Financing options for loss and damage: a review and roadmap

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

Bonn 2016

Discussion Paper / Deutsches Institut für Entwicklungspolitik
ISSN 1860-0441

Die deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.d-nb.de abrufbar.

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available at http://dnb.d-nb.de.

ISBN 978-3-96021-011-5
Printed on eco-friendly, certified paper

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

Alexis Durand is a recent graduate of Brown University and a researcher at the CDL
Email: alexis_durand@alumni.brown.edu

Victoria Hoffmeister is an undergraduate at Brown University and a researcher at the CDL
Email: victoria_hoffmeister@brown.edu

Romain Weikmans is a Postdoctoral Research Fellow of the Belgian Fund for Scientific Research at the Université Libre de Bruxelles / Free University of Brussels
Email: romain.weikmans@gmail.com

Jonathan Gewirtzman is an undergraduate at Brown University and a researcher at the CDL
Email: jonathan_gewirtzman@brown.edu.

Sujay Natson is a recent graduate of Brown University and a researcher at the CDL
Email: sujay_natson@alumni.brown.edu

Saleemul Huq is Director of the ICCCAD in Dhaka, Bangladesh and a Senior Fellow at the International Institute for Environment and Development
Email: saleemul.huq@iied.org

J. Timmons Roberts is the Ittleson Professor of Environmental Studies and Sociology at the Institute at Brown for Environment and Society, and Non-Resident Senior Fellow at the Brookings Institution
Email: timmons@brown.edu

Published with financial support from the Federal Ministry for Economic Cooperation and Development (BMZ)

Tulpenfeld 6, 53113 Bonn
☏ +49 (0)228 94927-0
🖷 +49 (0)228 94927-130
E-mail: die@die-gdi.de
http://www.die-gdi.de

Acknowledgements

The authors wish to thank the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) for hosting the workshop "Financing Loss and Damage", held in May 2016 at its office in Bonn, and for support in the production of this discussion paper. Steffen Bauer, Pieter Pauw, Maxim Injakin, Okka Lou Mathis, Marie Fuchs, Clara Brandi, Imme Scholz and Ina Gampfer were crucial in the success of the workshop. The workshop included three dozen experts who gave excellent feedback on an earlier version of this paper, and we would like to thank them all.

Contents

Abbreviations

cat bonds	Catastrophe Bonds
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDM	Clean Development Mechanism
CJP	Climate Justice Programme
COP	Conference of the Parties
EU	European Union
EUSF	European Union Solidarity Fund
ExCom	Executive Committee of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts
FTT	Financial Transaction Tax
IAPAL	International Airline Passenger Levy
ICAO	International Civil Aviation Organization
IMF	International Monetary Fund
L&D	Loss and Damage
LDC	Least developed country
NELD	Non-economic loss and damage
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
SDR	Special Drawing Right
SIDS	Small Island Developing States
UNFCCC	United Nations Framework Convention on Climate Change
WIM	Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts

Executive summary

Pressure to support responses to loss and damage under the United Nations Framework Convention on Climate Change (UNFCCC) has intensified in recent years. Loss and damage – an issue gaining prominence largely due to shortfalls of mitigation action and adaptation support – has never been officially defined under the UNFCCC. Here, the term "loss and damage" refers to irreversible losses (e.g. loss of life, species, land) and costly damages (e.g. destroyed infrastructure) caused, at least in part, by climate change.

Although loss and damage has been a subject of debate among Parties to the UNFCCC for years, the agreement reached in Paris was the first to devote a full article to loss and damage. In that article, Parties agreed to enhance "understanding, action and support" for loss and damage and to strengthen the Warsaw International Mechanism for Loss and Damage associated with Climate Change (WIM) (UNFCCC, 2015, Art. 8). In coming years, as climate change advances and Parties work to implement this and other directions from the Paris Agreement, it will prove more crucial than ever to support loss and damage response, especially should efforts to sufficiently scale up mitigation commitments and adaptation capacity fall short. Given mounting pressure to finance effective loss and damage response efforts, understanding of the Warsaw International Mechanism's activities must be strengthened, and the question of how funding for loss and damage response might be raised and allocated must be widely considered. To these ends, this paper endeavours to answer two questions at the core of the emergent drive to fund efforts to address loss and damage.

First, what do we mean by financing loss and damage response? We examine language relevant to financing efforts in the initial two-year workplan of the Executive Committee (ExCom) of the WIM to answer this question, reviewing the workplan's listed financing options (see Table 1 in Section 2.7 for a summary).

Second, what are some possible means for raising predictable funding that will prove adequate to finance loss and damage response? We discuss a number of innovative fundraising mechanisms that have been proposed and assess their adequacy, predictability, technical feasibility, fairness (whether polluters or the most vulnerable pay), indirect effects and link to loss and damage (see Table 2 in Section 3.7 for a summary). These criteria provide a framework to evaluate the concepts that underlie each mechanism (such as fairness and links to loss and damage), to assess whether each mechanism can be implemented and become a sufficient, stable source of support for loss and damage response (using criteria of feasibility, adequacy and predictability), and to judge what tangential impacts use of each mechanism might produce (by examining potential indirect effects).

We conclude that there are a number of viable proposals for both gathering and effectively using funds to support loss and damage response. Two proposals stand out: a levy on airline travel and risk transfer approaches. However, we also identify a number of outstanding issues in funding loss and damage response, including the ambiguity of relevant UNFCCC texts; the shortfalls of proposed mechanisms in terms of providing for slow onset or high-certainty events and non-economic loss and damage; the lack of an agreed definition of loss and damage under the UNFCCC; developed countries' disproportionate (and inadequate) support for risk transfer over other approaches; the large gap that exists between funding made available and funding needed; and the inevitable contention surrounding the question of how finance should be distributed.

1 Introduction

Pressure to provide adequate support under the United Nations Framework Convention on Climate Change (UNFCCC) for vulnerable nations facing climate-related loss and damage has intensified in recent years. This is the result of growing certainty that emissions reductions are inadequate to avoid significant climate-related damages, and that international support for adaptation in vulnerable nations is not sufficient to enable complete prevention of – or recovery from – climate impacts. Although the concept received an unprecedented level of attention during the 21st Conference of the Parties to the UNFCCC (COP21) held last December, there remains no internationally agreed definition of the terms (Durand & Huq, 2015). For our purposes, "loss and damage" refers to irreversible losses (e.g. loss of human life, species or land to rising seas) and damages of significant economic cost (e.g. destroyed infrastructure) that are caused, at least in part, by climate change.

Although loss and damage is not a novel issue within UNFCCC negotiations, its prominence in the Paris Agreement is unprecedented. A new institutional context for loss and damage was established in Paris with the inclusion in the final Agreement of a loss and damage-specific article, which stipulates that Parties will enhance "understanding, action and support" for loss and damage (United Nations Framework Convention on Climate Change [UNFCCC], 2015, Art. 8). Furthermore, in the decision text attached to the Agreement, Parties decided "on the continuation of the Warsaw International Mechanism" (UNFCCC, 2015, paragraph 47). Given these developments, it is crucial to revisit past discussions on the acquisition and allocation of climate finance, the role of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (WIM) in supporting loss and damage response efforts, and effective uses for loss and damage-related financing. Although many of the mechanisms discussed below as possible means to gather funding for loss and damage response have been previously proposed – most often in the context of adaptation finance – the growing urgency of the issue of loss and damage, in combination with the shifting position of loss and damage in global climate governance, fully merit their prompt reconsideration.

In its first section, this paper reviews relevant language in the Paris Agreement and the initial two-year workplan of the Executive Committee (ExCom) of the WIM. In Chapter 2, we briefly review each of the items that Action Area 7 of the WIM workplan lists as possibilities for funding to support responses to loss and damage. We then discuss each item's current applications, explore pros and cons, and consider how each might be further used to finance efforts to address loss and damage. Chapter 3 reviews and assesses several major financial tools that have been proposed to raise funding for climate change actions – particularly loss and damage response – in developing countries. We consider their adequacy; dependability, predictability and sustainability; technical feasibility; fairness; indirect effects; and association with climate-related loss and damage. In Chapter 4, the paper concludes by taking stock of outstanding issues on financing loss and damage response and proposing strategies for buffering losses and damages in the world's most vulnerable nations.

This paper seeks to encourage discussion on two core questions. First, ***what do we mean by financing loss and damage***? UNFCCC texts outline an assortment of approaches for preventing and dealing with loss and damage, including financial support for the

development of insurance schemes and risk transfer mechanisms, early warning systems, and emergency preparedness measures. Additionally, the texts discuss the provision of support for Parties' work to implement their own risk management strategies and to support funding efforts of international institutions (such as international risk insurance facilities). The texts also emphasise the need for knowledge-building around loss and damage impacts and responses. For example, the establishment of repositories of information on insurance and risk transfer or on climate-related displacement are included in the decision text of the Paris Agreement.

Financing loss and damage, then, could have a wide range of implications – finance could flow towards knowledge- and capacity-building, administrative applications, disaster response agencies or to various other approaches developed to reduce the burden of loss and damage upon individuals and communities. In systematically reviewing each of the approaches mentioned in the WIM ExCom's workplan, this paper clarifies the range of possibilities for funding loss and damage response that are currently being considered under the UNFCCC and that could become priorities of the WIM as it is strengthened under the Paris Agreement.

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 mechanisms that we discuss have not yet proven successful in raising sufficient funds in either mitigation or adaptation settings. Could these approaches prove successful in a context of funding efforts to address loss and damage?

1.1 Loss and damage under the UNFCCC

Although loss and damage initiatives have been proposed as early as 1991, consideration of loss and damage under the UNFCCC is quite recent compared to other major themes such as mitigation and adaptation. Loss and damage first featured prominently on a Conference of the Parties (COP) agenda in 2011 at COP17 in Durban, although the negotiating text devoted to loss and damage was ultimately subdivided and placed under the purview of various existing UNFCCC mechanisms, such as the Nairobi Work Programme on Impacts, Vulnerability and Adaptation. One key paragraph, however, escaped this separation to stand alone as COP17's Decision 7, the work programme on loss and damage, which states that Parties "[a]ppreciat[ed] the need to explore a range of … potential mechanisms, including an international mechanism, to address loss and damage, with a view to making recommendations on loss and damage [to the next COP]" (UNFCCC, 2011, Decision 7). At COP18 in Doha, although vulnerable countries urged immediate movement towards an international mechanism on loss and damage, the COP decided to "establish, at its nineteenth session, institutional arrangements, such as an international mechanism, including functions and modalities (…) to address loss and damage" (UNFCCC, 2012, Decision 3).

