Financing Options for Loss and Damage:
A Review and Roadmap

Climate and Development Lab (CDL), Brown University
International Centre for Climate Change and Development (ICCCAD)

INITIAL PROVISIONAL DRAFT
We welcome input

11 March 2016

Authors: Alexis Durand, Victoria Hoffmeister, J. Timmons Roberts, Jonathan Gewirtzman, Sujay Natson, Romain Weikmans and Saleemul Huq

Contact:
Timmons Roberts, Institute at Brown for Environment and Society, Brown University, USA
timmons@brown.edu
Saleemul Huq, International Centre for Climate Change and Development, Bangladesh
saleemul.huq@IIED.org

1. Introduction

Pressure to enhance the effectiveness of the existing loss and damage mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) has grown in recent years. This is the result of growing certainty that emissions reductions are inadequate to avoid damages, and international support for adaptation in vulnerable nations also is not being delivered at a scale to allow complete prevention and recovery from climate-related impacts. Loss and damage received attention and recognition in Article 8 of the Paris Agreement, but there remains no internationally agreed definition of the term. For our purposes we will use the terms to refer to irreversible losses (i.e. loss of human life, species, land to rising seas) and damages of significant economic cost (i.e. destroyed infrastructure) resulting from climate-related disasters.

This draft paper reviews the language in the Paris Agreement and Warsaw International Mechanism, and addresses five parts in the Action Area 7 text agreed by the Warsaw International Mechanism's Executive Committee. We very briefly review each of these ways to fund loss and damage in straightforward language, we discuss their current applications, their status in UNFCCC, some pros and cons, and how they might be applied to loss and damage. Part 3 reviews and assesses several major tools that have been proposed to raise funding for climate change actions in developing countries. We consider their adequacy, dependability, their feasibility, and we speculate on some of the political opportunities and likely barriers. We conclude by proposing some ways forward on financing loss and damage, focusing on the need to combine and layer different sources of funding and utilizing insurance mechanisms and bonds to accomplish the goals of buffering losses in the most vulnerable nations.

Understanding Article 8

The Paris Agreement states that "Parties should enhance understanding, action and support, including through the Warsaw International Mechanism, as appropriate, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change" (UNFCCC, 2015: Article 8.3, emphasis added). Article 8.4 of the Paris Agreement specifies that there should be "Areas of cooperation and facilitation to enhance understanding, action, and support: Early warning systems, emergency preparedness, slow onset events, events that may involve irreversible and permanent loss and damage, comprehensive risk assessment and management, risk insurance facilities, climate risk pooling and other insurance solutions, non-economic losses, resilience of communities, livelihoods, and ecosystems." Together, these passages suggest that nations will be expected to provide assistance to developing country Parties to implement a wide range of loss and damage approaches.

Article 9 of the Paris Agreement discusses finance for all areas of climate change action, but contains passages that are crucial for consideration of funding provision for loss and damage. Paragraphs 1 and 2 state that "Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the

convention. Other Parties are encouraged to provide or continue to provide such support voluntarily." Paragraph 3 stipulates that climate finance will be mobilized from a wide variety of sources, through a wide variety of actions, and will represent "a progression beyond previous efforts." Article 9.4 reads: "The provision of scaled-up financial resources should aim to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as the least developed countries and small island developing States, considering the need for public and grant-based resources for adaptation." This article does not address loss and damage directly, but discussing adaptation needs and capacity constraints in particularly vulnerable countries, especially the least developed countries (LDCs) and small island developing states (SIDS), suggests how these efforts are critical to reducing the overall loss and damage burden.

Various aspects of loss and damage listed in Article 8 certainly fall under the adaptation umbrella, such as early warning systems, emergency preparedness, risk assessment/management, and resilience-building for communities/livelihoods/ecosystems. Other elements of loss and damage covered in the Article, such as permanent losses, non-economic losses, and slow onset events, fit less easily within the category of "adaptation needs," unless the goal is to avert them instead of addressing them once they have already occurred. These distinctions highlight the need to provide adequate finance on adaptation to prevent losses and damages, while creating institutions that address the unique needs of communities who have experiences loss and damage.

How much must be generated to address loss and damage?

We will never know with precision what will be needed to address losses and damages in the world's most vulnerable countries, but there is value in deriving rough estimates to inform our thinking on the scale of funding that might be needed. Estimating future loss and damage requires analyses based on projections of climate trends and adaptation and mitigation scenarios. Hope (2009) provides cost estimates of mitigation, adaptation, and residual damages under a business-as-usual emissions scenario and under a scenario in which global emissions are stabilized at 450 ppm. UNFCCC cost estimates are used to inform the adaptation efforts used in the model. The model provides estimates of cumulative impacts over the period from 2000-2200, and Hope has calculated the mean residual damage at one point in time (in the year 2060). In their lowest emission and highest adaptation effort scenario (the best-case scenario for loss and damage that Hope analyzes), the mean cumulative cost of residual damages is US$ 275 trillion over 200 years. In the highest emission and lowest adaptation effort scenario (the worst-case scenario for loss and damage), the mean cumulative cost of residual damages is US$ 1,240 trillion. The estimates for residual damages in 2060 alone ranges from US$ 0.3 trillion to US$ 2.8 trillion, with an average of US$ 1.2 trillion (Hope, 2009).

Given a dearth of directly applicable estimates, what can we learn from past estimating efforts, such as those applied to adaptation and mitigation costs? In what is considered by the Intergovernmental Panel on Climate Change (IPCC, 2014: 959) as the most recent and most comprehensive study to date of the cost

of climate change adaptation in developing countries, the World Bank (2010) put the price tag of adaptation at US$ 70-100 billion annually by 2050 for a level of global warming limited to 2°C. As Fankhauser (2010) pointed out, the World Bank study defines adaptation as the measures needed to restore pre-climate change levels of welfare (in other words, adaptation is pushed to the point where there is no residual damage, rather than to the point where marginal adaptation costs equal marginal adaptation benefits). The numbers are therefore better understood as a proxy for adaptation costs plus residual damage. More recently, according to an IIED briefing published in November 2015 that estimates the funding necessary for LDCs to deliver on their most recent climate plans (*i.e.*, Intended Nationally Determined Contributions or 'INDCs'), about US$ 93.7 billion per year will be needed for all LDCs to implement their post-2020 mitigation and adaptation pledges (Rai, 2015).

However, this estimate does not account for the pledges made in LDCs INDCs relating to loss and damage. Of the 48 countries that make up the LDC group, seventeen submitted INDCs that mention "losses" and/or "damages," and seven submitted INDCs that explicitly mention the issue of "loss and damage." Many LDC INDCs mentioning "losses" and/or "damages" provide cost estimates of damages resulting from recent climate-related disasters, approximate counts for deaths, injuries, and other harms, and estimates of projected damages under future climate scenarios.

