Sinks, Biodiversity & Forests: The Implications of the Kyoto Protocol Upon the Other Primary UNCED Instruments.

Alexander Gillespie.

LL.B, LL.M(Hons)(Auckland); Ph.D.(Nottingham). Senior Lecturer in Law, Waikato University, New Zealand.
This paper seeks to explore some of the general implications of the United Nations Framework Convention on Climate Change (FCCC)\(^1\) and the Kyoto Protocol\(^2\) and their approval of the use of terrestrial sinks to sequester carbon. Specifically, it seeks to examine the relationships that this approach presents for the other United Nations Conference on Environment and Development (UNCED) documents. The documents in consideration at the Convention on Biological Diversity (CBD)\(^3\) and the Non-Legally Binding Authoritative Statement of Principles For A Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests (the Forest Principles).\(^4\)

In order to examine this relationship, I have divided the paper into four sections. The first deals with the ecological inter-relationship between the areas of climate, forestry and biodiversity. The second deals with the institutional overlap between the instruments. The difficulties connected with the use of sinks and the conceptual implications of the current policy direction forms the basis for the third section. Finally, a conclusion will attempt to draw together a few salient points of the difficulties regarding the new mechanism.

## 1. The Ecological Overlap.

Global ecology pays no respect to human perceptions of the world in ethical, political or legal terms. Accordingly, it is no surprise that the holistic basis in which the relationships between climate, forests and biodiversity fit together is very distant from the human institutions which attempt to respond to the changing natural world.

### A. Climate Change.

At the end of 1995 the Intergovernmental Panel on Climate Change (IPCC) released its fourth report. The IPCC expect that due to the increasing concentrations of carbon dioxide, methane, nitrous oxide and halocarbons within the next 100 years these will probably begin to affect the climate by a process of warming. Specifically, they suggest as a “best guess” that the average temperature will be two degrees (Celsius) warmer by 2100 than it is now.\(^5\) This increase represents a warming greater than anything in the previous 10,000 years.\(^6\) Accompanying the temperature increases will be rises in sea levels of around 50 centimetres (as a “best guess”).\(^7\)

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\(^2\)Adoption of the Kyoto Protocol. FCCC/CP/L.7.


\(^7\)The Science. Supra note 5. 45-47.
Although these figures are small, the implications may be very large. For example, climate change may have a direct impact upon human health with temperature extremes causing mortality and illness from deepening heat waves in terms of intensity and duration. Additionally, the introduction in new areas or the increase in existing areas of vector-borne diseases such as malaria, dengue and yellow fever is expected to increase. The coastal populations of the world are facing a particularly precarious future. Estimated land losses from sea level rises range from 17.5% for Bangladesh through to 80% for the Majuro Atoll in the Marshall Islands.

The effects upon ecosystems are also expected to be extreme, as change is expected to occur at a rate which outpaces the speed by which certain ecosystems grow, reproduce and re-establish themselves. Accordingly, complete ecosystems may end up either migrating or collapsing in the face of temperature changes. Food production, aquatic and coastal ecosystems such as wetlands, salt water marshes, coral reefs and sandy beaches, mountain glaciers, deserts and the global hydrological cycle are all expected to be seriously effected. The implications of the two accompanying concerns of this paper - biodiversity and forestry are of particular concern.

B. Climate And The Terrestrial Environment.

On a large scale, variation in ecosystem structure is closely related to controlling variables such as the climate. The link between vegetation and climate has been recognised since the first (modern) attempts to classify world vegetation at the turn of the nineteenth century. Subsequently, the link between climate and terrestrial biodiversity has been noted on micro, regional, and macro levels. It is on the macro level that the phenomena of climatic change comes into focus.

Predicted changes in climate for a doubling of atmospheric carbon dioxide are quite significant for most of the regions of the world. Models tend to demonstrate that the results of such a doubling may be a poleward shift of vegetation patterns. Each 1 degree Celsius increase in temperature may displace the limits of tolerance of land species some 125 kilometres towards the poles, or 150 metres vertically on mountains. Approximately 30% of the vegetation of the Earth may experience a shift as a result of the predicted climate change. The major threat for biodiversity is the speed with which this change will occur. Similar historical changes in the geological record took millennia to eventuate. Nevertheless, large scale extinctions still occurred, despite the slow speed of such an occurrence.

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9 IPCC. Impacts. Ibid. 9-10, 13-14.
10 IPCC. Impacts. Ibid. 10-12.
11 IPCC. Impacts. Ibid. 9-10.
13 UNEP. Ibid. 153-154, 419-420.
The current human-induced change will probably occur within a century, making the change 10-50 times faster than anything previously recorded. The rapid change in climatic conditions may radically hamper the ability of individual species to migrate to regions with climatic conditions similar to the present. Some ecological systems may not reach a new equilibrium for several centuries after the climate achieves a new balance.\textsuperscript{17} The exact results of how millions of species will respond (within both reductionist and holistic paradigms) to such changes is both deeply complex and unpredictable. Nevertheless, it can be expected that in many cases with species in closed ecosystems which cannot move, such as at the Poles, small island states, or endangered species in reserves, the survival prospects for them may be largely reduced. Thus, as the 1995 United Nations Environment Program (UNEP) Global Biodiversity Assessment noted: "a drastic reduction of global species diversity"\textsuperscript{18} may be about to occur.

C. Climate and Forests.

The natural range of many tree species could advance to higher latitudes or higher altitudes as temperatures increase. However, forests stressed by climate change, could become more susceptible to damage by fire, insects, pollution and disease. Genetic diversity could be reduced, leaving only more resistant genotypes, leaving areas in which many tree and undergrowth species could be lost.\textsuperscript{19} Overall forest area is expected to contract (although rising temperatures and increased precipitation may lead to more Boreal forests) with grasslands and deserts increasing in extent. The 1995 IPCC report on Impacts stated:

"A substantial fraction (a global average of one third, varying by region from one seventh to two thirds) of the existing forested area of the world will undergo major changes in broad vegetation types - with the greatest changes occurring in high latitudes and the least in the tropics. Climate change is expected to occur at a rapid rate relative to the speed at which forest species grow, reproduce and re-establish themselves....\textsuperscript{20}

D. Deforestation And Climate.

The relationship between climate and forests is multifaceted. Forestation, or more specifically, deforestation feeds directly back into changing climates.\textsuperscript{21} The 1990 IPCC report recognised that: "Deforestation and other changes in land use practices... together comprise about 18% of the enhanced (cumulative) radiative forcing."\textsuperscript{22} In

\begin{thebibliography}{9}
\bibitem{17} IPCC. Impacts. Supra note 8. 6.
\bibitem{20} IPCC. Impacts. Supra note 8. 6-7.
\bibitem{21} See Warrick, B. (ed). Climatic Change, the Greenhouse Effect and Ecosystems. (Wiley. Chichester). 136, 365. Currently the world's forests are estimated to be a net source of carbon dioxide emission. This is primarily because of deforestation and forest degradation in the tropics. Temperate and Boreal forests may however be a sink. See Dixon, R.K. et al. (1994). 'Carbon Pools and Flux of the Great Forest Ecosystems.' Science. 263: 185-190.
\end{thebibliography}
1995, the Food and Agricultural Organisation (FAO) suggested that tropical deforestation alone releases approximately 1.5 billion tons of carbon into the atmosphere each year which equates to about 19% of total carbon emissions worldwide. This influence of deforestation upon climatic change is so forceful that the IPCC recommended that a forestry protocol be attached to any future climate convention. This was because: "Forests cannot be considered in isolation, and solutions must be based on an integrated approach which links forestry to other policies."24