At COP19 in 2013, Parties created the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts. Its creation was perceived as a major victory among many developing country Parties; however, the establishment of the WIM *under* the Cancun Adaptation Framework was largely seen by the same Parties as a setback. Developing countries observed this institutional arrangement as undermining

their efforts to clarify that loss and damage is a standalone issue, not a subcategory of adaptation. At COP20, held in Lima in 2014, the membership and structure of the WIM ExCom were approved and an initial workplan was adopted. This workplan specifies nine areas for action by the ExCom over two years, including enhancing the understanding of vulnerability to loss and damage, risk management, resilience, non-economic losses, extreme and slow onset events, displacement and financial instruments. The workplan will be succeeded this November by a new five-year rolling workplan, which will build on the results of the two-year plan (UNFCCC Secretariat, 2014).

The devotion of a full article in the Paris Agreement to loss and damage was widely perceived as another breakthrough for vulnerable nations. Article 8 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, Art. 8.3). Article 8.4 of the Paris Agreement specifies:

> areas of cooperation and facilitation to enhance understanding, action and support may include 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; and resilience of communities, livelihoods, and ecosystems.

The article anchors loss and damage in a crucial agreement and provides initial guidance for next steps.

The "decision adopting the Paris Agreement", a text more temporary than the Agreement itself, also provides specifications relating to the activities of the WIM and the treatment of loss and damage under the Convention. First, in paragraph 47, Parties decide on the continuation of the WIM, following its 2016 review. In paragraphs 48 and 49, Parties request that the WIM ExCom establish a repository for information on insurance and risk transfer and a task force to develop recommendations to address climate-related displacement. Finally, the decision text states in paragraph 51 that Article 8 of the Agreement "does not involve or provide a basis for any liability or compensation", thereby eliminating a compensation regime as a loss and damage response under the Convention (UNFCCC, 2015).

The developments on loss and damage that occurred in Paris have been deemed a "Pyrrhic victory" because the majority of developing countries' specific demands were not included in the final texts. However, taken together, the Paris Agreement and its associated decision text transformed the institutional context of loss and damage by giving the WIM new permanence and the issue of loss and damage unprecedented prominence (Narayanan, 2016; Climate Focus, 2015). The decision text provides for the continued evolution of the WIM's work, while the Agreement reflects the core claim expounded by developing countries in the years leading up to the Agreement: loss and damage must be acknowledged as a third pillar of the UN climate regime, separate from adaptation (Climate Focus, 2015). After this institutional sea change and during a time of intensifying climate impacts, it is more crucial than ever before for Parties to the UNFCCC to consider how the activities of the WIM and other loss and damage support efforts will be funded.

Article 9 of the Paris Agreement discusses finance for many climate-related actions, but contains no mention of loss and damage. However, Article 9.4 focuses on the nations with the greatest loss and damage burdens, stating,

> the provision of scaled-up financial resources should … [take] into account ... 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. (UNFCCC, 2015)

Although this article may have been intended primarily to underscore the Paris Agreement's large-scale departure from the conception of differentiation as a simple developed/developing country binary, it may prove relevant to funding loss and damage response efforts nonetheless (Mbeva & Pauw, 2016).

The finance article's neglect of loss and damage does not reflect the core demand that many developing country Parties have made for years and that was implicitly accepted by the COP through Article 8 of the Paris Agreement – that loss and damage must be treated as a distinct issue area that deserves funding separate from, and additional to, that allocated to adaptation (Climate Focus, 2015). It is important to acknowledge that defining the bounds of adaptation finance under this article will necessarily comment on a definition for loss and damage finance, whether explicitly or by omission.

As the UN climate regime still lacks an official, shared definition of loss and damage, proactive consideration of what loss and damage finance the Paris Agreement may deliver is crucial. This consideration should include officially defining many of the aspects of loss and damage listed under Article 8. In the cases of some such list items, such as early warning systems, emergency preparedness, risk assessment and management, and resilience-building, the distinction used to categorise these aspects as loss and damage actions – as distinct from adaptation actions – is not clear. For other elements covered in the article, such as permanent losses, non-economic losses, and slow onset events, it must be specified whether Parties' goals are preventative or responsive.

2 Financing loss and damage: a review of approaches proposed by the WIM ExCom

In Action Area 7 of its initial two-year workplan, the WIM ExCom announced its intention to research and disseminate information regarding a range of financial tools that "address the risks of loss and damage". The ExCom's list of funding instruments to investigate includes "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" (UNFCCC Secretariat, 2014). Universal participation in the global discussion of loss and damage at the present moment is crucial and requires widespread awareness of available tools. To this end, we briefly review these ideas in the following section. For each instrument, we provide a concise description and discuss its current applications, its status under the UNFCCC, its associated pros and cons, and its current or potential loss and damage applications.

2.1 Comprehensive risk management capacity with risk pooling and transfer

Insurance facilitates a transfer of risk from the initial risk holder to the insurer, allowing risk holders to pass some of their high exposure to risk over to actors with relatively stable financial bases in exchange for a premium. Risk pooling allows individual risk holders to spread their risk over larger geographical areas by aggregating risks subnationally, nationally or regionally. As risk is aggregated across more diverse areas, it becomes increasingly likely that severe climate-related losses and damages in one area will be offset by relatively minor losses and damages in another. Aggregation of risk through risk management allows areas hard hit by disasters to access collective reserves when necessary and to "gain catastrophe insurance on better terms" (Warner et al., 2009, p. 3).

Insurance approaches offer numerous benefits, but global deployment is fraught with challenges. 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". However, insurance penetration in many developed countries remains low: in poor countries, an average of only 2 per cent of total losses due to weather-related events are insured, whereas insurance penetration in the United States and the European Union (EU) for certain weather-related events exceeds 60 per cent (Hoeppe, 2016). The main obstacle to the widespread use of risk pooling and transfer by developing countries remains the limited experience of governments with insurance. It is therefore crucial to build developing countries' capacities to obtain insurance and to close this wide international gap in coverage. Promisingly, the Paris decision text requests the WIM ExCom 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 risk management approaches (UNFCCC, 2015, 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 for a more complete discussion of the CCRIF). Another is the European Union Solidarity Fund (EUSF), 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 more than 70 disasters collectively, including floods, forest fires, earthquakes, storms and droughts (EUSF, 2015). An emergent example is the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI). The PCRAFI facility, which became effective in August 2016, provides participating Pacific nations with climate- and disaster-related insurance to promote financial resilience in the face of increasingly frequent and intense disasters.

Insurance approaches have become more mainstream, with a number of major actors supporting risk management tools for climate change applications. For example, at COP21, the United States pledged US$ 30 million towards climate risk insurance in vulnerable countries. Most of this funding contributes to existing risk pools and risk transfer efforts such as the PCRAFI, the African Risk Capacity programme and the expansion of the CCRIF to cover Central American countries (United States Department of State, 2015). In addition, in June 2015, the G7 announced a goal to increase insurance coverage in the world's most vulnerable developing countries by up to 400 million people by 2020 in order to help these nations cope with climate risks (Hagemann, 2015).

However, contributions from developed countries to insurance pools have thus far been ad hoc, and most of the burden of financing insurance schemes is still borne by developing countries. Furthermore, as explained above, insurance cannot provide for high-frequency and slow onset disasters with a high certainty of occurrence, according to climate change scenarios (Munich Climate Insurance Initiative [MCII], 2012). This shortcoming is especially troublesome in light of the fact that, as climate change intensifies, even disasters that are now unpredictable may increase in frequency.

To prepare for high-certainty events, risk transfer approaches without the limitations of conventional insurance must be identified and implemented (Balogun, 2013). For example, parametric insurance schemes can redefine triggers that would prompt a payout based on parameters that indicate slow onset events, such as mean annual temperature increase or sea level rise. The African Risk Capacity Insurance Company recently employed this technique to expand their efforts to apply to long-term droughts (Wilcox, Kassam, Syroka, & Mapfumo, 2014).

In an attempt to make insurance approaches align with the principle of Common but Differentiated Responsibilities and Respective Capabilities – a foundational tenet of the UNFCCC, which recognises that nations have contributed unevenly to climate change and have different capacities to address its effects – some actors have suggested that polluters shoulder the development and operating costs of insurance approaches. For example, an Alliance of Small Island States proposal to the Ad Hoc Working Group on Long-term Cooperative Action suggests that contributions from developed countries fund insurance in countries that "lack the financial means to adapt to the adverse effects of climate change and the capacity to manage financial risks from the direct impacts of climate change" (Alliance of Small Island States, 2012).

Critics of insurance approaches for managing climate risk have warned that insurance mechanisms could cause a "moral hazard" effect by reducing incentives for risk reduction (Hudson, Botzen, Czajkowski, & Kreibich, 2014). In the context of loss and damage, it is crucial to consider how purchasing risk insurance can be integrated with risk reduction efforts and embedded in a comprehensive climate risk management strategy (Hoeppe, 2016). Creating an "operational link between risk transfer and risk reduction" is essential to promoting adaptive responses while preparing for impacts (Surminski & Oramas-Dorta, 2014). Therefore, policy-makers should consider including complementary risk reduction approaches in risk transfer mechanisms. Such approaches can be incentivised by insurers offering discounted rates if risk is effectively reduced, or by insurers limiting coverage to those willing to take certain actions to mitigate their risk. Alternatively, insurers can directly finance risk reduction in order to avoid eventually paying large compensation claims. Governments can play an important role in the private insurance market by encouraging or requiring insurers to promote risk reduction in this manner. Insurance can also enhance the quality of pre-disaster risk assessments by endeavouring to improve the pricing accuracy of premiums ("anticipate"), improve financial liquidity, reduce distress asset sales, increase food security, enable rapid recovery once a disaster strikes ("absorb"), increase savings and investments, improve conditions to take up credits and promote risk reduction behaviour over the long term ("adapt") (Hoeppe, 2016).

