. 1997, UN Doc. FCCC/SBSTA/1997/12.

[31] Article 12 of the Kyoto Protocol.

[32] Article 3.12 of the Kyoto Protocol.

[33] See Article 16 bis of the Kyoto Protocol. See also Monique Chemillier-Gendreau, 'Marchandisation de la survie planétaire', *Le Monde diplomatique* 526, 1998, p. 3.

diffusion worldwide which leads to enhanced competitiveness, the reduction of risk and public relations gains.[34] Further, JI can provide better access to environmentally sound technologies for developing countries and contribute to increased employment opportunities and to the realization of sustainable development at the local level. [35]

JI fosters the involvement of the private sector in implementing the objectives of the Climate Change Convention. This constitutes a novel aspect in the implementation of international environmental law, entailing the participation of private businesses in the implementation of a public law instrument. The regime envisions private investment under public rules that credit GHG abatement actions abroad against domestic environmental obligations.[36] Different kinds of direct and indirect incentives are provided to induce private sector participation in JI. First, domestic environmental regulations can oblige private businesses to take action to mitigate climate change. Second, governments can offer tax breaks and facilitate JI deals by providing institutional support in the form of registration offices which contribute to lowering transaction costs.[37]

Joint implementation in the forestry sector

JI projects in the forestry sector have been strongly emphasized in discussions at the international level. This stress stems mainly from the perceived importance of forests in solving international environmental problems such as climate change and desertification. In this section, we outline the importance of forests in environmental terms and their role in the global carbon cycle. We then critically analyse the conceptual bases upon which JI forestry projects are predicated.

Basic elements

The importance of forests Forests are important for a variety of reasons at both the local and international levels. At the local level, for instance, some communities depend directly on forest resources for the satisfaction of their basic needs, such as food, shelter, medicine and energy for heating and cooking. Forests also provide fodder for livestock which constitute an important dietary

[34] See e.g. Tanya L. Forsheit, 'International emissions trading: equity issues in the search for market-based solution to global environmental degradation', *University of Pennsylvania Journal of International Economic Law* 18, 1997, p. 689; USIJI report.

[35] See e.g. USIJI report; Swiss Report; Forsheit, 'International emissions trading'.

[36] See e.g. Thomas C. Heller, 'Environmental realpolitik—joint implementation and climate change', *Indiana Journal of Global Legal Studies* 3, 1996, p. 295.

[37] 'Centre for Economic Analysis, domestic climate regimes and incentives for private sector involvement in JI' (ECON-Report No. 15/97, available at http://www-esd.worldbank.org/aij/domestc1.pdf, 1997). See also Anne Niederberger and Marie-Thérèse Niggli, 'Un nouvel instrument de politique environnementale: la "joint implementation"', *La vie économique* 3, 1997, p. 2.

supplement for many rural communities.[38] At the national level, forests constitute an economic mainstay for many countries, providing the basis for timber, biotechnology and pulp industries.[39] Further, forests provide valuable ecosystem services which include the prevention of erosion and the stabilization of water table levels. They also constitute habitats for flora and fauna and thus contribute to genetic diversity. Tropical forests, for instance, are believed to host more than half of all species of plants and animals.[40] Other global environmental benefits that forests offer include their role in the global carbon cycle. They absorb carbon through respiration from the atmosphere and store relatively large amounts both in plants and in soils.[41]

Increased industrial development, land use changes and domestic energy needs have led to a substantial loss of global forest cover. It is estimated that from the pre-industrial era to the present, tropical forests have declined by about 3.9 per cent, whereas temperate and boreal forests have lost about 20 per cent of their area.[42] To stem the loss of forest cover, forest conservation and afforestation projects have been undertaken in all parts of the world.

Forests and the carbon cycle Forests have various roles in the global carbon cycle. These include the contribution of land use changes, such as deforestation, to GHG emissions; the contribution of forests to carbon fixation on land; and their carbon storage capacities. First, land use changes contribute a significant share of anthropogenic GHGs.[43] Carbon dioxide (CO_2) and methane (CH_4) constitute two of the major GHGs. In the case of CO_2, land use changes contributed 25 per cent of global emissions of carbon from anthropogenic sources in the 1980s, with deforestation accounting for the largest share (15 per cent).[44] While deforestation was the dominant source of carbon emissions until the mid-1960s, fossil fuels today account for 75 per cent of the CO_2 released into the atmosphere at a global level.[45] With regard to methane, two-thirds of global emissions are attributable to human-related activities while the remaining one-third comes from natural sources, amounting overall to 515 million tonnes.

