The Little Biodiversity Finance Book

GCP
GLOBAL CANOPY PROGRAMME

Methodology Appendix

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Please cite this publication as:
Cranford, M., Oakes, N., Leggett, M., Parker, C., ed., 2012. The Little Biodiversity Finance Book Methodology Appendix, Global Canopy Programme; Oxford.

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This is an annex of the third edition of the Little Biodiversity Finance Book, first published October 2010.

Published by: Global Canopy Programme, 23 Park End Street, Oxford, OX1 1HU, UK

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INTRODUCTION

The Little Biodiversity Finance Book (LBFB) is first and foremost a review of the information available on biodiversity finance. The documents and organisations that provide this information are clearly stated throughout this methodology appendix, and most are cited directly in the LBFB main text.

Much of the work on which the LBFB builds provides either:

1) estimates of the scale of finance through a generic mechanism or market, which required additional investigative work and/or incorporating assumptions to estimate how much of that finance could actually be considered biodiversity or ecosystem finance,

or

2) estimates of revenues raised through mechanisms that are not ecosystem-specific and the revenues from which could be used for any global issue, so assumptions had to be made about how much revenue might be used for biodiversity.

Generally, Indirect Market Mechanisms faced the first issue, Other-Market Mechanisms faced the second issue, and Non-Market mechanisms faced one or both. Direct Market Mechanisms are the best accounted for in the available literature, but that accounting is restricted for some mechanisms, meaning some assumptions had to be made to reach global estimates.

Where it was necessary to make assumptions, they were arrived at based on the cited work, or by borrowing realities or assumptions from other relevant mechanisms. In some cases, reasonable assumptions could not be made, and so no estimate was made.

For the current scale of finance, the estimates and any assumptions used are intended to be conservative, meaning that they are likely to be underestimates. There is a large degree of uncertainty in all of these estimates. Rather than overestimate, and risk illustrating an incorrectly positive situation, which could lead to misplaced complacency, it was better to underestimate and risk showing an incorrectly negative scenario, which could lead to misplaced urgency. Considering the 2010 biodiversity targets were not reached, a sense of urgency would be better than complacency, and so the LBFB errs towards providing underestimates of current finance.

For the future levels of finance, the low estimate for each mechanism was developed with the aim of providing a feasible estimate of biodiversity finance in 2020 assuming that current political and/or market momentum is maintained. The high-end estimates were developed based on the question of what might be feasible with increased political will. These high estimates provide simply an idea of what is realistically possible. With enough political will, many of them could raise many billions of dollars more than the LBFB indicates.

The aim of the LBFB is to provide a reasonable idea of the scale of biodiversity finance that is currently available and could be generated in the future. The estimates within are not precise, but they build on a wealth of research already carried out and provide a good idea of how many billions are already being generated for biodiversity and ecosystems, and how many billions more policy-makers could directly or indirectly generate.

The following pages describe how the LBFB arrived at estimates of scale for each revenue generation mechanism. The mechanisms follow the order of the LBFB itself and each description follows the same structure:

- Overview
- Current Funding
- Low Future Funding
- High Future Funding
- Notes

DIRECT MARKETING MECHANISMS

DIRECT MARKET MECHANISMS
DIRECT ECOSYSTEM SERVICE FEES

Overview
The LBFB defines direct ecosystem service (ES) fees as payments for ecosystem services (PES) that are paid for by the beneficiary (either directly or via a fund), rather than any government or non-governmental organisation (NGO) paying on behalf of the beneficiary. These other forms of finance are covered under the mechanisms of Philanthropy and Domestic Budget Allocation, respectively. The type of Direct ES Fees (or beneficiary-pays PES) that is most prolific and for which the most data is available is payments for watershed services (PWS). As such, our estimate here focuses on private PWS.

2010 Funding
Drawing on expert opinion and their own accounting, Forest Trends estimate that the scale of "Privately Directed Watershed Management Payments" is approximately $5 million globally (Ecosystem Marketplace, 2012). Earlier version of their work indicates that this estimate is consistent back to 2010. Focusing only on water fees, this estimate would inherently be an underestimate. Outside of the water sector, however, there is no evidence of wide usage of, or large amounts of finance being generated from direct ES fees. As such, this estimate is believed to accurately approximate reality.

Low Future Funding
Ecosystem Marketplace (2012) estimates that the global value of private PWS could be approximately $50 million by 2020.

High Future Funding
In an earlier version of their work, Ecosystem Marketplace (2008) estimated that private PWS could be $2 billion by 2020. Both the current (lower) and past (higher) estimates are based on the information of PWS available and expert opinion at the time the estimate was determined. In the LBFB we respectively present these as the lower and upper estimates of what could be achieved by 2020.

Notes
Ecosystem Marketplace recently launched Watershed Connect (www.watershedconnect.com), an online community for watershed protection. As part of this initiative, they are building an inventory of projects that use economic instruments for watershed protection implemented around the world. In the future, this will help better estimate the scale of private PWS.

DIRECT MARKET MECHANISMS

DIRECT BIODIVERSITY FEES

Overview

Direct biodiversity fees are defined as payments, fees, or charges paid for access to or in situ use of biodiversity, and specifically access or use that is not extractive or degrading. If that access or use were extractive or degrading, the payment would be considered a Natural Capital Levy. Alternatively, if the use were based on ecosystem services, it would be a Direct Ecosystem Service Fee. Under the LBFB definition, Direct Biodiversity Fees are broadly synonymous with site-based revenues for protected area (PA), which includes revenues from entrance fees, concessions, licences, etc; but can also include off-site revenues such as biodiversity fees collected at hotels or airports.