2.2 Catastrophe risk insurance

Catastrophe risk insurance is a type of risk transfer, and descriptions from the previous section also apply here. Catastrophe risk insurance is defined as insurance coverage for low-probability, high-cost disasters, and can include meso- and micro-insurance, or coverage for individuals and communities. To achieve optimal effectiveness, micro-distribution is matched with meso- or macro-design, so that risk insurance contracts cover a sufficiently large area to incentivise risk reduction activities, such as infrastructure development, and to positively impact regional gross domestic product (Warner et al., 2009; Hoeppe, 2016).

Several current applications for catastrophe risk insurance exist. For example, the CCRIF is the first multi-country catastrophe risk insurance instrument. Formed in 2007, the Facility draws upon a regional fund jointly financed by Caribbean governments to quickly provide financial liquidity to respond promptly and limit the fiscal impact of hurricanes and earthquakes. Other regional or country initiatives include the African Risk Capacity Insurance Company and the Fondo de Desastres Naturales in Mexico. An Asian climate risk pool does not yet exist, and the establishment of such a pool has huge potential to energize the global climate risk insurance market.

Catastrophe risk insurance, along with other approaches that fall into the broader category of risk pooling and transfer, offers several advantages relative to other Action Area 7 approaches we discuss. First, it provides opportunities to incentivise risk reduction, enhance finance leveraged through private-public partnerships, pool risk across wide areas, and provide rapid payouts after catastrophes. The model is not without its disadvantages, however. For example, unlike risk pooling more generally, catastrophe risk insurance coverage necessitates high-quality (and potentially expensive) catastrophe risk models. Additionally, as with other types of risk transfer, catastrophe risk insurance may only have limited effectiveness in addressing loss and damage, as it cannot provide for slow onset or high-frequency events. Nevertheless, catastrophe risk insurance has clear potential for application to 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, as mentioned in the previous section, the African Risk Capacity Insurance Company recently expanded its efforts to apply to long-term droughts.

2.3 Contingency finance

In planning the finances of various types of projects or writing budgets, it is common practice to include extra finances (“contingency finances” or “rainy day funds”) on top of strictly necessary funds, in case of cost overruns or unforeseen circumstances (European Commission, 1998). Some localities and institutions have adapted this approach to prepare for unpredictable climate-related disasters, setting aside funds to finance contingency plans for emergency situations and integrating this finance with other aspects of comprehensive risk management approaches. The routine and reliable capture of funds for contingency finance incentivises more extensive contingency planning, which can reduce risk by improving responses to shocks.

Setting aside funds for pre-planned uses during emergencies 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 finance 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 Programme continually provides basic aid to the chronically food insecure, but includes contingency funds in its budget that permit it to scale up coverage to include the temporarily food insecure in the event of a shock that damages agricultural productivity (Makaudze, 2012). If a severe climate-related shock occurs and no contingency budget exists, governments must rely on other means over which they have less control to finance disaster response, such as borrowing money or receiving insurance payouts.

There has been debate over the reliability of contingency finance as an option. Uncertainty as to the potential types, frequencies and intensities of climate disasters provides a challenge in terms of determining the size of an adequate contingency fund reserve. Also, contingency finance is widely considered a public sector option because governments are typically better positioned to address the scope and scale of the broader systemic risks associated with climate change than are private sector entities. However, some note that private sector funding mechanisms could be relatively well suited to cover distinct climate events, such as floods (Molk, 2015).

Overall, the mechanism may contribute to better disaster planning, as pools of money are designated before impact. However, by tying public funds to specific projects, it may reduce flexibility in responses to unpredictable disasters. Furthermore, the mechanism places the onus on governments in vulnerable nations to set aside contingency funds. Support for these funds from polluter nations could make the mechanism more equitable.

2.4 Climate-themed bonds

Climate bonds are debt securities used to finance projects. Bonds are typically sold to raise funds for projects that turn profits, which then allow the bond issuer to pay interest and/or repay the principal. Because loss and damage-related projects are less likely to be profitable than are mitigation projects, such as solar or wind farms or forest restoration, they may be unattractive targets for investors.

Climate bonds are mostly issued by corporations, state-owned rail companies and utilities, and multilateral development banks. The World Bank and the European International Finance Corporation are the most high-profile issuers, but corporate bonds, project bonds, municipal bonds, financial sector bonds and others can fall into the climate bond category. Although purchasers are largely institutional investors such as pension funds and fund managers, bonds are becoming increasingly available to individuals for purchase as well (see Climate Bonds Initiative below). Large-scale purchase of climate bonds by central banks has been suggested as a way to mobilise finance for the Green Climate Fund, with the potential to raise sums larger than US$ 100 billion (Kroll, 2015).

As of 2015, the universe of climate-aligned bond initiatives totalled US$ 597.7 billion, including 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 grows, certification will be increasingly important in order to ensure that investors can locate bonds aligned with climate initiatives (the UK-based Climate Bonds Initiative is one organisation that currently offers certification, employing a set of "Climate Bond Standards"). Although the UNFCCC has not acted directly on climate bond issuance or certification, it has recognised 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 platform since 2014.

Several obstacles hinder effective utilisation of green bonds for climate initiatives. The Institute for Climate Economics notes that, despite certification efforts, further efforts must be made in order to ensure the environmental integrity of green bonds. Some projects receiving finance from climate bonds have been criticised as unhelpful, or even detrimental to environmental initiatives at large. For example, Hydro-Quebec received a US$ 15.7 billion bond issue that was categorised as a climate bond, but some have decried its hydropower project as harmful to the local environment and indigenous peoples. The Institute for Climate Economics further notes a need to expand the pipeline of available climate-friendly projects through strategies such as reducing the cost of capital (Shishlov, Morel, & Cochran, 2016).

The greater uncertainty is how green/climate bonds could realistically be used to finance loss and damage projects. Climate bonds can serve as an attractive long-term investment instrument in areas such as infrastructure projects, where there are likely to be significant returns for purchasers – this seems unlikely to apply in the context of loss and damage. Still, green bonds can support adaptation and mitigation projects in order to prevent loss and damage. Creative developments in the catastrophe bond market, which we differentiate from the climate bond market, have yielded more relevant products, discussed below.

2.5 Catastrophe bonds

Whereas climate-themed bonds are issued to raise capital for climate-related projects, catastrophe bonds protect the bond issuer from catastrophic impacts. Catastrophe (cat) bonds are high-yield debt instruments that transfer specified risks from the bond issuer to an investor in order to provide the bond issuer with funds if a catastrophe strikes (Lebens, 2013). Cat bonds have a specific set of attached conditions stating that if the bond issuer suffers from a certain pre-defined disaster, the issuer's obligation to pay interest and/or repay the principal to investors is either deferred or completely forgiven. Cat bonds may be issued by insurers to protect themselves from financial ruin should disaster strike, or by countries to ensure sufficient financing for disaster response. Alternatively, countries or insurance pools may purchase catastrophe bonds from subnational governments or communities in order to transfer local risk to themselves – large entities better equipped to shoulder the burden of climate risk.

There are multiple advantages to cat bonds. First, they are not closely linked to the stock market or economic conditions (their value is not correlated with that of equities or corporate bonds) and therefore may be attractive to investors, as they allow diversification of risk (Lebens, 2013). Moreover, they reduce "roll over" risk (Lebens, 2013, p. 2),

decreasing the chances of refinancing a debt, and do not require a mandatory reinstatement. The application of cat bonds could reduce reliance on traditional forms of insurance, thereby reducing the overall costs of a programme.

Cat bonds have proven successful in the past. Several entities, including the CCRIF, African Risk Capacity and the Turkish Catastrophe Insurance Pool have already employed cat bonds or are considering their use on a regional scale.

There are also several disadvantages associated with cat bonds. Their main shortfall is that they cover only sudden catastrophes, not slow onset events. Second, cat bonds tend to come with stricter terms and conditions than does traditional insurance (Lebens, 2013). Third, they generally have a higher fixed cost than traditional insurance, irrespective of how much is insured. Fourth, cat bonds are often available only to institutional investors. Finally, the cat bonds market tends to experience a lower level of liquidity relative to the traditional bonds market (Lebens, 2013).

Very recently, there have been proposals for "attribution bonds", which would cover the component of the probability of a natural disaster attributable to climate change, or sea level rise bonds, which would provide dividends in the event that the mean sea level exceeds a predetermined threshold (Estrin & Tan, 2016). These bonds exist only in a conceptual stage, but could perhaps be pursued as future sources for loss and damage finance.

2.6 Other direct and indirect financing approaches

Addressing loss and damage centres on sound development: loss and damage considerations must be fully integrated into poverty reduction and other development strategies to ensure equitable, effective and sustainable development. Such an integration would yield positive economic and social returns not only in the long term, but also in the short run. Additional resources are necessary to ensure that the incorporation of loss and damage considerations into development projects, programmes and policies does not lead to a diversion of the financial means used for other climate-related initiatives or other development objectives such as improved education or health. In this regard, the mobilisation of "new and additional" resources is critical. This has proven problematic in the past for other parts of the climate finance puzzle. The WIM included a final category entitled "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)". The WIM must consider innovative finance mechanisms that may have been proposed in the past that could raise substantial new funds to support loss and damage response efforts. Several of such mechanisms are reviewed in the following section.

2.7 Conclusion

The range of approaches suggested by the WIM ExCom reveals a major weakness in applying traditional tools to the challenge of loss and damage – they do not adequately address slow onset events and non-economic loss and damage. Although insurance approaches can incentivise risk reduction, enhance finance leveraged through private-

public partnerships, pool risk across wide areas and provide rapid payouts after catastrophes, they have not been applied to non-economic loss and damage and are not easily applied to slow onset or high-frequency events. Although contingency finance can allow localities to distribute funds earlier in the course of disasters, and reduce risk by improving responses to shocks, it has only been applied to sudden disasters, and its applicability to slow onset events or non-economic loss and damage remains uncertain. While climate-themed bonds can align market incentives with important climate outcomes, loss and damage activities are unlikely to provide a profit motive for investment. Although cat bonds are attractive in their facilitation of more rapid disaster response – funds become available quickly when catastrophe strikes, as they are already held by the bond issuer when loans are forgiven – they are not useful for slow onset climate events, at least as presently applied. A review of the Action Area 7 options indicates that creative changes to existing tools or new additions to the toolkit are necessary to adequately address loss and damage.

