1	Financing REDD in Developing Countries: A Supply and Demand Analysis.
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1 **Abstract:** Reducing emissions from deforestation and forest degradation in developing 2 countries (REDD) has been at the centre of negotiations on a renewed international 3 climate regime. Developing countries made it clear that their ability to engage in REDD activities would depend on obtaining sufficient and stable funding. Two alternative 4 5 REDD financing options are examined to find possible ways forward: financing through 6 a future compliance market and financing through a non-offset fund. First, global 7 demand for hypothetical REDD credits are estimated. The demand for REDD credits 8 would be highest with a base year of 1990, using gross-net accounting. The key factors 9 determining demand in this scenario are the emissions reduction targets and the allowable 10 cap. A proportion of emissions reduction targets available for offsets lower than 15% 11 would fail to generate a sufficient demand for REDD. Also examined is the option of 12 financing REDD through a fund. Indirectly linking the replenishment of a REDD fund to 13 the market is a promising mechanism but its feasibility depends on political will. The 14 example of overseas development assistance for global health indicates the conditions for 15 possible REDD financing. The best financial approach for REDD would be a flexible 16 REDD mechanism with two tracks, a market track serving as mitigation option for 17 developed countries and a fund track serving as mitigation option for developing 18 countries.

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21 Biography:

<u>Jordan Isenberg</u> was an intern at the Climate Change office of Panama's National
Authority for the Environment in the context of a program offered by McGill University
in Panama when he did this research. He is now pursuing a graduate degree.

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26 <u>Catherine Potvin</u> is Professor at McGill University. She is advisor on forests and 27 negotiator for Panama's National Authority for the Environment on REDD and on 28 Nationally Appropriate Mitigation Actions (NAMAs). She negotiates REDD since COP11 and, since the Accra Workshop, further negotiates mitigation under the AWG LCA. She has been an active participant in several regional negotiations in Latin
 America.

4

5 Introduction

6 Land use change is a large source of greenhouse gas (GHG) emissions (IPCC 2000) that

7 is not fully covered in the present climate regime (Streck and Scholz 2006).

8 Deforestation accounts for nearly 20 percent of global CO₂ emissions (Stern 2007) and up

9 to 25 percent of global GHG emissions (Houghton 2005). Nearly all emissions

10 associated with deforestation are tropical (FAO 2006) having released a total of 499 \pm

11 202 GtCO₂ to date (IPCC 2000). Due to the average annual net-loss of approximately 13

12 million ha of forests (FAO 2006), emissions from land-use change were, on average, 5.86

13 ± 2.92 GtCO₂ yr⁻¹ throughout the 1990s. In its review of the economic consequences of

14 climate change, Stern (2007) indicated that unless immediate action is taken, projected

15 emissions from deforestation in developing countries will remain a large constituent of

16 total global CO_2 emissions. In Latin America, for example, tropical deforestation is the

17 largest source of CO₂ emissions (Silva-Chávez 2005). If Brazil's national emissions are

18 calculated to include the Land Use, Land-Use Change and Forestry (LULUCF) sector,

19 total emissions would increase by 225 percent; from 0.67 to 1.47 $GtCO_2 yr^{-1}$

20 (FCCC/SBI/2005/L.26).

The reasons for the forests' exclusion from the climate regime under the Kyoto
Protocol (KP) for the first commitment period (2008- 2012) include concerns that,
through the use of carbon sinks associated with forest conservation, developed countries
would meet their emissions targets without cutting domestic emissions (Fearnside 2001).

1	Two decisions reached at the Conference of Parties (COP) to United Nations Framework
2	Convention on Climate Change (UNFCCC) in Bali, December 2007, are now opening the
3	door to pilot projects aimed at reducing emissions from deforestation and forest
4	degradation in developing countries (REDD) (Grubb 2008) and including REDD in the
5	Bali Action Plan (FCCC/CP/2007/6/Add.1).
6	Before the Bali COP, REDD was largely discussed as an independent agenda item
7	under the technical subsidiary body of the UNFCCC (SBSTA). Since Bali, REDD
8	became interwoven in the complex negotiations of both the Ad-Hoc Working Group on
9	Long-Term Cooperative Action (AWG-LCA) under UNFCCC and of the Ad-Hoc
10	Working Group on Further Commitments (AWG-KP) under KP (Ott et al. 2008).
11	Consequentially, moving the REDD agenda forward necessitates an understanding of the
12	broader climate negotiations. Regardless of the interest surrounding REDD (Gullison et
13	al. 2007; Laurance 2007), sizable obstacles exist preventing its implementation. The
14	resolution of technical issues, as well as the assessment of the political and social
15	implications of REDD are some of the challenges that need to be addressed. There are
16	also uncertainties as to the types of financial incentives, the form they will take and under
17	whose auspices they will fall (Karsenty et al. 2008). It has been suggested that technical
18	disagreement could be resolved given sufficient political will and adequate perceived
19	benefits for individual countries (Ebeling 2006).
20	The goal of this paper is to shed light, from a developing country's perspective,
21	on REDD financing and to identify possible ways forward in the current climate
22	negotiations. In its preamble, Decision 2/CP 13 states that " sustainable reduction in
23	emissions from deforestation and forest degradation in developing countries requires

1 stable and predictable availability of resources" (FCCC/CP/2007/6/Add.1). Financing of 2 REDD is a major concern for developing countries. It has been suggested that REDD 3 could enable developed countries' acceptance of larger commitments by creating low-4 cost options to abate emissions (Ebeling 2006; Kindermann et al. 2008), which would 5 further reduce global GHG emissions (Fearnside 2005; Moutinho 2005). We therefore 6 examined scenarios for global supply and demand of hypothetical REDD credits under 7 the assumption of a new compliance market post-2012. Options for financing REDD 8 outside of a compliance market, as suggested by Brazil, were also examined.