2010 Funding

Bovarnick et al. (2010) carried out the most thorough survey of PA financing to date. They focused on 20 countries in Latin America and the Caribbean (LAC). The data collected covered 207 million hectares of PA (representing 42% of LAC PA surface area) and indicated that nearly USD 44 million of site-based revenues were generated and captured by these PAs. That is an average of $0.21/Ha. In 2010, the total area under protection according to the World Database of Protected Areas (WDPA, 2011) was over 1.7 billion hectares (notably about 7.6% of this is marine area out to 12 nautical miles, which is on par with the LAC region where according to WDPA marine areas are around 5.5% of the total). Applying the average $0.21/Ha gives an estimated USD 370 million in global PA revenues. That is a large underestimate based on evidence, including Bovarnick et al. (2010), indicating that PA budgets (and revenues) are lower in Latin America then most other places in the world.

The definition of Direct Biodiversity Fees in the LBFB also includes off-site biodiversity specific revenues, in particular biodiversity fees collected at airports. This is known to occur in a few countries in Latin America, specifically Belize, Costa Rica and Guatemala. Incorporating those funds into the estimates does not drastically change the results, but brings the lower bound estimate for global Direct Biodiversity Fees closer to USD 0.4 billion.

Low Future Funding

The low future estimate assumes that Aichi Target 11 is reached and that 17% of global terrestrial and inland water area and 10% of coastal and marine area is under protected status by 2020. Maintaining the approach of estimating a lower bound by extrapolating the average revenue from Latin America to all PAs globally, the low future estimate for Direct Biodiversity Fees is USD 0.5 billion annually.

High Future Funding

If Target 11 is reached and the average on-site revenue could be approximately doubled to $0.5/Ha, then the total on-site PA revenues could be around $1 billion. Further inclusion of off-site fees could provide another nearly USD 1 billion if a global average of $1 of airport or other off-site tourist fees could be collected for each tourist visit (based on an annual average of over 0.9 billion of international visits to all countries in 2007-2010; World Bank, 2012). Overall, Direct Biodiversity Fees could generate around USD 2 billion if greater effort to capture those revenues were implemented.

Notes

The key assumption in these estimates is the level of revenue that could be raised for biodiversity rich areas, which here are represented as PAs. The data from Latin America provides an excellent foundation, but likely lead to global underestimates. This aligns with the approach of the LBFB to err on the side of conservative estimates, but more research on the true level of revenues currently raised by and for protected areas would be a great help to both understanding current and future biodiversity finance.

DIRECT MARKET MECHANISMS

CAP-AND-TRADE MARKET

Cap-and-trade markets are used to improve environmental stocks (e.g. fish stocks) and flows (e.g. water quality), but they still permit a certain level of environmental degradation to take place (i.e. the cap). Further, they aim to provide efficiency benefits, based on the assumption that some participants can reduce their environmental impact at lower costs than other participants. That reduction may occur through technology uptake, but may also be due to management changes, or even simply reducing effort (e.g. reducing the number of hours spent fishing). Combining these factors, even though the scale of trading that occurs can be measured, it is impossible with current data availability to estimate how much of that value represents a direct investment in improving biodiversity and ecosystem services. As such, no estimates of the revenue generating potential of cap-and-trade markets are made.

DIRECT MARKET MECHANISMS

OFFSET MARKET: FOREST CARBON

Overview
There are two types of ecosystem-based offset market that currently exist in the world, forest carbon and biodiversity offsetting. Although they are different application of the same mechanism, the LBFB estimated the size of each market separately. Forest carbon is dealt with first. The estimates for the forest carbon market are based on the data collected by Ecosystem Marketplace for its series of "State of the Forest Carbon Market" reports.

2010 Funding
Based on data from a survey of forest carbon projects, Diaz et al. (2011) estimated that the total forest carbon market was approximately USD 177 million in 2010. Their market data indicated that around 96.4% of the market value was from primary markets, meaning that around USD 171 million was generated by forest carbon projects in 2010.

Low Future Funding
Diaz et al. (2011) also found that 373.1 MtCO2e is already contracted for the 5-year period 2011-2015, which averages 74.62 MtCO2e per year. Assuming this volume of supply is maintained, and that with a steady demand the price achieved an average 5% annual compound growth (which brings it to $9-10 in 2020), the value of forest carbon offsetting in 2020 could be USD 717 million.

High Future Funding
Eliasch (2008) reported that in 2020 forest carbon markets based on a compliance mechanism could generate USD 7 billion annually. This is an order of magnitude greater than the LBFB's low future estimate of USD 0.7 billion. That seems reasonable based on the difference in order of magnitude seen in voluntary and compliance carbon markets more broadly. In 2009 and 2010, the voluntary carbon market respectively represented just 1.3% and 1.9% of all global carbon markets by volume of trade, and 0.3% (in both years) by value of trade (Peters-Stanley et al., 2011).

Notes
There is good accounting for the current scale of forest carbon markets. The biggest gap in research is in understanding the true scale of the future market if forest carbon was incorporated into a compliance mechanism, specifically the market dynamics if forest carbon were included in compliance carbon markets.

DIRECT MARKET MECHANISMS

OFFSET MARKET: BIODIVERSITY

Overview
As with forest carbon markets, Ecosystem Marketplace has taken great strides in accounting for biodiversity markets and offsets taking place around the world. It is this work that the LBFB cites and builds on.

2010 Funding
Madsen et al. (2011) estimate that biodiversity markets (i.e. "compensatory mitigation" schemes) generated USD 2.4-4 billion in 2010. They also highlight that this is likely an underestimate because transaction information is not available for the vast majority of programmes.