E. Biodiversity And Forests.

Not all ecosystems on the planet are rich in biodiversity. There are however some exceptional concentrations of species which are highly endemic.25 These areas are the grasslands, wetlands, mangroves, coral reefs and tropical rainforests.26 It is in the latter two hotspots - especially tropical forests - where the greatest masses of species diversity are to be found.27 Tropical forests alone are thought to contain at least 50% of the species around the globe.28 This is not surprising when consideration is given to facts such as that 1,200 species of beetle were found upon a single linden tree in the Panamanian rainforest.29 The reference to tropical forests is important to understand the distinction between different types of forests. Since such 'hotspots' of diversity are found within certain forests, it is generally agreed that disturbance of forests may alter the relative frequency of animal and plant species and, where severe, disturbance may cause a "commitment to extinction."30 Accordingly, it can comfortably be asserted that the link between the protection of biodiversity and the protection of forests is well established.31

The interconnections and mutual feedbacks which exemplify the relationship between climate and forests, is very similar to the ecological relationships between forests and biodiversity. That is, despite gaps in knowledge about the relationship between forests and biodiversity, it is still widely recognised that biodiversity is essential for the functioning of healthy forests and that proper forest management is vital to the maintenance of biodiversity.32

F. Forest Loss.33

'Cumulative' refers to where all greenhouse gases are converted and calculated within a single index.


33 The following figures need to be treated with caution as despite several decades of attempts, no single, widely accepted forest classification system for sustainability exists. This is due to overt differences regarding the necessary quantitative, qualitative and descriptive indicators covering social, cultural,
Today, forests cover more than one quarter of the world's total land area, excluding Antarctica and Greenland. Global closed forest is roughly split between Temperate and Boreal which form as one grouping, with tropical areas forming the others. These divisions reflect divisions based upon three latitudinal belts. Temperate and Boreal forests are thought to be in a relatively stable state at present, or even showing a slight increase. However, such figures must be viewed with caution as they can obscure the important regional variations and significant losses of old growth forests. For example, within Europe, old-growth forest represents less than 1% of their total forested area. Outside of Europe, only Canada and New Zealand are among the temperate countries which retain more than 20% of their forested areas in old-growth. This distinction between old and new growth forests is important, as it is the old growth forests which are frequently the richest habitats in the regions that they inhabit (although not as diverse as their tropical counterparts).

With regard to the loss of tropical forests, a frequently cited study by the International Tropical Timber Organisation (ITTO) asserted that fewer than 1 million hectares of tropical forests out of the 828 million hectares within ITTO member countries were under sustainable yield management in the mid 1980s. The FAO (Food and Agricultural Organisation) estimated that 15.4 million hectares of tropical forests were lost each year during the 1980s and that the area of severe forest degradation is perhaps even larger than the area of forest depletion. Between 1991 and 1995 the FAO put the average loss at 12.6 million hectares per year. During this small window of time, 4% of the world's tropical forests were lost. This figure may actually be understated as plantation figures may offset (in terms of hectares planted) deforestation figures in tropical countries by up to 19.6%.

2. Institutional Linkages.

The institutional overlap between the three areas has been much slower to unfold than that of the ecological. Nevertheless, by 1988 the inter-relationship between the three UNCED instruments was becoming increasingly pronounced.
A. The Convention on Biological Diversity and its Conference of the Parties.

The direct connections between other international instruments and the CBD is seen initially in the preamble which suggests that it is "desiring to enhance and compliment existing international arrangements." Elsewhere, the Convention calls for the establishment of appropriate forms of co-operation with the executive bodies of such conventions and instructs the Secretariat to co-ordinate with other relevant international bodies. Such co-operation with other biodiversity related conventions has been a standing item included in the agenda of all of the Conferences of the Parties (COP) to the CBD.

Indirectly, the preamble suggests that: "It is vital to anticipate, prevent and attack the causes of significant reduction or loss of biological diversity at source." Elsewhere, the signatories are required to identify and monitor processes and categories of activities likely to have significant adverse impacts on the conservation and sustainable use of biodiversity. Where these "significant effects" are recognised, it is necessary to: "regulate or manage the relevant processes and categories of activities." Climate change and deforestation (amongst other concerns) were noted as causes of concern within this ambit. However, the FCCC is not a treaty which relates to the conservation of biodiversity in an obvious manner. Nevertheless, prior to the CBD, the Global Biodiversity Strategy suggested that it was important that the other UNCED agreements on climate and forests be made mutually compatible with the CBD. Specifically, it warned:

"Biodiversity could be destroyed by some of the strategies proposed for mitigating atmospheric carbon-dioxide build-up - among them, proposals to replace mature forests with younger, more rapidly growing ones. The provisions of both the conventions on climate and biological diversity should therefore prohibit global-warming prevention or adaptation strategies that involve the degradation or conversion of diverse natural ecosystems... By the same token... to the extent that a forest agreement slows the loss of natural forests, it supports the objectives of the CBD... But if the agreement uncritically mandates 'net afforestation' strategies without a strong commitment to both conserving natural forests and fostering biodiversity in planted forests, it may contravene the spirit and provisions of the CBD."

The direct linkage between the CBD and the FCCC was confirmed in May 1988, at the fourth Conference of the Parties to the CBD. Here, the Executive Secretary was

43CBD. Article 23.3.(h).
44CBD. Article 24.1.(d). Article 25 of the Convention goes so far to note that: "The provisions of this Convention shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement, except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity."
45See UNEP/CBD/COP/2/Inf.2.
46CBD. Article 7(c)
47CBD. Article 8 (l).
50Put together by the WRI, IUCN, UNEP, FAO & UNESCO
51WRI. Supra note 15. 65
52WRI. Supra note 15. 65.
requested to "strengthen relationships with, in particular, the United Nations Framework Convention on Climate Change and its Kyoto Protocol."  

The linkage between the CBD and deforestation is also both direct and indirect. Indirectly, it evolves through one of the primary innovations of the CBD, which is its emphasis on the ecosystem approach to conservation. Under this, species and landscapes are viewed primarily as an integral part of their encompassing ecosystem. Accordingly, the emphasis of the Convention was/is in-situ conservation (which aims to protect species in their natural habitats) as opposed to ex-situ conservation (such as gene banks or zoos). As such, the concern is typically with larger units, habitats or complete ecosystems. This approach was also recognised in Agenda 21 which suggested that habitat destruction is the main cause for the loss of the world's biological diversity.

Forests were clearly within the consideration of the type of ecosystems (along with other key areas such as wetlands, coral reefs, coastal lands etc) which require protection. Since UNCED this connection between protecting biodiversity, and protecting forests through an in-situ approach has been slowly drawn out. 'Slowly' is the key word, as forests did not figure predominantly at the first COP in 1994. These discussions were centred mainly around keeping any type of forest instrument out of the ambit of the CBD. This line was in accordance with the original UNCED mindset of keeping the two areas very separate. This, unsurprisingly, was the source of some confusion given that so much biodiversity is to be found in forests.