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10 Financing REDD through markets

11 A- <u>Global supply of REDD generated carbon credits</u>

12 In order to calculate the supply of REDD hypothetical carbon credits that could be 13 generated, we summed the products of the annual rate of forest-cover change (FAO 2007) 14 for every developing country with a negative rate and the carbon in biomass (IPCC 2003; 15 FAO 2007). Countries such as India and Costa Rica where forests actually represent a 16 sink for carbon were excluded from the analysis (see Annex). Our estimate of annual 17 average deforestation in developing countries is 11,953,000 ha, which is in accordance 18 with the FAO's estimate of 13 million hectares lost annually (FAO 2006). 19 We then calculated the weighted average CO₂ emissions per hectare for 127 developing countries' potential carbon dioxide emission from tree biomass to be 20 approximately 265 tCO₂ ha⁻¹ (Annex). The resulting estimate for global emissions from 21 22 deforestation in developing countries is 3.71 GtCO₂ when it is calculated as the emissions 23 from net-deforestation alone. Other estimates of emissions from deforestation in developing countries have been published: (Fearnside 2000): 7.32 GtCO₂yr⁻¹, (Malhi and 24 Grace 2000): 8.78 GtCO₂ yr⁻¹, (DeFries, Houghton et al. 2002): 3.29 GtCO₂ yr⁻¹, 25

(Houghton 2003): 2.20 GtCO₂ yr⁻¹ and (Achard, Eva et al. 2004): 3.60 GtCO₂ yr⁻¹. The 1 mean of these estimates is 6.22 + 2.57 Gt CO₂ yr⁻¹. Our value of 3.71 GtCO₂ yr⁻¹ is 2 3 therefore within the lower range of the values published to date. In our analysis of supply 4 and demand for REDD credits, we considered, following the suggestion of the Stern 5 review (Stern 2007), that the maximum potential supply of REDD generated carbon 6 credits corresponds to 50 percent of estimated emissions from deforestation or 1.85 7 $GtCO_2$ yr⁻¹. It should be noted that the values above are expressed in $GtCO_2$ rather than 8 GtCO₂ equivalent.

Latin America's carbon in biomass was calculated to be on average 360 tCO₂ ha⁻¹, 9 10 slightly higher than the global mean value. With an average deforestation rate of 4,743,000 ha per year, Latin America emits approximately 1.68 GtCO₂ yr⁻¹ as compared 11 to 1.01 GtCO₂ yr⁻¹ for Asia and 0.99 GtCO₂ yr⁻¹ for Africa. Brazil accounts for 70 12 13 percent of the emissions from deforestation in Latin America. According to the Sixth 14 Compilation and Synthesis of Initial Communications from Parties not included in Annex 15 I to the Convention (FCCC/SBI/2005/18/Add.2), the LULUCF sector shows important regional differences; for Africa, Asia and the Pacific the LULUCF is currently acting as a 16 17 net sink for CO₂ whereas the converse is true for Latin America. On the one hand, Gabon and China report high removals for LULUCF, at 0.50 GtCO₂ yr⁻¹ and 0.41 GtCO₂ 18 yr⁻¹ respectively, while Brazil, at 0.82 GtCO₂ yr⁻¹, shows high emissions. Interestingly, 19 20 despite Gabon's LULUCF being a sink for carbon, our data suggests that the forest sector 21 alone is a small source of GHG (see Annex). It is important to bear in mind that emission 22 patterns from the entire LULUCF sector differ slightly from those of deforestation. Here, 23 we focus on deforestation. 24

25 B- Global demand for REDD generated carbon credits under a hypothetical

- 26 compliance market.
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1 (i) Emissions reduction target by developed countries

2 In order to determine the feasibility of financing REDD in the context of a future compliance market, the demand for hypothetical REDD credits must be examined. A 3 4 REDD market could be formed as part of a new climate deal reached in the negotiations 5 of the AWG-LCA, as part of an expanded CDM under a post-Kyoto agreement, or as a 6 new stand-alone protocol (FCCC/AWGLCA/2008/CRP.5). Regardless of the mechanism 7 retained in the negotiations, the size of a compliance market will first depend on the 8 emissions reduction targets for developed countries and the proportion of emissions 9 reduction allowable for trading. One of the major developed country players in these 10 negotiations, the European Union, made it clear that its intention was to limit climate 11 change to two degrees Celsius. It therefore endorses an objective of a 30 percent 12 reduction in GHG emissions by 2020 as compared to 1990 and yows to unilaterally 13 reduce emissions by at least 20 percent by 2020 compared to 1990, regardless of its 14 position in international negotiations (European Commission 2007). In keeping with the 15 European Union's position, we used emissions reduction by developed countries of 30 16 percent as the high-end of any future climate agreement with today's regime's 5 percent 17 as the low end. We used two global base year emissions: the accepted base year of 1990 for Annex I parties to the UNFCCC, which includes the U.S.A., (18.70 GtCO₂ equivalent 18 yr⁻¹) and a hypothetical new base year emission value obtained by summing the most 19 20 recent GHG emissions data reported for all the developed countries (18.18 GtCO₂) *equivalent* yr⁻¹) (FCCC/SBI/2007/30). This first scenario does not take into account the 21 22 proportion of emissions reduction that would be available for trading.

1	Our calculation shows that emissions reduction targets would yield a demand
2	ranging between 0.936 and 5.61 GtCO ₂ equivalent yr ⁻¹ (Table 1). Emissions reduction
3	from REDD, assuming a 50 percent reduction in global deforestation and target
4	emissions reduction for developed countries cross over between 10 and 15 percent
5	reduction, with the selected base year being of little consequence (Figure 1). Thus,
6	emissions reduction of 15 percent for developed countries represents the lowest
7	acceptable target to finance REDD through a compliance market assuming that 100
8	percent of these emission reductions are available to offset REDD.
9	
10	(ii) Capping hypothetical REDD credits
11	The risk of flooding the carbon market with REDD credits is a preoccupation for
12	several developing countries (Karsenty et al. 2008). In fact, the compliance-certified
13	emissions reductions (CERs) from registered Clean Development Mechanism (CDM)
14	Projects (projected for the end of the first commitment period of the KP) represents 40
15	percent of our estimates for global deforestation (Fenhann 2007). For several developing
16	countries, the CDM represents an important tool to reach a sustainable development and
17	investments have been made in creating offices to promote and oversee the CDM. For
18	these countries, REDD might be perceived as a threat. As such, limitations on a REDD
19	market will have to be developed in order to preserve the integrity of CDM's existing
20	flexibility mechanisms. In the negotiations of KP, the amount of emission reduction
21	from LULUCF sector that could be credited through the CDM has been capped to protect
22	the integrity of the climate regime (Scholz 2006). This cap has been established as "one
23	per cent of base year emissions of that Party, times five" in the Annex to Decision