Low Future Funding
If the global value of biodiversity offsets increased 5% annually, they could collectively generate around USD 5 billion in 2020. This corresponds with the low-end of Ecosystem Marketplace's (2012) estimate that compliance biodiversity offsets could reach USD 5-8 billion in 2020. Ecosystem Marketplace (2012) also estimate that voluntary offsets could be USD 70 million in 2020, but this does not effect the estimate at the level of USD billions.

High Future Funding
For the high estimate, it is assumed the same 5% growth is coupled with the introduction of a large offsetting programme in Europe or an increase in small-scale programmes in developing regions. Europe seems poised for such a policy based on relevant policies being introduced in various EU member states including biodiversity offsetting pilots in the UK (Defra, 2012a) and interest from the European Commission (eftec, IEEP, et al., 2010). If it is assumed that a European programme would reach the scale of the US biodiversity banking programmes, then the high future estimate of the global value of biodiversity offsets in 2020 is around USD 10 billion.

Notes
The accounting of current biodiversity markets and offsetting could be improved if the data were available. That research could also help illustrate trends in market value as programmes and policies mature.

DIRECT MARKET MECHANISMS
BIOPROSPECTING

Overview
Although bioprospecting was originally hoped to be a great source of revenue for biodiversity and ecosystems, currently only one instutitionalised bioprospecting programmes exists. This provides the basis of current finance estimates, but does not provide much information for future estimates. Instead, future estimates are based on academic research that estimates the value of biodiversity to potential bioprospectors.

2010 Funding
The only institutionalised bioprospecting programme in 2010 is in Costa Rica. The country's National Institute of Biodiversity (INBio) generates some of its budget from contracts with institutions and companies. Around 2005, its budget was USD 6 million, 70% of which came from such contracts, meaning USD 4.2 million was generated from bioprospecting (WWF, 2009). INBio's financial statement from 2009 indicates a budget of USD 8 billion (INBio, 2009), but does not indicate how much revenues are generated from bioprospecting specifically. It appears, however, that around 50% of it could be related to contracts with research institutions or companies. Without more specific information, the estimate of USD 4.2 million is assumed to approximately hold in 2010. Only 10% of that, however, is directly reinvested in conservation (WWF, 2009), meaning that on the order of USD 420,000 in biodiversity finance is generated through bioprospecting.

Low Future Funding
Costello and Ward (2006) estimated that the mean value per hectare of the most biodiverse hotspot on the planet would be around USD 14/Ha. Adjusting that based on average species density and applying it to all of the world's hotspots implies that bioprospecting could be valued at USD 0.443 billion. That value aligns with the same value if the biodiversity finance raised through INBio were adjusted based on average species density and applied to all of those same hotspots, which is USD 0.425 billion. As such, USD 0.4 billion is applied in LBFB as an estimate of potential annual revenue.

High Future Funding
Costello and Ward (2006) indicate that their high-end estimate of the value of the most biodiverse hotspot is USD 65/Ha. If that is adjusted by average species density and applied to all global hotspots, the total value is USD 2.1 billion. Following the low future estimate, it is assumed this value is captured annually.

Notes
In regards to estimating potential revenues, bioprospecting is the mechanism in the LBFB with the most contradictory evidence. The estimates were developed based on current experience and academic literature, and so are reasonable estimates. The contradiction comes from the facts that 1) the market for naturally derived products is USD hundreds of billions annually (TEEB, 2009) and, 2) certain interest groups (e.g. pharmaceuticals) appear to be taking a large interest in the CBD process. Those points imply that even USD 2 billion annually might be low if there was a concerted effort to capture the genetic value of biodiversity. Particularly in light of the Nagoya Protocol, further research on the potential scale of revenues from bioprospecting is warranted.

INDIRECT MARKETING MECHANISMS

INDIRECT MARKET MECHANISMS
GREENING COMMODITIES: TIMBER

Overview
The aim of the LBFB is to identify new and additional biodiversity finance. In the case of existing commodity markets, this means estimating the portion of revenues generated by certified commodity sales that can be considered "for biodiversity." In theory, this portion is what would be considered a price premium for certified products.

2010 Funding
In 2008, the Forest Stewardship Council (FSC) reported that global sales of FSC certified wood products were at minimum USD 20 billion in 2007 (FSC, 2008) and continued to report this minimum market size in 2010 (FSC, 2010). This estimate was taken as a conservative minimum. To obtain an estimate of total market value in 2010, the FSC estimated market value was than increased based on the percentage of area certified by FSC compared to total certified forest area globally (from UNECE & FAO, 2010). This does essentially mean that the average market value of certified wood per hectare of forest certified was assumed constant over both FSC and PEFC certified areas globally. That led to an estimated market value of certified wood of USD 69 billion in 2010.

Once the total market size is conservatively estimated, only a portion of this can be considered new and additional finance for biodiversity and ecosystem services: the price premium. Evidence of a price premium for certified timber is highly variable, but on balance it appears that at least a small price premium exists in places where the majority of certified timber is produced. FSC (2009) carried out an extensive literature review, highlighting studies carried out in various contexts that reported price premiums ranging from 2-50%. Many of the reported premiums were 5-15%. After reviewing this document and the key primary sources it cited, a price premium of 5% was used to conservatively estimate the new and additional revenue for biodiversity generated through certified timber sales. Applying that to the total market estimate indicates that around USD 3.4 billion of ecosystem finance was generated through sale of certified wood in 2010.

Low Future Funding
From 2001-2006, the area of certified forest grew linearly. The rate of growth continued linearly, but slowed further 2006-2011 to an average 23 million hectares per year (UNECE & FAO, 2011). The greatest potential for future certification is in the tropics, where growth is occurring, but slow. As such, the low future estimate was determined based on a slightly slower, linear trend. The average increase in forested area over 2008-2011 was 18.3 million hectares. This was maintained to 2020 and the same average market value per hectare and price premium applied to get a low future estimated value of USD 5 billion in biodiversity finance.

