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## The Allocation of (Adaptation) Resources

Lessons from fiscal transfer mechanisms

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## Executive summary

At some point, the Green Climate Fund (GCF) will have funds to disburse. By then it will need to have decided how much funding resources should be allocated to countries over a given period of time. In order to ensure acceptability for the disbursement process, several factors – such as effectiveness and efficiency – should be considered when designing a resource allocation method. However, the most politically contentious factor is equity/distributive justice: What is a fair/just allocation of GCF funds to eligible countries?

With this in mind, the aim of this Brief is to draw lessons of how to allocate funding, particularly for adaptation, from relevant experience in fiscal transfers from national to sub-national governments. After summarizing a World Bank analysis of intergovernmental fiscal transfers, the Brief presents four short illustrative country experiences – China, India, Switzerland, and the USA – chosen for the diversity in their underlying political systems and for the lessons to be learned. On the basis of this material the Brief suggests four lessons,<sup>2</sup> two of a general nature, and two pertaining to adaptation funding:

- **Lesson 1:** A formulaic (rule-based) approach is essential for the credibility and acceptability of any exogenous resource allocation.
- **Lesson 2:** Every eligible country needs to receive something. Based on the principle of sovereign equality, any exogenous resource allocation should have a flat per country component (an equal ‘floor allocation’ for each eligible country).
- **Lesson 3:** In the case of adaptation funding, the remainder should be allocated in proportion to funding needs, possibly with a prior division of eligible countries into categories with respect to their poverty intensity of GDP (measured by the number of poor people per unit of GDP).
- **Lesson 4:** Adaptation funding needs could be estimated in terms of vulnerability-adjusted numbers of people exposed to climate change impacts.

The Brief ends with two Appendices. The first considers the background of Lesson 3 in more detail, specifically bearing in mind the fairness of (adaptation funding) allocations with respect to the UNFCCC principles of common but differentiated responsibilities and respective capabilities (CBDR/RC). The second is an application of Lesson 4 to Least Developed Countries as a recipient group, as in the context of the UNFCCC LDC Fund.

## 1 Introduction and definitions

In March of this year the GCF Board initiated the process of designing a resource allocation methodology in accordance with the relevant section<sup>3</sup> of the GCF Governing Instrument (GI).

This Brief is part of an OIES trilogy of papers aimed at facilitating this process through in-depth analyses of certain relevant key issues. The first paper of the trilogy<sup>4</sup> looks at an example of what are called ‘endogenous’ resource allocations through fair transactions, in the context of mitigation funding. The aim of this Brief is to look at rule-based ‘exogenous’ resource allocation methods in the context of adaptation funding. The final paper will look at performance-based exogenous allocations.<sup>5</sup>

The choice of thematic contexts in the first two is purely for illustrative purposes and is not intended to be exclusive.<sup>6</sup> Moreover, while the issue of resource allocation arises in many different allocation contexts – such as ‘thematic’ (such as mitigation or adaptation, GI para. 50), ‘geographical’ (Africa, LDCs, SIDS, etc., GI para. 52), and ‘sovereign’ – this Brief focuses on the sovereign type, that is, the allocation of resources between eligible countries.

While the third paper of the trilogy considers certain lessons to be learned from other multilateral funds,<sup>7</sup> this paper deliberately takes its inspiration from outside that multilateral funding box, focusing instead on lessons to be learned from domestic fiscal transfer mechanisms.

### 1.1. Definitions

‘*Resource allocation*’ is here taken to refer to the process of setting aside/earmarking certain (minimum/maximum) amounts for certain types of themes and recipients, such as those mentioned above.

Allocations in this sense must not be confused with disbursements of funds in the course of individual transactions. Allocations can set exogenous limits to disbursements (1.1.a.), or they can be determined endogenously by disbursements (1.1.b). In short, they are related, but they are not the same.

- a. ‘*Exogenous Resource Allocations*’. An increasingly popular way of making exogenous allocations in multilateral funds is by way of a ‘*top-down*’ *formula*: a quantitative, centrally calculated yardstick to allocate scarce resources – as pioneered by the International Development Association (IDA), the concessional lending arm of the World Bank.
- b. ‘*Endogenous Resource Allocations*’. A possible alternative to the use of top-down formulae is an implicit or ‘endogenous’ approach, where resource allocation is simply the outcome of all the transactions carried out under the chosen instrument over the period in question.