1 11/CP7 (FCCC/CP/2001/13/Add.1). Countries could similarly resort to capping as a way 2 to ensure that a REDD compliance market would not dwarf other sectors of the carbon 3 market. In the future climate regime, including REDD may entice countries to take on 4 bigger emissions cuts, but a cap on REDD credits could restrict the demand. 5 We created scenarios where a REDD cap, in a post-Kyoto era, ranged between 1 6 to 15 percent of base year emissions (Figure 2). Such caps would yield a potential 7 demand ranging between 0.909 to 2.81 GtCO₂ yr⁻¹ (Table 1). Recalling that we estimated 50 percent of average emissions from deforestation at 1.85 Gt CO_2 yr⁻¹, the minimum cap 8 9 that could provide a demand to allow REDD to offset 50 percent of emissions from 10 deforestation is approximately 10% (Figure 2). Said cap is double the allowance of the 11 cap currently admitted for LULUCF under CDM. Thus, our calculation shows that in 12 order to create a demand for REDD credits, developed countries must be granted a larger 13 cap than that of the first commitment period of the CDM, while including REDD. 14 15 (iii) LULUCF accounting method 16 Much debate surrounded the inclusion of the LULUCF sector in Annex I 17 accounting under UNFCCC (Yamin and Depledge 2004). One of the issues debated 18 pertained to accounting methodologies. Under the gross accounting approach, the 19 emissions reduction targets would be set in relation to all sources of GHGs, excluding 20 any emissions from the land-use sector, while the *net* approach would include them. For 21 afforestation, deforestation and reforestation, Annex I countries report emissions to the 22 UNFCCC using a gross-net accounting method in which the base year target is 23 determined using a *gross* approach while the end of the compliance period will be

1	calculated using a net approach (Article 3.3 of KP). Conversely, for other activities in the
2	land-use sector, Annex I accounting uses a net-net approach. Accounting for the land-use
3	sector is actively debated under the AWG-KP (e.g. FCCC/KP/AWG/2008/5) and the
4	chosen accounting method will have an impact on the potential demand for hypothetical
5	REDD credits under a compliance market.
6	We used data from UNFCCC national GHG inventory for all Annex I countries
7	(FCCC/SBI/2007/30) to quantify the impact of these accounting methods on base year
8	emissions. Aggregate emissions in 1990 were reported to be 18.7 GtCO ₂ equivalent or
9	17.6 GtCO ₂ equivalent with and without LULUCF respectively and could serve in gross-
10	net and net-net accounting. The most recent data for GHG reporting indicates an
11	aggregate decrease in emissions of 4.6 percent with LULUCF (FCCC/SBI/2007/30). We
12	used this reduction in emissions to calculate hypothetical new base year emissions for
13	2005 under both <i>gross-net</i> (18.7-16.7 = 2 GtCO ₂ <i>equivalent</i>) and <i>net-net</i> (17.6-16.7 = 0.9
14	GtCO ₂ equivalent) accounting (FCCC/SBI/2007/30). The former method would allow
15	Annex I parties to the UNFCCC to claim a 10.6 percent reduction in GHG while the
16	latter method would only credit them with a 5.1 percent reduction.
17	Overall our analysis of demand for hypothetical REDD credits show that
18	accounting, like caps, will interact with emissions targets significantly in determining the
19	future demand for REDD credits in a compliance market (Figure 1 and 2). For
20	developing countries, it would be advantageous to retain 1990 as the base year and to rely
21	on gross-net accounting. However, to determine the demand for hypothetical REDD
22	credits, the magnitude of the emissions reduction targets and the size of the cap allowed
23	for REDD are the factors of overriding importance.

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2 (iv) Voluntary Market

3	We considered voluntary markets as another potentially interesting source of
4	financing for REDD. Under a new climate regime in which the USA would play a role,
5	the voluntary market could be merged with the new market options discussed under
6	AWG-LCA substantially increasing the demand for REDD credits. Furthermore, the
7	voluntary carbon market represents an important opportunity to engage non-
8	governmental organization in REDD (Karsenty et al. 2008). Estimation of the voluntary
9	markets' size and development (exchange traded volume, action price) are hindered by
10	the lack of a centralized system for non-CDM registration. Many of the transactions take
11	place "over-the-counter" and there is little regulation, which limits the amount of
12	information available about the nature of these transactions (Taiyab 2006). Nevertheless,
13	in 2006, 26 $MtCO_2$ were documented as being voluntarily mitigated as compared to the 6
14	$MtCO_2$ accounted for in 2005 (Gardette and Locatelli 2007). While the voluntary carbon
15	market is currently the smallest sources of REDD financing, some studies suggest that it
16	may experience rapid growth (Table 2). The voluntary carbon market could therefore
17	represent an interesting demand for REDD, particularly for countries who seek to engage
18	the private sector at the project level. Some of the most emblematic REDD projects, such
19	as Noel Kempf-Mercado in Bolivia and the FACE project in Malaysia, are currently
20	financed through the voluntary market.

21

22 Financing REDD through non-offset funds

23 A- <u>Cost of REDD</u>

1	The literature increasingly recognizes the role a fund could play in financing
2	REDD activities (Karsenty 2008; Levin et al 2008). It has been proposed a fund should
3	be used in a phased-approach, being used initially in preparatory activities, with full
4	implementation culminating by access to markets (IWG-IFR 2009). In such phased-
5	approach, the fund-based approach would be used when only proxy measures of
6	implementation defined as "simplified but conservative input assumptions" are available
7	(IWG-IFR 2009). This proposal is coherent with the suggestion that REDD might help
8	developed countries meet ambitious emissions reduction targets. The EU, for example,
9	recognizes the need to reverse emissions from deforestation within two decades
10	(European Commission 2007), while Norway outlines its interest in considering REDD
11	as an acceptable mitigation strategy (FCCC/KP/AWG/2008/MISC.1). However, as the
12	negotiations on nationally appropriate mitigation actions (NAMAs) advance, it is
13	becoming clear that REDD might also be instrumental in allowing the implementation by
14	developing countries of low-carbon strategies. Brazil, for example, made it clear that
15	REDD will be an important part of its mitigation efforts and suggested that REDD should
16	not be used to offset the emissions of developed countries
17	(FCCC/AWGLCA/2008/MISC5). REDD is therefore at the cross-roads, seen by some as
18	a mitigation action by developing countries while others consider it as an offset option for
19	developed countries. Financing REDD through a fund would be compatible with the first
20	of these options. In which case, non-offset funds would remain an important source of
21	financing throughout implementation even when performance can be assessed in terms of
22	emissions reduction.