Table 1: Summary of financing options in the WIM ExCom in Action Area 7

	Public/ private	**Clear link to loss and damage**	**Useful for slow onset events and non-economic loss and damage (NELD)?**	**Indirect effects**
(1) Risk pooling and transfer, *including* (2) catastrophe risk insurance	Public	Yes, pays when climate catastrophe strikes	Not as applied up to present: collect payout when sudden disaster strikes unpredictably. In theory could apply to NELD, but currently no standard method exists to quantify NELD for insurance payouts	Improves risk assessments, provides faster disaster response since payout is immediate, lowers premiums for lower risks, incentivises adaptation
(3) Contingency finance	Public	Yes, pays when climate catastrophe strikes	Not as applied up to present: triggered only in event of sudden disaster	Improves risk planning since budget is certain, funds are held in reserve at expense of other government programmes
(4) Climate-themed bonds	Mostly private; can be public	No, only applied to mitigation and tenuously to adaptation in the past	Application to loss and damage and to slow onset events is unclear	Indirect effects are unknown since application to loss and damage is unclear
(5) Catastrophe bonds	Public and private	Yes, pays when climate catastrophe strikes	Not as applied up to present: loans only forgiven in event of sudden disaster	Facilitates faster disaster response, as response funds are already held and simply used when needed

Source: Authors

3 Innovative finance tools: What has been proposed?

In this section, we provide a brief review of six major tools that have been proposed at various times in the past dozen years to raise funding for climate change actions in developing countries (see also van Drunen et al. 2009; Müller, 2008; United Nations High-Level Advisory Group on Climate Change Financing [AGF], 2010; Pauw, Klein, Vellinga, & Biermann, 2016), and we set out to assess each tool using six criteria. Under the first of these criteria, **adequacy**, we consider various estimates for revenues that each mechanism could gather. Once we collected estimates for each of the six mechanisms considered below, we categorised each mechanism into one of three tiers of fundraising adequacy: mechanisms that could raise more than US$ 25 billion per year, mechanisms likely to raise between US$ 10 and 25 billion per year, and mechanisms projected to raise less than US$ 10 billion per year. It is important to note that a mechanism's position within these tiers should not be considered a testament to its adequacy outside of our analysis, as we selected US$ 10 billion and US$ 25 billion cutoffs purely to distinguish the six mechanisms examined here in terms of their relative adequacies. In fact, considering projections of future loss and damage costs, no single mechanism in isolation can be considered adequate to support all necessary response efforts (see Hope (2009) and United Nations Office for Disaster Risk Reduction (2015) for yearly cost estimates that dwarf US$ 25 billion). Second, we assess the **dependability, predictability and sustainability** of each instrument, gauging whether they would generate roughly the same amount of funding each year without fluctuating based on relevant factors such as the price of oil or participation in carbon markets. Predictability can be interpreted as simply allowing countries to know that funds will be available in the future. Sustainability means that funds will remain constant or increase over time (see Pauw et al., 2016). Third, we consider each approach's **technical feasibility**, evaluating whether funds can be gathered without the construction of significant new financial infrastructure. This criteria may assess whether funds are collected at relatively few sources upstream, for example, or whether purchasers of a product downstream need to be taxed. Additionally, this criteria appraises whether collection infrastructure is already in place. Fourth, we consider the **fairness** of each funding mechanism. This criteria demonstrates if the financial burden falls on those who caused or are causing climate change, or on the poor and those who have contributed little to the problem. Fifth, we take stock of some of the likely **indirect effects** of each funding mechanism, including on other economic sectors and industries. Finally, we assess whether each instrument has a **clear link to loss and damage**.

3.1 Financial transaction tax

A financial transaction tax (FTT) is a small levy placed on monetary transactions or trades of financial instruments, such as bonds, stocks, options and foreign currencies. Proposed FTT levies are usually only a tiny fraction of a per cent but still have the potential to generate substantial revenues. A number of developed and developing countries have already implemented FTTs at the domestic level to generate funds for government use, and the EU has proposed a region-wide FTT (Williams, 2015). An international FTT has been suggested as a partial solution to the significant shortfall of funds available to support climate change-related initiatives. Although use of funding gathered by an FTT would likely be at the discretion of the governments of the countries subject to the tax, an

FTT could provide a large boost to loss and damage response efforts, or to climate initiatives more broadly.

There are a number of advantages to imposing a financial transaction tax. First, in terms of adequacy, the UN High-Level Advisory Group on Climate Change Financing expects that an FTT could raise about US$ 2–27 billion in revenue globally (AGF, 2010). In 2011, the European Commission proposed a harmonised FTT for the entire EU with a minimum tax rate of "0.1% for the trading in shares and bonds, and 0.01% for derivative agreements such as options, futures, contracts for difference or interest rate swaps" (European Commission, 2014). The EU estimated that the tax would raise about US$ 63 billion per year (European Commission, 2011). Although member states rejected the EU-wide proposal, it indicated that a significant amount of capital could result from a coordinated FTT. Second, funding from an FTT would be highly predictable, provided the revenues are earmarked. Third, an FTT is technically feasible, given such taxes' implementation in numerous domestic markets in both developed countries and developing countries such as India (Oxfam, 2012). Beyond its primary benefit of raising predictable and substantial funds, an FTT is expected to slow the rate of speculation in currency and security markets, which can reduce market volatility. Finally, the fact that this potential revenue source is conceptually distinct from loss and damage could make it more politically acceptable to developed countries, given the explicit exclusion of liability and compensation in relation to Article 8 of the Paris Agreement (UNFCCC, 2015, paragraph 52).

Although the FTT is an attractive option for the above reasons, it has some downsides as well. Even if an FTT has been used successfully in domestic financial markets, there are obstacles to overcome when implementing an FTT at the global level. Some countries may be unwilling to impose such a tax or may not be logistically prepared to administer the tax. Illustrative of these potential issues is the fact that talks of imposing an FTT in 10 Eurozone nations have been dragging on since 2011 due to disagreements between member countries regarding tax rates and coverage (Reuters, 2016a). Although a global tax is bound to invite discord among countries, agreement on coordinated tax implementation by major Parties such as the EU and the United States could encourage wide cooperation (Burman et al., 2015).

3.2 International Airline Passenger Levy

The concept of a fee placed on airline passengers to finance adaptation efforts in developing countries has been suggested by several groups, and the International Airline Passenger Levy (IAPAL) scheme was officially proposed to the UNFCCC in 2008 by Maldives on behalf of the 48-country least developed countries (LDCs) group of nations. As originally contrived by Benito Müller and Cameron Hepburn (2006) of the Oxford Institute for Energy Studies, the IAPAL would take the form of a modest flat fee of US$ 5–10 or EUR 5–10 (depending on class of travel) on international airline tickets, and this fee would be paid directly into the Adaptation Fund of the UNFCCC Kyoto Protocol. Two reviews for the LDCs supported by the London-based International Institute for Environment and Development (Chambwera et al., n.d.; Baker, 2011) concluded that the IAPAL met criteria of appropriateness, adequacy, predictability, equity, additionality and accessibility. After a decade of inaction on IAPAL, in 2016 a new initiative seeks to revive the idea to fund adaptation or loss and damage using fees on airline tickets, this

time by appealing to passengers who can opt to pay a levy while purchasing tickets online (Benito Müller & Saleemul Huq, personal communication).

One risk that has been flagged is the high reliance of many LDCs and small island developing states (SIDS) on tourism, and therefore on international air travel. However, Müller (2009) notes that increases in oil prices have not deterred tourists, concluding that a small levy on airline travel will similarly not result in reductions. The LDC group published studies supporting this point, suggesting that IAPAL at the rate of US$ 5–10 per ticket would not affect passenger travel (Chambwera, Evans, & Loga, n.d.; Baker, 2011). 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), so funding from ticket fees to protect likely victims and rehabilitate those damaged by these emissions is appropriate. The original IAPAL proposal was designed for funds to go directly into the Adaptation Fund of the UNFCCC. By creating a funding stream straight from travellers to this international fund, the IAPAL sought to avoid a complicated path through national treasuries, which are fraught with spending demands contingent on national politics and policy-makers. Channelling potential IAPAL revenues to an International Risk Insurance Pooling Facility or a UNFCCC "Loss and Damage Fund" would similarly avert involvement of national policy-makers making decisions on revenue allocation. The technical feasibility of the IAPAL is supported by that of 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 IAPAL, this Solidarity Levy is not a universal tax that produces revenue to be allocated by a single global actor. Instead, it is levied domestically by participating countries. Nine countries have implemented the air ticket levy, including Cameroon, Chile, Congo, France, Madagascar, Mali, Mauritius, Niger and South Korea. Each nation decides upon the amount of its own levy and agrees to allocate funds collected to support a common cause. The revenue from the Solidarity Levy as it currently exists supports UNITAID, an international drug purchase facility that combats malaria, tuberculosis and HIV/AIDS in developing countries. As of 2007, total revenue from this levy was approximately EUR 180 million per year from France alone and an estimated EUR 22 million annually from seven other participating countries (Brookings Institution, 2007).

Although the Solidarity Levy in France represents a large percentage increase in existing air travel tax rates, the levy remains small relative to the total cost of a trip and was never intended to be significant enough to affect passenger behaviour (Brookings Institution, 2007; Lockley & Chambwera, 2011). In fact, France designed the tax with an eye towards limiting its effect on the competitiveness of the airline industry and on the appeal of France as a destination. It did so by ensuring that the majority of passengers (70 per cent) pay the lowest possible rate of 1 euro per ticket, as well as 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 Institution, 2007).