Nevertheless, by the second COP of the CBD in 1995 the emphasis in negotiations was changing and the COP responded to a direct request by the Intergovernmental Panel on Forests (IPF) and the CBD's own Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). Following this, the COP decided to "strengthen relationships" and "establish a dialogue with the Intergovernmental Panel on Forests on..."
issues relating to forests and biological diversity."\textsuperscript{61} Decision II/9 was a statement from the second COP to the IPF. This decision and accompanying annex noted:

"... the crucial role of forests in maintaining biodiversity... Together, tropical, temperate and boreal forests provide the most diverse sets of habitats for plants, animals and micro-organisms, holding the vast majority of the world's terrestrial species. This diversity is the fruit of evolution... the maintenance of forest ecosystems is crucial to the conservation of biological diversity well beyond their boundaries, and for the key role they play in global climate dynamics...."\textsuperscript{62}

Decision II/9 also noted that "forest management should take an ecosystem approach."\textsuperscript{63} The protection of "primary/old growth and ecologically mature secondary forest ecosystems" as a matter "of particular importance"\textsuperscript{64} was also drawn out. This recognition of old-growth forests over new ones reflected the same concern within the Forest Principles.\textsuperscript{65}

The "crucial role" that "some forests" can play in conserving biodiversity, and the realisation that "the conservation and sustainable use of forests cannot be isolated from the conservation and sustainable use of biological diversity in general" was reiterated at the third COP.\textsuperscript{66}

B. The Forest Principles and Subsequent International Fora.

The linkage between the Forest Principles and the other main UNCED documents reflects a process that is far more difficult than that than with the others. This is not to suggest that there is no overlap. Indeed, the extreme converse is the rule, as multiple international conventions (such as the CBD, the Convention on Desertification, the Convention on Trade in Endangered Species, the International Tropical Timber Agreement, Ramsar and the FCCC) all deal indirectly with forests. However, according to the IPF, such a situation: "reveals more of an institutional walk around forest-related issues over the past two decades than a co-ordinated assault on forest problems."\textsuperscript{67} This failure to present a co-ordinated assault on the issue of forests is because forest politics in the international arena, according to the FAO are "among the most controversial challenges facing the world community."\textsuperscript{68} This difficulty has arisen as local, national and international forest issues have evolved out of narrow sectoral concerns into multi-level international political debates.


\textsuperscript{63} Paragraph 12. Ibid.

\textsuperscript{64} Paragraph 13. Ibid.

\textsuperscript{65} See Principle 8(f).

\textsuperscript{66} Decision III/12. Future Program of Work for Terrestrial Biological Diversity. Sentences 1 & 4 of the preamble. Reprinted in Intergovernmental Panel on Forests. (1997). Decision III/12 of the Conference on the Parties to the Convention on Biological Diversity. E/CN.17/IPF/1997/8. 7 February. 1997. See also Biological Diversity and Forests: A Note By the Executive Secretary. UNEP/CBD/COP/3/16. 12 September 1996. Accordingly, a work program has been established that focuses upon research, cooperation and the development of technologies necessary for the conservation and sustainable use of forest biological resources.


\textsuperscript{68} FAO. Supra note 19. 256.
Indeed, throughout the world, forests are the topics of discussion among articulate groups of populists, industrialists, statists, internationalists, consumers, environmentalists, farmers, indigenous forest communities, city dwellers, scientists, educators and humanists. Each level of this debate reflects differing interpretations of the causation of the problem, the level at which 'solutions' can best be achieved, and consideration of who 'owns' the forests. These multiple entry points reflect the fact that forests provide multiple services and needs. These range from the macro with the regulation of the global climate, through to the micro with the provision of food for local communities.

Initial attempts since the early 1980s to control deforestation were plagued by failure. Accordingly, in the run-up to the 1992 Earth Summit, many attempts were made to gather up support for a powerful international instrument on forests. This drive was primarily from Northern countries whose concern tended to reflect the international importance of forests. This concern was/is most manifest with the inter-relationship between forests and climatic change. The supporting document, which was first mooted in the initial preparatory meetings, fully reflected this concern. The FAO document, Possible Main Elements of An Instrument for the Conservation and Development of the World's Forests recognised:

"The conservation of the world's forests is essential for global climatic stability, particularly having regard to the important contributions of forest destruction to global warming through the emission of carbon dioxide, methane and other trace gases and to the role of forests as reservoirs and sinks of greenhouse gases.... In view of the critical role of forests as an absorber and contributor of greenhouse gases, a global goal could be established of reducing net biotic emissions from the forest sector to zero by the year 2000."

However, the resultant forest principles had only a minimalist concentration of any such international flavour. The document (much like the Rio Declaration and the Biodiversity Convention) was couched strongly in the language of direct sovereign control over resources. Accordingly, concepts such as "global commons" or "common heritage" - and by inference international control over the said forests - was explicitly rejected by Southern countries in the debate over an international forestry

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71 See for example, the failures of the Tropical Forestry Action Plan and the International Timber Trade Organisation. Discussed in Humphreys. Supra note 69. Chapters 3 & 4.
73 This can be found in Annex 1 to the Independent Review of the Tropical Forestry Action Plan (1990). COFO 90/11(A), September, 1990.
74 Ibid. I, 1(f) & VI, 1 (b).
75 Principle 2 states that sovereign countries have the right to exploit their own resources according to their own environmental and developmental policies.
76 The Preamble of the CBD reaffirms that "States have sovereign rights over their own biological resources. Article 3 goes on: "States have, in accordance with the Charter of the United Nations and principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."
77 See Articles 1(a) & 2(a). The latter stipulates: "States have the sovereign and inalienable right to utilise, manage and develop their forests in accordance with their development needs..."
This rejection was (and will probably remain) steadfast unless substantial benefits are going to accrue to those countries where the forests are located.

The result, in terms of the recognition of the role that forests play in climatic change was a very watered down version of the FAO document. The Forest Principles only went so far as to recognise that:

"Forest resources and forest lands should be sustainably managed to meet...human needs of present and future generations. These needs are for...[amongst multiple other concerns] carbon sinks and reservoirs..."

and:

"The vital role of all types of forests in maintaining the ecological processes and balance at the local, national, regional and global levels through....photosynthesis, should be recognised."

The years following UNCED saw a number of confidence building exercises between the North and the South. At its third session in 1995, the Commission on Sustainable Development, (CSD) in its review of the Forest Principles and Chapter 11 (Deforestation) of Agenda 21, initiated intergovernmental deliberations on forests with the creation of a new panel.

This panel, the IPF, assembled four times with the hope of providing a report to the 1997 CSD. Its mandate and focus of work was wide-ranging. Unfortunately, many of the key debates followed the traditional and acrimonious lines of previous discussions. Among the areas that specific and useful agreement remained elusive was with the underlying causes of deforestation, the valuation of forest goods, specific

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78 See Humphreys. Supra note 69. 94-96. This reflects a general view that the idea of global commons which are not owned by any State, but belong to the whole community is distinctly unfavourable within the present international climate. See Gillespie, A. (forthcoming). International Environmental Law, Policy and Politics. (Oxford University Press. Oxford), Chapter 10.

79 The importance of new and additional financial assistance to protect forestry was recognised in Agenda 21 and the Forest Principles. See Article 1(b) & article 10 of the Principles. See also Chapter 33 of Agenda 21, paragraphs 3,4 & 16.