For instance, Bangladesh's INDC estimates that floods in 2007 caused damage of over US$1 billion and that Bangladesh may experience a 2% gross domestic product (GDP) annual loss by 2050 because of climate change. Comoros' INDC estimates that costs associated with climate change will surpass the value of its GDP by 2020. Djibouti's INDC estimates damages for the period 2010-2060 under a 2˚C scenario, a 4-5˚C scenario, and a 10,000 year flood scenario to be US$ 5 billion, US$ 9 billion, and US$ 65 billion, respectively. Senegal's INDC estimates that capital losses resulting from the floods of 2009 were about US$ 104 million, with restoration costs of about US$ 204.5 million.

These estimates are only the costs of loss and damage that have already been realized or are likely to be experienced—they do not account for the expenses necessary to implement LDCs' plans to reduce loss and damage. The LDCs' initiatives and existing policies relating to loss and damage, as summarized in their INDCs, are not attached to specific estimates for the funding necessary to carry them out. For this reason, and because loss and damage mentions in the INDCs often fall under broader sections devoted to adaptation, it is not possible to pull together a neat estimate for funding needs related to national actions on loss and damage. It is also infeasible to estimate a total cost of recent or projected damages the LDCs have experienced or will likely experience using the INDCs, as each Party with an INDC mentioning "loss" or "damage" uses a different climate-related event to illustrate past loss and damage or a different future year for projecting loss and damage.

A large body of retrospective estimates of disaster losses can provide an indication of disaster trends. The Center for Research on the Epidemiology of Disasters (CRED) estimates that in 2014 (the most recent year analyzed) US$ 98.5 billion in damages from natural disasters (geophysical events included) was accrued worldwide (CRED, 2014). Although the year-to-year figures are highly variable, disaster losses are exhibiting a general upwards trend. The 2015 UN Global Assessment Report on Disaster Risk Reduction reported that the average yearly cost of disasters worldwide has reached $250 billion to $300

billion every year (UNISDR, 2015). Disaster loss estimates are very conservative indicators of overall loss and damage, as they may exclude slow-impact events and some non-economic loss and damage, especially among poor and rural populations whose impacts are not well documented or insured. Additionally, using disaster figures to gauge climate change losses and damages raises important questions about the connections between climate change and extreme weather events. Of the recorded losses, how much can be attributed to climate impacts of extreme weather?

Although the LDCs' INDC mentions of loss and damage do not have specific price tags attached, many are linked to general calls for international support in the forms of finance, technology transfer, and capacity building. It is clear that increased international support will be necessary for LDCs to implement their loss and damage-related plans and to reduce future losses and damages in other, currently unforeseen ways. Therefore, even US$ 93.7 billion flowing exclusively to LDCs each year will not be sufficient for full implementation of their INDCs, as the IIED briefing on adequate finance suggests (Rai, 2015). Note that according to the briefing, LCDs receive only US$ 11.8 billion of public climate finance (both for mitigation and adaptation) each year (and even this can be credit-based and is not all 'new and additional').

Three core questions

This paper seeks to begin discussion on three core questions. First, ***what do we mean by financing loss and damage***? The UNFCCC texts specify a wide range of elements of funding provision for loss and damage. The texts outline an assortment of approaches for preventing and dealing with loss and damage (including financial support for development of insurance schemes and risk transfer mechanisms, early warning systems, emergency preparedness measures, and so on). Additionally, the texts discuss the provision of financial support for parties' efforts to implement their own risk management strategies and for the financial support for international institutions (such as international insurance facilities like the Caribbean Catastrophe Risk Insurance Facility). The texts also emphasize the need for knowledge-building around loss and damage impacts and approaches. For example, repositories of information on insurance and risk transfer or on climate-related displacement are included in the texts. A compensation regime is ruled out in the Paris Agreement's weaker and more temporary "Decision" text paragraph 52, which "Agrees that Article 8 of the Agreement does not involve or provide a basis for any liability or compensation."

Financing loss and damage, then, can have a wide range of implications – finance could flow towards knowledge-building, capacity-building, administrative applications, and directly to approaches developed to reduce the burden of loss and damage upon affected individuals and communities. In providing an overview of the approaches mentioned in UNFCCC texts, this paper clarifies the range of possibilities for finance provision for loss and damage in the short and medium term.

Second, ***what are some of the possible means of raising predictable and adequate levels of funding*** to address loss and damage? Many of the innovative financial options that we discuss have not yet proven

successful in either mitigation or adaptation settings. Could these approaches enjoy more success in a context of funding loss and damage?

Third, ***who would be funded***? Would insurance schemes be designed to serve supranational regions, nations, subnational regions, states, cities, groups of households or businesses, or individual households? For example, the Caribbean Catastrophe Risk Insurance Facility provides payouts to national governments who have experienced a disaster based on the estimated damage immediately, and these amounts are adjusted later. Unfortunately this question will have to be addressed by Parties in the future, as thinking on the issue is refined, so our contribution here is just to raise this issue that will shape funding efforts.

We begin with a review of the key points that have marked discussion of loss and damage, both inside and outside the UN negotiations.

2. Financing loss and damage: What's been said?

In the initial two-year workplan of the Warsaw International Mechanism, the Executive Committee announces its intention to research and disseminate information regarding a range of financial instruments and tools that may be applicable to loss and damage. In Action Area 7, the Executive Committee provides a list of possible financial instruments and tools to investigate, including "comprehensive risk management capacity with risk pooling and transfer; catastrophe risk insurance; contingency finance; climate-themed bonds and their certification; catastrophe bonds; and financing approaches to making development climate resilient, among other innovative financial instruments and tools." We seek here to very briefly review these ideas, making them understandable for non-experts in straightforward language. Universal participation in the global discussion of loss and damage at this crucial moment requires as much. For each instrument or tool discussed, we provide a brief explanation in simple English, discuss its current applications, its status in UNFCCC, associated pros and cons, and how it might be applied to loss and damage.

2.1. Comprehensive risk management capacity with risk pooling and transfer

Insurance allows risk holders to transfer some of their high risk exposure to parties with relatively stable financial bases in exchange for an insurance premium. In other words, insurance facilitates a transfer of risk from the party to the insurer. Warner *et al.* (2009: IV) point out that insurance has "historically facilitated entrepreneurship and economic growth in developed countries" by permitting investment in "higher risk, higher yield activities" and could do the same for certain developing countries in coming years. However, insurance schemes do not always constitute the optimal response to climate-related losses and damages: insurance may not be an appropriate solution for ongoing, slow-onset events that all but guarantee substantial financial losses, such as sea level rise or desertification, or for disasters that occur with very high frequency, such as recurrent flooding (Munich Climate Insurance Initiative, 2012). Nevertheless, insurance approaches can, if carefully leveraged, be used to manage risks associated with

sudden and unpredictable climate-related disasters by "spreading losses among people and across time" and thereby mitigating "disaster-induced poverty traps" and enabling more reliable and timely post-disaster relief (MCII, 2012).

Risk pooling allows individual risk holders to spread their risk over larger geographical areas by aggregating risks nationally or regionally. As risk is aggregated across diverse areas, it becomes more likely that severe climate-related losses and damages in one area will be offset by relatively minor loss and damage in another. Aggregation of risk allows areas hit hard by disasters to access collective reserves when necessary and to "gain catastrophe insurance on better terms" (Warner *et al.*, 2009: 3). The main challenge to widespread use of risk pooling and transfer by developing countries remains their governments' historical lack of experience with insurance. Promisingly, the Paris decision text requests the Executive Committee of the Warsaw International Mechanism to "establish a clearinghouse for risk transfer that serves as a repository for information on insurance and risk transfer" in order to facilitate Parties' efforts to improve their own risk management approaches (Paragraph 49).