High Future Funding
The high future estimate applied a different logic. Ecosystem Marketplace (2012) estimates that the market value of FSC certified wood could be USD 228 billion in 2020. In 2008-2011 FSC has linearly increased its market share of certified timber by nearly 2% each year. Maintaining that trajectory of market penetration out until 2020, an estimate of the total market value of certified wood is 408 billion (56% of which is FSC market share). Taking 5% of this, a high estimate of USD 20 billion is reached.

Notes
Estimates of biodiversity finance generated through certified timber could be greatly improved based on a better understanding of the market value of certified timber and the proportion of that value that can be considered going towards sustaining biodiversity and ecosystem services. An added difficulty is that as certified supply increases, it should inherently erode the price premium meaning that a premium will not exist in the long run. Even if a price premium does not exist, greater demand for certified timber and wood products will, meaning that certified wood should capture a larger market share of timber and wood products in the future. There is a wealth of further research that could be carried out to indentify the proportion of current and future certified wood revenues that support sustaining biodiversity and ecosystem services.

INDIRECT MARKET MECHANISMS

GREENING COMMODITIES: AGRICULTURE

Overview
Estimates of the biodiversity and ecosystem finance generated from certified agriculture are based on the same basic process of those for certified timber. First the total market size is estimated and then a price premium is assumed. It should be noted that although a price premium may not be captured, we still must assume that some portion of the revenue is going towards improving the environmental performance of agriculture. So the concept of a price premium is not strictly necessary, it simply provides a proxy for estimating the proportion of revenues that are used to fund improved environmental outcomes.

2010 Funding
Ecosystem Marketplace (2012) estimate that the global market for certified agricultural products is at minimum USD 64 billion. This estimate is based on data from 2010 and so is used as the basis of the current funding estimate in LBFB. To align with the estimated revenue generated from certified timber, a price premium of 5% is assumed, indicating the current level of biodiversity finance from certified agriculture is approximately USD 3.2 billion.

Low Future Funding
Assuming a 5% annual compound growth of certified agricultural markets leads to an estimate of a total market value of USD 104 billion in 2020. Five percent of that is USD 5.2 billion.

High Future Funding
Ecosystem Marketplace (2012) estimates a future market value of certified agriculture of approximately USD 190 billion. This is based on 15% compound annual market growth 2010-2013, and 10% thereafter to 2020. Five percent of that is USD 9.5 billion.

Notes
Unlike certified timber, there is more information available on the market value of many different commodities. Similar to certified wood, however, further research is needed on the assumed growth rate in the market value of certified agricultural product and, particularly, a better understanding how much of the revenues actually support sustaining biodiversity and ecosystem services.

OTHER MARKETING MECHANISMS

OTHER MARKET MECHANISMS

NATURAL CAPITAL LEVY

In the LBFB a natural capital levy is a fee, tax or charge on the extractive or consumptive use of biodiversity. There is sparse research and primary data available on the extent of natural capital levies globally. More importantly, even where some information is available on how much finance a levy raises, there is no evidence of how much of that finance is then actually used as biodiversity finance (instead of going to the government's general coffers). As such, no reasonable assumptions could be made relating to the level of biodiversity finance raised through this mechanism.

It is worth noting, however, that there is likely to be at least a few billion dollars raised this way globally. The OECD/EEA (OECD & EEA, 2012) database on instruments used for environmental policy was scoured and those taxes, fees or charges that fit the LBFB definition of a natural capital levy were identified. The data is believed to be far from exhaustive, but does indicate that at minimum over USD 1 billion is raised in OECD countries annually through natural capital levies. Other research (OECD, 2005) indicates that such levies are fairly common in non-OECD countries. Unfortunately, there is no indication of how much of the finance that is raised is then specifically used to sustain biodiversity and ecosystem services.

OTHER MARKET MECHANISMS
AUCTIONING OF EMISSIONS ALLOWANCES

Overview
Germany's International Climate Initiative (ICI) is a unique programme that uses some of the revenues generated from auctioning emissions allowances (in the EU ETS) to finance REDD+ and other ecosystem-based interventions for climate change mitigation and adaptation globally. The ICI is the only known current example of using revenues generated from the auctioning of emissions allowances to finance ecosystem-based activities. The EU is, however, broadly increasing the proportion of allowances that will be auctioned by 2020, which provides the basis for future funding estimates.

2010 Funding
The ICI makes information about all of its activities publicly available (ICI, 2012). Accounting for all of the projects listed as of Spring 2012, and assuming that project financing is distributed equally each year over the life of a given project, the ICI spent around EUR 33.5 million in 2010 on activities listed as supporting "Ecosystem-based Adaptation" or "Natural Carbon Sinks". Based on an average 2010 exchange rate of 1.33 USD/EUR, the estimated current funding in 2010 is USD 44.4 million.

Low Future Funding
The EU is committed to increasing the amount of emissions allowances it auctions in Phase III of the EU ETS (DECC, 2012). Cooper and Grubb (2011) estimated the gross revenues associated with an increase in the auctioning of allowances under various scenarios, including the EU committing to 20% and 30% emissions reductions targets. With the current allocation distribution and auctioning mainly occurring in the power sector, under a 20% scenario, the estimated revenues of auctioning are EUR 150-190 billion total in 2013-2020. With increasing auctioning in the cement and steel sectors, but still maintaining the 20% target assumption, that estimate increases to EUR 180-225 billions. The low end of both estimates assumes a carbon price of EUR 17. The average of the low end estimates is EUR 165 billion, which distributed equally over 8 years indicates that approximately EUR 20.6 billion will be raised through broad EU ETS auctioning of allowances in 2020.