1	If REDD activities were to be financed by a fund, then demand should be
2	determined by the cost of reducing emissions from deforestation rather than by estimating
3	developing countries' supply in terms of carbon credits. Estimates of the cost of REDD
4	are variable and vary with the assumptions made in the calculations. Stern (2007)
5	suggests that 50 percent of emissions reduction could cost between \$US 3 and 11 billion
6	depending on the valuation of any timber and on land use opportunity cost. The estimates
7	from the Informal Working Group on Interim Financing for REDD (IWG-IFR) were
8	higher with EUR 15 to 25 billion (\$US 22.5 to 37.5 billion) over 5 years to reduce
9	deforestation by 25 percent (IWG-IFR 2009) while Kindermann et al. (2008) more
10	recently estimated the cost of reducing deforestation by 50 percent, or to \$17.2 to \$28
11	billion per year. The average cost of reducing emissions from deforestation and forest
12	degradation based on the estimates above is \$US 14.2 billion per year. Regardless of the
13	variation in the estimates, it is clear that REDD will necessitate an amount of money that
14	is significantly higher than the current level of overseas development aid (ODA) (Johns
15	et al. 2008).
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- 17 B- <u>Replenishment of a non-offset REDD fund</u>
- 18 (i) Proposals under UNFCCC

19 A crucial question is therefore to identify sources of replenishment. A few

20 proposals have been made in the context of the AWG-LCA negotiations, Tuvalu, for

- 21 example, proposed to finance REDD through a fund and to generate money for the
- 22 REDD fund by auctioning national emissions trading allowances
- 23 (FCCC/AWGLCA/2008/CRP.5). Greenpeace suggested that developed countries should

be obliged to purchase and hold a certain amount of Tropical Deforestation Emissions
Reduction Units (TDERU). The amount of units they would be obliged to hold would be
calculated as a percentage of each developed countries' base year emissions (Hare and
Macey 2008; Greenpeace 2008). The value of the TDERU would depend on the market
value of CO₂ *equivalent* with the proceeds of the sale to be used to replenish a REDD
fund.

7 We estimated the potential percentage of base-year emission allowances that 8 would be necessary to rise \$US 14.2 billion depending on the different values for one 9 tCO₂ (Table 3) using a simple formula: ((cost of 50 % REDD)/unit price)/base year 10 emissions). Our estimates suggest that sufficient funds could be raised by emissions-11 trading allowances representing approximately 5% of global base year emissions if the 12 value of emission allowances is similar to current market price for CO₂equivalent (Table 13 3). The IWG-IFR proposed that REDD would be best financed by a range of options 14 including bilateral and multilateral funds through direct funding from national budget of 15 developed countries, emissions of rainforests bonds and estimates that auctioning of 16 allowances could raise as much as EUR 4 to 18 billion (\$US 6 to 27 billion) in 2015 17 (IWG-IFR 2009), a statement that our calculations support. Clearly, a financial 18 mechanism indirectly linked with the carbon market could generate significant income 19 for a REDD fund.

20

21 *(ii) On the feasibility of replenishing a REDD fund*

Whether relying on auctioning of allowances or not, political feasibility is ofparamount importance with regard to non-market REDD financing options. The IWG-

1 IFR indicates that a "crucial element in financing is the establishment of commitments by 2 developed country financially to reward a given amount of mitigation". A main issue, up 3 to Copenhagen and beyond, is therefore; what are the best incentives and institutional 4 arrangements that will allow REDD to mobilize sufficient financial resources in addition 5 to existing ODA? Evidence suggest that, in the last decade, developed countries have 6 substantially increased their ODA targeting global health issues (Heller 2009; McCoy et 7 al. 2009; Ravishankar et al. 2009) although critics have pointed out that the total ODA for 8 health nevertheless falls short from the developed countries' 0.7% pledge of gross 9 internal product (Gostin and Lok 2009; Schieberg et al. 2007). One analysis indicates 10 that, between 1990 and 2007 development assistance for health (DAH) increased from 11 approximately \$US 5 to 21 billion per year (Ravishankar et al. 2009) while other figures 12 suggest that DAH increased by 179% between 2001 and 2006 (Kates et al. 2008). A 13 critical analysis of the ODA pledged for global health highlights lessons for REDD. 14 First, DAH increased largely because of an increase in public funding especially 15 in the USA, where a substantial increase in *in-kind* contribution (e.g. technical assistance 16 and commodity aid) and an increase in private donation and philanthropy was seen 17 (Heller 2009; Ravishankar et al. 2009). Private sources represented 19% of DAH in 1998 18 and 26.7% in 2007, tax benefits and corporate social responsibility programs playing an 19 important role as incentives (Heller 2009). Philanthropic interests for REDD already 20 exist with some well known champions such as His Royal Highness the Prince of Wales 21 and several foundations, such as the David and Lucile Packard Foundation, the Ford 22 Foundation, the Blue Moon Fund, etc., being already actively involved in supporting a 23 variety of REDD activities. The future financing mechanism should explicitly allow their

1	continued participation in financing while ensuring countries' ownership of REDD
2	activities and stability of funding objectives (Schieber et al. 2007; Sridhar 2009).
3	Second, the expansion of global expenditure for health was accompanied with a
4	change in institutional framework with a decreased in funding channeled through the
5	various UN agencies and the regional development banks (Ravishankar et al. 2009) as
6	well as an increased role for international health NGOs (McCoy et al. 2009). According
7	to McCoy et al (2009), some 75% of DAH was channeled bilaterally in 2006, NGOs
8	often assisting government in channeling support. Furthermore, two international public-
9	private partnerships, the Global Health Fund, aimed at combating HIV/AIDS,
10	tuberculosis and malaria, and the Global Alliance for Vaccines and Immunization provide
11	yet another avenue to channel both public and private funds. The institutional framework
12	for REDD therefore will necessitate careful consideration. The proliferation of actors in
13	global health has led to some degrees of confusion (McCoy et al 2009; Schieberg et al
14	2007; Sridhar 2009) a concern also present for REDD given the number of initiatives that
15	are emerging (e.g. Forest Carbon Partnership Facility, UN-REDD, Forest Investment
16	Program, Congo Basin Forest Fund, International Tropical Timber Organization -
17	Reducing Deforestation and Forest Degradation and Enhancing Environmental Services).
18	Expansion of the sources of replenishment for a REDD fund will therefore have to pay
19	attention to harmonization (i.e. coordination among donors), alignment (i.e. coordination
20	with developing countries development goals and policies) and coherence (i.e. ensuring
21	coherence of the overall ODA agenda) (Schieberg et al 2007; Sridhar 2009).
22	Finally, the international profile of global health rose as the issue began to be
23	considered as one of foreign policy (Reich and Takemi 2009; Sridhar 2009). Japan, in