80 See Humphreys. Supra note 69. 82-88.

81 Principle 2(b).

82 Principle 4.

83 This development was broadly in accordance with the Forest Principles and Agenda 21 which suggested that these documents be kept "under assessment for their adequacy in regard to further international co-operation in forest issues." Preamble, Forest Principles.

84 Such as the Conference on Global Partnerships in Forests, sponsored by Indonesia. The Malaysian-Canadian Initiative, and the India-UK initiative. These attempted to start the process on establishing criteria and indicators of sustainable development. For a discussion of this, see Chapter 6 of Humphreys. Supra note 69.


87 Underlying causes of deforestation are as contentious as is the suggestion of which is the best level (ie. as international or national resources) from which to view the protection of forests. From population
indicators of sustainable management and whether or not negotiations on a global forest convention should begin or not.

This lack of conclusion helped lead to the establishment of the Intergovernmental Forum on Forests (IFF) which has been instructed to continue the policy dialogue, and to report back to the CSD in the year 2000. Within this area remains the (elusive) goal of "identify[ing] the possible elements of work towards consensus on international arrangements and mechanisms, for example, a legally binding instrument."

This failure of the international community to possess a powerful international document on forestry is a key point. The overall long-term objective of the Forest Principles, Article 2(b) and all subsequent discussions in this area is to promote the attainment of sustainable forest management in all countries and in all kinds of forests. Despite this objective, the closest point to a short term goal is the ITTO's "Objective 2000" by which: "all tropical timber exports should come from sustainably managed forests." However, this objective is severely limited by the failure of the ITTO or the international community to define what sustainable management is in this context. Moreover, this agreement in only for a few select countries that have a limited focus of concern which represents only one facet of the debate on deforestation - international trade in tropical timbers. Accordingly, there is no 'hard' international mandate before the countries of the world to stop deforestation.

With regard to the specific issue of the inter-relationship between forestry and climate, progress has also been slow. The recognition of the role that forests play in the regulation of climate remains problematic. That is, although some of the non-international confidence building measures post UNCED did recognise that any definition of sustainable forest management must consider the role of forests as part of the global carbon cycle, others - did not.

growth, to poverty, international consumption and global economic patterns, multiple catalysts, often acting in country-specific ways have created powerful drives against sustainability. See Rudel, T. (1997). "The Paths of Rain Forest Destruction: Cross National Patterns of Tropical Deforestation, 1975-1990." World Development. 25(1): 53-65. However, no specifics have been singled out in international documents. The best list is probably in Chapter 11, paragraphs 11-12 of Agenda 21. It suggests that "Forests worldwide have been and are threatened by uncontrolled degradation and conversion to other types of land uses, influenced by increasing human needs, agricultural expansion, and environmentally harmful mismanagement, including, for example, lack of adequate forest-fire control and anti-poaching measures, unsustainable commercial logging, overgrazing and unregulated browsing, harmful effects of airborne pollutants, economic incentives and other measures taken by other sectors of the economy..."

Indeed, so controversial was this issue within the IPF, that when it came to the end of its mandate, it could only come to suggest that (another) future workshop be convened to examine this issue. For the list of such supposed causes, see IPF. Supra note 33.


Article 2(b) suggests: "Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural, and spiritual needs of present and future generations." See also Article 8(f).

Paragraph 11 (3) suggests that the objectives of the program are "To ... enhance the scope and effectiveness of activities related to the management, conservation and sustainable development of forests."


See Humphreys. Supra note 69. 68-81, 122-129

This division also broadly reflects the North-South split, with the Helsinki, and Montreal Processes recognising this concern, but with the Amazonian one failing to do so. See Humphreys. Supra note 69. 142.
Discussion within the which followed UNCED international fora on forestry have only just begun to progress past this point. The IPF recommended that the importance of services and the proper valuation of forests for the services (ie. international services) that they provide should take place in the context of the FCCC and the CBD. Finally, at the end of June, 1988, the International Expert Consultation, as part of the IFF process, took place. At this meeting, it became apparent that the Kyoto Protocol could have implications for sustainable forest management (although the implications were far from clear).

C. The Framework Convention on Climate Change and the Kyoto Protocol.

The indirect relationship between the FCCC and the other UNCED documents can be seen in the FCCC's emphasis upon an ecosystem approach. This is apparent through the objective of the FCCC which is to achieve the stabilisation of greenhouse gas concentrations in the atmosphere at such a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change. By inference, such ecosystems include forests and biodiversity.

The direct relationship between the FCCC and the other UNCED documents can be seen in its consideration of sinks, reservoirs and the net approach for greenhouse gases. This relationship can be traced back to provisions within the 1992 FCCC. The "Role and importance in terrestrial ... sinks and reservoirs of greenhouse gases" was noted in the preamble, and the use of sinks as a method to slow climatic change was used repeatedly in the section on commitments within the FCCC. This approach was reiterated with the 1995 Berlin Mandate and the 1996 Geneva Declaration. Finally, the Kyoto Protocol with its reduction mandate of greenhouse gases 5% below 1990 levels calls upon parties to make:

"Net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990."

In opening the door for the use of sinks, the Protocol also placed the important caveat with regard to the protection and enhancement of sinks and reservoirs for greenhouse gases. Accordingly, it is necessary for the signatories to:

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94IPF. Supra note 33. Paragraph 96.
96FCCC. Article 2.
97The Net approach views greenhouse gases within a net ambit. That is, a final net figure is arrived at by ascertaining gross emissions, then subtracting any greenhouse gases which were removed from other methods, such as carbon fixing from this target.
99FCCC. Article 4.1.(b); 4.1.(d); 4.2.(a); 4.2.(b); 4.2.(c). See also Article 3.3.
100This recognised that the signatories agreed to strengthen their commitments with removals of "anthropogenic emissions by source" and "protecting and enhancing sinks and reservoirs of greenhouse gases." Sections II & III. The Berlin Mandate. Decision 1/CP.1. (1995). This is reprinted in the United Nations Climate Change Bulletin. 7(2):7.
101This hoped that the then forthcoming Kyoto Protocol would have commitments regarding "forestry," and reduction targets "with respect to ... anthropogenic emissions by sources and removals by sinks..." Paragraph 8 of the Geneva Declaration. (1996). This is reprinted in the United Nations Climate Change Bulletin. 12(3):7.
102Kyoto Protocol. Article 3.3.
"take into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation."\(^{103}\)

3. Terrestrial Sinks.

A. The Possibilities of Forests.

The promotion of the role of forests as an important concern within the control of climatic change has been long realised. A typical advocacy is that of the IPCC's 1996 Technical Paper on Technologies, Policies and Measures for Mitigating Climate Change. This paper suggested that:

"Managing forests in order to retain and increase their stored carbon will help to reduce the rate of increase in atmospheric carbon dioxide and stabilise atmospheric concentrations... there is considerable potential for mitigation through improved management of forest lands for carbon conservation, storage and substitution, in balance with other objectives."\(^{104}\)

This type of statement is useful in setting out the ambit of the role of forest concerns within the climatic change debate. As it stands, there are three categories of promising forestry practices that may promote the sustainable management of forests and at the same time conserve and sequester carbon.\(^{105}\)

The first of these pertains to the conservation practices of existing pools of carbon. This category includes such options as controlling deforestation, (probably the most cost-efficient way of reducing current levels of carbon dioxide emissions); improving harvesting regimes and protecting forests from other anthropogenic disturbances such as fire and pest outbreaks.