Advantages of the Solidarity Levy include its proven feasibility and clear link to loss and damage. The development and implementation of the programme shows that in willing countries, it is possible to implement the levy on top of existing airline taxes and fees. The voluntary programme preserves national sovereignty and does not require universal adoption like a global tax. The programme explicitly includes opportunities for countries to adjust their participation as economic conditions change.

The Solidarity Levy also has some disadvantages, however. At the top of the list is the question of whether it can garner adequate funds, since it is relatively modest and national participation is voluntary. 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. Only if a solidarity levy were to be implemented more widely could the revenue approach adequate levels. However, the levy could encounter difficulties of political feasibility if there are efforts to extend its base across nations reluctant to participate. 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 alter passenger behaviour, some have argued that "another increment" of tax on air travel "could reduce a country's competitiveness at the margin" (Brookings Institution, 2007). Only universal application of a levy would render this concern irrelevant. The Solidarity Levy is plagued by a central dilemma: efforts to make the Solidarity Levy more flexible to avoid resistance and gain wider adoption will potentially lower its reliability and adequacy.

3.4 Bunker fuels levy

Transport of cargo by container or bulk transport ships across the world's oceans and skies is growing as production and consumption systems become more globalised. Emissions from international aviation and maritime transport increased by 70 per cent between 1990 and 2010 (Cames, Graichen, Siemons, & Cook, 2015, p. 12). International aviation and maritime shipping currently accounts for 3–4 per cent of all greenhouse gas emissions, and these emissions are projected to increase between two- and six-fold by 2050 (Cames et al., 2015, p. 25). There are currently no regulations or taxes on these emissions, and "bunker fuels" used in aviation and shipping are largely untaxed. The International Monetary Fund (IMF) estimated that a tax on airplane and ship fuels of US$ 30 per tonne of CO_2 would have raised about US$ 25 billion in 2014, from advanced economies only (Darby, 2016; Farid et al., 2016). In the report, the IMF concludes that a bunker fuels tax should be "front and center" in raising funds for climate action (Farid et al., 2016). The IMF report also states that "substantial amounts could 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, pp. 5–6).

As mentioned, airplane and ship fuels are not currently taxed, and were not explicitly addressed in the 2015 Paris Agreement. International coordination is critical, and the sectors are overseen globally by the International Civil Aviation Organization (ICAO) and the 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". Nevertheless, the IMF report concludes that

eliminating those barriers "should be manageable" (Farid et al., 2016, p. 29). On the criteria of adequacy, predictability and technical feasibility, bunker fuels levies are potentially promising. However, there is likely to be political resistance from very organised and powerful sectors, and some risk of avoidance of the levies by firms attempting to purchase fuels in locations without taxation. We consider these potential obstacles as being important to address but not deal-breakers. As is the case with air travel levies, the link between transport emissions and the impacts of climate change is straightforward, strengthening the case for this kind of levy. As an indirect effect, the levy may incentivise fuel-saving measures such as efficiency.

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 found that just 90 companies were responsible for 63 per cent of anthropogenic greenhouse gas emissions (Heede, 2014). The organisation 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 large oil, coal, and gas producers. While an early CJP report called for a one-time payment and ongoing taxes for each of the 90 companies implicated in the Carbon Majors Study, an 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 & Boom, 2014). The CJP has suggested that revenues from the levy be funnelled directly into a "loss and damage mechanism", whether through a Loss and Damage Window in the Green Climate Fund or a specific finance stream that may be developed as part of the WIM under the UNFCCC. This ongoing funding stream would be supplemented by an initial one-time payment from each company based on historical emissions, as well as additional funds from Annex I (developed) countries.

The concept of a fossil fuel levy is familiar at the national level. Several nations and individual US states impose severance taxes for the extraction of non-renewable resources. In the United States, state severance tax revenues typically end up in a general fund, and many states rely heavily on these revenues to fulfil budgetary needs. An international extraction levy, however, has never been employed.

CJP analyses international liability and compensation schemes, such as the regime governing oil spills at sea, to describe a potential analogous regime for climate-related 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, and is financed by taxes on entities that receive more than 150,000 tonnes of oil per year. One-hundred and fourteen states are Parties to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage that established the regime and 31 states are Parties to its Supplementary Fund Protocol (United Nations Convention on the Law of the Sea, 2015).

Richards and Boom (2014) argue that a starting fossil fuel majors levy of US$ 2 per tonne of CO_2 could yield US$ 50 billion per year. The levy may have the additional impact of increasing the cost of fossil fuels enough to incentivise greater use of renewable energy,

and the authors note that the levy will "reinforce the need to phase out fossil fuels" (Richards & Boom, 2014). If extraction rates are reduced, however, the income stream may also falter. This negative feedback loop could reduce the amount of funding available over time. The potential feasibility of participation and coordination poses 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 feature to this approach is its defining principle of compensatory justice. The levy targets 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 but would not themselves receive any revenue. However, this new source of finance for loss and damage would not add an additional burden to states' existing 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 European Union Emissions Trading System. The pricing system could apply to all carbon across industries, or to carbon only in specific industries such as energy and transport. 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. The tax could also be levied on CO_2 emissions, rather than on the fuels themselves, to similar effect. Such a tax could raise funds to support loss and damage programmes regardless of their profitability; thus, it is an attractive option for funding mitigation and adaptation initiatives as well.

Although there is nothing resembling a carbon tax operating at the global scale today, transnational, national and subnational carbon pricing instruments have been implemented in recent years. According to the World Bank, about 40 nations and more than 20 subnational jurisdictions have adopted carbon pricing schemes. These jurisdictions account for about 12 per cent of global emissions (World Bank, 2015). In addition, 15 countries are implementing – or have passed – legislation to impose a direct carbon tax (World Bank, 2013).

Revenues from a global carbon tax would be highly scalable and would vary according to taxation rate, coverage and market responses. One estimate by the Swiss Government, based on a levy of US$ 2 per tonne of CO_2 emissions, projected 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 potential confounder is that revenues would progressively decline if the tax were successful in its goal of shifting consumption away from fossil fuels, thereby gradually downsizing the market being taxed. The former issue could be mitigated by ensuring true global coverage with the tax, though this would

obviously require exceptional international cooperation. 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 worldwide consent, but many countries would resist the proposal. 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 highly contentious among developing countries. To address this issue, the tax could be progressive, with developed countries paying greater rates, to be redistributed among developing countries to defray costs. However, this could lead to leakage, with carbon production shifting towards those countries with lower tax rates.

Both of the last two UNFCCC Executive Secretaries, Christiana Figueres and Yvo de Boer, have expressed scepticism regarding the feasibility of a truly global carbon pricing system (Reuters, 2016b). Nonetheless, there is some push from countries, international institutions and the private sector to institute a global pricing scheme (World Bank, 2013). Although 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 harmonisation between them could help to reduce the risk of leakage and ensure greater revenues, compliance and success. If established, such a tax could provide, at least for a time, a fair and significant source of funding, with the largest revenues being contributed by the largest polluters.

3.7 Other tools

Some other innovative finance tools have attracted significant attention in the past but become less prominent over time. This is the case with the issuance of additional Special Drawing Rights (SDRs), a reserve asset created by the IMF, which was suggested by businessperson and philanthropist George Soros in December 2009 to finance a global climate fund. The idea was subsequently adopted by the IMF's then-Managing Director Dominique Strauss-Kahn during a panel session at the 2010 Davos World Economic Forum, but its details have apparently never been further developed by the IMF (International Monetary Fund, 2010). The idea was also discussed by ActionAid, which suggested several more specific options for uses of SDRs 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, p. 6).

The idea of a tax on banks that could partially finance climate-related activities in developing countries was proposed by some observers after the 2007–2008 international financial crisis, with limited echoes since (Craeynest & Doig, 2010). Another proposal that has faded from the climate finance discourse is a levy on carbon market mechanisms beyond the current two percent levy on the Clean Development Mechanism (CDM) of the Kyoto Protocol that currently goes 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 discussed at COP14 in Poznan in 2008 but were opposed by many developed countries (Craeynest & Doig, 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.

Table 2: Summary assessment of proposed innovative funding mechanisms for loss and damage

	Adequacy	Predict-ability	Technical feasibility	Fairness	Indirect effects	Link to L&D	Overall
Financial transaction tax	From +/- to ++	++	+/-	+	+	+/-	7 or 8+ / 2 or 3 -
IAPAL	+/-	++	+	+/-	0	++	7+ / 2-
Solidarity Levy	+/-	+/-	+	+/-	0	++	6+ / 3-
Bunker fuels levy	++	+ → -*	+/-	++	+ / ++*	++	9 or 10 + / 1-
Fossil fuel majors levy	++	+ → -*	+/-	++	+ / ++*	++	9 or 10 + / 1-
Global carbon pricing	++	+ → -*	+/-	++	+ / ++*	++	9 or 10 + / 1-

Notes to table: Symbols range from ++ to -- (+ +, +, +/-, -, - -). "→" shows passage of time and "0" signifies no effect. Overall totals pertain to the immediate effect of each mechanism.

* Includes the possibility of a negative feedback loop, wherein incentivised reductions in greenhouse gas use result in less fundraising.

See Appendix for ranking criteria, a key for ranking symbols and a full explanatory table.

Source: Authors

4 Conclusion

We reviewed a range of proposals for how funding might be collected and used to address loss and damage in developing countries. In this final section, we summarise the most salient parts of this overview and look ahead to pragmatic steps that might be taken in the short and medium terms to gather and use funding for loss and damage response. In doing so, we acknowledge that – given the inadequate science on the scale of likely future disasters, the limited ability to predict the scope of irreparable damage these disasters will cause, and the lack of a political understanding of what defines and "counts" as loss and damage – these points are necessarily extremely preliminary. It is also outside of the scope of this paper to determine how funding, once collected using innovative financial mechanisms, should actually be *allocated*, equitably and effectively. Rather, we seek here to assess which finance streams and uses for funding seem most feasible and to suggest steps towards the development of a lasting financial mechanism to support loss and damage response efforts.