1	particular, views global health as a matter of national security and economic stability.
2	Since the publications of the Fourth Assessment Report of the Intergovernmental Panel
3	on Climate Change (IPCC 2007) and of the economical review of Sir Nicholas Stern
4	(Stern 2007), the international profile of climate change and of REDD has been rising
5	constantly. Between September and November 2009, for example, there has been a
6	multiplication of meetings of, and statements by, Heads of States on climate change. The
7	end point of the negotiations at COP 15 in Copenhagen will be key in raising the profile
8	of REDD as one issue of importance for global policy.
9	
10	(iii) The special case of bunker fuels
11	At the workshop on policy approaches and positive incentives for REDD in
12	Accra, August 2008, Tuvalu proposed to either apply a levy on international aviation and
13	maritime transport or auction allowances under a self-contained cap and trade regime for
14	international transport to generate funds to support REDD activities
15	(FCCC/AWGLCA/2008/CRP.5, FCCC/AWGLCA/2008/CRP.4). Under the IPCC's
16	guidelines, emissions from international aviation are not counted towards national
17	emission totals and are not classified under national emissions from transport (IPCC
18	1997). Fuel emissions sold to ships or aircraft engaged in international transport are
19	reported by the country where the fuel is loaded but are excluded from that country's
20	national total. In other words, all civil domestic flights inside a country are classified as
21	domestic emissions, and ships not engaged in international transport are accounted for
22	nationally, regardless of the length of a journey (Yamin and Depledge 2004). Emissions
23	from international bunker fuels are regulated by the International Civil Aviation

1	Organization and the International Maritime Organization rather than the KP^1 . As a
2	result, both organizations have been leading policy option discussions. Limitation of
3	bunker fuels under the present climate change regime is contentious, especially regarding
4	policy issues surrounding allocation and control options (Yamin and Depledge 2004).
5	The European Union is currently heading discussions, hoping to have all flights arriving
6	or departing the European Union covered by their Emissions Trading Scheme by 2012
7	(European Commission 2007).
8	Emissions from international aviation and navigation are reported to be 0.208
9	$GtCO_2 yr^{-1}$ (FCCC/TP/2003/3) and 0.546 $GtCO_2 yr^{-1}$ (IMO 2000) respectively, summing
10	$0.754 \text{ GtCO}_2 \text{ yr}^{-1}$. These emissions are made up of both developed and developing
11	countries, who emit approximately $11.7 \text{ G} \text{tCO}_2 \text{ yr}^{-1}$ (FCCC/SBI/2005/L.26) and 22.2
12	$GtCO_2yr^{\text{-1}}(FCCC/SBI/2006/26$) respectively, summing 33.86 $GtCO_2yr^{\text{-1}}released$
13	globally. Therefore, slightly more than 2 percent of global emissions are a result of
14	international aviation and navigation. International aviation and navigation emissions
15	would be sufficient to offset 17 percent of the REDD emissions. However, with air
16	traffic expected to grow no more than 4.7 percent (IPCC 1999) and seaborne traffic by no
17	more than 3 percent (IMO 2000). Because of both the slow expected growth of
18	emissions from bunker fuel and because these emissions are regulated under the
19	International Civil Aviation Organization and the International Maritime Organization,
20	we believe that the proposal to use a non-offset mechanism to link bunker fuel with a
21	non-offset REDD fund might be limited.

¹ Article 2.2 of the KP states that Parties to the protocol shall "pursue limitation or reduction of emissions... from aviation and marine bunker fuels, working through ICAO and IMO, respectively."

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2 Conclusion: The future of REDD financing.

3

4 Besides our study, other models have analyzed the use of international financing to 5 reduce forest loss in the context of climate change. The Eliasch Review focuses on the 6 scale of finance required and on the mechanisms that could effectively reduce forest 7 carbon emission, helping to stabilize atmospheric GHG concentrations (Eliasch 2008). 8 The review examines how mechanisms to address forest loss and incentives can both 9 contribute to poverty reduction and preserve other ecosystem services. One of the central 10 elements of the Eliasch Review is the inclusion of the forest sector in global carbon 11 markets, which will lower the costs of reducing emissions thus eventually translating into 12 higher emissions targets. The Eliasch Review suggests that the inclusion of REDD could 13 provide the financing and produce the proper incentive structure for the reduction of 14 deforestation rates by up to 75 percent in 2030. The Environmental Defense Fund 15 recently developed another analytical model surveying forest carbon finance and states 16 that international carbon markets are the first, and possibly last, chance to create 17 economic value for forests at a level commensurate with large-scale deforestation 18 (Schwartzman 2008). The Environmental Defense Fund suggests that a variety of market 19 and non-market approaches are needed to address different countries and circumstances, 20 but that a robust forest carbon market, initially for high emitting countries, will free up 21 aid funds for non-market mechanisms. It further concludes that developed countries lack 22 the political will and resources to fund the indefinite protection of tropical forests. 23 Conversely, in 2008, Greenpeace International proposed a mechanism to raise sufficient