The second concerns sequestration and storage practices. This includes expanding forest ecosystems by increasing the area or density of natural and plantation forests.

The final option involves substitution practices which aim at increasing the transfer of forest biomass carbon into products rather than using fossil fuel based energy and products, cement based products and other non-wood building materials. Substitution management has the greatest potential for removing carbon in the long term. It views

\(^{103}\)Kyoto Protocol. Article 2.3.
forests as renewable resources, and focuses on the transfer of biomass carbon into products that are substitutes for fossil fuels, rather than on increasing the carbon pool itself. For example, substitution of plantation wood for coal in the generation of electricity can avoid carbon emissions by an amount up to four times the carbon sequestered in the plantation.

The literature commonly bypasses the third option and concentrates upon slowing deforestation, afforestation and reforestation. It is suggested that 700 million hectares (Mha) of land might be available for carbon conservation and sequestration. Under baseline conditions this would involve slowing deforestation (138 Mha) and promoting natural forest regeneration (217 Mha) in the tropics, combined with the implementation of a global reforestation program (345 Mha of agroforestry and plantations). Such figures could possibly offset cumulative fossil fuel emissions by 12-15% over the same time. In total, it is the tropics which have the greatest potential to conserve and sequester the largest quantity of carbon (80% of the total potential). This area is followed by the temperate (17%) and the boreal zones (3%).

Finally, it is important to note that the literature has been forthright in assuming that sinks remain distinctly secondary in response strategies to climate change. As such "while forests can help moderate net carbon emissions, increasing tree plantations cannot compensate for the lack of a comprehensive and enlightened energy policy." That is, "forest management... needs to be balanced with other objectives."

B. Forests at Kyoto.

The debate at Kyoto focused primarily on the second option - sequestration via increased plantation, and tended to gloss over the other two (deforestation and substitution exchanges), and the idea of the limitations in the use of sinks as a response

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106Reforestation involves planting trees on previously cropped land. The time limit is usually land which was deforested within the previous 50 years. Afforestation is the replanting of land which had forests on it 50 years or more previously.
107IPCC. Supra note 104. 55. IPCC. Supra note 105. 778, 784.
108Today’s climate and no change in the estimated available amount of land.
109IPCC. Supra note 105. 775.
110IPCC. Supra note 104. 55. This is because the carbon released per acre of cut forest is greater in tropical than in temperate regions. This is due to the fact that the tropical forest crown, unlike that of the temperate forests, contains more carbon than the soil.
111IPCC. Impacts. Supra note 105. 775.
112For example, just to keep pace with global carbon dioxide emissions (about 3.2 billion tonnes per year), planting trees in an area the size of India annually would have to be implemented. Even if all the available land speculated upon was reforested, - approximately 4 million square kilometres (about half the size of Australia) even then, only 10% of the estimated emissions from fossil fuel burning world wide would be achieved by sequestration. See Schneider, S.H. (1989). Global Warming. Sierra Club Books. San Francisco. 188-189. Adger, W.N. & Brown, K. (1994). Land Use and the Causes of Global Warming. Wiley. London. 189-195, 227-230.
113Likewise, in 1990, the US announced that they would plant one billion trees in every subsequent year. However, even this massive reforestation project would only be equivalent to a 5% reduction of annual US carbon dioxide emissions. See Crutzen, P. (1993). ‘Linkages Between Global Warming And Other Aspects of Global Environmental Change.’ In Mintzer, I.M. (ed). Confronting Climate Change: Risks, Implications and Responses. (Cambridge University Press. Cambridge). 15, 28.
115IPCC. Impacts. Supra note 105. 778.
mechanism. Even with this restricted mandate the adoption of a net approach at Kyoto was not without incident. Certain countries,\textsuperscript{115} had to argue very hard to get the inclusion of sinks within the Protocol. "Open hostility\textsuperscript{116} had met such proposals in the past, and at Kyoto "angry exchanges about sinks" continued as "the inclusion of such schemes ... was regarded by some participants as an attempt to create a loophole for evasion."\textsuperscript{117} Nevertheless, the countries which advocated the use of sinks were successful in their drive for inclusion in the Protocol. As such, not only are sinks recognised as a legitimate method to reduce the build-up of greenhouse gases, they may also be used without limit to how much credit can be claimed from them. Moreover, the credits can be traded internationally between countries.\textsuperscript{118}

The countries which opposed the use of sinks in the Protocol\textsuperscript{119} wished to defer any decisions upon what role sinks should play in the FCCC until many of the uncertainties had been satisfactorily resolved.\textsuperscript{120} Their reasons for the rejection of the net approach ranged from the inherent inequities of trying to hoist an approach which only a few countries can geographically and demographically adopt, through to recognition that sequestering carbon only postpones the inevitable, as the carbon that is stored must eventually be released anyway.\textsuperscript{121}

It is important to recognise that these were not arguments against sinks or forests as part of an appropriate mechanism in context for combating global warming. Nor were they denials that sinks form part of the international legal framework as a mechanism to slow climatic change. Indeed, both the European Community and Japan explicitly rejected the idea that excluding sinks from the Protocol would reduce any incentive to protect them. Thus, they maintained that the protection and enhancement of sinks should be done regardless of obligations under the FCCC.\textsuperscript{122}

C. Uncertainties With The Use of Sinks.

The net approach is troubled for a number of reasons. At Kyoto, these reasons focused upon scientific and social uncertainties, definition problems (exactly what the

\textsuperscript{115}Such as New Zealand, which was supported by Australia, Canada, Norway, Iceland, the United States, and the Russian Federation. For a series of discussions on New Zealand's approach on this issue, see Gillespie, A. (1997). Burning Follies: The Failure of the New Zealand Response to Climate Change. (Dunmore Press. Palmerston).
\textsuperscript{118}Article 6.
term "sink" encompassed) and policy concerns. It is with the last area that the connection between the other UNCED conventions will be drawn out.

Scientific uncertainties have been highlighted since the first IPCC workshop on the carbon balance of the world's forested ecosystems. The "considerable uncertainty because of an inadequate understanding of the processes controlling the uptake and release of carbon dioxide from the oceans and terrestrial ecosystems" was later noted in the 1992 IPCC Supplementary Report. This report clearly set out the methodological problems and scientific uncertainties surrounding the measurement of sinks.

The IPCC Revised Guidelines in 1996 also recognised that major uncertainties exist relating to emissions factors and activity data for sinks. In his report to the seventh session of the Subsidiary Body For Scientific And Technological Advice in October 1997, Professor Bolin, on behalf of the IPCC, reiterated the problems relating to sinks. He specifically pointed out in relation to terrestrial ecosystems: "the error margin for the determination of sources and sinks are quite large" and that "[b]ecause of our limited understanding and lack of observations simplified methods have been proposed by the IPCC and have been adopted by the FCCC for the assessment of sources and sinks by countries." As these were "very approximate" Professor Bolin highlighted the importance of analysing "their possible shortcomings" in the context of the IPCC's work.

According to the Secretariat there are multiple concerns in this area. As such, the rate of uncertainty was put at 60% by the IPCC. A useful indicator of the uncertainties with sinks in this area is also manifest for individual signatories to the FCCC. For example, substantial variation between the first and second national communications for the Annex 1 signatories on the role that sinks played in their strategies ranged from a 430% change for the UK, down to 3% for France.