A key difference between these two allocation types is that the fairness of endogenous allocations is determined procedurally: as long as the transactions in questions were carried out in a fair manner, the resulting allocation has to be considered fair. The fairness of exogenous allocations, by contrast, generally depends on other factors, such as the principles of CBDR/RC and other equity principles. This will be considered in Section 4 on lessons learned from fiscal transfer mechanisms, (and in more detail, in Appendix 1). But first let us turn to look at fiscal transfer mechanisms themselves.

## 2 World Bank comparative analysis of fiscal transfer mechanisms

The issue of (re-) distributing central funds – resources, mostly collected as tax revenue by national governments – to sub-national entities (states, provinces, territories, or generally ‘regions’) has been, and always will be, at the heart of national fiscal policy. One of its more recent centre-stage appearances has been the fundamental reform of the Chinese fiscal system in 1994. An important paper written in that context was Jun Ma’s comparative country analysis *Intergovernmental Fiscal Transfer* (Ma, 1997), which provides an overview of the fiscal transfer mechanisms in nine major industrial and developing countries,<sup>8</sup> with special reference to the design of mechanisms that are meant to overcome certain fiscal disparities between regions (‘equalization transfers’). Ma’s paper advocates a formula-based (equalization) transfer approach which would have at least three advantages over so-called ‘discretionary’ systems, namely:

1. *It bases the evaluation of each region’s entitlement largely on objective variables, thus avoiding excessive bargaining and lobbying by the sub-national governments. As a result, it increases the fairness of the distribution outcome.*
2. *A formula-based system, if properly designed, can eliminate the disincentives inherent in many discretionary systems that encourage low tax efforts and overspending by the sub-national governments.*
3. *Most importantly, a formula-based equalization system provides an effective means to address regional disparity issues.* (Ma, 1997, 47).

As regards ‘effectiveness’, the paper – citing Anwar Shah (1995) – puts forward the following four criteria:

- a. **Revenue adequacy:** *the sub-national authorities should have sufficient resources, including transfers, to undertake the designated responsibilities.*
- b. **Local tax effort and expenditure control:** *ensuring sufficient tax efforts by local authorities. Formulae should not encourage fiscal deficits.*
- c. **Equity:** *transfer should vary directly with local fiscal needs and inversely with local fiscal capacity.*
- d. **Transparency and stability:** *the formulae should be announced and each locality should be able to forecast its own total revenue (including transfers) in order to prepare its budget. And the formulae should be stable for at least a few years (3–5) to allow long-term planning at the local level.* (Ma, 1997, 3)

Ma distinguishes four types of equalization transfer formula:

- i. formulae that consider both fiscal capacities and needs of the recipients,
- ii. formulae that only consider fiscal capacities,
- iii. formulae that are based on some fiscal needs indicators,
- iv. simple per capita allocation.

### Type of fiscal transfers

**Fiscal Gap Transfers** are intended to fill any fiscal gap between (reasonable) fiscal needs and (normative) fiscal capacities of the regions. The total funding available is transferred in proportion to the fiscal gaps.

**Fiscal Capacity (Equalization) Transfers** assume that the total (sub-national) tax revenue *should* be distributed in proportion to the total population of the sub-national entities in question. The transfers are to make up the difference for those who fall below that normative level (generally, those that are

above this level will not have to transfer funds to the central government). Fiscal needs are not taken into consideration.

**Fiscal Needs Transfers** are intended to cover (a proportion of) the fiscal needs of sub-national entities. A region's fiscal needs are calculated as the sum of the fiscal needs of the relevant sectors (such as education, health, transportation, telecommunications, social welfare, police, fire, environmental protection). Each of these sectoral needs is calculated as the number of units that receive the service from the sector in question, multiplied by the national average unit cost for providing that service, and adjusted to local circumstances by an 'adjustment index'.

For example, the fiscal need for education is calculated by multiplying the number of children of school age by the national cost of education per school child and a weighted average of wage, rental cost, student disability, and poverty indices.

Fiscal needs, in other words, are calculated as 'reasonable' costs given the regional circumstances and national averages. The total amount available is transferred in proportion to the needs. Fiscal capacities are not taken into account

**Simple Per Capita Transfers** are transfers where the available amount of funding is shared in proportion to the share in the relevant 'eligible' population – for example, the share of people below a certain income. As Ma points out, this type of transfer cannot actually fully equalize fiscal capacity,<sup>9</sup> but that is immaterial in the present context, as it clearly cannot be the aim of a disbursement regime to equalize fiscal capacities in the world.