1	funds to substantially reduce deforestation and related emissions while avoiding many of
2	the difficulties related to rewarding and incentivizing market-related deforestation
3	reductions (Hare and Macey 2008).
4	We suggest that the best financial approach for REDD is a flexible REDD
5	mechanism with two tracks, a market track serving as mitigation option for developed
6	countries and a fund track serving as mitigation option for developing countries. This
7	idea has been incorporated in a submission by Panama, Paraguay and El Salvador to
8	AWG-LCA (FCCC/AWGLCA/2009/MISC.4 (Part II). Acceptable activities under the
9	REDD market track would be those in which a differential in emissions or carbon stock
10	could be measured such as reductions of emissions from deforestation and forest
11	degradation as well as increment in forest carbon stocks. The second track would be
12	fund-based and allow inclusion of important LULUCF activities such sustainable forest
13	management and conservation activities as well as deforestation and forest degradation
14	for countries that so desire.
15	A flexible REDD mechanism would allow to account for the different national
16	circumstance of big emitter countries. Deforestation in Brazil accounts for 1.17 Gt CO ₂
17	or 46 percent of the global emissions from deforestation and Brazil has indicated, since
18	the beginning of the REDD negotiation, that it will not participate in a market mechanism

19 (FCCC/AWGLCA/2008/MISC5; Potvin et al. 2008). At the same time, India and China,

20 where forest are regrowing, have been strong proponents of forest conservation and

sustainable forest management (Potvin and Bovarnick 2008). REDD would therefore

22 yield a real benefit to climate if these three countries, the largest developing countries

emitters, were to participate in the non-offset track 2 since REDD would act as one of
 their mitigation commitment.

3 In support of this flexible two track REDD mechanism, our financial flow 4 analysis suggests that while, on the one hand, demand for hypothetical REDD credits 5 could, in theory, represent an annual potential of 6.628 GtCO_2 compared with 100 percent 6 emissions from deforestation of 3.71 GtCO_2 , the real demand for hypothetical REDD 7 credits will depend on the proportion of emissions reduction commitment that would be 8 available for offsets. The current proposals by the EU and Australia suggest that these 9 values will be low, around 5 percent of these countries 1990 emissions, which would not 10 be sufficient to create the necessary demand for hypothetical REDD credits. On the other 11 hand, our analysis suggests that, provided the correct political profile and institutional 12 arrangements, important sums could be leveraged for a REDD fund.

13 Thus the claim that only a global carbon market can mobilize sufficient resources 14 (Schwartzman 2008) might not be true. As observed in the financing of global health, 15 mutual accountability, i.e. the fact that recipient countries are accountable for the results 16 of the action undertaken and that donor countries are likewise accountable for the support 17 pledge (Schieberg et al 2007), will be an essential for public funding, private donors and 18 philanthropic support of REDD. The negotiations on measuring, reporting and verifying 19 that will continue after Copenhagen will therefore remain one of the most important 20 negotiation issues. At the same time increased attention should be given to identifying 21 replenishment sources for a REDD fund.

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Table 1: Annual potential supply of REDD credits generated, under a *gross-net*

2 accounting, from (A) different caps over the 1990 or hypothetical 2005 base year

3 emissions or (B) through increased Annex I countries emission reductions under the post-

4 Kyoto commitments. Global base year emissions for Annex I countries were summed

5 from FCCC/SBI/2007/30. Emissions reduction can be compared with the maximum

6 REDD supply, which was calculated to be $1.85 \text{ GtCO}_2 \text{ yr}^{-1}$.

	GtCO ₂ yr ⁻¹	GtCO ₂ yr ⁻¹
	Base year	Base year
	(1990)	(2005)
	18.71	18.18
A. Target increased scenarios		
Emission reduction target of 5%	0.936	0.909
Emission reduction target of 15%	2.81	2.72
Emission reduction target of 30%	5.61	5.45
B. Cap-based scenarios		
Proportion of 1990 emissions available for REDD 5%	0.936	0.909
Proportion of 1990 emissions available for REDD 10%	1.87	1.82
Proportion of 1990 emissions available for REDD 15%	2.81	2.72

Table 2: Estimates of the volume of the voluntary carbon markets from various sources. 1 Units reflect $tCO_2 \text{ yr}^{-1}$. Median of growth expectations from survey respondents of the 2 3 estimates reflect the overall voluntary markets but do not include the World Bank Forest 4 Carbon Partnership Facility and are not limited to forestry. Some of the estimates for 5 past volumes were future projections at the time when they were published and, to the 6 best of our knowledge, remain the best available estimates at the date of submission. 7 (Data are the courtesy of Dr Till Neef, EcoSecurities Inc. personal communication 2009)

8

Time frame	(Hamilton et al. 2007)	(Butzengeiger 2005)	(The Climate Group 2006)	(Harris 2006)	(The World Bank 2007a)
pre 2002	35m				
2002	13m				
2003					
2004	15.1m		3-5m		
2005		1.4m			
2006	23.7m		20-50m		20m
2007	47.4m		100m		
2008	71.1m	6.3m		7m	
2009	106.7m				
2010	160m				
2011	240m				
2012	307.2m			36m	
2013	384m	NA			

9

Table 3: Estimates of a potential percentage of base-year emission allowances needed to

2 generate the sufficient money to replenish a REDD fund. As in Table 1, we used 18.71

3 and 18.18 $GtCO_2$ yr⁻¹ respectively for the 1990 and 2005 base year emissions and based

- 4 our estimates on the need to generate an income of \$US 14.2 billion per year for REDD.

Price of REDD Trading Unit	Percent base year emissions 1990	Percent base year emissions 2005
\$1.00	75.8%	78.1%
\$5.00	15.2%	15.6%
\$15.00	5.1%	5.2%

- .

Figure 1: Effect of UNFCCC's Annex I emissions reduction target on the demand for REDD associated with different accounting system for LULUCF for our two base years, 1990 and 2005 are calculated as the sum of developed countries using the most recent reporting of emissions (FCCC/SBI/2007/30). The horizontal black line represents 50% of the emissions generated by REDD, while the horizontal dotted line represents the expected value of Certified Emissions Reductions (CERs) expected for 2012 (Fenhann 2007).



- 1 Figure 2: Effect of cap size on the demand for REDD associated with different
- 2 accounting system for LULUCF and the two base years as in Figure 1. The horizontal
- 3 black line is *equivalent* to 50% of global REDD emissions.