EU Member States are committed, but not legally bound, to spend 50% of their revenues from the auctioning of emissions allowances on climate change related activities (DECC, 2012). It is believed that some States will overshoot this level, but more will go under. Here it is assumed that 40% of revenues from auctioning of allowances will be spent on climate change mitigation and adaptation. Of that, it is broadly assumed that 50% will be spent internationally to support Europe's increasing commitments to international climate finance. The estimate here only focuses on international finance as it is assumed that EU domestic spending in climate action will be primarily on grey infrastructure such as renewable energy and flood defences, and so to be conservative it is assumed none of the revenue from auctioning of allowances spent domestically will be spent on ecosystem-based activities. This 50% of the 40% corresponds to about EUR 4.2 billion in 2020, which can be compared to the anticipated support of climate-related actions in developing countries of EUR 22-50 billion annually by 2020 (European Commission, 2009).

But how much of this would go to ecosystem-related activities? Germany's ICI spends about 28% of its total funds on "Ecosystem-based Adaptation" and "Natural Carbon Sinks". Applying this percentage across the EU and converting to USD based on the average 2010 exchange rate of 1.33 USD/EUR, the low end, fairly conservative, estimate of biodiversity finance raised through auctioning of allowances in 2020 is USD 1.6 billion.

Finally it is important to note that the aviation sector is being incorporated into the EU ETS in Phase III and 15% of its allowances are planned to be auctioned. As such, emissions from 15% of the proposed aviation cap were priced using Cooper and Grubb's (2011) assumed prices and included in the estimates. The proportion associated with aviation, however, is very small and does not change the estimate at the scale of billions.

High future funding
The highest estimate that Cooper and Grubb (2011) report is EUR 370 billion. It assumes the EU takes a 30% target, the cement and steel sectors face a high level of auctioning, and the carbon price is EUR 25. They also note additional revenues could be received from border levelling. As such, a starting point of approximately EUR 400 billion is used. Then using the same assumptions as the low-end estimate relating to how much of that finance is used for climate action, internationally, and for ecosystem-based climate action, the annual amount generated for ecosystem finance in 2020 could be around USD 7.28 billion. Of course this high-end scenario assumes significant revenues in Europe, which may not be feasible. The estimate can still be considered relatively conservative, however, since the 30% target in Europe is predicated on greater action in the international community, which could very well lead to auctioning of allowances internationally or in other countries, which also has the potential to generate ecosystem finance.

Notes
Relatively rigorous research and specific policy objectives provide the foundation of these estimates. The main assumptions are the market price of carbon in the EU ETS, which directly affects the total revenues generated from auctioning of allowances. The carbon price has proven highly volatile in the past, but this is often directly or indirectly attributed in large part to policy decisions and announcements. Additionally, the above estimates are built on assumptions about how much of the revenues will be allocated to certain objectives, which are based on policy statements and the available evidence from current practice. Essentially, all of this means that the level of ecosystem finance generated from auctioning of allowances will depend primarily on policy decisions.

OTHER MARKET MECHANISMS
MARITIME LEVY

Overview
There are three main proposals for incorporating maritime greenhouse gas emissions into a global climate agreement (Parker et al., 2009). The text of the LBFB mentions all of the options and categorises all of them generally as a form of levy; a policy through which governments can generate revenues from the shipping sector. For the purposes of estimating revenue generation, however, the LBFB focuses on the estimates of finance raised through a maritime emissions trading scheme that incorporates auctioning of allowances. This policy receives the focus because there is a precedent set by aviation being incorporated into the EU ETS and incorporating auctioning of allowances.

2010 Funding
None.

Low Future Funding
Parker et al. (2009) reference the European Commission when they state that auctioning of allowances for maritime emissions could generate USD 3-34 billion annually. Taking the low end of the estimate, and conservatively assuming that as with other auctioning of allowances only about 20% of this is available for international climate change mitigation and adaptation, and of that, only about ¼ goes to ecosystem-based activities, it is estimated that around USD 0.15 billion in ecosystem finance could be raised form the maritime sector paying for its greenhouse gas emissions.

High future funding
Using the same assumptions as the low estimate, but applying them to the high-end of the USD 3-34 billion range, it is estimated that around USD 1.7 billion could be generated for ecosystems.

Notes
As with all the other market mechanisms, these estimates are highly dependent on assumptions that are directly dependent on political decisions, particularly pertaining to how much of generated revenues will be used for ecosystem-based activities.

OTHER MARKET MECHANISMS

FINANCIAL TRANSACTION TAX

Overview
A financial transaction tax (FTT) is not yet implemented but is currently proposed within the EU and globally.

2010 Funding
None.

Low Future Funding
In 2011, the European Commission proposed a financial transaction tax that could raise EUR 57 billion annually (European Commission, 2012). That value was converted to USD based on the annual average over 2010 of approximately 1.3 USD/EUR, giving USD 75.6 billion. Assuming that only 5% of that was used to support biodiversity goals, the FTT in Europe could generate USD 3.8 billion for biodiversity and ecosystems.

High Future Funding
The Robin Hood Tax campaign estimates that a 0.05% global FTT could raise GBP 250 billion annually (Robin Hood Tax, 2012). As this campaign specifically advocates using that money for sustainable development purposes, and this is the high future estimate, here 10% is assumed available for biodiversity and ecosystem related interventions. That totals USD 16.2 billion annually, based on the average 2010 exchange rate of approximate USD 0.65/GBP.

Notes
A key assumption to these estimates is the proportion of finance raised through a FTT that would be used for biodiversity. Further research on the political economy of such a financial instrument would be useful to understand how best to leverage such a mechanism to raise finance for global environmental goals.