Several current applications of risk insurance serve as examples of how international risk pooling can address climate-related loss and damage. One is the Caribbean Catastrophe Risk Insurance Facility (CCRIF) (See section 2.2 below). Another is the EU Solidarity Fund (EUSF), a fund created to finance responses to major natural disasters in Europe. Since 2002, the EUSF has distributed more than EUR 3.7 billion to support 24 different European countries experiencing over 70 disasters, including floods, forest fires, earthquakes, storms, and drought (EUSF, 2015).

2.2. Catastrophe risk insurance

Catastrophe risk insurance creates a pool for low-probability, high-cost events. It can also include micro- and meso-insurance (which bundles individuals' loans and insurance), catastrophe reserve funds, and insurance-linked securities (Warner *et al.*, 2009). In the context of loss and damage, it is crucial to consider how purchasing catastrophe risk insurance can be attached to risk reduction efforts. A few examples of ideas to synchronize the two are improving accuracy of risk pricing, creating government incentives for insurance policies to promote risk reduction or require risk reduction as a prerequisite for coverage, and financing of risk reduction directly by insurers to avoid large compensation claims.

Several current applications of catastrophe risk insurance exist. For example, the Caribbean Catastrophe Risk Insurance Facility is the first multi-country catastrophe risk insurance instrument. Formed in 2007, the Facility draws upon a regional fund for Caribbean governments to quickly provide financial liquidity to limit the financial impact of hurricanes and earthquakes. Other regional or country initiatives include the African Risk Capacity Insurance Company and the Fondo de Desastres Naturales (FONDEN) in Mexico.

The catastrophe risk insurance approach offers several advantages. For example, this type of financing provides opportunity for enhanced finance leveraged through private-public partnerships, pooling across wide areas, and rapid payouts after catastrophes. The model is not without its disadvantages, however. For

example, catastrophe risk insurance initiatives necessitate high-quality catastrophe risk models, and often require a high deductible. Additionally, this approach may only have limited loss and damage applications; for example, this approach may not be applicable to slow-onset events. Nevertheless, Catastrophe Risk Insurance has clear applications for acute climate impacts, especially if the events are parametric (tied to a particular trigger event). Additionally, current initiatives have suggested that the approach could be expanded to include a wider range of impacts. For example, the African Risk Capacity Insurance Company recently expanded their efforts to apply to droughts.

2.3. Contingency finance

In budgeting for many diverse types of projects and budgets, it is common practice to include extra finances ("contingency finances") on top of strictly necessary funds, in the case of cost overruns and unforeseen circumstances (European Commission, 1998). Some localities and institutions have adopted a similar approach to preparing for unpredictable climate-related disasters, setting aside funds to finance contingency plans for emergency situations and integrating this finance with other aspects of risk management. The routine and reliable capture of funds to be set aside contingency finance incentivizes more extensive contingency planning, which can reduce risk by improving responses to shocks.

For instance, the development of contingency funds for use according to contingency plans allows localities to distribute funds earlier in the course of disasters, and thereby to provide vulnerable households assistance "at the crucial time of shock, *before* they resort to livelihood-eroding coping mechanisms" (Makaudze, 2012). During climate-related disasters, contingency resources can also be used to extend existing low-level resource coverage to benefit a larger number of people. For example, Ethiopia's Productive Safety Net Program continually provides basic aid to the chronically food insecure, but includes contingency finance in its budget that permits it to scale up coverage to include the temporarily food insecure in the event of a shock that damages agricultural productivity (Makaudze, 2012). Finally, if a severe climate-related shock occurs and response needs cannot be met through the contingency budget, other instruments such as contingency debt (if available through government) and insurance payouts must be used to finance disaster response.

2.4. Climate-themed bonds and their certification

Climate bonds, the largest subcategory of green bonds, are debt securities used to finance projects related to addressing climate change. The bonds are largely issued by corporations, state-owned rail companies and utilities and multilateral development banks; current issuers include the World Bank and the European International Finance Corporation. Purchasers are largely institutional investors like pension funds and fund managers, although bonds are increasingly available to individuals for purchase as well (*Climate Bonds Initiative*). Large-scale purchasing of climate bonds by central banks has been suggested as a way to finance the Green Climate Fund, with the potential to raise sums larger than US$ 100 billion (Kroll, 2015).

To allow investors to more easily locate climate-aligned bonds, the UK-based Climate Bonds Initiative offers certification according to their Climate Bond Standards. These standards include environmental, social and corporate governance (ESG) disclosure and a contribution toward the delivery of a low-carbon economy, subject to verification by a third party and confirmation by the Climate Bond Standards Board.

As of 2015, the universe of climate-aligned bond initiatives totalled US$ 597.7 billion, with US$ 65.9 billion of labelled green bonds. The climate bond market is expanding rapidly: global issuance of green bonds could surpass US$ 50 billion in 2016, exceeding the previous record of US$ 42.4 billion set in 2015 (Kidney *et al.*, 2015). As the market expands, certification will be increasingly important in order to ensure that investors can locate the bonds most directly aligned with climate initiatives. While the UNFCCC has not acted directly on climate bond issuance or certification, it has recognized the importance of climate bonds by making a database of non-state actor green bond issuance available on its Non-State Actor Zone for Climate Action (NAZCA) platform.

Some projects receiving finance from climate bonds have been criticized as unhelpful or even detrimental for environmental initiatives at large. For examples, Hydro-Quebec received a US$ 15.7 billion bond issue that was categorized as a climate bond, but its hydropower project has been decried as harmful to the local environment and First Nations. Nonetheless, climate bonds can serve as an attractive long-term investment instrument suitable for private sector finance of loss and damage initiatives, particularly in areas such as infrastructural projects where there is likely to be significant return on investment for purchasers. Purchase by central banks and the public sector offers a way to raise billions for loss and damage, while simultaneously supporting green development. Efforts to increase transparency and certification rates are underway (though more work remains to be done), and with the market expanding, climate bonds are likely to remain an attractive option for climate finance for the foreseeable future.

2.5. Catastrophe bonds

Catastrophe (CAT) bonds are risk-linked securities that transfer specified risks from a sponsor to an investor (Lebens, 2013). They are usually used by large insurers to protect themselves in cases of natural disasters. They were created and first used in the 1990s in the aftermath of Hurricane Andrew and the Northridge Earthquake in the U.S. CAT bonds are high-yield debt instruments that are usually linked and meant to raise money in case of a catastrophe such as an earthquake (Lebens, 2013). It has a specific set of conditions that state that if the issuer (insurance or reinsurance company) suffers a loss from a particular pre-defined catastrophe, then the issuer's obligation to pay interest and/ or repay the principal is either deferred or completely forgiven.