[38] See e.g. FAO, R.H. Kemp *et al.*, *Conservation of genetic resources in tropical forest management—principles and concepts*, FAO forestry paper no. 107 (Rome: FAO 1993).

[39] See e.g. FAO, *State of the world's forests 1997* (Rome: FAO, 1997) [hereafter FAO forest survey 1997].

[40] See e.g. Thomas Lovejoy, 'Biodiversity: what is it?', in Marjorie L. Reaka-Kudla *et al.*, eds, *Biodiversity II understanding and protecting our biological resources* (Washington DC: Joseph Henry, 1997), p. 7.

[41] See e.g. FAO forest survey 1997, p. 39.

[42] See e.g. Adger and Brown, *Land use.*

[43] Nitrous oxide (N_2O) is another important GHG but its contribution to global warming seems to be much smaller than for CO_2 and CH_4. See e.g. Adger and Brown, *Land use.*

[44] See e.g. R.T. Watson *et al.*, 'Sources and sinks', in J.T. Houghton *et al.*, eds., *Climate change 1992—the supplementary report to the IPCC scientific assessment* (Cambridge: Cambridge University Press, 1992), p. 25; R.K. Dixon *et al.*, 'Carbon pools and flux of global forest ecosystems', *Science* 263, 1994, p.185; and FAO, *Forest resources assessment 1990—global synthesis* (FAO Forestry Paper no. 124, 1995) [hereafter FAO 124].

[45] See e.g. Richard A. Houghton, 'Converting terrestrial ecosystems from sources to sinks of carbon', *Ambio* 25, 1996, p. 267, noting that only 25 per cent of current CO_2 emissions come from changes in land use. See also Adger and Brown, *Land use*, noting that between 1850 and 1985, the net carbon emissions from deforestation were about 100–130 billion tonnes (GtC) compared to 190 GtC from fossil fuels.

Wetlands are the largest natural source of methane, accounting for 22.3 per cent of the total. Anthropogenic sources include fossil fuel production operations (19.4 per cent), rice paddies (11.6 per cent) and enteric fermentation (15.4 per cent).[46] Second, forests constitute one of several carbon sinks. The atmosphere accounts for 3.2 ± 0.2 Gigatonnes of Carbon (GtC) and the oceans for 2.0 ± 0.8 GtC. While forests account for 65 per cent of net plant growth and carbon fixation on land,[47] widespread deforestation limits their contribution as terrestrial sinks. The 0.5 ± 0.5 GtC sink provided by forests is nearly entirely due to the northern hemisphere forest regrowth.[48] Third, forests contribute to carbon storage. Their role as carbon reservoirs has to be seen within the context of all aggregate reservoirs. Oceans account for 80 per cent, fossil carbon reserves for 12.6 per cent, soils for 4 per cent (2.5 per cent of organic carbon and 1.5 per cent of calcium carbonate), the atmosphere for 1.5 per cent, and plant biomass for between 1.36 per cent and 1.75 per cent.[49] Forests account for more than half (54.5 per cent) of all carbon stored in terrestrial plants and soils,[50] and are estimated to contain up to 80 per cent of all above-ground carbon and about 40 per cent of all below-ground (soils, litter and roots) terrestrial carbon.[51] They constitute an important terrestrial reservoir, storing between 20 and 100 times more carbon per unit area than croplands.[52]

Forests found in different areas of the world have different carbon storage capacities. About half of the carbon in forest soils is stored in boreal forests, more than one-third in tropical forests and about one-seventh in temperate forests.[53] A comparison of boreal and tropical forests shows that the former store a much higher proportion of carbon than the latter in forest soils, detritus and litter than in their woody biomass.[54] Thus, in high-latitude forests, 84.3 per cent of the total carbon content is stored in the soil, while the proportion is 63 per cent and 50.4 per cent in mid- and low-latitude forests respectively.[55] Overall, more than two-thirds of the global forest carbon pool is contained in soils and peat deposits.[56]