OTHER MARKET MECHANISMS

LEVY IN INSURANCE PREMIUMS

Overview
A levy on insurance premiums has been proposed as a way for insurance providers to help fund a reduction of the environmental risks they and their clients face, and so reduce the future payouts insurance providers must make. The most prominent research on the proposed mechanism was carried out as part of the Prince's Rainforests Project 2009 report "An Emergency Package for Tropical Forests."

2010 Funding
None.

Low Future Funding
There is currently no significant political momentum for introducing a levy on insurance premiums to raise environmental finance. As such, under a low future scenario based on "current momentum", it is assumed this revenue generating mechanism is not implemented.

High Future Funding
If it is implemented, however, the Prince's Rainforests Project (2009) illustrated that a small levy on insurance premiums could raise around USD 3.3 billion annually. Assuming about 25% of this actually goes towards biodiversity-relevant activities, it is estimated, that about USD 0.8 billion in biodiversity finance could be raised.

Notes
A FTT seemed politically infeasible at first, but has gained traction. In comparison, a levy on insurance premiums seems more reasonable. It targets an industry more directly facing the risks of climate change, so there is a stronger logic to using this mechanism. A better understanding of the political palatability and acceptance within the insurance industry of such a mechanism would be helpful to understand how much of the industry's risk is related to ecosystems and in turn how much finance could be raised for ecosystems.

NON-MARKET MECHANISMS

NON-MARKET MECHANISMS
DOMESTIC BUDGET ALLOCATION

Overview
The primary and most direct delivery of biodiversity finance by domestic governments is to finance protected areas. As such, estimating government spending for protected areas forms the basis of the estimates here. Additionally, consideration must be given to other, newer programmes through which governments fund ecosystems, in particular government funded payments for ecosystem services (PES).

2010 Funding
Bovarnick et al. (2010) find that across 20 Latin American countries the average funding allocated out of the domestic government budget is $1.08/Ha. Estimates of the government budget per hectare in other regions can be determined based on the ratio of protected area budgets in James et al., 1999. They present data for the total protected area budget and the area covered in 108 countries. Based on that data, an average budget per area (USD/Ha in 1996) was calculated for 6 separate regions: USA/Canada, Europe, Oceania, LAC, Asia and Africa. The aim was to understand the ratios between the budgets using the LAC region as the basis of comparison. Those ratios were assumed to remain constant in 2010 and applied to the average budget allocation reported by Bovarnick et al. (2010) to estimate a current budget allocation per hectare of protected area. The resulting estimates were:

- $24.7 in US/Canada
- $21.3 in Europe
- $13.9 in Oceania
- $1.08 in LAC
- $4.9 in Asia
- $1.2 in Africa

Those estimates were applied to the total area protected in 2010 according to the World Database for Protected Areas (WDPA, 2011) to estimate the total domestic government budget allocation for protected areas in 2010.

Some additions and adjustments were also included. These were adding funds for publicly funded watershed payments (PWS) and agricultural payments not accounted for under agricultural subsidy reform (all information based on data from Stanton et al., 2010), plus an adjustment for better data in the US (based on Walls et al., 2009).

The resulting estimate of domestic government budget allocation on biodiversity and ecosystems is USD 25.6 billion globally in 2010. It is difficult to evaluate this estimate, but possibly worth noting that it represents 0.04% of global GDP in 2010 (based on World Bank, 2012b). In the first Global Monitoring Report (CBD, 2010), the Secretariat of the CBD reported that for the country data available, domestic government environment spending ranged from 0.01% to 0.05% of the respective national current GDPs.

Low Future Funding
Building on data from the World Database of Protected Areas (WDPA, 2011), the total area under protection (combined terrestrial and marine) must be increased by about 35% to achieve Aichi Target 11. The low future estimate assumes that the budget for PAs is increasingly obtained from specific revenue sources rather than the general government budget. Under such a scenario if government budget allocation for biodiversity increased by just 10% over the currently estimated amount, it would be USD 28 billion annually by 2020.

High Future Funding
If government budgets keep pace with the increase in protected areas and perhaps even begin to cover some of the shortfall in current protected area budgets or there are increases in other spending (e.g. PES), the total government budget allocation would need to increase by more than 35%. If it increased by 40% over the currently estimated amount, it would be nearly USD 36 billion annually by 2020.

Notes
Greater accounting of government spending on biodiversity and environment generally would help to refine these estimates, and would also inform the discussion about resource mobilisation under the CBD.

NON-MARKET MECHANISMS
OFFICIAL DEVELOPMENT ASSISTANCE

Overview
The vast majority of Official Development Assistance (ODA) related to biodiversity is bilateral ODA. Bilateral ODA funding is usually delivered for projects that have multiple objectives, one of which can be a biodiversity goal. So rather than speak of biodiversity ODA, it is best to describe the biodiversity finance raised through ODA as "biodiversity-related ODA".

2010 Funding
The majority of biodiversity-related ODA is bilateral in nature. The OECD Development Assistance Committee (DAC) Database provides data on all of the ODA commitments with Rio Markers (OECD, 2012a). Total commitments from DAC countries with biodiversity as a significant marker were USD 6.6 billion in 2010, and an estimated USD 6.8 billion if non-DAC-member ODA included in the OECD database is considered. Certain adjustments need to be made for a final estimate of disbursed, bilateral ODA. First, the actual disbursements of all ODA in 2010 were 90% of commitments. Additionally, about 3% of ODA with the biodiversity marker that is counted in the OECD database is actually disbursed via the UN or World Bank. These adjustments were applied to estimate that the total bilateral ODA for biodiversity that was disbursed in 2010 was approximately USD 6 billion.