There are certain advantages to CAT bonds. First of all, they are not closely linked to the stock market or economic conditions and offer significant attraction to investors. Second, CAT bonds provide a good diversification of risks, as the insurance risk securitization of them show no correlation with equities or corporate bonds (Lebens, 2013). Moreover, they reduce a 'roll over' risk (Lebens, 2013: 2) and do not require a mandatory reinstatement. Overall, the application of CAT bonds could also reduce the reliance on traditional forms of insurance, thereby reducing the overall costs of a program.

There are however, certain disadvantages associated with CAT bonds as well. Firstly, CAT bonds tend to come with stricter terms and conditions compared to traditional insurance (Lebens, 2013). Secondly, they have a higher fixed expense component. Third, CAT bonds are usually only available to institutional investors. Lastly, the CAT bonds market tends to experience a lower level of liquidity compared to traditional bonds (Lebens, 2013).

CAT bonds can be useful in mitigating risks from extreme weather events for loss and damage projects. Several entities have adopted or are in the process of considering CAT bonds for their own implementation on a regional scale. Examples include the Caribbean Catastrophe Risk Insurance Facility (CCRIF), African Risk Capacity (ARC) and the Turkish Catastrophe Insurance Pool (TCIP). Financial organizations, like the ARC, can use it to transfer the burden of climate risk away from the governments and farmers to itself, an African-owned, African Union-led financial entity that can better handle these risks.

2.6. Financing approaches to making development climate resilient, among other innovative financial instruments and tools, both at the micro level (direct tools) and meso and macro level (indirect tools)

Losses and damages from climate variability, extremes, and changes are already occurring on a regular basis, but the prospects of higher levels of climate change add urgency to these existing challenges and demand a renewed focus on prioritization. Addressing loss and damage is fundamentally about sound development: loss and damage considerations must be fully integrated into growth and poverty reduction strategies to be equitable, effective and sustainable. Such an integration would yield positive economic and social returns not only in the long term, but also in the short run.

Incremental resources will be needed to ensure that the incorporation of climate considerations into development projects, programmes and policies does not lead to a diversion of the financial means used for other development objectives (education, health, etc.). In this regard, the mobilization of "new and additional" resources is absolutely critical and could be achieved through several innovative finance mechanisms that are reviewed in the next section.

3. Other innovative finance tools: What has been proposed?

In this section we provide a very brief review and assessment of several major tools that have been proposed to raise funding for climate change actions in developing countries each on five criteria. Those were, first, their **adequacy**, which we operationalized as generating more than a few billion a year, based on estimates from reliable sources. Second, the **dependability and predictability** of these sources of

funds, that is, whether they would generate roughly the same amount each year, without fluctuating wildly depending on relevant factors - the price of oil, or participation in carbon markets, for example. Third, we consider each approach's **feasibility**, or whether the finance can be collected without the construction of vast new financial infrastructure. Can funding be collected at relatively few sources upstream, for example, or would there need to be taxation of many purchasers of a product downstream? Is collection infrastructure already in place? Fourth, what is the likely **political feasibility** of each proposal--who might oppose the approach and how powerful are they? How could their concerns be met, even partially, as a new system of revenue collection is established? Finally, is there a **clear link to loss and damage**--will payers be more comfortable with contributing since they see that such payments correspond to their values of helping those hurt by their own actions of energy use? We very briefly review six possible tools and mention a few others.

3.1 Financial transaction tax

A financial transaction tax (FTT) is a small levy placed on monetary transactions or financial instrument trading like bonds, stocks, options and foreign currency exchange. Proposed FTT levies are usually only a tiny fraction of a percent but would be able to generate a substantial amount in revenues that could be used for a number of purposes. Besides its direct benefit in raising predictable and substantial revenues, FTTs are expected to slow the rate of speculation in currency and security markets, which can make them less prone to volatility. A number of developed and developing countries have already implemented FTTs on the domestic level to generate funds for government use, in addition to the EU proposing a region-wide FTT (Williams, 2015).

An international FTT has been proposed as a possible partial solution to meet the needs of climate finance. According to a 2012 Oxfam report for the UNFCCC, if the EU is able to implement an FTT across the EU for the ten countries who were considering it, it would generate about US$ 5-10bn in funding (Oxfam, 2012). While it might likely be up to the discretion of the funding countries to decide where the funds will go, an FTT would be a big boost to provide a stable source source of income for loss and damage, or climate finance more broadly. However, the talks on the implementation of this FTT in Europe have dragged on since 2011 as the interested EU member states struggle to agree what instruments should be covered and at which tax rate (Reuters, 2016a).

There are a number of advantages to using a financial transaction tax. First, in terms of adequacy, the UN High-Level Advisory Group on Climate Change Financing (AGF) expects about US$ 7-16 billion in revenue globally could be raised (Oxfam, 2012). Second, there is a strong predictability of funding, provided the revenues are ear-marked. Third, it is both technically feasible, given its implementation in numerous domestic markets, and politically feasible, as it has a strong level of support in the EU states (Oxfam, 2012). Not only have developed countries adopted FTT in their domestic markets but also developing countries like India have them in place as well, speaking to FTT's wide level of acceptance.

While an attractive option, there are some downsides too. While it has been implemented successfully in a number of domestic financial markets, there are obstacles to overcome when implementing an FTT on a

global level. Some domestic financial systems may not be politically willing to impose such a tax or be ready at the time of implementation to administer the tax. For example, the EU-wide tax itself has been postponed a few times due to opposition from some member countries (Christie and Brunsden, 2011). A global tax is bound to invite disagreements from some countries. Agreement on coordinated tax implementation by major parties such as the EU and US could encourage others to do the same (Burman *et al.*, 2015). Designing a coordinated FTT would be challenging; for example, Parties would have to agree if the tax would be applied universally on all transactions or just specific trades and how. Ideally the cost of the FTT would be on the market makers, such as institutions, instead of the individual consumers (Burman *et al.*, 2015).

A globally coordinated FTT holds potential overall for financing loss and damage initiatives. With its implementation already in a number of domestic markets, the FTT could present an opportunity for climate finance provision across nations if aligned with the UNFCCC.

3.2 International Airline Passenger Levy (IAPAL)

Fees on airline passengers to pay for adaptation efforts in developing countries have been proposed by several groups, and the scheme was officially proposed to the UNFCCC in 2008 by Maldives on behalf of the 48-country LDC group of nations. As originally proposed by Benito Muller and Cameron Hepburn of the Oxford Institute for Energy Studies (2006), the basic idea behind the International Airline Passenger Levy (IAPAL) proposal was that international airline tickets would include a modest flat fee–US$ 5-10 or EUR 5-10 (depending on class of travel)–, which would be paid directly into the Adaptation Fund of the UNFCCC Kyoto Protocol. Two reviews for the Least Developed Countries supported by IIED (Chambwera et al., n.d. and Baker, 2011) concluded that the IAPAL met the criteria of appropriateness, adequacy, predictability, equity, additionality, and accessibility. The paper assessed some modifications of the plan, especially to protect LDCs.