1 Annex: Calculation of the potential supply of REDD generated carbon credits, assuming

- 2 100 percent reduction in deforestation and the exclusion of countries with either net-
- 3 increases in annual forest cover or an insignificant change or where insufficient
- 4 information exists to perform the calculations. Data for column 2 and 3 are based on the
- 5 FAO State of the World's forests 2007 (FAO 2007), except where noted in *italics*, where
- 6 data is based on the IPCC's 2003 Good practice guidance for land use, land-use change
- 7 *and forestry* (IPCC 2003).
- 8

				Potential quantity
	Annual rate change	Carbon in		of emissions
	(2000-2005)	biomass	CO ₂ in biomass	reduction
	1000ha	tones/ha	tCO ₂ /ha	tCO ₂
Africa				
Angola	-125	82	300.612	37576500
Benin	-65	97.5	357.435	23233275
Botswana	-118	12	43.992	5191056
Burkina Faso	-24	44	161.304	3871296
Burundi	-9	93.5	342.771	3084939
Cameroon	-220	90	329.94	72586800
Central African Republic	-30	123	450.918	13527540
Chad	-79	20	73.32	5792280
Comoros	-1	32.5	119.145	119145
Democratic Republic of				
the Congo	-319	173	634.218	202315542
Equatorial Guinea	-15	70	256.62	3849300
Eritrea	-4	16	58.656	234624
Ethiopia	-141	19	69.654	9821214
Gabon	-10	167	612.222	6122220
Ghana	-115	90	329.94	37943100
Guinea	-36	95	348.27	12537720
Guinea-Bissau	-10	29	106.314	1063140
Kenya	-12	95	348.27	4179240
Liberia	-60	144	527.904	31674240
Madagascar	-37	244	894.504	33096648
Malawi	-33	47	172.302	5685966
Mali	-100	19	69.654	6965400
Mauritania	-10	26	95.316	953160
Mozambique	-50	31	113.646	5682300
Namibia	-74	30	109.98	8138520
Niger	-12	9	32.994	395928
Nigeria	-410	126	461.916	189385560
Republic of the Congo	-17	231	846.846	14396382
Senegal	-45	43	157.638	7093710
Sierra Leone	-19	69.5	254.787	4840953
Sudan	-589	23	84.318	49663302
Tanzania	-412	64	234.624	96665088