[46] R. T. Watson *et al.*, 'Sources and sinks', p. 25.
[47] Norman Myers, 'The world's forests: problems and potentials', *Environmental Conservation* 23, 1996, p. 156.
[48] Additional terrestrial sinks include the CO_2 fertilization, nitrogen fertilization and climatic effects which account for 1.4 ± 1.5 GtC. See e.g. FAO, William M. Ciesla, *Climate change, forests and forest management: an overview* FAO, Forestry Paper no. 126, [hereafter FAO 126] (Rome: FAO, 1995). See also Dixon *et al.*, 'Carbon pools'; J. M. Melillo *et al.*, 'Terrestrial biotic responses to environmental change and feedbacks to climate', in J.T. Houghton *et al.*, eds, *Climate change 1995: the science of climate change* (Cambridge: Cambridge University Press, 1996), p. 445.
[49] FAO 126.
[50] Myers, 'The world's forests'.
[51] Dixon *et al.*, 'Carbon pools'.
[52] Adger and Brown, *Land use.*
[53] See e.g. Sandra Brown *et al.*, 'Management of forest for mitigation of greenhouse gas emissions', in Robert T. Watson *et al.*, eds, *Climate change 1995: impacts, adaptations and mitigation of climate change: scientific–technical analyses* (Cambridge: Cambridge University Press, 1996), p. 773, at p. 777, states that approximately 32.9 per cent of this carbon is stored in low latitude forests, 14.5 per cent in mid-latitudes and 52.5 per cent in high latitudes.
[54] Myers, 'The world's forests'.
[55] FAO 126.
[56] Myers, 'The world's forests'; Dixon *et al.*, 'Carbon pools', state that soils and peat contain about 69 per cent and vegetation about 31 per cent of the total forest carbon pool.

Forestry projects Forestry projects have been promoted for a long time to foster the conservation of natural resources and biodiversity, agroforestry and the commercial exploitation of timber.[57] More recently, the capacity of woody biomass to store carbon has been highlighted.[58] Forestry projects for carbon storage have thus been proposed as a vital component of climate change mitigation strategies.[59] Different kinds of forestry projects have been initiated for carbon sequestration.[60] Some projects seek to enhance forests' carbon conservation potential through improving growth rates of existing forests or protecting existing forests.[61] This includes the setting-up of protected forest areas. The aim of setting up such areas is to prevent the release of carbon fixed in vegetation and to ensure that forests are not converted to other land uses such as agriculture, pasture, uncontrolled logging and urbanization, which store less carbon than forests. Other projects focus on the enhancement of the potential of forests to store carbon by reducing the rate of deforestation, rehabilitating degraded forests and expanding forested areas through plantations.[62] Finally, some projects seek to increase the efficiency of fuelwood use through improved stoves or diminishing wood wastes generated from logging or construction operations which are left to decay.[63]

Most JI forestry projects have been carried out in the tropics, for a variety of reasons. First, trees in tropical areas have higher potential growth rates than temperate forests due to warmer climates, allowing quicker carbon sequestration. Second, it is assumed that there is more land available to support the projects.[64] Finally, JI forestry projects have been vindicated for their perceived economic efficiency in climate change mitigation.[65] The costs of establishing forests in the tropics are purportedly lower because land and labour are cheaper. The assumption that the market cost of land is low in tropical countries may, however, be fallacious because large-scale radical land use change through afforestation in the tropics seems to have important social and economic consequences, such as the destabilization of local communities highly dependent on land for subsistence, that are not reflected in the market price.[66]

[57] See e.g. World Bank, OP 4.36, Forestry (Sept. 1993) stating that the aims of the Bank's involvement in the forestry sector are to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty and encourage economic development.

[58] See e.g. Sandra Brown, 'Mitigation potential of carbon dioxide emissions by management of forests in Asia', *Ambio* 25, 1996, p. 273.

[59] See e.g. Olga N. Krankina *et al.*, 'Carbon storage and sequestration in the Russian forest sector', *Ambio* 25, 1996, p. 284.

[60] In the World Bank context, carbon sequestration refers to the process whereby forested areas retain a revolving but stable store of organic carbon in their biomass. See World Bank, OP 4.36 Annex A, Forestry (Sept. 1993).

[61] Pedro Moura Costa, 'Tropical forestry practices for carbon sequestration: a review and case study from Southeast Asia', *Ambio* 25, 1996, p. 279.

[62] See e.g. Brown *et al.*, 'Management of forest', p. 780.

[63] Houghton, 'Converting terrestrial ecosystems from sources to sinks of carbon', *Ambio* 25, 1996, p.267.