One risk that was identified is that most LDCs and SIDS are highly reliant on air travelers for their main sources of foreign exchange through tourism, and their own citizens also rely on international air travel for their livelihoods. The proposal was not acted upon by the UNFCCC. As with adaptation, an airline passenger levy seems to apply nicely to loss and damage, since air travel releases greenhouse gases directly into the atmosphere (at a particularly damaging altitude), and so raising funding to protect likely victims and rehabilitate those damaged by these emissions is appropriate. The original IAPAL proposal was for the funding to go directly into the Adaptation Fund of the UNFCCC, to avoid that account requiring funding from national treasuries, which is fraught with national politics and contravening demands on policy-makers. Having an International Risk Insurance Pooling Facility or UNFCCC “Loss and Damage Fund” would avoid having national policy-makers face the dilemma of whether to allocate funds locally or abroad. The technical feasibility of the IAPAL is supported by the Solidarity Levy, discussed in the next section.

3.3 Solidarity Levy

In 2006, France imposed a levy on passengers departing from French airports, ranging from EUR 1 to 40 and assigned according to class of service and destination. Unlike the proposed International Airline Passenger Levy, this Solidarity Levy is not a universal tax producing revenue to be allocated by a single global actor. Instead, it is levied domestically by participating countries. Nine countries (both developed and developing ones) have implemented the air ticket levy: Cameroon, Chile, Congo, France, Madagascar, Mali, Mauritius, Niger and South Korea. Each nation decides the amount of their own levy and agrees to allocate funds collected to support a common cause. The revenue from the Solidarity Levy supports UNITAID, an international drug purchase facility that combats malaria, tuberculosis, and HIV/AIDS in developing countries. Total revenue from this levy has been approximately EUR 180 million per year from France alone and an estimated EUR 22 million annually from the seven other participating countries.

Although the Solidarity Levy in France does represent a large increase over existing air travel tax rates in percentage terms, it remains small relative to the total cost of a trip, and was never intended to be significant enough to change passengers' behavior (Brookings, 2007; Lockley 2011). In fact, France designed the tax specifically to limit its effect on the competitiveness of the airline industry, and to avoid having an impact upon the appeal of France as a destination. It did so by ensuring that the majority of passengers (70 percent) pay the lowest possible rate of 1 euro per ticket, and by refraining from imposing the tax on connections through France shorter than 24 hours. It also imposed the levy on passengers instead of carriers, to avoid distorting competition between airlines (Brookings, 2007).

Strengths of the Solidarity Levy include its feasibility and clear link to loss and damage. The development and implementation of the program shows that in willing countries it is relatively easy to implement the levy on top of existing airline taxes and fees. National sovereignty is preserved, since the program is voluntary, and it does not require universal adoption, since it is not a global tax. The program explicitly includes opportunities for countries to adjust their participation as economic conditions change.

The Solidarity Levy idea has some weaknesses, however. At the top of the list is whether it can be adequate, since it is relatively modest and that each country can decide to put it in place or not. It may run into difficulties of political feasibility if there are efforts to extend its base across less-interested nations. Although the French Solidarity Levy has successfully delivered approximately US$ 200 million annually to UNITAID, this amount is far from sufficient to finance loss and damage response efforts. However, if a solidarity levy were to be implemented more widely, revenue might approach adequacy. In addition, solidarity levies face numerous political challenges based on concerns about harming airlines' and airports' competitive abilities. Although the levy is not intended to be large enough to change passengers' behavior, some have argued that "another increment" of tax on air travel "could reduce a country's competitiveness at the margin" (Brookings, 2007). However, again, universal application of a levy would avoid this problem. Every effort to make the program more flexible to avoid resistance and gain wider adoption potentially lowers the reliability and adequacy of the solidarity levy.

3.4 Bunker fuels levy

Transportation of cargo by container or bulk transport ships across the world's oceans is skyrocketing, as production and consumption systems become ever more globalized. International shipping is estimated to account for 3 or 4 percent of all carbon emissions, and these emissions are projected to increase by 150-250 per cent by 2050 (Oxfam, 2012). There are currently no regulations or taxes on these emissions, and "bunker fuels" used in shipping are largely untaxed. Oxfam estimated a levy pegged to carbon emissions would raise about US$25bn per year by 2020 if the rate was US$ 25 per ton of CO_2. This estimate is quite similar to one announced in early 2016, when the International Monetary Fund estimated that a US$ 30 a ton tax on airplane and ship fuels would have raised about US$ 25 billion in 2014, from advanced economies only (Darby, 2016; Farid *et al.*, 2016). In the report, the IMF said that bunker fuels tax should be "front and center" in raising funds for climate action (Farid *et al.*, 2016).

The IMF report summarized that "Substantial amounts could also be raised from charges on international aviation and maritime fuels. These fuels are a growing source of emissions, are underpriced, and charges would exploit a tax base not naturally belonging to national governments" (Farid *et al.*, 2016: 5-6). These are precisely the sources sought in innovative mechanisms for financing climate action.

Air and ship fuels are not currently taxed, and were not explicitly addressed in the 2015 Paris Agreement. There is need for international coordination, and the sectors are overseen globally by the International Civil Aviation Organization (ICAO) and International Maritime Organization, both of which have considered bunker fuels levies in the past. However the ICAO points to the existence of "treaties and bilateral air service agreements limiting fuel taxes," something the IMF report concludes "should be manageable" (Farid *et al.*, 2016: 29). On the criteria of adequacy, predictability and feasibility, bunker fuels levies are quite positive. However there is likely to be political resistance from very organized industrialized sectors, and some risk of avoidance of the levies by firms attempting to purchase fuels in locations without taxation. The link of transportation emissions to the impacts of climate and loss and damage is quite a clear one, strengthening the case for this levy, and it is gaining momentum among international institutions.

3.5 Fossil fuel majors carbon levy

The concept of a fossil fuel majors levy linked to loss and damage finance provision is based on the 2013 Carbon Majors Study, which concluded that just 90 companies were responsible for 63% of anthropogenic greenhouse gas emissions (Heede, 2014). The organization providing the driving force behind the concept of a carbon majors levy, the Climate Justice Programme (CJP), has proposed that a global fossil fuel extraction levy be imposed to target the big oil, coal and gas producers. While an earlier report called for a one-time payment and ongoing taxes for each of the 90 companies implicated in the Carbon Majors Study, the expanded and revised report states that the one-time payment and ongoing taxes would be extended to the broader category of big oil, coal, and gas producers to "establish a level playing field and capture all relevant emissions in the scheme" (Richards and Boom, 2014). The CJP has suggested that the revenues from the levy be funneled directly into a "loss and damage mechanism." This would occur through a Loss and Damage Window in the Green Climate Fund or a specific finance stream that may be developed as part of the Warsaw International Mechanism for Loss and Damage. This

ongoing funding stream would be supplemented by an initial one-time payment from each company based on historical emissions, and additional funds from Annex II (developed) countries.