4.1 Potentially effective uses of funds

A number of uses for funds gathered by the mechanisms discussed above could viably contribute to effective support for loss and damage response efforts. First, risk management approaches, including risk pooling, catastrophe risk insurance and catastrophe bonds, are clearly technically feasible, as they are already in use in some form in many developed and developing countries. Furthermore, developed countries' recent pledges to such mechanisms covering developing countries suggest that risk management approaches may also be the most politically feasible option currently available for loss and damage-related funding. Although the equity of insurance approaches remains a concern, certain measures could increase access to – and the fairness of – these proposals. Financing paid into risk transfer approaches could take the form of direct funding that targets insurance-related administrative costs in government, thereby minimising distortion of loss prevention incentives. Alternately, these finances could be used to support local insurers in order to lower premiums, or to fund risk reduction measures that would allow insurers to offer reduced premiums (MCII, 2012, pp. 8–10).

However, an exclusive focus on risk transfer approaches is short-sighted. Without external financial support lowering risk insurance premiums in vulnerable nations, private insurance remains largely unaffordable for households and small or medium-sized enterprises in highly exposed countries, where insurers face steep start-up and transaction costs. In addition, substantial education on the use of insurance mechanisms will be required. Furthermore, for the governments of the world's most vulnerable nations, the purchase of risk transfer instruments comes at the price of insufficient government funding for other human needs (MCII, 2012, p. 12). In other words, governments may be unwilling to invest precious funds in risk insurance or set money aside as contingency finance in anticipation of a disaster that is not certain to occur, as this might diminish their capacity to meet already-present human needs.

Another important use for funding gathered for loss and damage response is support for capacity-building in vulnerable nations (see Hoffmeister, Averill, & Huq, 2016). Especially as more information on risk transfer, risk pooling and other risk management tools is made available in coming years, it will prove crucial to build the capacities of citizens of vulnerable nations to understand and optimally utilise data to develop effective risk reduction and loss and damage response measures.

4.2 Potentially effective tools for gathering funds

In the course of our review, several **mechanisms for gathering funds** emerged as particularly promising. Three of the six financial mechanisms we considered involve air travel, suggesting that there is great potential to raise climate finance with some form of levy in this sector. We found that these options were promising for three key reasons. First, the conceptual link between air travel emissions and climate-related loss and damage is clear. Second, a tax that is small relative to the total price of airline tickets and/or fuel can raise significant funds without distorting airline competitiveness or consumer decisions. This is particularly important to small island states and other developing countries with economies highly dependent on tourism. Finally, as air travel is already

subject to a number of taxes and fees and the number of firms is relatively small, a further levy could be easily implemented.

An IMF statement made early this year is positive evidence of the momentum for such an approach, but leadership from the ICAO will be necessary. If needed, a more piecemeal approach could be taken in expanding the French-led effort to assess a modest Solidarity Levy on passenger travel. Although voluntary country participation in the existing French Solidarity Levy is promising, a levy applied uniformly – at least to international flights and shipping routes originating or arriving in developed countries – is necessary to raise sufficient new and additional finance for loss and damage and to assuage concerns regarding competitiveness. However, achieving agreement among all developed countries to levy these fees poses a diplomatic challenge.

4.3 Outstanding issues in financing loss and damage response

Although some options listed in Action Area 7 of the WIM two-year workplan are promising, several outstanding issues must be addressed for progress to be made. First, the WIM ExCom should do its part to ensure that its own texts relating to loss and damage finance are as intelligible and unambiguous as possible. It can begin by clarifying certain points in Action Area 7, including why "catastrophe risk insurance" is listed separately from "risk pooling and transfer", even though it is a type of risk transfer, as well as how it believes climate-related bonds could be leveraged to finance loss and damage response.

Second, a common definition of loss and damage should be agreed upon under the UNFCCC in order to advance discussions of loss and damage finance (Durand & Huq, 2015). Funding loss and damage response is a contentious issue that will be made only more unwieldy if Parties' conceptions of loss and damage are at odds. Putting off the complex process of agreeing upon a common definition will inevitably create misunderstandings and difficulties down the road, as more severe loss and damage grows more common, countries' individual loss and damage response programmes develop, and international coordination on loss and damage is more essential than ever before. It should also be understood that some discussions of adaptation finance that proceed without explicitly defining loss and damage may comment on its definition by omission.

Third, much greater attention should be paid to the pressing question of how funding raised can support efforts to address loss and damage from slow onset, high-certainty events such as sea level rise and desertification. None of the items listed in Action Area 7 were devised to apply to slow onset events: most listed instruments release funds only if triggered by sudden, unpredictable disasters. Therefore, an investigation of how finance for loss and damage can be leveraged to support responses to such slow onset events is urgently needed. Furthermore, as climate change intensifies and the occurrence of now-unpredictable disasters becomes increasingly definite, mechanisms founded on the uncertainty of disaster occurrence will become increasingly unviable. Therefore, it is crucial to consider channels for funding for loss and damage other than risk transfer, catastrophe bonds and contingency finance.

Fourth, non-economic loss and damage should be considered as an element of any formulation of support for loss and damage response (Serdeczny, Waters, & Chan, 2016).

Non-economic loss and damage cannot be straightforwardly compensated by insurance payouts or government disaster response funds, although valuations of the impacts of non-economic injuries may sometimes offer useful methods for determining appropriate remedies for climate-related non-economic loss and damage. Because it occurs in concert with losses and damages that can be valued and compensated, such as destruction of infrastructure, non-economic loss and damage must be made a part of relevant discussions. Furthermore, poor citizens of vulnerable countries may suffer severe non-economic loss and damage in the aftermath of disasters and will not benefit from insurance schemes, as they do not own property to insure. Means to facilitate inclusion of non-economic loss and damage in a potential loss and damage financing system, such as systematic evaluation, should be considered.

Fifth, although risk transfer approaches certainly have an important role to play in the effective use of loss and damage funding, it must be ensured that developed countries' support for loss and damage response does not continue to almost exclusively take the form of one-time contributions to insurance schemes. Such pledges are made on an ad hoc basis and have thus far been too small and infrequent to shift the bulk of the financial burden associated with risk insurance off of vulnerable country governments. Instead, contributions by wealthy countries and funding gathered from innovative sources should be sustained, predictable, and adequate and must increase steadily as climate change intensifies. Furthermore, it must be understood that contributions to insurance schemes – even if continuously adequate, predictable and sustained – would not constitute sufficient delivery of support for efforts to address loss and damage. Developed countries should create loss and damage programmes that prioritise reporting on their initiatives, sharing relevant information, building capacities and exploring means to support responses to slow onset events and non-economic loss and damage.

Sixth, a major gap remains between the amount of funding needed to support response to loss and damage and the amount of funding currently available. Most climate finance currently goes to mitigation efforts rather than to adaptation (AdaptationWatch, 2015; Climate Policy Initiative, 2015), let alone to efforts to address loss and damage. To raise funding for loss and damage response, it must be emphasised that loss and damage is an issue distinct from adaptation, that it is in serious need of adequate financial support and that virtually no such support currently exists. As new fundraising tools are developed, they should incorporate accountability and efficiency at all levels of fundraising for loss and damage, including sourcing, allocation, disbursement, contracting, implementation and evaluation.

Finally, if these six outstanding issues with financing loss and damage response were resolved, a key question would still remain: *Who* will be funded? Should insurance schemes be designed to serve supranational regions, nations, subnational regions, states, cities, groups of businesses and households, or individuals? How should funding be allocated between insurance pools, other international institutions, nations, communities and individuals themselves? How should it be allocated among different losses and damages, such as sudden versus slow onset events, and easily monetised damages versus non-economic losses? As efforts to raise sufficient funding for loss and damage response and utilise these funds effectively proceed in coming years, Parties will inevitably have to address these complex questions at length.

References

ActionAid. (2010). *Using special drawing rights for climate finance: A discussion paper*. Retrieved from 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). Retrieved from http://adaptationwatch.org/

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

Alliance of Small Island States. (2012). *Views and information on elements to be included in the recommendations on loss and damage in accordance with decision 1/CP.16*. Retrieved from http://aosis.org/wp-content/uploads/2012/11/AOSIS-Submission-on-Loss-and-Damage-Submission-Final.pdf

Anderson, A. (2010). *A review of public sources for financing climate adaptation and mitigation*. Johannah Bernstein Environmental Law and Policy Consulting. Retrieved from 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*. London: International Institute for Environment and Development. Retrieved from http://pubs.iied.org/pdfs/16504IIED.pdf

Balogun, K. (2013). *Managing loss and damage from slow onset events: Applicability of risk transfer tools including insurance*. Loss and Damage in Vulnerable Countries Initiative. Retrieved from http://loss-and-damage.net/download/7271.pdf

Brookings Institution. (2007). *Airline solidarity contribution*. Global Health Financing Initiative. Retrieved from http://www.brookings.edu/~/media/Projects/global-health/airline.PDF

Burman, L. E., Gale, W. G., Gault, S., Kim, B., Nunns, J., & Rosenthal, S. (2015). *Financial transaction taxes in theory and practice*. Washington, DC: Tax Policy Center, Urban Institute and Brookings Institution. Retrieved from http://www.taxpolicycenter.org/UploadedPDF/2000287-Financial-Transaction-Taxes-in-Theory-and-Practice.pdf

Cames, M., Graichen, J., Siemons, A., & Cook, V. (2015). *Emission reduction targets for international aviation and shipping*. Brussels: European Parliament – Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy. Retrieved from http://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU(2015)569964_EN.pdf

Chambwera, M., Evans D. N., & Loga, D. (n.d.). *The International Air Passenger Adaptation Levy: Opportunity or risk for least developed countries?* (LDC Paper Series). London: International Institute for Environment and Development. Retrieved from https://ldcclimate.files.wordpress.com/2012/05/iapal.pdf

Climate Focus. (2015). *Loss and damage in the Paris Agreement*. Client Brief on the Paris Agreement IV. Retrieved from http://www.climatefocus.com/sites/default/files/20160214%20Loss%20and%20Damage%20Paris_FIN.pdf

Climate Policy Initiative. (2015). *The landscape of climate finance*. Venice: Author. Retrieved from http://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2015/

Craeynest, L., & Doig, A. (2010). *The political economy of climate finance*. ChristianAid. Retrieved from http://www.christianaid.org.uk/images/climate-finance-report.pdf

Darby, M. (2016, 12 January). IMF calls for carbon levy on ships and planes. *Climate Home*. Retrieved from http://www.climatechangenews.com/2016/01/12/imf-carbon-tax-on-aviation-and-shipping/

Durand, A., & Huq, S. (2015). *Defining loss and damage: Key challenges and considerations for developing an operational definition*. Dhaka, Bangladesh: International Centre for Climate Change and Development.