In sum, Ma's paper is focused on the provision of **central government grants**, conditional or unconditional. **Conditional grants** – either matching or non-matching – are tied to a certain purpose, whereas **unconditional grants** can take the form of a general revenue-sharing. *The formulae used to allocate the equalization transfers to sub-national government are the central element of this grant system, and are subject to intense debate both academically and in practice* (Ma, 1997, 4). The formulae used in Ma depend on a basic template, namely:

$$u \times c \times a$$

where:

$u$  = **number of relevant units in the region**,

$c$  = **national unit average** (contribution or cost), and

$a$  = **regional adjustment factor**.

Ma's typology is based on a differentiation with regard to (increasing) information needs. While there are parameters – in the needs assessment – that do not involve people as relevant units, the simplest formula in Ma's typology is the per capita one. Clearly, informational simplicity cannot be the (sole) reason for this, given that an equal distribution among the regions would not be more complex. The reason for choosing a per capita allocation in this context would have to be the assumption that, in the end, the relevant units for fiscal purposes – **the ultimate contributors and beneficiaries** – are not regions, not enterprises, but **individuals**.

### 3 Selected country experiences

#### 3.1 China

The situation in China regarding the distribution of central funds to sub-national governments is of particular interest because it has undergone extreme variations over recent decades. During China's centrally planned period, funding decisions were more or less retained at the central level; all the revenue was collected by the central government, which also made detailed decisions on how it was to be spent at all levels.

*The pre-reform fiscal regime resulted in an equal fiscal capacity among regions, but the sub-national governments had no incentives ... to develop their local economies because of lacking fiscal autonomy [this] became one of the starting points of the economic reform (Su and Zhao, 2004, 1).*

In the 1980s, China began a process of **fiscal decentralization**, allowing sub-national governments ('regions') to have more say in how to finance their needs and to build up their accountability gradually. The tools employed were a variety of **contracting methods**, and the basic idea was to apportion revenue and expenditure between the central and regional authorities, while holding the latter responsible for their own profits and losses. Intergovernmental transfers fluctuated; indeed the central government became dependent on revenue transfers from better-off provinces, which in turn could negotiate better contracting terms than less well-off ones. This led to a considerable increase in economic and fiscal disparities between the regions, which was seen as a threat to the unity of the country, and led to a fundamental fiscal reform in 1994. A new **tax transfer system** with three channels – a **tax rebate system** (*shuishou fanhuan*), a system of **special transfer payments** ('earmarked grants', *chuanxiang buzhu*), and a rule-based **standard fiscal transfer**<sup>10</sup> system (also known as 'transitional transfer payments', *zhuan yi zhifu*) – was introduced in the 1994 reform. The aim of this reform was to establish an **objective, normative** mechanism which would transfer funds to poor regions.

*Of the three central allocations, distribution of [transitional] transfer payment is supposed to be the most progressive in nature. The actual amount of funds allocated to a province is determined by the following factors: (a) the fiscal strength of the locality; (b) the success of the province in revenue collection; (c) political considerations – priority is given to ethnic minority, revolutionary and border regions. In other words, even for this category, need is not the only concern. As it turns out, the last consideration appears to be most influential as ethnic minority provinces manage to surpass many poorer regions in the scramble for transfer payments (Park et al. 2002 as quoted in Yep, 2008).*

However, the system has, thus far, been unable to address these disparities genuinely. Further reforms have been recommended (Kwan, 2005), key among them:

- i. Delegation of legislative powers regarding fiscal issues in accordance with the **principle of subsidiarity**;
- ii. Reform of the transfer payment system with the objective of creating equal access to public services across the country through **rule-based transfers** ('objective criteria').

### 3.2 India

For some time India (GOI, 1997), like China, applied a central planning system. India, however, has had a formula-based intergovernmental transfer system for some time.

The Indian fiscal transfer system follows two routes. On the one hand there are the statutory transfers based on a formula determined by the Indian Finance Commission, while on the other there is the non-statutory Normal Central Assistance carried out under the so-called *Gadgil Formula*.

The Finance Commission is tasked with *redressing the vertical imbalances* between the taxation powers and expenditure responsibilities of the Centre and the States respectively, and *equalizing all public services across the States*. The formula currently used for this purpose takes into account population size, income distance (deviation from income benchmark), area, tax effort, and fiscal discipline, but is weighted predominantly (75 per cent) in favour of the first two – in other words, *essentially in favour of the number of poor people*.