The concept of a fossil fuel levy is familiar on the national level. Nations and individual US states have different severance taxes for the extraction of nonrenewable resources. In the US, state severance taxes usually end up in the general fund, and many states rely heavily on severance taxes to fill their budgetary needs. An international extraction levy, however, has not been employed. CJP analyzes international liability and compensation schemes, such as the regime governing oil pollution damage spills at sea, to demonstrate how such a regime could look in the context of climate loss and damage. The oil pollution regime attempts to ensure that compensation is available to those injured by maritime pollution damage involving ships transporting oil, creating a set of rules governing liability and compensation within this context established in the instrument texts. The regime is financed by taxes on entities that receive more than 150,000 tons of oil per year. One-hundred and fourteen states are Parties to the Fund Convention that established the regime and 31 states are Parties to the Supplementary Fund Protocol.

Richards and Boom argue that a starting levy of US$2 per tonne of CO2 could yield US $50 billion per year. They suggest increasing the levy based on mitigation and adaptation action based on estimates from reliable sources. However, the authors note that the levy will "reinforce the need to phase out fossil fuels," increasing the cost of fossils enough to incentivize renewables (Richards and Boom, 2014). If extraction rates are reduced, however, the income stream may also falter. Participation and coordination pose a challenge to the establishment of the levy; states may be unwilling or unable to engage and coordinate the implementation of such a levy based on their national situations.

An attractive advantage to this approach is its underlying idea of compensatory justice. The levy attempts to target those most responsible for emissions and therefore also for loss and damage arising from climate impacts. There are advantages and disadvantages to bypassing state aid while still relying on nations' participation and compliance. For example, states would still have to adopt a regulatory framework to facilitate the collection of funds. However, this new source of finance would not be adding an additional burden to mitigation and adaptation funding obligations.

3.6 Global carbon tax

A worldwide system of carbon pricing could raise funds for loss and damage in the form of either a tax or auction revenues generated from trading schemes such as the EU-ETS. The pricing system could apply to all carbon across industries, or to carbon in specific industries such as energy and transportation. Levied on the carbon content of fossil fuels, rather than on energy content as in conventional energy taxes, a carbon tax would raise funds that could be applied to financing loss and damage, while simultaneously promoting substitution of cleaner energy sources not subject to the tax. The tax could also be levied on CO_2 emissions, rather than on the fuels themselves, to similar effect. A tax could raise funds to be used for financing loss and damage programs, regardless of the profitability of those programs; thus, it is an attractive option for mitigation and compensation payments as well as adaptation.

While there is nothing resembling a carbon tax at the global scale today, national, subnational, and transnational carbon pricing instruments have been implemented in recent years. According to the World Bank, about 40 nations and over 20 sub-national jurisdictions (like cities, states, and regions) have adopted carbon pricing schemes. These jurisdictions represent about 12% of global emissions (World Bank, 2015). Fifteen countries are implementing or have passed legislation to instill a direct carbon tax (World Bank, 2013).

Revenues from a carbon tax would be highly scalable and would vary according to taxation rate, coverage, and market responses. An estimate by the Swiss Government, based on a levy of US$ 2 per ton of CO_2 emissions, projects revenues of US$ 40-50 billion per year (Anderson, 2010). One factor confounding revenue estimation is leakage, wherein emissions reductions in highly-taxed jurisdictions are negated by emissions increases in low or non-taxing regions. Another is that revenues would progressively decline if the tax were successful in its goal of shifting consumption away from fossil fuels, thereby downsizing the market being taxed. The former issue can be mitigated by ensuring true global coverage with the tax. The latter may be inevitable, but revenues could still be substantial in the short run.

Establishing true global coverage is a problematic issue. A global tax would require the consent of countries worldwide, many of which resist the idea. It would also require the establishment of an entity with the authority and capacity to implement the tax, and the costs of enforcement and compliance would be significant. Moreover, as the tax would be based on current consumption rather than historical responsibility, it would be unpopular with some developing countries. However, the net outcome would be strongly positive for developing countries: the tax could be progressive, with developed countries paying greater rates to be redistributed among developing countries and defray costs. However, this could again lead to leakage.

Both UNFCCC Executive Secretary Christiana Figueres and Yvo de Boer before her have spoken on the infeasibility of a global carbon pricing system (Reuters, 2016b). However, there is some push from both countries, international institutions, and the private sector to institute a global pricing scheme (World Bank, 2013). While a truly global carbon pricing instrument is unlikely to be established in the immediate future, national and subnational schemes remain important possibilities, and coordination and harmonization between them could help to ensure greater revenues, compliance, and success, and reduce the risk of leakage.

3.7 Other tools

Some innovative finance tools have attracted significant attention in the past but have all but disappeared in the discourse since. This is the case with the issuance of additional Special Drawing Rights (SDRs), a reserve asset created by the International Monetary Fund (IMF), that was suggested by philanthropist George Soros in December 2009 to finance a global climate fund. The idea was then adopted by the IMF's then Managing Director Dominique Strauss-Kahn during a panel session at the 2010 Davos World Economic Forum (IMF, 2010), but the details of it have apparently never been further developed by the IMF. The idea was discussed by ActionAid (2010), which suggested several options on how SDRs could

be used to finance climate action in developing countries. ActionAid also identified several associated risks, including "giving the IMF – an institution with an undemocratic governance structure and a history of attaching very harmful conditions to its loans – any role at all in climate finance" (ActionAid 2010: 6).

Similarly, the idea of a tax on banks that could partially finance climate activities in developing countries was also put forward by some observers after the 2007-8 international financial crisis (Christian Aid, 2010) but with limited echoes since then. Another proposal that has faded from the discourse is the potential levy on carbon market mechanisms – beyond the current two per cent levy on the Clean Development Mechanism (CDM) of the Kyoto Protocol that is currently allocated to the Adaptation Fund. The idea was either to increase the tax percentage on the CDM, or to apply a tax to other carbon market mechanisms (such as the Joint Implementation Mechanism and emissions trading mechanisms). These options were notably discussed at COP14 in Poznan in 2008, but opposed by many developed countries (Christian Aid, 2010). In addition, since the near collapse of the CDM market, the funding from the levy has almost dried up, and the Adaptation Fund now mainly depends on voluntary contributions from developed countries.

4. Summary and steps toward a funding mechanism for loss and damage

We reviewed a range of proposals for how funding might be arranged to support approaches to loss and damage in developing countries. In this final section we summarize the most salient parts of that overview and look ahead to pragmatic steps that might be taken in the short- and medium-term. In doing so, we acknowledge that given inadequate science on the scale of likely future disasters, limited economics to determine which parts of these disasters will result in irreparable damage, and the lack of a political definition of what "counts" as loss and damage, these points are necessarily extremely preliminary. The few exercises that have been undertaken to estimate losses and damages from key disasters and in example sectors can inform our understanding of what we should be considering as loss and damage. It is outside of the scope of this paper to determine how funding, once collected using innovative financial mechanisms, would actually be *allocated* in ways that are equitable and effective. Rather, we seek here to assess which funding streams seem most likely and useful directions, and some first steps to move towards developing a funding mechanism for loss and damage.