[64] Manoj Dabas and Shubhra Bhatia, 'Carbon sequestration through afforestation: role of tropical industrial plantations', *Ambio* 25, 1996, p. 327.

[65] Swiss Report.

[66] Adger and Brown, *Land use.*

Carbon absorption and forests: basic flaws

Over-emphasis on tropical forestry projects JI forestry projects have, as noted above, been mainly proposed in tropical areas. It is, however, important to determine whether tropical deforestation deserves as much attention as it has received in the search for climate change mitigation strategies. Though deforestation is not a new phenomenon, it has recently attained significance at the international level as a result of increasing losses of tropical forest cover.[67] In the last few decades, the rate of deforestation in tropical countries has risen sharply due to commercial logging, land-use change and population pressure. In the 1980s, the overall diminution of forest and wooded land in tropical countries was 3.6 per cent.[68] This has led decision-makers to focus on tropical countries in the search for solutions to global deforestation problems.[69]

Tropical forestry projects should, however, not be emphasized in mitigating climate change. First, in the long term the rate of deforestation in tropical countries is much lower than deforestation in industrial countries. Developed countries lost a substantial amount of their forest cover during the process of industrialization: it is estimated that the temperate and boreal forest area has declined by about 20 per cent since pre-industrial times.[70] Second, tropical forests amount to slightly less than half of the total world forest area.[71] Third, while deforestation in developed countries has largely been stemmed and a slight increase has been achieved in forest cover in temperate countries in the last decade,[72] this is attributable almost entirely to the already diminished forest cover and the fact that agricultural intensification took place in previous centuries.[73]

Limited carbon sequestration potential of forests The carbon sequestration potential of forests is linked to the potential of wood to subsist for long periods of time, both as plants and as wood products when utilized by human beings.[74] The sequestration potential is, however, entirely dependent upon the time frame under which it is considered. In the long run planting trees cannot help sequester carbon unless the forested surface of the earth is continuously expanded with young trees whose potential for carbon accumulation is much

[67] See e.g. Peter Read, *Responding to global warming: the technology, economics and politics of sustainable energy* (London: Zed, 1994).

[68] See World Resources Institute *et al.*, *World Resources 1996–7* (1996) and FAO 124. For 1990–95 forest area changes, see FAO forest survey 1997, pp. 17–18.

[69] FAO 124 noting that there was a 1.9 per cent diminution of forest and wooded land between 1981 and 1990 worldwide.

[70] See e.g. Adger and Brown, *Land use.*

[71] See e.g. Dixon *et al.*, 'Carbon pools'; Richard A. Houghton, 'The role of the world's forests in global warming', in Kilaparti Ramakrishna and George M. Woodwell, eds, *World forests for the future: their use and conservation* (New Haven, CN: Yale University Press, 1993), p. 21.

[72] World Resources Institute *et al.*, *World Resources 1996–7*, noting that between 1981 and 1990 there was an increase of 0.1 per cent in forest and wooded land in all temperate countries (New York: Oxford University Press).

[73] Adger and Brown, *Land use.*

[74] See e.g. Dabas and Bhatia, 'Carbon sequestration'.

higher. Given the limited land area of the earth, the overall amount of carbon that can be absorbed is finite.

In a medium-term perspective, the amount of carbon released into the atmosphere can be marginally influenced by humanity through the manufacture of long-lived products such as buildings and furniture. However, this storage is not permanent because the products eventually all decay or burn. It has thus been pointed out that the rate at which carbon in cut wood is returned to the atmosphere through burning and decay must be taken into account when evaluating the net effect of forest harvest and regrowth in the global carbon budget.[75] Further, in the longer term, the carbon sequestered through tree planting will probably be equal to the amount released to the atmosphere.[76] Even over a single decade, the IPCC has found that the net effect of forest harvest and regrowth for mid- and high latitudes of the northern hemisphere on terrestrial net carbon storage was approximately zero in the 1980s.[77]

JI forestry projects which show positive returns have falsified baselines which are invalid with regard to long-term climate change mitigation. The establishment of baselines should take into account deforestation over a long time period. First, the sequestration effect of forests planted to replace previously existing ones should not be credited to investor countries even if they contribute to global climate change mitigation. Second, forestry projects can only show positive carbon returns within a short period of time. Finally, the perceived cost-effectiveness of such projects depends on a cost–benefit analysis which does not take into account that no wood will be kept indefinitely. No baseline can therefore satisfy the climate change mitigation goal in forestry projects.