*Normal Central Assistance* by the central government to State plans/budgets (the second route taken by India's fiscal transfer system) was initially allocated without reference to an formula. However, in response to a general demand for an *objective* and *transparent* allocation of Central assistance for State plans, the '*Gadgil formula*' was adopted during the Fourth Five Year plan (1969–74), and since then it has been modified a number of times. The most recent (1991) incarnation of the formula – now known as the *Gadgil-Mukherjee Formula* – is a weighted combination of the following parameters (weights in brackets):

1. *Population in 1971 (60%)*;
2. *Per capita income (25%)*;
  - a. 'Deviation' method, covering States with per capita SDP below the national average (20%)
  - b. 'Distance method', covering all states (5%)
3. *Performance (7.5%)*;
  - a. Tax policy (2.5%);
  - b. Fiscal Management (2%)
  - c. Progress in respect of national objectives (3%)
    - i. *Population control (1%)*
    - ii. *Elimination of illiteracy (1%)*
    - iii. *On-time completion of externally aided projects (0.5%)*
    - iv. *Land reforms (0.5%)*
4. *Special problems (7.5%)*, at discretion of the Planning Commission.

These parameters can be divided into two categories. On the one hand, there are those which are justifiable in terms of needs, namely size of population, poverty (relative per capita income), and special needs/problems. On the other, there are the performance-related indicators which are used as incentives. What is striking is that the needs-based parameters far outweigh the performance ones (92.5 : 7.5), and that the lion's share (60 per cent) is an egalitarian per capita allocation.

### 3.3 Switzerland

Switzerland has a long-standing *fiscal equalization system*. Financially weak states (cantons) receive unconditional payments to equalize financial strengths (*'resource levelling'*) as well as financial needs (*'burden compensation'*) between the cantons. The former is based on an index which involves the taxable income of individual taxpayers, the earnings from taxable assets of individual taxpayers, and the taxable profit of firms. These factors are all relative to the population size: they are all on a *per capita* basis. Resource levelling in Switzerland is purely aimed at *wealth redistribution* and is clearly separate from other objectives, such as burden compensation which, in turn, takes into account two kinds of financial needs:

- *Geographic cost compensation* which takes into account the higher expenses incurred by mountainous cantons.
- *Socio-demographic cost compensation* which reflects additional expenses incurred by urban agglomerations with a disproportionate share of high public expenditure population groups.

The key lesson from the Swiss experience is that it is both possible and desirable to make a clear separation between wealth distribution and burden compensation.

### 3.4 United States

US federal budget spending falls roughly into two categories: *discretionary spending* (at the discretion of the annual appropriations procedure) and *mandatory/direct spending* (mostly – but not exclusively – used to fund *entitlement programmes* such as social security, Medicare, and Medicaid). Most of the beneficiaries entitled to such funds are individuals. There is, however, one programme – the *Drinking Water State Revolving Fund* ('American Water Fund')<sup>11</sup> – where the beneficiaries are legal bodies.

The aim of the 1996 American Water Fund is to provide individual states with a financing mechanism which ensures safe public drinking water. States receive federal capitalization grant money, which is awarded to set up *in-state infrastructure funding accounts* from which assistance is made available to public water systems. Each state can provide loans – with interest rates between 0 per cent and market rate, and standard repayment terms of up to 20 years – to public water systems. It is expected that loan repayments will provide the state with a continuing long-term source of infrastructure financing.

Every four years, the US Environmental Protection Agency (EPA) completes a State by State *funding needs survey* concerning drinking water infrastructure. The amount of annual American Water Fund funding that each state is eligible to receive is based on the State's *proportionate share of the total national needs* identified in that survey. Each state is, however, *guaranteed a minimum of 1 per cent* of the total amount available to all states from the annual appropriation from Congress. In other words, as there are 50 states in the Union, *half* the funding made available is *divided equally among the eligible recipients*, and the other half *in proportion to their needs*.

The US Safe Drinking Water Act requires the EPA to conduct a *Drinking Water Infrastructure Needs Survey and Assessment* of the nation's public water system capital improvement needs every four years, in order to document the 20-year capital investment needs of public water systems that are eligible to receive American Water Fund funding, and to report the results to Congress. The Assessment is developed in consultation with a working group composed of *state and water utility representatives*. The fourth Report to Congress, released in 2009, is based on data collected from utilities in 2007. EPA found an estimated investment need of \$334.8 billion between 2007 and 2027.