Additionally, finance from UNEP, UNDP, GEF and World Bank (WB) Recipient-Executed Trust Funds (RETFs) must be included. GEF-4 provided an average USD 247.5 million for biodiversity annually (GEF, 2006). UNEP annual reports indicate that spending on ecosystem management in 2010 was about USD 30 million. Finally, building on Steckhan (2009), it is estimated that the UNDP provided over USD 25 million for biodiversity and ecosystem work in 2010 and WB RETFs provided over USD 18 million.
Summing all of these estimates gives a final estimated USD 6.3 billion in disbursements of biodiversity-related ODA in 2010.

Low Future Funding
The low future estimate assumes that biodiversity and ecosystem funding from UNEP, UNDP, GEF and WB RETFs continues to grow at the average rate it has over 2004-2010. Each was calculated separately. The low future estimate for bilateral ODA disbursements assumes that total disbursements continue to grow at their average annual rate in 2007-2010 and that biodiversity-related ODA is 6% of disbursements (slightly higher than the current 5.7%). Combined, these estimates indicate that if current momentum continues, biodiversity-related ODA could reach USD 8.3 billion in 2010.

High Future Funding
Over 2009 and 2010, total ODA averaged 0.315% of GNI of DAC members. The high future estimate assumes that the target of 0.7% GNI is reached and the ratio of 0.7/0.315 is applied to the low future funding estimate. The resulting high-end estimate of future biodiversity-related ODA disbursements is USD 18.5 billion in 2020.

Notes
With the DAC reporting system in place, the majority of biodiversity-related ODA is well accounted for. Estimates of future finance could be improved, however, by a better understanding of donor countries' thinking on how much of the needed global biodiversity funding they are willing to provide. Additionally, emerging donor countries not part of the core DAC membership and their focus on biodiversity could be better understood.

NON-MARKET MECHANISMS
DEBT-FOR-NATURE SWAPS

Overview
Although fairly popular in the 1980s and 1990s, currently, debt-for-nature swaps are only regularly implemented by the US relieving debt to certain tropical forest countries.

2010 Funding
Information about all of the swaps carried out under the US Tropical Forest Conservation Act (US TFCA) is available on the USAID web page (USAID, 2011). Assuming that project funding is spread evenly over the years of the project, debt swaps generated around USD 18 million of biodiversity finance in. It is important to note, however, that as of 2011, swaps already agreed were estimated to generate a peak of USD 28 million annually in 2012-2014.

Low Future Funding
In 2002-2012, the annual growth in biodiversity finance generated through debt-for-nature swaps of the US TFCA averaged 35% compound growth. It seems difficult for one country to maintain that growth. If no other countries greatly increased their use of debt swaps, it is assumed that the value in 2020 would be around the average of the swaps already agreed by the US in the period 2012-2020, which is nearly USD 20 million annually.

High Future Funding
If, however, the rate of increase could be maintained out to 2020 then debt-for-nature swaps would generate over USD 300 million in 2020. The US may continue to increase their use of such swaps, but even if they did not keep their own pace from the past 10 years, other countries are starting to use swaps as well (e.g. France) and there is growing interest in their use for both ecosystems and climate. So USD 300 million is reasonable if political interest in debt-for-nature swaps increases.

Notes
Better knowledge on the amount of debt governments might be willing to forgive would help improve estimates of how much biodiversity finance could be generated through debt swaps. It is also important to note that debt relief is reported as ODA. So during estimation of ODA for biodiversity, the level of funding from debt-for-nature swaps was not included.

NON-MARKET MECHANISMS
PHILANTHROPY

Overview
Upon observation of the data for ODA disbursements, it was clear that ODA funding delivered via NGOs tends to be delivered via local NGOs. As such, to the Philanthropy mechanism focuses on international NGOs (INGOs). The resulting estimates are likely conservative, but they avoid any significant double counting with ODA.

2010 Funding
The current funding estimate simply accounts for the expenses of the largest international conservation groups and assumes they represent a certain percentage of all philanthropic biodiversity finance. Further, any ODA that was delivered through these INGOs in 2010 was removed from final estimates. Based on annual reports, total expenses were accounted for:

1. World Wildlife Fund, US
2. Worldwide Fund for Nature, International
3. Wildlife Conservation Society
4. The Nature Conservancy
5. Environmental Defence Fund
6. Conservation International
7. International Union for the Conservation of Nature
8. Birdlife International
9. Royal Society for the Protection of Birds

Conservatively assuming this captures around 90-95% of philanthropic spending on conservation, and then removing ODA contributions, the total amount of biodiversity finance from philanthropy is estimated to be around USD 1.6 billion in 2010.

Low Future Funding
Where data on 2009 or even 2008 was still publicly available, it indicated that expenditures across all of these organisations remained relatively stagnant in those years, likely due to global economic strain. Assuming this stagnant momentum is maintained, particularly as there is increasing focus on "innovative" or "market-based" sources of finance, then philanthropic spending for biodiversity may be the same in 2020.

High Future Funding
It has been estimated, however, that at its height, the expenditures of large international conservation organisations reached around USD 3 billion annually (CBD, 2010). If this height is reached once again and it is more liberally assumed that this represents around 75% of global philanthropic biodiversity finance, then this mechanism could generate around USD 4 billion annually within this decade.

Notes
Financial reports for the large conservation organisations are publicly available. Additional research to account for other NGOs would be helpful to estimate current and future scales of finance. Further, research on the change of philanthropic expenditures for biodiversity over time could help better estimate the scale of future funding.