It is remarkable that all the discussions on JI forestry projects focus on short-term gains, all of which are reversible in the longer term. The mitigation of climate change is a long-term objective which does not stop at the end of a project,[78] even if it provides that the land is to be kept under forest cover for a hundred years.[79] In a long-term perspective, the efficacy of JI forestry projects is thus negated despite the recognized importance of forests in the carbon cycle.

Limited efficacy of biomass fuel projects JI forestry projects have brought renewed attention to biomass fuels. It is argued that substituting biomass for fossil fuels constitutes an avenue for climate change mitigation. The rationale for the development of biomass-based energies on a commercial scale is their potential

[75] Melillo *et al.*, 'Terrestrial biotic responses'.
[76] See e.g. Andrew Clark *et al.*, 'Climate change: an overview', in Parikh *et al.*, eds, *Climate change and North–South cooperation*, p. 50.
[77] Melillo *et al.*, 'Terrestrial biotic responses'.
[78] AIJ Decision.
[79] See e.g. Hans Verweij, 'The approach of the FACE foundation', in Kalipada Chatterjee, ed., *Activities implemented jointly to mitigate climate change*, p. 325, stating that FACE contracts run for 99 years even though the actual afforestation takes three years.

to displace current uses of fossil fuels and thereby contribute to GHG emission reduction.[80] The argument for biomass fuels is based on the fact that trees are planted for the specific purpose of producing energy.[81] While planting trees does sequester carbon, the whole amount sequestered during the plant's growth is released during combustion and the net contribution of such projects to GHG emissions is thus zero.[82]

While it is indisputable that the development of biomass fuels to displace fossil fuels would have a positive impact in terms of GHG emission stabilization, other factors must be taken into account.[83] First, if biomass-based energy projects increase energy supply without contributing to further GHG emissions,[84] they cannot be classified in the GHG emission reduction category since they do not contribute to the enhancement of terrestrial sinks.[85] Second, it is unclear whether the fossil displacement potential should be credited directly as emission reduction since energy use is widely expected to increase. Since biomass production is more likely to be undertaken in developing countries and the energy used in developed countries, the question arises as to who should be held responsible for the sequestration (plant growing) and for emissions (energy use). Third, account has also to be taken of rising energy needs. If new biomass-based energies only serve to meet new energy demand, their contribution to GHG concentration stabilization would be zero. It is therefore highly unlikely that planting more trees in developing countries would displace fossil fuels when the fuelwood needs of numerous people are currently not met and energy demand is growing overall.[86] Finally, it is ironical that biomass fuels are now being emphasized while economic development was supposed to reduce fuelwood consumption by fostering the use of alternative energy sources. It has indeed traditionally been argued that increased use of fuelwood associated with poverty is one of the causes of deforestation.

[80] See e.g. Brown *et al.*, 'Management of forest', pp. 780–81.
[81] Land availability for this purpose is as much a concern as in the case of forestry projects for carbon sequestration. See e.g. David Hall *et al.*, 'Biomass for energy: supply prospects', in Thomas B. Johansson *et al.*, eds, *Renewable energy: sources for fuels and electricity* (Washington DC: Island Press, 1993), p. 593.
[82] Ibid.
[83] See generally Gregg Marland and Scott Marland, 'Should we store carbon in trees?', *Water Air and Soil Pollution* 64, 1992, p. 181.
[84] See e.g. José Goldemberg *et al.*, 'The Brazilian fuel-alcohol program', in Thomas B. Johansson *et al.*, eds., *Renewable energy: sources for fuels and electricity* (Washington DC: Island Press, 1993), p. 841.
[85] Some scholars have tried to tackle this problem by proposing, for instance, to start making coal by planting biomass and burying it in the soil. See e.g. Read, 'Responding to global warming'.
[86] See e.g. concerning Africa, FAO forest survey 1997, p. 140.