Uganda 66 38 139.308 1198048 Zambia 445 27 98.982 44040990 Asia	Тодо	-20	77.5	284.115	5682300
Zambia 445 27 98.982 44046992 Zimbabwe -313 31 118.646 35571192 Asta	Uganda	-86	38	139.308	11980488
Zimbabwe -313 31 113.646 3557119g Asia	Zambia	-445	27	98.982	44046990
Asia Afghanistan -30 7 25.62 769860 Armenia -4 64 234.624 938496 Bangladesh -2 36 131.976 263952 Cambodia -219 121 443.566 97145334 Indonesia -1871 67 245.622 459558762 Kazakhstan -6 41 150.306 901833 Laos -778 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 16741888 Nepal -53 133 487.578 25841634 North Korea -157 136 498.576 7143876 Philippines -157 136 498.576 78276432 South Korea -7 41 150.906 239758 Thaland -50 73	Zimbabwe	-313	31	113.646	35571198
Afghanistan -30 7 25.662 76986C Armenia -4 64 234.624 938466 Bangladesh -2 36 131.976 283952 Cambodia -219 121 443.586 97145334 Indonesia -1871 67 245.622 45958762 Kazakhstan -6 41 150.306 901833 Laos -78 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.266 17039566 Myanmar -466 98 359.268 167418886 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598400 <td>Asia</td> <td></td> <td></td> <td></td> <td></td>	Asia				
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Bangladesh 2 36 131.976 263952 Cambodia 219 121 443.586 97145334 Indonesia 1871 67 245.622 45958762 Kazakhstan 6 41 150.306 901836 Laos 78 92 337.272 26307216 Malaysia -140 168 615.888 86224322 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 167418886 Nepal -53 133 487.578 25841634 North Korea -127 37 135.642 1726534 Philippines -157 136 498.576 21438765 Sri Lanka -30 21 76.986 2309587 Thailand -59 49 179.634 10598406 Latin America -303 21 76.986 2309587 Brizian -150 73 267.618 <	Armenia	-4	64	234.624	938496
Cambodia -219 121 443.586 97145334 Indonesia -1871 67 245.622 45958762 Kazakhstan -6 41 150.306 901833 Laos -78 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 167418886 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 1058400 Latin America - - 70 90 329.94 89083800 Brazil -3103 103 </td <td>Bangladesh</td> <td>-2</td> <td>36</td> <td>131.976</td> <td>263952</td>	Bangladesh	-2	36	131.976	263952
Indonesia -1871 67 245.622 459558762 Kazakhstan -6 41 150.306 901836 Laos -78 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 16741888 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 1056840 Latin -7107 73 267.618 40142700 Bolivia -270 90 329.94 89063803 Brazil -3103 103 377.598 1171	Cambodia	-219	121	443.586	97145334
Kazakhstan 6 41 150.306 901836 Laos 78 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia 83 56 205.296 17039566 Myanmar -466 98 359.268 167418886 Nepal -53 133 487.578 25841634 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America -30 21 76.986 2309580 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 <	Indonesia	-1871	67	245.622	459558762
Laos -78 92 337.272 26307216 Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 167418886 Nepal -53 133 487.578 25841634 North Korea -127 37 135.642 171226534 Pakistan -43 136 498.576 21438766 Fhilippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Lain America -30 21 76.986 2309580 Colombla -150 73 267.618 40142700 Brazil -3103 103 377.598 117168659 Colombla -47 133 487.578 22916166 Evador -55 107 370.266	Kazakhstan	-6	41	150.306	901836
Malaysia -140 168 615.888 86224320 Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 167418886 Mepal -53 133 447.578 225841634 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America -70 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -474 133 487.578 22916166 Ecuador -198 75.5 276.783 5480334 El Salvador -5 107 370.266	Laos	-78	92	337.272	26307216
Mongolia -83 56 205.296 17039566 Myanmar -466 98 359.268 167418885 Nepal -53 133 487.578 25841634 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438765 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America - - 73 267.618 40142700 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -5 107 370.266 1851333 Guatemala -54 126 461.916 24943464	Malaysia	-140	168	615.888	86224320
Myanmar -466 98 359.268 16741888 Nepal -553 133 487.578 25841634 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America -303 73 267.618 40142700 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Euador -198 75.5 276.783 54803034 El Salvador -55 107 370.266 1851330 Guatemala -54 126 461.916	Mongolia	-83	56	205.296	17039568
Nepal -53 133 487.578 25841634 North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 21438766 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thalland -59 49 179.634 10598406 Latin America -30 21 76.986 2309580 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 5480334 El Salvador -5 107 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 <t< td=""><td>Myanmar</td><td>-466</td><td>98</td><td>359.268</td><td>167418888</td></t<>	Myanmar	-466	98	359.268	167418888
North Korea -127 37 135.642 17226534 Pakistan -43 136 498.576 21438766 Philippines -157 136 498.576 721438766 South Korea -7 41 150.306 1052142 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America - 70 90 329.94 89083800 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 5480334 El Salvador -5 101 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76	Nepal	-53	133	487.578	25841634
Pakistan -43 136 498.576 21438765 Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sit Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America - - - - - Argentina -150 73 267.618 40142700 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 5480304 El Salvador -5 101 370.266 185133 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -156 52.5 192.465	North Korea	-127	37	135.642	17226534
Philippines -157 136 498.576 78276432 South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America - - 90 329.94 89083800 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 54803034 El Salvador -5 107 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -156 52.5 192.465 30024540 Mexico -260 27 98.982 25735320 Nicaragua -70 138 505.90	Pakistan	-43	136	498.576	21438768
South Korea -7 41 150.306 1052142 Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America - - 73 267.618 40142700 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 54803034 El Salvador -54 126 461.916 24943464 Haiti -1 76 278616 278616 Honduras -55 101 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -55 192.465 30024540 Mexico -260 27 98.982 25735320	Philippines	-157	136	498.576	78276432
Sri Lanka -30 21 76.986 2309580 Thailand -59 49 179.634 10598406 Latin America	South Korea	-7	41	150.306	1052142
Thailand -59 49 179.634 10598406 Latin America	Sri Lanka	-30	21	76.986	2309580
Latin America Argentina -150 73 267.618 40142700 Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 54803034 El Salvador -5 101 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -156 52.5 192.465 30024540 Mexico -260 27 98.982 25735320 Nicaragua -70 138 505.908 35413560 Panama -3 144 527.904 1583712 Paraguay -179 29.5 108.147 19358313 Peru -94 122.5 449.085 4221390 Venezuela -288	Thailand	-59	49	179.634	10598406
Argentina-15073267.61840142700Bolivia-27090329.9489083800Brazil-3103103377.5981171686594Colombia-47133487.57822916166Ecuador-19875.5276.78354803034El Salvador-5101370.2661851330Guatemala-54126461.91624943464Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-288116.5427.08912301632Oceania-288116.5427.08912301632Papua New Guinea-13929106.3141477646Haiti-176278.616278.616	Latin America				
Bolivia -270 90 329.94 89083800 Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 54803034 El Salvador -5 101 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -156 52.5 192.465 30024540 Mexico -260 27 98.982 25735320 Nicaragua -70 138 505.908 35413560 Panama -3 144 527.904 1583712 Paraguay -179 29.5 108.147 19358313 Peru -94 122.5 449.085 42213990 Venezuela -288 116.5 427.089 123001632 Oceania - 29 106.314 14777	Argentina	-150	73	267.618	40142700
Brazil -3103 103 377.598 1171686594 Colombia -47 133 487.578 22916166 Ecuador -198 75.5 276.783 54803034 El Salvador -5 101 370.266 1851330 Guatemala -54 126 461.916 24943464 Haiti -1 76 278.616 278616 Honduras -156 52.5 192.465 30024540 Mexico -260 27 98.982 25735320 Nicaragua -70 138 505.908 35413560 Panama -3 144 527.904 1583712 Paraguay -179 29.5 108.147 19358313 Peru -94 122.5 449.085 42213990 Venezuela -288 116.5 427.089 123001632 Oceania -2 29 106.314 14777646 Haiti -1 76 278.616 278616<	Bolivia	-270	90	329.94	89083800
Colombia-47133487.57822916166Ecuador-19875.5276.78354803034El Salvador-55101370.2661851330Guatemala-54126461.91624943464Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646Caribbean-76278.616278616	Brazil	-3103	103	377.598	1171686594
Ecuador-19875.5276.78354803034El Salvador-5101370.2661851330Guatemala-54126461.91624943464Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632Oceania-13929106.31414777646Haiti-176278.616278616	Colombia	-47	133	487.578	22916166
El Salvador-5101370.2661851330Guatemala-54126461.91624943464Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646Haiti-176278.616278616	Ecuador	-198	75.5	276.783	54803034
Guatemala-54126461.91624943464Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632Oceania-13929106.31414777646Haiti-176278.616278616	El Salvador	-5	101	370.266	1851330
Haiti-176278.616278616Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646Haiti-176278.616278616	Guatemala	-54	126	461.916	24943464
Honduras-15652.5192.46530024540Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646Haiti-176278.616278616	Haiti	-1	76	278.616	278616
Mexico-2602798.98225735320Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646Haiti-176278.616278616	Honduras	-156	52.5	192.465	30024540
Nicaragua-70138505.90835413560Panama-3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646CaribbeanHaiti-176278.616278616	Mexico	-260	27	98.982	25735320
Panama3144527.9041583712Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646CaribbeanHaiti-176278.616278616	Nicaragua	-70	138	505.908	35413560
Paraguay-17929.5108.14719358313Peru-94122.5449.08542213990Venezuela-288116.5427.089123001632OceaniaPapua New Guinea-13929106.31414777646CaribbeanHaiti-176278.616278616	Panama	-3	144	527.904	1583712
Peru -94 122.5 449.085 42213990 Venezuela -288 116.5 427.089 123001632 Oceania Papua New Guinea -139 29 106.314 14777646 Caribbean -1 76 278.616 278616	Paraguay	-179	29.5	108.147	19358313
Venezuela -288 116.5 427.089 123001632 Oceania	Peru	-94	122.5	449.085	42213990
Oceania -139 29 106.314 14777646 Caribbean -1 76 278.616 278616	Venezuela	-288	116.5	427.089	123001632
Papua New Guinea -139 29 106.314 14777646 Caribbean -1 76 278.616 278616	Oceania				
Caribbean Haiti -1 76 278.616 278616	Papua New Guinea	-139	29	106.314	14777646
Haiti -1 76 278.616 278616	Caribbean				
	Haiti	-1	76	278.616	278616