To conduct the survey, the EPA selects a set number of systems to serve as a statistical representation of the industry. The Agency sends questionnaires to all the nation's large water systems, and to a random sample of medium and small water systems. The results of the survey are used to determine the needs-based component of the American Water Fund disbursement. A *Federal Register* notice announcing the revised disbursement percentages, based on the results of the most recent survey, is released every four years, shortly after the report is released.

## 4 Lessons

### 4.1 *The need for formulaic allocations with flat-rate components*

#### 4.1.1 *Formulaic allocations*

Exogenous resource allocations are specifications – in absolute figures or in percentages of the overall available funding – of how much funding is to be made available for each eligible country during a funding period. They could be carried out on a ‘discretionary’ basis, but if there is any lesson to be learned from fiscal transfer mechanisms in this context, it must be that a ***formulaic*** (or ‘rule-based’) ***approach is clearly preferable***, for reasons put forward in Section 2 and illustrated in Section 3.

Exogenous allocations can be based on equitable entitlements.<sup>12</sup> Adaptation funding allocations, in particular, could legitimately be based on (historic) responsibilities for anthropogenic climate change and (economic) capabilities to deal with the problem. Müller and Mahadeva (2013) suggest the following two-step approach to how this could be operationalized (see also the discussion in Appendix 1):

- i. Calculate fair/just cost/burden shares, based on the CBDR/RC for each country, and
- ii carry out *ex post* resource allocations/transfers which ensure the resulting cost/burden distribution after these transfers is fair/just, in this sense.

However, they also acknowledge that this may generally not be practicable. What might be more practicable, particularly with respect to adaptation funding, is to:

- i. group eligible countries into those that have ***high poverty intensities*** (number of poor per unit of GDP), and those that do not, and, following the example of the American Water Fund (Section 3),
- ii. ***allocate resources within these groupings in proportion to funding needs.***<sup>13</sup>

#### 4.1.2 *Flat-rate components*

The American Water Fund also embodies an important general<sup>14</sup> lesson: ***everyone who is eligible needs to get something***. It also shows that if a claim can be made on the basis of sovereign equality, it is best to allocate some funding portion at a flat rate. Indeed, the American Water Fund exemplifies the importance of using such a (‘sovereign’) ***flat per country component*** in any exogenous resource allocation system. While the same lesson has been learned elsewhere – not least by a number of multilateral funds (see Müller, 2013) – what is astonishing is the weight given in the American Water Fund to these egalitarian flat allocations: ***a full 50 per cent of the funding originally set aside on the basis of an in-depth needs assessment is nonetheless distributed as a flat per-state allocation.***<sup>15</sup>

#### 4.1.3 *Other considerations*

There are other considerations that might be raised in the context of exogenous (adaptation) funding allocations, such as performance-based incentives and (the lack of) ‘absorptive capacity’. However,

this is not really the place to discuss these, not only because this Brief is meant to be about lessons learned from fiscal transfer mechanism, but also because the case of performance-based exogenous allocations is discussed in detail in Müller (2013). As to the lack of absorptive capacity – that is to say, the inability of eligible countries to use the allocated funding – this warrants a separate analysis, not least because it stands to reason that it is as much a shortcoming of the funding agencies in building the required capacity as it is of the countries in question.

At this point, let us return instead to discuss some specific lessons from the field of fiscal transfers with regard to allocations in proportion to funding needs.

## 4.2 *Allocations proportional to funding needs*

### 4.2.1 *Sector-based needs estimates*

Following the example of the American Water Fund, the remaining ‘non-sovereign’ funding to eligible countries could be allocated (within each of the poverty intensity categories, if applicable) in proportion to (adaptation) *funding needs*. These needs could be ascertained through in-depth needs assessment, as carried out in the context of the American Water Fund (Section 3.4). Alternatively, one could use the more formulaic approach used in Fiscal Needs Transfers, described in Section 2. This would involve sectoral needs estimates, by way of identifying *a unit for the assessment* in the relevant sector (such as a metre of sea defences, or a person exposed to climate impacts) and multiplying the *number of such units* relevant to the country by a ‘reasonable’ unit cost and a local adjustment parameter. To put it in more formal notation, the sectoral financial *need*  $n_k^i$  (for adaptation) of country  $k$  in sector  $i$  could be estimated by the formula:

$$(4.1) \quad n_k^i = u_k^i \times c^i \times a_k^i$$

where:

$u_k^i$  = number of units in country  $k$  relevant for adaptation in sector  $i$ ;

$c^i$  = agreed ‘reasonable’ average cost for providing one of these units; and

$a_k^i$  = adjustment factor (based on a separate formula) for these costs in country  $k$ .