Broader concerns at the international level

Recording JI priorities

As noted, there are two main kinds of JI projects. While the first concentrates on GHG emission reduction through increased energy efficiency, the second stresses the enhancement of GHG sinks and reservoirs. Though all types of projects have the potential to contribute to climate change mitigation, the Climate Change Convention mainly emphasizes the reduction of fossil fuel emissions. Thus, Article 4(2)(a) of the convention provides that developed countries and other Annex I Parties must adopt national policies and take measures to mitigate climate change by limiting their emissions of GHGs and protecting and enhancing the GHG sinks and reservoirs. While a reading of this article underscores the need to reduce emissions and enhance sinks and reservoirs, it is clear that the emphasis should be on the reduction of anthropogenic emissions by developed countries.[87] Further, it has been pointed out that reducing emissions from fossil fuels would have the largest effect on future atmospheric carbon content.[88]

Accommodating development concerns in JI

While economic considerations have influenced the development of JI, it still has to fit within the ambit of sustainable development. Article 2 of the convention states explicitly that the concept of sustainable development must be integrated into any action taken to implement its provisions. The Kyoto Protocol further exhorts Annex B parties, in fulfilling their obligations, to minimize social, environmental and economic impacts, particularly on developing countries.[89] As expounded in Agenda 21, the concept of sustainable development entails the fulfilment of the basic needs of the world's poor without compromising the capacity of the environment to provide similar benefits for future generations.[90] In the context of forestry projects, sustainable management involves the controlled utilization of forest resources to produce wood and

[87] See Article 4.2 (a), second sentence, of the Climate Change Convention, read together with Article 1.4 defining 'emissions' as the release of GHGs and/or their precursors into the atmosphere over a specified area and period of time.

[88] Titus D. Bekkering, 'Using tropical forests to fix atmospheric carbon: the potential in theory and practice', *Ambio* 21, 1992, p. 414. See also para. 2. of the Ministerial Declaration, reprinted in 'Report of the Conference of the Parties on its Second Session', Framework Convention on Climate Change, Conference of the Parties, Second Sess., Geneva, 8–19 July 1996, UN Doc. FCCC/CP/1996/15/Add.1, noting that the stabilization of GHG concentrations in the atmosphere at levels double those of before industrialization will require in the longer term a reduction of more than 50 per cent of world emissions.

[89] See Articles 2.3 and 3.14 of the Kyoto Protocol.

[90] See Agenda 21, in 'Report of the United Nations Conference on Environment and Development', United Nations, Rio de Janeiro, 3–14 June 1992, UN Doc. A/CONF.151/26/Rev.1 (Vol. 1), Annex II.

non-wood benefits in perpetuity.[91] Protocol 10 of the revised Lomé Convention recognizes, for instance, the importance and necessity of the rational and integrated management of forest resources so as to ensure sustainable development in the long term as propounded in the Rio Forest Principles, the Rio Declaration, the Climate Change Convention, the Biodiversity Convention and the Convention to Combat Desertification.[92] Thus, projects promoting the growth of exotic species deemed to grow faster than local varieties and sequestering more carbon may lead to the neglect of indigenous tree species and have long-term consequences for biological diversity preservation.[93]

JI as currently developed does not fully take into account development impacts. Thus, while JI forestry projects have socio-economic impacts at the local and national levels, they overlook the basic needs of local people for such things as fuelwood, food and medicine. They also fail to address the fundamental causes of deforestation, such as land-use conversion, demand for timber and fuel needs. Further, forestry projects take up large amounts of land which must be kept under forest cover for long periods of time even though projects are usually of short duration. There is thus a high opportunity cost for both local people and host countries, since alternative land uses may be prohibited during that time.[94] Moreover, the responsibility for carbon emissions occurring after the end of the project has to be determined. In situations where these emissions are allocated to host countries, JI projects may involve an indirect transfer of the responsibility for emissions from developed countries to the developing countries hosting the projects. Where emissions are allocated to the investor party, this may decrease the emission reduction allowance granted to a developed country and reduce the attractiveness of JI to investors. In either case, this reduces the attractiveness of JI.