NON-MARKET MECHANISMS
AGRICULTURAL SUBSIDY REFORM

Overview
The revenue generation mechanism of subsidy reform assumes that subsidies for environmentally damaging activities are reduced and that a portion of the newly available funds are redirected to incentivise environmentally positive activities. It is very difficult to understand exactly how much of a reduction in one subsidy leads to an increase in budgetary allocation to a separate specific goal. For agriculture, it is assumed that some of the reduction in environmentally damaging agricultural subsidies is used for environmentally positive goals, since many agricultural ministries control both traditional agricultural subsidies and environmentally focused ones. The key is to understand whether the environmentally friendly subsidies are generated from a decrease in environmentally damaging subsidies, in which case subsidy reform has taken place and generated biodiversity finance.

2010 Funding
OECD data (OECD, 2012b) indicates that the producer support for OECD countries plus Brazil, Russia, South Africa, China and Ukraine totalled USD 346 billion in 2010. The question is how much of that support is "good" or "bad" for the environment, which is very difficult to discern. To be conservative, three types of subsidies as defined in the OECD Producer Support Estimate (PSE) Manual (OECD, 2010) are excluded to attempt to ensure that no environmentally positive subsidies are included in what could be defined as "traditional" agricultural subsidies. Determination of what to exclude is based on the definitions of PSE and the worked examples provided in the OECD PSE Manual. The excluded subsidies are:
1. All "payments based on non-commodity criteria", which is the category that generally comprises agri-environmental and conservation payments. Examples include afforestation (EU), the Conservation Reserve Program (US), and payments for floral fallow (Switzerland).
2. Any support that comes "with input constraints". The qualifying criterion of "with input constraints" means that these subsidies include specific restrictions on allowed farming practices or require a reduction, replacement or withdrawal of specific inputs, which could include subsidies with a positive environmental goal. Examples include counter-cyclical payments in the US where producers are required to comply with conservation or wetlands provisions, and an agri-environmental grass premium in France.
3. Any support that comes "with commodity exceptions". This criterion means that the subsidy can not be applied for acreage under production of certain crops, seemingly this tends to be certain fruits and vegetables. Although this specific criterion is not necessarily directly related to an environmental objective, it appears generally associated with types of support that include input constraints (including the two examples of such above), and so for purposes of being cautious, producer support with commodity exceptions is excluded.

The resulting total of USD 287 billion in 2010, is the estimate of all agricultural producer support that is very likely not intended to incentivise the direct or indirect provision of public goods.

Looking at the level of this subset of subsidies in 2001-2010 in individual countries, there are only two countries that have, on average, reduced them: the EU and USA. At the same time, the US and EU have specifically implemented policies to incentivise environmentally friendly agricultural practices and provision of public goods. As such the agri-environmental and conservation payments in the US and EU can be portrayed as environmentally friendly agricultural reform. In 2010, they respectively provided an estimated USD 4.1 billion (Monke & Johnson, 2010) and USD 3.7 billion (Cooper et al., 2009); this includes Member State co-financing).

NON-MARKET MECHANISMS
AGRICULTURAL SUBSIDY REFORM

Low future funding
Although large agri-environmental and conservation support schemes exist in other countries, they are coupled with increasing producer support that is unlikely to be based on positive environmental outcomes. As such, those funds are not considered to be generated through agricultural subsidy reform. The current momentum globally is that the EU and US are to some degree "reforming" agricultural subsidies, but under the weak economic climate it appears it could be difficult for any drastic increase in reform that moves subsidies away from incentivising production levels. Overall this leads to a low funding estimate that is stagnant out to 2020.

High future funding
The USD 287 billion of subsidies that very likely do not incentivise environmental aims is in countries that represented 66% of global agricultural producer value in 2010 (FAO, 2012). The remaining 34% of global agricultural production (by producer value) occurs in countries that OECD data does not account for. It is assumed that in these countries with lower agricultural production value, that the subsidies per dollar of producer value are 50% of those in the countries for which OECD data is available. That leads to a total global estimate of USD 361 billion in non-environmentally positive subsidies in 2010. If there was enough political movement to ensure that just 10% of those subsidies were reformed by 2020 and even just 25% of the newly-available funding was redirected towards environmentally positive activities, around USD 9 billion could be generated for biodiversity and ecosystem finance.

Notes
There is excellent data available for agricultural subsidies covering the majority of global agricultural production. A key assumption in the above estimates, however, is how much of a reduction in "bad" subsidies will be translated into "good" subsidies. This is most relevant for the high future estimate. It depends largely, however, on political decisions. More research and discussion with policy makers and agricultural ministries would be helpful for environmentalists to understand the true potential of this revenue generating mechanism, which based on the level of current agricultural subsidies, could be huge if the political will is present.

NON-MARKET MECHANISMS
FOSSIL FUEL SUBSIDY REFORM

Overview
To date there is no known example of fossil fuel subsidies being reduced and some portion of that being hypothecated to fund biodiversity and ecosystem-based activities. There is, however, a commitment in the G20 to reduce these subsidies. It is assumed that some of the funds made available would be used for climate change mitigation and adaptation; and so some small portion of fossil fuel subsidies could be redirected to finance ecosystem-based activities.

2010 Funding
None.

Low Future Funding
The International Energy Agency (IEA, 2011) estimated that fossil fuel subsidies totalled USD 410 billion globally in 2010. Assuming just 5% of these were reduced (and no more were added) and then following similar assumptions as with the Other Market Mechanisms (i.e. 20% of finance raised actually goes to global issues, of which a quarter goes to biodiversity and ecosystems), a little over USD 1 billion could be generated for biodiversity.

High Future Funding
Following the same assumptions except also assuming the reduction in total subsidies increased from 5% to 20%, that reduction could raise around USD 4.1 billion globally in 2020 for biodiversity.

Notes
The main issue with subsidy reform is that, as with other forms of public finance, it is very difficult to estimate how much of the finance raised would actually then translate into an increase in spending on certain objectives, such as protecting biodiversity. More research on this issue would be beneficial.

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