Estrin, D., & Tan, S. V. (2016). *Thinking outside the boat about climate change loss and damage: Innovative insurance, financial and institutional mechanisms to address climate harm beyond the limits of adaptation*. Centre for International Governance Innovation. Retrieved from https://www.cigionline.org/sites/default/files/workshop_washington_march2016.pdf

European Commission. (1998). *Understanding and monitoring the cost-determining factors of infrastructure projects: A user's guide*. Retrieved from http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/5_full_en.pdf

European Commission. (2011). *Financial transaction tax: Making the financial sector pay its fair share*. Retrieved from http://europa.eu/rapid/press-release_IP-11-1085_en.htm?locale=en

European Commission. (2014). *Taxation of the financial sector*. Taxation and Customs Unit. Retrieved from http://ec.europa.eu/taxation_customs/taxation/other_taxes/financial_sector/index_en.htm#prop

EUSF (European Union Solidarity Fund). (2015). European Union Solidarity Fund – Brussels. Retrieved from http://ec.europa.eu/regional_policy/en/funding/solidarity-fund/#2

Farid, M., Keen, M., Papaioannou, M., Parry, I., Pattillo, C., & Ter-Martirosyan, A. (2016). *After Paris: Fiscal, macroeconomic, and financial implications of climate change* (IMF Staff Discussion Note SDN/16/01). Washington, DC: International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/sdn/2016/sdn1601.pdf

Hagemann, S. (2015). *G7 climate risk insurance initiative: Stepping up protection for the most vulnerable*. UNFCCC Newsroom. Retrieved from http://newsroom.unfccc.int/lpaa/resilience/g7-climate-risk-insurance-initiative-stepping-up-protection-for-the-most-vulnerable/

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.

Hoeppe, P. (2016). *Climate risk insurance for the poor and vulnerable*. Presentation, MCII Side Event: Insurance and Comprehensive Climate Risk Management. Bonn, Germany.

Hoffmeister, V., Averill, M., & Huq, S. (2016, July). *The role of universities in capacity building under the Paris Agreement* (Policy Brief). Dhaka and Providence, RI: International Centre for Climate Change and Development & Brown University's Climate and Development Lab. Retrieved from https://www.brown.edu/academics/institute-environment-society/sites/brown.edu.academics.institute-environment-society/files/uploads/Capacity%20Building%20Policy%20Brief%20July%204.pdf

Hope, C. (2009). The costs and benefits of adaptation. In M. Parry, N. Arnell, P. Berry, D. Dodman, S. Fankhauser, C. Hope, … T. Wheeler, *Assessing the costs of adaptation to climate change: A review of the UNFCCC and other recent estimates* (pp. 100–111). London: International Institute for Environment and Development and Grantham Institute for Climate Change.

Hudson, P., Botzen, W. J. W., Czajkowski, J., & Kreibich, H. (2014). *Risk selection and moral hazard in natural disaster insurance markets: Empirical evidence from Germany and the United States*. Philadelphia, PA: Risk Management and Decision Processes Center.

IMF (International Monetary Fund). (2010, 30 January). *IMF proposes "Green Fund" for climate change*. Washington, DC: Author. Retrieved from http://www.imf.org/external/pubs/ft/survey/so/2010/new013010a.htm

Inman, P. (2013, January 22). EU approves financial transaction tax for 11 Eurozone countries. *The Guardian*. Retrieved from https://www.theguardian.com/business/2013/jan/22/eu-approves-financial-transaction-tax-eurozone

Kidney, S., Sonerud, B., Dupré, S., Thomä, J., Cochran, I., Moslener, U., … Perroy, L. (2015). *Shifting private finance towards climate-friendly investments: Policy options for mobilising institutional investors' capital for climate-friendly investment*. Rotterdam: The Financing the Future Consortium. Retrieved from 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.). Retrieved from http://www.worldfuturecouncil.org/file/2016/01/WFC_2015_Financing_the_Green_Climate_Fund_En.pdf

Lebens, J. (2013, November 4). *Cat bonds cedant's perspective*. CAS Annual Meeting. Retrieved from https://www.casact.org/education/annual/2013/handouts%5CPaper_2724_handout_1506_0.pdf; http://www.uwiseismic.com/Downloads/Poster_CAT%20Bonds.pdf

Lockley, P., & Chambwera, M. (2011). *Solidarity levies on air travel* (Oxford Energy and Environment Brief). Retrieved from 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*. Stellenbosch, South Africa: African Sun Media.

Mbeva, K. L., & Pauw, W. P. (2016). *Self-differentiation of countries' responsibilities: Addressing climate change through Intended Nationally Determined Contributions* (Discussion Paper 4/2016). Bonn: German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE).

MCII (Munich Climate Insurance Initiative). (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. Retrieved from http://unfccc.int/resource/docs/2012/smsn/ngo/276.pdf

Molk, P. (2015). The government's role in climate change insurance. *Boston College Environmental Affairs Law Review*. Retrieved from http://ssrn.com/abstract=2702879

Müller, B. (2009). *International Air Passenger Adaptation Levy (IAPAL): 13 questions and answers*. Retrieved from http://www.un-ngls.org/IMG/pdf/ecbi_Brief_-_IAPAL_13_Q_As-1.pdf

Müller, B. (2008). *International Air Passenger Adaptation Levy (IAPAL): A proposal by the Group of Least Developed Countries (LDCs) within the framework of the Bali Action Plan* (European Capacity Building Initiative Policy Brief). Retrieved from http://www.eurocapacity.org/downloads/ecbi_Brief_-_IAPAL_13_Q&As.pdf

Müller, B., & Hepburn, C. (2006). *IATAL – An outline proposal for an International Air Travel Adaptation Levy*. EV 36. Oxford: Oxford Institute for Energy Studies. Retrieved from http://www.oxfordclimatepolicy.org/publications/documents/EV36.pdf

Narayanan, N. (2016). *The Paris deal is done, but is weak on climate finance for countries like India*. Retrieved from http://scroll.in/article/775422/the-paris-deal-is-done-but-is-weak-on-climate-finance-for-countries-like-india

Oxfam. (2012). *The UNFCCC Work Programme on long-term finance* (Oxfam Technical Briefing). Oxford: Author. Retrieved from https://unfccc.int/files/cooperation_support/financial_mechanism/long-term_finance/application/pdf/oxfam14aug12.pdf

Pauw, W. P., Klein, R. J. T., Vellinga, P., & Biermann, F. (2016). Private finance for adaptation: Do private realities meet public ambitions? *Climatic Change (2016), 134*: 489. doi:10.1007/s10584-015-1539-3

Reuters. (2016a). France says financial transaction tax talks deadlocked. Retrieved from http://uk.reuters.com/article/uk-france-eu-tax-idUKKCN0WC140

Reuters. (2016b). Climate change deal will not include global carbon price: UN Climate Chief. Retrieved from http://www.reuters.com/article/us-climatechange-summit-figueres-idUSKCN0SL1J220151028

Richards, J.-A., & Boom, K. (2014). *Carbon majors funding loss and damage*. Berlin: Heinrich Boell Foundation. Retrieved from https://www.boell.de/en/2014/06/05/carbon-majors-funding-loss-and-damage

Serdeczny, O., Waters, E., & Chan, S. (2016). *Non-economic loss and damage: Addressing the forgotten side of climate change impacts* (Briefing Paper 3/2016). Bonn: German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE). Retrieved from https://www.die-gdi.de/en/briefing-paper/article/non-economic-loss-and-damage-addressing-the-forgotten-side-of-climate-change-impacts/

Shishlov, I., Morel, R., & Cochran, I. (2016). *Beyond transparency: Unlocking the full potential of green bonds*. Institute for Climate Economics. Retrieved from http://www.i4ce.org/download/unlocking-the-potential-of-green-bonds/

Surminski, S., & Oramas-Dorta, D. (2014). Flood insurance schemes and climate adaptation in developing countries. *International Journal of Disaster Risk Reduction*, *7*, 154–164.

Trends Tendances. (2016, July 5). La taxe sur les transactions financières pourrait rapporter 22 milliards. *Trends Tendances*. Retrieved from http://trends.levif.be/economie/banque-et-finance/la-taxe-sur-les-transactions-financieres-pourrait-rapporter-22-milliards/article-normal-520303.html

UNFCCC (United Nations Framework Convention on Climate Change). (2011). *Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Addendum part two: Action taken by the Conference of the Parties at its seventeenth session*, FCCC/CP/2011/9/Add.1. Durban. Retrieved from http://unfccc.int/resource/docs/2011/cop17/eng/09a02.pdf#page=5

UNFCCC. (2012). *Report of the Conference of Parties on its eighteenth session, held in Doha from 26 November to 8 December 2012. Addendum part two: Action taken by the Conference of the Parties at its eighteenth session*, FCCC/CP/2012/8/Add.1. Paris. Retrieved from http://unfccc.int/resource/docs/2012/cop18/eng/08a01.pdf#page=21

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. Paris. Retrieved from http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf

UNFCCC Secretariat. (2014). *Report of the executive committee of the Warsaw International Mechanism for Loss and Damage associated with climate change impacts*. FCCC/SB/2014/4. Paris.

UNFCCC NAZCA (United Nations Framework Convention on Climate Change/Non-State Actor Zone for Climate Action). (2016). *Extensive data on climate bonds made available*. NAZCA web portal. Retrieved from http://climateaction.unfccc.int/

United Nations Convention on the Law of the Sea. (2015). *Report by the international oil pollution compensation fund 1992 to the division for ocean affairs and the law of the sea*. London: International Oil Pollution Compensation Fund.