On a more general level, it has been argued that JI may discourage technological innovation in environmentally sound technologies in the North as it may be cheaper to invest in CO_2 emission reduction in developing countries. JI may thus constitute a way for the North to put off necessary adjustments to its development policies.[95] Some developing countries even feel that JI could constitute a form of colonization and undermine their national development and investment priorities.[96] This is partly linked to the concentration of JI on primary sector activities which tends to reinforce the role of developing coun-

[91] See e.g. World Bank, OP 4.36 Annex A, Forestry (Sept. 1993).
[92] See Article 1 of Protocol 10 to the Fourth ACP-EC Convention of Lomé as revised by the agreement signed in Mauritius, 4 Nov. 1995, *The Courier ACP-EU* 155, 1996.
[93] On the impact of exotic species on host environments, see e.g. Daniel H. Janzen, 'Wildland biodiversity management in the tropics', in Edward Osborne Wilson, ed., *Biodiversity II*, p. 411.
[94] See e.g. Jyoti K. Parikh, 'Joint implementation and North–South cooperation for climate change', *International Environmental Affairs* 7, 1995, p. 22.
[95] See e.g. Reinhard Loske and Sebastian Oberthuer, 'Joint implementation under the Climate Change Convention', *International Environmental Affairs* 6, 1994, p. 45.
[96] See e.g. Usher, 'Costa Rica conference perspectives'.

tries in the production of primary products instead of facilitating the development of a manufacturing base deemed to be imperative for economic growth. JI forestry projects which involve only the planting or conservation of trees have, for instance, only very limited potential to foster technology transfer.[97]

For JI forestry projects to foster sustainable development, they should, for instance, aim at combating desertification through soil improvement and erosion control, community involvement, enhancement of biodiversity, re-establishment of native forests and other ecosystems and protecting existing forests from felling. They should also take into account that fuelwood and charcoal are the dominant forms of wood use in developing countries.[98]

Involvement of the private sector

The involvement of the private sector in the implementation of the Climate Change Convention derives from the perceived need to diversify sources of funding for climate change mitigation. JI is thus specifically designed to be attractive to the private sector. This raises a number of concerns. First, the involvement of the private sector does not as such reflect any commitment to climate change mitigation. The economic viability of a JI project is the main consideration for investors. It has been pointed out that many private projects brought under the JI purview are economically viable in their own right and would be implemented with or without JI incentives.[99]

Second, where governments decide to finance JI projects, there is concern that development aid may be diverted to JI and thus negatively affect public sector priorities and activities often focused on poverty alleviation.[100] Indeed, the first conference of parties decided that the financing of JI should be additional to the financial obligations of Annex II parties within the framework of the financial mechanism as well as to current official development assistance.[101]

Third, the quest for economically viable projects leads investors to look for cost-effective mitigation opportunities. This tends to restrict the location of projects to countries where abatement costs are lower than in the investor's country. The problem is that these projects may exhaust low-cost mitigation opportunities in developing countries and thus deprive these countries of further opportunities if they take on commitments to reduce GHG emissions and limit their development options.[102]

[97] J. P. Painuly and Jyoti K. Parikh, 'Opportunities for joint implementation', in Parikh *et al.*, eds., *Climate change and North–South cooperation*, p. 21, noting that in afforestation, unlike in other AIJ projects, there is no transfer of technology.

[98] FAO 124.

[99] Swiss Report.

[100] See e.g. S. Maya and J. Gupta, *Joint implementation for Africa: carbon colonies or business opportunities?* (Harare: Centre for Energy and the Environment, 1995).

[101] AIJ Decision.

[102] Afforestation projects implemented in the South may, for instance, reduce the land available for subsistence agriculture and other local needs. See e.g. Climate Network Europe, 'Joint implementation: a European NGO statement', in *Joint implementation from a European NGO perspective* (Brussels: Climate Network Europe, 1994). See also Anil Agarwal, 'Cheap stake', *Down to Earth* 6: 11, 1997, p. 6.

Conclusion

The Climate Change Convention emphasizes GHG emission stabilization, thereby favouring measures aimed at reducing fossil fuel use. This can be achieved through the reduction of domestic and industrial consumption and the search for alternative technologies. Carbon absorption should be supplementary in implementing the convention's objectives. In the context of the convention, JI is one of the subsidiary implementation mechanisms. The COP has played an important role in operationalizing JI by developing a framework within which the pilot phase is implemented. The Kyoto Protocol envisages a more developed form of JI where credits will accrue.

JI can in principle be a useful instrument in implementing international environmental agreements. It does, however, raise several issues of concern in relation to the convention's objectives and the realization of different aspects of sustainable development, such as the satisfaction of basic needs. Forestry projects raise profound concerns which make their effectiveness in climate change mitigation doubtful. More specifically, the carbon sequestration potential of JI forestry projects is not borne out by available data. They have, for instance, a very limited capacity for carbon sequestration in the long term, considering that woody biomass eventually decays or burns.