125 For example, it is difficult to obtain accurate estimates of carbon sequestration rates for different species of trees, accurate information on the type of land being planted; the effects that mass planting will have on volatile hydrocarbons and carbon monoxide. Information is also required for improvements in the understanding of the carbon exchanges between soil, forest and atmosphere; information about decomposition and storage times of carbon deposited after soil erosion; and the necessity to develop sequestration models for indigenous as well as plantation forests. These problems have also been reflected on the international stage. For example, Borine and Ripert stated, "It is in fact quite impossible, in the present state of scientific knowledge, to aggregate on a common basis the figures of reductions of the different greenhouse gases... it is also difficult at this stage, to identify and to quantify all the sinks. Commitments on net emissions could therefore be considered impossible to implement." Borine. D & Ripert, J. (1994). Exercising Common But Differentiated Responsibility. In Mintzer. Supra note 112. 77, 88. See also Brown, K & Adger, N. (1993). Estimating National Greenhouse Gas Emissions Under the Climate Change Convention. Global Environmental Change. June. 145-158. Finally, see also Brown, S. (1992). 'Missing Carbon Dioxide.' Science. 257:11.

126 Noted in the Marshall Island. Response From Parties. Supra note 120.


129 The Technical Paper on sinks, supra note 120, noted that "None of the problems with comparability of CO2 emission estimates from this sector identified in the compilation and synthesis of first national communications appear to be resolved. The information provided did not shed additional light on various
The 1998 Bonn meeting of the Subsidiary Body for Scientific and Technological Advice to the FCCC suggested that technical uncertainties related to:

"[1]. Differing interpretations of source and sink categories or other definitions, assumptions or units.
[2]. Use of simplified data formats and average values (especially emission sequestration factors).
[3]. Uncertainties introduced by changing national models for estimating activities, or random errors in reporting; and
[4]. Inherent uncertainty in the scientific understanding of the basic processes leading to emissions and removals."

The other area of uncertainty that needs examining in this context is that no studies to date have addressed the mitigation potential of forests under a changed climate and atmosphere. The mitigation potential of forests has only been assessed under a current baseline scenario. However, given that a changing climate is expected to have dramatic effects upon forestry, many of the current predictions may be thrown.

Next to the technical uncertainties reside the social uncertainties. That is, the potential of plantations may become increasingly questionable due to the limited supply of land which is available to grow trees as an economically valid option. In the most simplistic terms, the land which is best available for 'carbon forestry' tends also to be reasonably good for crops. On this point, the IPCC suggested there is "high uncertainty" as future land use will be determined by a multitude of factors involving institutional, economic, demographic and cultural patterns.

In addition to the above difficulties are a number of problems with definitions referring to sinks within the Protocol. These problems became manifest within the first national communications which reflected the absence of a common reporting framework for emissions from the sub-categories of land-use change and forestry category. That is, many countries had differing ideas about what constitutes sinks. Although some of the difficulties in this area have been addressed within the definitions of the Protocol,

assumptions related to the definitions of anthropogenic activities and their treatment for emissions reporting purposes." FCCC/SBI/1997/19, Annex, para 29.


IPCC. Impacts. Supra note 105. 776.

FAO. Supra note 19. 60-61.

IPCC. Impacts. Supra note 105. 783, 792.

This category originally (1995) included changes in forests and other woods biomass stocks; forests and grasslands conversion and abandonment of managed lands. In 1996 the IPCC added changes in mineral soil carbon stocks.

With such considerations in mind, the Technical Paper on sinks concluded, "It is clear that further methodological work is necessary in order to ensure that the estimation and reporting of GHG inventory data for land-use change and forestry are consistent, transparent and comparable." Technical Paper. Supra note 120. pp.10. Very similar conclusions were reached with the compilation and synthesis of second national communications, "Further research and methodological work is needed to ensure that estimation and reporting is done in a consistent, transparent, and comparable manner." FCCC/SBI/1997/19, Annex, para 29.

The specific language agreed upon suggested in Article 3 (3) stipulated, "The net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human-induced land
a number of important difficulties remain recognised within the Protocol. Thus: “Uncertainties, transparencies in reporting, verifiability and methodological work” all pertaining to the sinks question still have to be worked out in the short-term future of the Convention.

D. Equity Concerns.

What the nation of Nauru called "the broader arena of socio-economic concerns" of the sinks issue is yet to fully surface. Socio-economic, (or equity) concerns enter into the context of the debate through the consideration of appropriate actions between responding countries.

According to the first and second national communications of Annex I parties under the FCCC, the aggregate removals from this category (terrestrial sinks) represent 6.7% and 8% of total greenhouse gas (GHG) emissions in carbon dioxide equivalent and total carbon dioxide emissions of the reporting Annex I Parties. However, the amounts varied widely amongst the parties. For example, whereas the average was 8% reductions by sinks of national carbon dioxide emissions, for some countries this figure can reach as high as 81%.

It may have been more appropriate to restrict carbon credits from sinks to verifiable changes in stock up to a set percentage of the given reduction targets which Annex I. A logical standard may have been that sequestration as part of national response strategies should not exceed this global average (8%). It may have been even more sensible to go below the 8% global average due to scientific uncertainties in this area.

Had this been done then two pitfalls pertaining to equity may have been mitigated. The first, is that it may be inequitable for one country to make the majority of its reductions through sequestration when this option is not available to other countries. Advocates of the sink approach will reply that as the carbon credits from sinks can now be traded internationally, there is no discrimination between countries. Unfortunately, this fact overlooks not only the financial differences between countries, it also tends to obscure per-capita differences and historical causation (and hence responsibilities) behind
sovereign responses. Both of these concerns are within the FCCC and its subsequent documents, and feed into the principle of "common but differentiated responsibilities." Additional (but now eclipsed) difficulties of comparing different gases should also have been of consideration within the ambit of equity. Exactly how these considerations of equity have been fully addressed within the Protocol is a matter of debate.

E. Influences On Other UNCED Concerns.

It was asserted in the Kyoto debates that the inclusion of sinks in the reduction objectives may actually end up running counter to the objectives of other international treaties. As such, measures designed to benefit the climate may "do greater harm to the environment at large." This contention may be well grounded in that carbon sequestration, if unchecked, may create a powerful incentive to begin or to accelerate the felling of old growth forests, the destruction of biodiversity, and/or the movement of indigenous peoples. This may occur in efforts to secure geographical space so that signatories or their financially poorer partners can take credit for planting fast growing mono-culture forests to fix carbon.

F. Plantations: Promotions And Limitations.

Although available figures show considerable variation, a ball-park figure suggests that between 150-180 million hectares of plantations exist worldwide. Between 1980 and 1995 the global extent of plantations roughly doubled, to an area in size slightly smaller than Mexico. Plantations are roughly divided 25-75% tropical - temperate. Plantations in tropical countries are expected to at least double by 2020. Between 1980 and 1990 they increased by 88%, and by 1994 were growing at a rate of around 2.6 million hectares per year. Rates of plantation establishment during this period were much higher in tropical Asia and the Pacific (189%) Africa (75%) and Latin America and the Caribbean (76%) than in the temperate countries of these regions.

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147 The Cumulative Approach has been adopted within the Kyoto Protocol.

148 That is, although a ton of (weighted) greenhouse gas absorbed from planting trees may be the same for the atmosphere as a weighted ton of greenhouse gas prevented from entering the atmosphere from methane from rice paddies, the social and political context of these reductions is different.