United Nations Office for Disaster Risk Reduction. (2015). *Global Assessment Report on disaster risk reduction 2015*. Geneva: Author. Retrieved from http://www.preventionweb.net/english/hyogo/gar/2015/en/home/GAR_2015/GAR_2015_1.html

United States Department of State. (2015). *U.S. Climate Risk Insurance announcement*. Office of the Spokesperson media note. Washington, DC: Author.

Van Drunen, M. A., Bouwer, L. M., Dellink, R. B., Gupta, J., Massey, E. E., & Pauw, W. P. (2009). Financing adaptation in developing countries: Assessing new mechanisms. Amsterdam: Instituut voor Milieuvraagstukken.

Warner, K., Ranger, N., Surminski, S., Arnold, M., Linnnerooth-Bayer, J., Michel-Kerjan, E., … Herweijer, C. (2009). *Adaptation to climate change: Linking disaster risk reduction and insurance*. Geneva: United Nations International Strategy for Disaster Reduction Secretariat. Retrieved from http://risk-award.org/dms/MRS/Documents/Microinsurance/MIC_Agriculture_Bibliography/9654_linkingdrrinsurance.pdf

Wilcox, R., Kassam, F., Syroka, J., & Mapfumo, S. (2014). *African risk capacity briefing book*. Addis Ababa and Rome: African Union and the United Nations World Food Programme.

Williams, J. (2015, 9 December). European Commission seeks agreement on FTT by mid-2016. *Investments and Pensions Europe* (*IPE.)* Retrieved from 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*. Washington, DC: Author.

World Bank. (2013). *Putting a price on carbon with a tax* (Background Note). Washington, DC: Author. Retrieved from http://www.worldbank.org/content/dam/Worldbank/document/SDN/background-note_carbon-tax.pdf

World Bank. (2015). *The state and trends of carbon pricing*. Washington, DC: Author. Retrieved from: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/09/21/090224b0830f0f31/2_0/Rendered/PDF/State0and0trends0of0carbon0pricing02015.pdf

Appendix

Table A1: Ranking criteria and key to ranking symbols							
	Evaluation	**Adequacy**	**Predictability**	**Technical feasibility**	**Fairness**	**Indirect effects**	**Clear link to loss and damage?**
++	Among the best options on this criterion	Among the most promising options we considered in terms of potential revenues: Over US$ 25 billion	Highly stable revenue source	Systems proven in other applications or mechanisms would be added to existing levies	Protects the most vulnerable by clearly targeting polluters	Large positive indirect effect (contributes to the well-being of the vulnerable)	Clear conceptual link
+	Satisfactory on this criterion	Middle ground of options we considered in terms of potential revenues: US$ 10 to 25 billion	Stable revenue source	Implementation is feasible	Protects the most vulnerable by indirectly targeting polluters	Positive indirect effect	Conceptual link can be argued
+/-	Satisfactory for one or more reasons *and* unsatisfactory for one or more different reasons on this criterion	Among the less promising options we considered in terms of potential revenues: Under US$ 10 billion	Revenue source may be stable or unstable	Implementation is feasible, but the mechanism might be difficult to apply worldwide, leakage could occur, and/or extensive administration and coordination efforts would be required	Protects the most vulnerable, and consumers whose actions result in pollution (but who are not themselves sources of pollution) pay	Positive indirect effect, as well as a negative indirect effect	Conceptual link is tenuous
-	Unsatisfactory on this criterion	NA	Revenue source is unstable	The scope of administration, coordination and monitoring efforts required for implementation cannot feasibly be provided	The most vulnerable pay the largest share for their protection	Negative indirect effect	No conceptual link
--	Among the worst options on this criterion	NA	Revenue source is highly unstable	Successful implementation is impossible	The most vulnerable pay for all of their protection; polluters do not contribute	Large negative indirect effect (hurts the well-being of the most vulnerable)	Conceptual disconnect suggesting use of the mechanism is inappropriate

Misc.			"+ → -*": revenue is initially stable, but, by effectively disincentivising fossil fuel use, could decline over time and eventually cause obsolescence of the mechanism			"0": No effects have been observed, despite numerous perceptions of negative effects "+ / ++*": Mechanism could disincentivise fossil fuel use, and if highly effective, could end use of fossil fuels and itself cease to be an adequate revenue source	

Table A2: Full explanatory table						
Mechanism	**Adequacy**	**Predictability/ sustainability**	**Technical feasibility**	**Fairness:**	**Indirect effects**	**Clear link to loss and damage?**
Financial transaction tax	- US$ 7–16 bn/year (AGF, 2010) - US$ 17–35 bn/year (Craeynest & Doig, 2010) - US$ 5–10 bn/year (only Europe) (Oxfam, 2012) - Up to EUR 35 bn/year for the FTT proposed in 11 Eurozone members (Inman, 2013) - EUR 20–22 bn/year for the FTT proposed in 11 Eurozone members (Trends Tendances, 2016)	High: Predictable revenues	- Designing a worldwide-coordinated FTT would be challenging - Difficulties linked to the administration of the tax in some countries	Questionable: most financial speculation and currency transactions undertaken by banks and traders – these groups are not generally considered major polluters	- Could help reducing volatility in currency and security markets - Other impacts uncertain	Conceptually disconnected from L&D – does not suggest compensation or liability
IAPAL	US$ 5–10 fee per international flight would raise about $5–10 billion/year	High: Airline travel is increasing and the fee likely to be negligible vis-à-vis ticket prices	High: Identical to existing Solidarity Levy and relatively few companies would collect	Yes: Much international airline travel is by wealthy citizens, who are also responsible for a disproportionate amount of impacts	Concern it might reduce travel to poor locations in SIDS or LDCs	Yes, aviation fuel a sharply growing source of fossil fuel emissions
Solidarity Levy	Currently raises US$ 200 m/year; global levy could raise about US$ 5–10 bn/year or more, but model is voluntary	High/low: Airline travel is increasing but would require national opt-in	High: System instituted in France and 7 other countries	Yes: Much international airline travel is by wealthy citizens, who are also responsible for a disproportionate amount of impacts	Universal application would reduce chances of distorting travel decisions	Yes, aviation fuel a sharply growing source of fossil fuel emissions

Bunker fuels levy	US$ 25 bn/year by 2020 if the rate was US$ 25–30/tonne CO_2	Medium: Fossil transport use may drop	Medium: Relatively fewer companies but possibility of avoidance	Yes: Much international travel is by wealthy citizens, who are also responsible for a disproportionate amount of impacts	May incentivise fuel-saving measures such as efficiency	Yes, shipping and aviation fuel use a sharply growing source of fossil fuel emissions
Fossil fuel majors carbon levy	A starting levy of US$ 2 per tonne of CO_2 could yield US$ 50 bn/year	Stable revenues until fossil fuel extraction falls	Participation and coordination needs pose a challenge	Yes: Based on ideals of compensatory justice, the scheme targets polluters and distributes resulting finance to those who need it most	May incentivise shift away from fossil fuels	The idea was developed with loss and damage in mind. Suggests liability and compensatory justice
Global carbon pricing	US$ 40–50 bn based on a US$ 2 per tonne levy	Highly scalable; declining revenue with decarbonisation	Broad-based participation required to prevent leakage; would require large-scale administrative management	Questionable: A progressive tax would be more fair, but this could result in leakage	May incentivise shift away from fossil fuels	Yes, while not necessarily developed specifically for loss and damage, it recognises liability of emitters

Publications of the German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE)

Studies

91 Ströh de Martínez, Christiane, Marietta Feddersen, & Anna Speicher. (2016). *Food security in sub-Saharan Africa: A fresh look on agricultural mechanization: How adapted financial solutions can make a difference* (171 pp.). ISBN 978-3-96021-009-2.

90 Brüntrup, Michael, Katharina Becker, Martina Gaebler, Raoul Herrmann, Silja Ostermann, & Jan Prothmann. (2016). *Policies and institutions for assuring pro-poor rural development and food security through bioenergy production: case studies on bush-to-energy and Jatropha in Namibia* (204 pp.). ISBN 978-3-88985-681-4.

89 von Haldenwang, Christian, Alice Elfert, Tobias Engelmann, Samuel Germain, Gregor Sahler, & Amelie Stanzel Ferreira. (2015). *The devolution of the land and building tax in Indonesia* (123 pp.). ISBN 978-3-88985-673-9.

[Price: EUR 10.00; publications may be ordered from the DIE or through bookshops.]

Discussion Papers

20/2016 Grävingholt, Jörn, & Christian von Haldenwang. (2016). *The promotion of decentralisation and local governance in fragile contexts* (26 pp.). ISBN 978-3-96021-010-8.

19/2016 Striebinger, Kai. (2016). *The missing link: values and the effectiveness of international democracy promotion* (16 pp.). ISBN 978-3-96021-008-5.

18/2016 von Haldenwang, Christian. (2016). *Measuring legitimacy – new trends, old shortcomings?* (35 pp.). ISBN 978-3-96021-006-1.

17/2016 Burchi, Francesco, Margherita Scarlato, & Giorgio d'Agostino. (2016). *Addressing food insecurity in sub-Saharan Africa: The role of cash transfers* (34 pp.). ISBN 978-3-96021-007-8.

16/2016 Strupat, Christoph. (2016). *From protection to reduction? The impact of the public health insurance scheme on child labour in Ghana* (20 pp.). ISBN 978-3-96021-005-4.

15/2016 Schützhofer, Timm B. (2016). *Ecuador's fiscal policies in the context of the citizens' revolution: A 'virtuous cycle' and its limits* (62 pp.). ISBN 978-3-96021-004-7.

14/2016 Baumann, Max. (2016). *Reforming the UN Development System: Can North and South overcome their political differences in making the UN fit for purpose?* (38 pp.). ISBN 978-3-96021-003-0.

13/2016 Scholz, Immer, Niels Keijzer, & Carmen Richerzhagen. (2016). *Promoting the Sustainable Development Goals in Germany* (36 pp.). ISBN 978-3-96021-002-3.

12/2016 Never, Babette. (2016*). Wastewater systems and energy saving in urban India: governing the Water-Energy-Food Nexus series* (24 pp.). ISBN 978-3-96021-000-9.

[Price: EUR 6.00; publications may be ordered from the DIE or through bookshops.]

For a complete list of DIE publications:
www.die-gdi.de