In our review, a few promising options of **financial mechanisms for gathering funds** rose to the top. Three of the six mechanisms we reviewed to raise funding involved airline transport—there is a huge opportunity to tax this sector in one form or another, recognizing its role in creating loss and damage in least developed countries and low-lying island states. The IMF statement in early 2016 is positive evidence of the momentum for such an approach, so what is needed appears to be leadership from the International Civil Aviation Organization (ICAO). If needed, a more piecemeal approach could be taken in expanding the French-led effort to assess a modest Solidarity Levy on passenger travel. The Solidarity Levy approach has been proven to work, was not be too cumbersome to implement, nor did it significantly depress airline travel. However it alone certainly will not raise enough revenue, especially

since it historically has been earmarked for key public health issues. Rather, a passenger levy that is broadly assessed—at least applying to international flights originating or arriving in developed countries—could raise substantial new and additional finance, and again the linkage to loss and damage in the poorest nations is clear.

There are a number of **viable ways to use the funds gathered** via the mechanisms discussed above in order to finance efforts to address loss and damage. First, the risk insurance approaches discussed above are politically feasible, as many have already been undertaken in some form by developed countries, and funds gathered could be used to subsidize insurance premiums for highly vulnerable nations in order to lower the financial burden governments, enterprises, and individuals face when purchasing insurance. However, without external financial support, private insurance is not realistically affordable for households or small and medium-sized enterprises in highly exposed countries, where insurers face steep start-up and transaction costs and large amounts of back-up capital and reinsurance are necessary in case insurers have to meet large claims all at once. Further, in the world's most vulnerable nations, "opportunity costs of private risk-financing instruments can be prohibitively high in terms of meeting other human needs" (MCII, 2012: 12). Financial support to enable the purchase of risk insurance in vulnerable nations could take the form of direct funding that targets governments' administrative costs and thereby minimizes distortion of loss prevention incentives, capital support for local insurers designed to lower premiums, or funding for risk reduction measures that will allow insurers to offer reduced premiums (MCII, 2012: 8-10).

Climate bonds could also potentially be a major tool for loss and damage response, as they can apply to a wide range of projects. However, at the present time, it seems unlikely that a large portion of funds accumulated using climate bonds would be allocated to loss and damage. Rather, they are more likely to go towards resilience-building. Catastrophe bonds also appear to be viable option because groups are already using them at regional scales, and they could therefore feasibly be applied at the global scale.

Another important use for loss and damage funding gathered will be financial support for capacity building at the national level. Especially as the flow of information on risk transfer, risk pooling, and other risk management tools increases in coming years under the Paris Agreement, it is crucial to build developing country governments' capacities to understand and optimally utilize the data newly available to them so that they may actually develop and implement effective risk reduction measures.

Finally, we must note that a major gap remains between the amount of funding needed for loss and damage resulting from climate change and the amount that is currently available. Most climate funds currently are going to mitigation, rather than to adaptation (CPI, 2015; AdaptationWatch, 2015), let alone to efforts to address loss and damage. To raise such funding sustainably in the face of skeptical and stretched budgets of public officials and taxpayers, there needs to be accountability and efficiency at each relevant level, including sourcing, allocation, disbursement, contracting, implementation, and evaluation.

References

ActionAid (2010), *Using Special Drawing Rights for Climate Finance: A Discussion Paper*, Available at: http://www.usclimatenetwork.org/resource-database/using-special-drawing-rights-for-climate-finance

AdaptationWatch (2015), *Towards Mutual Accountability: The 2015 Adaptation Finance Transparency Gap Report*. A partnership of Adaptify (Netherlands), Brown University's Climate and Development Lab (US), the International Centre for Climate Change and Development (Bangladesh), the Institute for Social and Environmental Transition (Nepal), Nur University (Bolivia), the Stockholm Environment Institute (Sweden, UK, US), and the University of Colorado-Boulder (US). Available at: http://adaptationwatch.org/

AGF (2010), *Report of the Secretary-General's High-level Advisory Group on Climate Change Financing*, United Nations, New York, Available at: http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGF_reports/AGF_Final_Report.pdf

Altamirano-Cabrera, J.-C., Biccheti, D., Drouet, L., Thalmann, P., and Vielle, M. (2008), *A Global Carbon Tax to Compensate Damage and Adaptation Costs*, École Polytechnique Fédérale de Lausanne, Available at: http://gemini-e3.epfl.ch/webdav/site/gemini-e3/shared/A%20global%20carbon%20tax%20to%20compensate%20damage%20and%20adaptation%20costs

Anderson, A. (2010), *A Review of Public Sources for Financing Climate Adaptation and Mitigation*, Johannah Bernstein Environmental Law and Policy Consulting, Available at: http://www.usclimatenetwork.org/resource-database/a-review-of-public-sources-for-financing-climate-adaptation-and-mitigation

Baker, A. (2011) How can air travel contribute to the costs of adapting to climate change? The feasibility of the International Air Passenger Adaptation Levy (IAPAL) as a market governance mechanism. International Institute for Environment and Development. London.

Burman, L.E., Gale, W.G., Gault, S., *et al.* (2015), *Financial Transaction Taxes in Theory and Practice*, Tax Policy Center, Urban Institute and Brookings Institution, Washington, D.C., Available at: http://www.taxpolicycenter.org/UploadedPDF/2000287-Financial-Transaction-Taxes-in-Theory-and-Practice.pdf

Chambwera, Muyeye, Evans Davie Njewa, and Denise Loga. n.d.. "The International Air Passenger Adaptation Levy: Opportunity or risk for Least Developed Countries?" LDC Paper Series. IIED, London. https://ldcclimate.files.wordpress.com/2012/05/iapal.pdf

ChristianAid (2010), *The political economy of climate finance*, A report by Lies Craeynest with imput from Alison Doig, Available at: http://www.christianaid.org.uk/images/climate-finance-report.pdf

Christie, Rebecca and Brunsden, Jim (2011). "EU Transaction Tax Debate Highlights Euro-Area Disagreement", Bloomberg Businessweek. Available at: http://www.bloomberg.com/news/articles/2011-11-08/eu-transaction-tax-debate-highlights-euro-area-disagreement

Congressional Budget Office (2013), *Effects of a Carbon Tax on the Economy and the Environment*, 22 May 2013, Available at: https://www.cbo.gov/sites/default/files/113th-congress-2013-2014/reports/Carbon_One-Column.pdf

CPI (2015), *The Landscape of Climate Finance*, Climate Policy Initiative, Venice, Available at: http://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2015/

CRED (2014), *Disaster trends - Total economic damage*, Centre for Research on the Epidemiology of Disasters, Brussels, Available at: http://www.emdat.be/disaster_trends/index.html

Darby, M. (2016), "IMF calls for carbon levy on ships and planes", *Climate Home*, Last updated on 12/01/2016, 4:06 pm, Available at: http://www.climatechangenews.com/2016/01/12/imf-carbon-tax-on-aviation-and-shipping/

European Commission (1998), "Understanding and Monitoring the Cost-Determining Factors of Infrastructure Projects: A User's Guide." Available at: http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/5_full_en.pdf

EUSF (2015), *EU Solidarity Fund*, European Union Solidarity Fund, Brussels, Available at: http://ec.europa.eu/regional_policy/en/funding/solidarity-fund/#2

Fankhauser (2010), « The Costs of Adaptation », *Wiley Interdisciplinary Reviews: Climate Change*, vol. 1, p. 23-30.