150 See Brown. Supra note 37. 126-127. It is important to note that statistics on plantations must be treated with some caution because some reports use figures based on the accumulated area planted without any deductions for the area felled. With others, figures may simply be based on the number of seedlings planted. See FAO. Supra note 19. 269.

151 See WRI. Supra note 135. 208.
These figures feed into the current drive to reforest the world, or as the Forest Principles stressed “Efforts should be undertaken towards the greening of the world.” Thus, "The role of planted forests... should be recognised and promoted.”\textsuperscript{154} Agenda 21,\textsuperscript{156} and the IPF\textsuperscript{157} have reiterated this. The role of plantation forests, is usually brought forward for specific accreditation, because, according to the 1997 Antalya Declaration: Forestry For Sustainable Development: Towards the XXI Century:

"Fast growing tree plantations can contribute to sustainable management of forests by meeting subsistence needs and can complement, and/or reduce the pressure on, natural forests through increased supply of forest goods and services.”\textsuperscript{158}

Despite the merits of plantations, there are also distinct problems with them, and caution is always urged in their implementation. This is due to the fact that plantations are highly variable. They may be monoculture or mixed, composed of indigenous or exotic species, large scale or small scale, structurally complex or simple. These parameters have important effects on their success or costs. Failure, in terms of social and ecological costs, is well documented.\textsuperscript{159}

Many diverse forest ecosystems and the biodiversity within them have been, and continue to be, transformed into high yielding monoculture tree plantations. Many of these are now closer to resembling fields of crops as opposed to natural forest. Worldwide, at least 180 million hectares of forest have been converted to tree plantations. Recent specific examples include the fires that burned close to 2 million hectares of Indonesian forests and scrublands in 1997. These were set to clear land for industrial plantations (in this case, including plantations for products such as palm oil). In Chile 132,000 hectares of native forests have been replaced by pine plantations in the last 30 years. In the southeastern United States, experts predict that 70% of the native pine forests will be converted to plantations by 2020.\textsuperscript{160}

Specific regard is commonly focused upon the loss of biodiversity caused by plantations.\textsuperscript{161} The 1995 UNEP Global Biodiversity Assessment summarised the situation:

\textsuperscript{154}Principle 8(a) & (b) of Agenda 21; Article 6(a) of the Forest Principles.
\textsuperscript{155}Article 6(d) of the Forest Principles.
\textsuperscript{156}The present situation calls for urgent and consistent action for conserving and sustaining forest resources. The greening of suitable areas, in all its component activities... is an effective way in protecting and managing forest resources.” Chapter 11, paragraph 12.
\textsuperscript{157}The IPF suggested that it is necessary to "recognise and enhance the role of forest plantations as an important element of sustainable forest management complementary to natural forests.” IPF. Supra note 33. Paragraph 28(b).
\textsuperscript{158}Antalya Declaration: Forestry for Sustainable Development, Towards the XXI Century. (1997). Reprinted in Environmental Policy and the Law. 27(6): 502. Agenda 21 and the Forest Principles also note their being able to help meet multiple human needs (from providing employment, to renewable fuel and commercial uses) help maintain some ecological processes, and offset pressure on primary/old growth forests. See Chapter 11, paragraph 11.14.(e). Article 6. (c) & (d) of the Forest Principles. See also FAO. Supra note 19. 267-269.
\textsuperscript{159}See FAO. Supra note 19. 268-271. The 1995 IPCC Assessment stated : "The establishment of plantations is becoming less socially and politically desirable, especially with the global concern for biodiversity and other social, cultural, land-tenure and economic factors.” See IPCC. Impacts. Supra note 105. 781.
\textsuperscript{161}UNEP. Supra note 12. 751, 952-954.
"Plantation forestry often creates artificially homogenous forests with one of a few tree species with individuals of the same size and age, like the cultivated monocultures of agriculture... But compared with a diverse community of trees, the plantation monoculture will simplify the other components of the ecosystem, not least the structure, fauna and flora of the soil. When industrial tree plantations are based on exogenous species, much of the native biodiversity is inevitably lost, especially through the active suppression of competing species, parasites etc. Although plantations can be managed to maximise species diversity they are unlikely to attain the biodiversity levels of natural forests and should not be regarded as an alternative to natural forests...”

Plantations cannot produce the full range of goods and services that can be supplied by the natural forest, particularly non-wood forest products and some environmental functions. This realisation caused the CBD to recognise that only "some forests" can play a crucial role in conserving biodiversity. This delineation with the word "some" was due to the debate between the virtues of plantation as opposed to natural forests.

Given such concerns, it has been stipulated that the use of plantations must be utilised carefully. That is, according to the Forest Principles, increases in forest cover and forest productivity should be undertaken in ecologically, economically, and socially sound ways. Agenda 21 suggested the greening of "suitable areas" and the IPF stipulated that plantations should be "complementary to natural forests.”

According to the World Resource Institute, the International Union for the Conservation of Nature, and the United Nations Environment Program, there are three rules for successful timber plantations. First, no policy should promote the conversion of diverse natural forests to plantations. Plantations should be located on already deforested and unproductive lands. Second, no policy should condone or support the displacement of rural communities through the privatisation of their private or common lands. Third, no policy should promote the establishment of uninterrupted stands of monoculture over large areas. Although such stands are cheap to establish and easy to harvest, they are also vulnerable to disease, market fluctuations and changes in technology. Accordingly, plantations should be employed only within a patchwork or land use that includes native tree species and wildlife and that provides products, livelihoods, and living space to local communities.

The problem is that the above stipulations are not international dictates. They are, at best ideals to help flesh out the few words of caution by Forest Principles, Agenda 21 and the IPF. Moreover, there is, as noted above, no powerful international treaty to protect natural forests. Sustainability remains an undefined ideal in this area. Unfortunately, the Kyoto Protocol seems to have overlooked this fact when it suggested

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162 UNEP. Supra note 12. 751.
164 See UNEP/CBD/COP/3/L.8.
166 Principle 8(a) & (b) of Agenda 21; Article 6(a) of the Forest Principles.
167 Chapter 11, paragraph 12.
168 IPF. Supra note 33. Paragraph 28(b).
that, with regards to sinks, it is necessary to: "take[ ] into account... commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation." The difficulty is that the pursuit of carbon sinks may run into the abyss between ideals and hard law. Simply, the incentive for countries to obtain international currency for sequestering carbon may become more powerful than the soft promises to protect forests and biodiversity.

G. Questions Over Demand, Economic Value and Deforestation.

Currently, there is no international law against deforestation. Ultimately, countries are at liberty to destroy their forests if they wish. This is despite the overt influence that this has upon climatic change. Moreover, a distinct irony has developed in that countries with tropical forests receive no financial recompense for keeping these forests standing. They may however receive financial benefits if they plant fast growing, carbon fixing plantations.

There may be an overt demand to increase carbon fixing sinks in tropical countries for two reasons. Firstly, plantations grow much quicker in the tropics, and the quicker that something grows, the sooner the investment will be reaped. For example, annual growth rates of 3-5 cubic meters per hectare in eastern Canada and 10 cubic meters per hectare in the Southeastern United States pale in comparison to rates as high as 25 cubic meters in Indonesia and 30-40 in Brazil in the same period. And while it takes at least 15 years in Alabama (USA) to grow pine large enough to cut, rotations of eucalyptus in Brazil can be as short as 4-6 years.

The ability to have a quick turn around on investment will be aided by a second factor which is that the costs per unit of carbon sequestered or conserved generally increase from low to high latitude countries (between $2-$8 per ton). With such a price differential in an international market, it can be expected that, as the IPF recognised, carbon rights will go to those who can provide the lowest cost service.

However those who provide the lowest cost service may need space to plant such sequestering profit making sinks. The irony is that this land may become available from tropical forests which already sequester more carbon than plantations do. However, they currently receive no compensation for this service, despite the fact that it may be worth much more than the plantation alternative.

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170 Kyoto Protocol. Article 2.3.
172 See Brown. Supra note 37. 126-127.
174 Economic theory holds that in order for any resource to be properly managed, the cost of using the resource needs to reflect all the values that society places upon it, social and economic, including the costs of the external effects associated with exploiting, using or transforming the resource, together with the costs of opportunities forgone. In economic parlance, this means internalising the external benefits and costs, known as externalities, associated with such a resource. Failure to properly value resources means that the incorrect signals are sent to decision makers, conveying, in turn, misleading information about resource scarcity and thus providing inadequate incentives for the management, efficient utilisation and enhancement of living resources. Typically, it is asserted that it is because biological diversity has been under-valued economically at both micro and macro levels that it has been overly exploited. For example, the IPF has noted: “The need to value realistically the goods and services of forests, forest lands and wooded lands has been recognised for quite some time but seldom attempted seriously. Indeed, it has been pointed out that a major cause of the failure of sustainable forest management, and even of
"Direct benefits of carbon sequestration at the national level are small when compared with the real costs of protecting a 'carbon sink.' Poor countries with large sinks cannot be expected to provide 'sequestration services' on their own. Here... substantial transfers are needed."175

Tropical forests and the ecological services they provide to the international community should make them "extremely valuable"176 (in a financial sense). A number of international documents have suggested that this should be investigated further.177 With regard to their role in climate regulation (i.e. what it would cost if the carbon they sequester had to be undertaken by an alternative method) it is estimated that the forests in Brazil alone are worth an estimated value of (US) $1,300 per year, per hectare.178 Other studies have suggested that replacing the carbon storage function of all tropical forests would cost as estimated (US) $3.7 trillion - the equivalent of the gross national product for Japan.179 Obviously, if such funds were channelled into the correct areas they could create a powerful incentive system to conserve existing natural forests.180 However, at the moment no payment for these services accrues to the countries that possess them.181 Moreover, there is no powerful international dictate to protect them. There may, however, now be an incentive to replace them with carbon sinks, for which financial benefits may be reaped.

This situation may now introduce an economic paradox, which acts against the principles of the CBD, the Forest principles, and also actually make climatic change worse. A worsening climatic situation could avail because it is better not to convert forests with a large initial standing biomass of carbon and slow growth rates (e.g. old growth forests) to managed stands because it may take a very long time (up to centuries) until the net carbon sequestered returns to its initial value.182 That is, large deforestation and transfer of forests to other land uses, is the inadequate recognition and underestimation of the values of the many goods and services provided by forests at the local, the national, the regional, and global level." Intergovernmental Panel on Forests. (1996). Scientific Research, Forest Assessment and Development of Criteria and Indicators For Sustainable Forest Management. E/CN.17/IPF/1996/7. 14 February. 1996. Paragraph 9. See also UNEP. Supra note 12. 827-904.

177The need to develop methodologies to calculate the financial benefit of such services was noted in the Forest Principles, and Agenda 21. (11.22(a). Specifically, Agenda 21 hoped to help improve and develop "methodologies for a comprehensive assessment that will capture the full value of forests, with a view to including that value in the market-based pricing structure of wood and non-wood products."(11.23.(j). Likewise, the Forest Principles hoped that: "Decisions taken on the management, conservation and sustainable development of forest resources should benefit... from a comprehensive assessment of economic and non-economic values of forest goods and services and of the environmental costs and benefits." Principle 6(c). See also Principle 13(c).
178UNEP. Supra note 12. 880.
179FAO. Supra note 19. 288.
180IPF. Supra note 175. Paragraph 38.
181Despite some distinct problems with environmental economics, it remains important not to throw the baby out with the bathwater.
182See Marland, G. (1992). 'Should We Store Carbon In Trees ?' Water, Air and Soil Pollution. 64: 181-
amounts of carbon could be released into the atmosphere during transitions from one forest type to another, because the rate at which carbon may be lost during times of high forest mortality is greater than the rate at which it may be gained through growth to maturity. Finally, a potentially ominous environmental side effect of reforestation may be increased emissions of nitrous oxide. This is particularly so if reforestation is accompanied by extensive use of nitrogen fertiliser. The risk for increased nitrous oxide emissions may be particularly great in the areas of tropical forests, which in their natural form are already major sources of this gas.

The answer to this paradox is either make sure that no further deforestation takes place (something that the international community has been unable to achieve to date) or offer compensation to the countries which possess the tropical forest not to deforest (something that Northern countries are unwilling to do) due to the benefits that such ecosystems provide to the global environment. This latter option may arise sooner than expected as a question of what the IPF labelled “moral hazard” becomes pertinent if countries begin to demand payment for not releasing more carbon into the atmosphere if they are not being paid for keeping it sequested. After all, in atmospheric terms, there is no difference in where the carbon is going or coming from, and if a country may get credit for forestation, it may be innocuous to be excluded from financial transfers for not deforesting.

4. Conclusion.

Ecologically, climate, forests and biodiversity are all deeply interconnected. Institutionally, the international instruments that deal with these areas are slowly coming to terms with this, and the overlaps between the areas is becoming increasingly recognised. The use of terrestrial sinks, as mandated within the Kyoto Protocol as a mechanism to help in mitigating climatic change may become the epi-centre of this relationship. Unfortunately, it is possible that this new approach will not necessarily compliment the other UNCED documents. A conflict with the other UNCED documents may develop because irrespective of the questions pertaining to uncertainties of this method of mitigation and its possible inequities, carbon sinks in an international context may introduce an incentive to increase carbon-fixing plantations.

With the assistance of international trading mechanisms, it will be possible for the developed countries to claim credit for reductions made in developing countries. The financial benefits that non-Annex I countries may get from this are substantially more than the failure to receive any compensation at all for the same service provided by their natural forests. Moreover, ultimately, there is no international dictate that prevents such countries choosing a path that destroys their natural forests, and replaces them with plantations. Such actions, stemming from the catalyst of the Kyoto Protocol,

183IPCC. Impacts. Supra note 8. 6-7.
184See Crutzen. Supra note 112. 29.
185IPF. Supra note 175. Paragraph 36(c).
186The Protocol does not cover “all” forests, but is limited to direct human-induced land use change and forestry activities, limited to afforestation, reforestation, and deforestation. The question of whether this includes natural/indigenous forests was addressed within the IPCC Guidelines which state that natural, undisturbed forests, where still in equilibrium should not be considered either as an anthropogenic source or sink, and therefore be excluded from the national inventory calculations. Of course, the protocol is meant for Annex I countries, but if a country can claim credit for forestation in a non-Annex I country, it begs the question, why not for stopping deforestation which would also release carbon.
although not contra to specific international mandates, may certainly be against the spirit of Convention on Biodiversity and the Forest Principles.