Farid, M., Keen, M. Papaioannou, M., *et al.* (2016), *After Paris: Fiscal, Macroeconomic, and Financial Implications of Climate Change*, IMF Staff Discussion Note SDN/16/01, International Monetary Fund, Washington, D.C., Available at: https://www.imf.org/external/pubs/ft/sdn/2016/sdn1601.pdf

Heede, R. (2014). Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010. *Climatic Change,* 122(1-2), 229-241.

Hope, C. (2009), "The Costs and Benefits of Adaptation", in Parry, M., *et al*, *Assessing the Costs of Adaptation to Climate Change: A Review of the UNFCCC and Other Recent Estimates*, International Institute for Environment and Development and Grantham Institute for Climate Change, London, p. 100-111.

HSBC Climate Change Centre of Excellence (2015), *Bonds And Climate Change: The State Of The Market In 2015*. Climate Bonds Initiative.

IMF (2010), *IMF Proposes "Green Fund" for Climate Change Financing*, January 30, International Monetary Fund, Washinton, D.C., http://www.imf.org/external/pubs/ft/survey/so/2010/new013010a.htm

IPCC (2014), *Climate Change 2014, Impacts, Adaptation, and Vulnerability, Contribution of Working Group II to the Fifth Assessment Report*, Intergovernmental Panel on Climate Change, Geneva, Available at: https://ipcc-wg2.gov/AR5/report/full-report/

Kidney, S., Sonerud, B., Dupré, S., *et al.* (2015), *Shifting Private Finance towards Climate-friendly Investments: Policy Options for Mobilising Institutional Investors' Capital for Climate-friendly Investment*, The Financing the Future Consortium, Rotterdam, Available at: http://ec.europa.eu/clima/policies/international/finance/docs/climate-friendly_investments_en.pdf

Kroll, M. (2015), "Financing the Green Climate Fund. How central banks can contribute to staying below the 2°C benchmark by purchasing Green Climate Bonds", *Future Finance Policy Brief*, No. 1., Available at: http://www.worldfuturecouncil.org/file/2016/01/WFC_2015_Financing_the_Green_Climate_Fund_En.pdf

Lebens, J. (2013), *Cat Bonds Cedant's Perspective*, CAS Annual Meeting, November 4th 2013, Available at: https://www.casact.org/education/annual/2013/handouts%5CPaper_2724_handout_1506_0.pdf http://www.uwiseismic.com/Downloads/Poster_CAT%20Bonds.pdf

Lockey, P., & Chambwera, M. (2011), "Solidarity Levies on Air Travel." Oxford Energy and Environment Brief. Available at: http://www.oxfordclimatepolicy.org/publications/documents/Comment-March-2011_2.pdf

Makaudze, E. (2012), *Weather Index Insurance for Smallholder Farmers in Africa: Lessons Learnt and Goals for the Future*. African Sun Media.

MCII (2012), *Insurance solutions in the context of climate change-related loss and damage: Needs, gaps, and roles of the Convention in addressing loss and damage*, Submission to the SBI Work Program on Loss and Damage, Munich Climate Insurance Initiative, Available at: http://unfccc.int/resource/docs/2012/smsn/ngo/276.pdf

Moody's (2016), *Moody's: Green Bond Issuance Could Exceed $50 Billion In 2016*, 9 Mar. 2016, Available at: https://www.moodys.com/research/Moodys-Green-bond-issuance-could-exceed-50-billion-in-2016--PR_343234

Müller, B. and Hepburn, C. (2006) IATAL -- An Outline Proposal for an International Air Travel Adaptation Levy. EV 36. Oxford Institute for Energy Studies, Oxford. See http:// www.oxfordenergy.org/pdfs/EV36.pdf

Oxfam (2012), *The UNFCCC Work Programme on Long-Term Finance*, Oxfam Technical Briefing, Oxfam, Oxford, Available at: https://unfccc.int/files/cooperation_support/financial_mechanism/long-term_finance/application/pdf/oxfam14aug12.pdf

Rai, N., Soanes, M., Norton, A., *et al.* (2015), "A fair climate deal in Paris means adequate finance to deliver INDCs in LDCs," International Institute for Environment and Development Briefing, Available at: http://pubs.iied.org/pdfs/17333IIED.pdf?

Reuters (2016a), "France says financial transaction tax talks deadlocked", *Reuters*, Available at: http://uk.reuters.com/article/uk-france-eu-tax-idUKKCN0WC140

Reuters (2016b), "Climate Change Deal Will Not Include Global Carbon Price: UN Climate Chief", *Reuters*, Available at: http://www.reuters.com/article/us-climatechange-summit-figueres-idUSKCN0SL1J220151028

Richards, Julie-Anne and Boom, Keely (2014). "Carbon Majors Funding Loss and Damage." The Heinrich Boell Foundation. Available at: https://www.boell.de/en/2014/06/05/carbon-majors-funding-loss-and-damage

The Brookings Institution (2007), "Airline Solidarity Contribution." Global Health Financing Initiative. Available at: http://www.brookings.edu/~/media/Projects/global-health/airline.PDF

UNFCCC (2015), *Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015 Addendum Part two: Action taken by the Conference of the Parties at its twenty-first session*, FCCC/CP/2015/10/Add.1, United Nations Framework Convention on Climate Change, Paris, Available at: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf

UNFCCC NAZCA (2016), *Extensive Data On Climate Bonds Made Available: NAZCA Portal*, UNFCCC, Available at: http://climateaction.unfccc.int/

UNISDR (2015), *Global Assessment Report on Disaster Risk Reduction 2015*, United Nations Office for Disaster Risk Reduction, Geneva, Available at: http://www.preventionweb.net/english/hyogo/gar/2015/en/home/GAR_2015/GAR_2015_1.html

Warner, K., Ranger, N., Surminski, S. *et al.* (2009), Adaptation to Climate Change: Linking Disaster Risk Reduction and Insurance, United Nations International Strategy for Disaster Reduction Secretariat (UNISDR), Geneva, Available at: http://risk-award.org/dms/MRS/Documents/Microinsurance/MIC_Agriculture_Bibliography/9654_linkingdrrinsurance.pdf

Williams, J. (2015), "European Commission Seeks Agreement On FTT By Mid-2016", *IPE*, Available at: http://www.ipe.com/news/regulation/european-commission-seeks-agreement-on-ftt-by-mid-2016/10011107.fullarticle

World Bank (2010), *The Costs to Developing Countries of Adapting to Climate Change: New Methods and Estimates*, The World Bank, Washington, D.C.

World Bank (2013), *Putting a Price on Carbon with a Tax*, Background Note, The World Bank, Washington, D.C., Available at: http://www.worldbank.org/content/dam/Worldbank/document/SDN/background-note_carbon-tax.pdf

World Bank (2015), *The State and Trends of Carbon Pricing*, The World Bank, Washington, D.C., Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/09/21/090224b0830f0f31/2_0/Rendered/PDF/State0and0trends0of0carbon0pricing02015.pdf

Zillow (2016), *What is a Financing Contingency on a Home Purchase?*, Available at: http://www.zillow.com/mortgage-learning/financing-contingency/