The proportionality parameter for allocating adaptation resources would be a country’s total funding *Need*, given by the sum of the relevant sectoral needs:

$$(4.2) \quad N_k = \sum_i n_k^i$$

Clearly, these figures can only be rough estimates of funding needs, but they do have the advantage of simplicity and transparency, because of which they are also less prone to artificial needs inflation than an in-depth needs assessment. Moreover the fact that this methodology is widely used in fiscal transfers shows that it could be acceptable. As it happens, fiscal transfer practice suggests another methodology for estimating funding needs which is even simpler.

### 4.2.2 *Population-based needs estimates and risk-based allocations*

As mentioned in Section 2, some countries are using ‘Simple Per Capita Transfers’ – allocations in proportion to the size of certain segments of the population – as fiscal equalization instruments. In the context of adaptation funding, this could be emulated by using *Exposure Headcounts* ( $EH_k$ ), that is to say the number of people exposed to climate change impacts, as a total funding needs parameter:

$$(4.3) \quad N'_k = EH_k.$$

In practical terms, these estimates could, for example, be carried out with data used in the 2011 World

Risk Report (UNU-EHS, 2011) which uses an exposure index  $e_k$  given by the share of the population exposed to natural hazards.<sup>16</sup> The exposure headcount is accordingly:

$$(4.4) \quad EH_k = e_k \times P_k, \quad \text{where } P_k \text{ is the population size of country } k.$$

In UNU-EHS (2011), this index is combined with a vulnerability index  $v_k$  to form what is called the World Risk Index  $WRI_k = e_k \times v_k$ . As such, the WRI has some striking similarities (see Box 1) with the Multi Dimensional Poverty Index  $MPI_k$  used in the UNDP Human Development Report, and it suggests that it might be possible to use the WRI vulnerability index qua risk-based measure of the ‘intensity of total adaptation funding needs’ to modify the above simple headcount measure:

$$(4.5) \quad N''_k = EH_k \times v_k = P_k \times WRI_k.$$

### Box 1. Poverty Needs Assessments

The Oxford Approach to measuring a country’s economic capability (Müller and Mahadeva, 2013, Section II.2) involves certain **Poverty Capability Adjustments**, reflecting the magnitude of the country’s ‘poverty problem’. These adjustments are given by a **poverty headcount** ( $PH_k$ ), representing, as it were, the ‘breadth’ of the problem, and a **poverty intensity index**  $PII_k$ , as a measure of its ‘depth’ (and a general conversion parameter  $\Pi$ ). The relative proportions of these adjustments – and *ipso facto* of the relevant poverty problems – are accordingly given by the product of the poverty headcount and the relevant poverty intensity index:

$$(1) \quad PH_k \times PII_k.$$

The Oxford Approach uses the Multidimensional Poverty Index ( $MPI_k$ ) – developed by the Oxford Poverty and Human Development Initiative ([www.ophi.org.uk](http://www.ophi.org.uk)) – to operationalize these ideas. The MPI is defined as the product of two factors, namely (i) the proportion of poor people (within a given population), referred to as the ‘**multidimensional headcount ratio**’ ( $h_k$ ), and (ii) the ‘**intensity** (or breadth) **of poverty**’ ( $a_k$ ):

$$(2) \quad MPI_k = h_k \times a_k$$

with  $h_k = PH_k^{MPI} / P_k$  (where  $PH_k^{MPI}$  is the number of MPI-poor, and  $P_k$  the total size of the population, respectively), and  $a_k = c_k / PH_k^{MPI}$  (where  $c_k$  is the total ‘deprivation score’ of the relevant poor population). This means that (1) is operationalized as:

$$(3) \quad PH_k^{MPI} \times a_k = P_k \times h_k \times a_k = P_k \times MPI_k.$$

To sum up, fiscal transfer practice shows that there are a number of formulaic estimates of adaptation funding needs that might be acceptable as a parameter for a proportional adaptation resource allocation ranging – in order of increasing information requirements – from a simple exposure headcount, to a vulnerability adjusted headcount, to a formulaic sector-based estimate. For an initial allocation, the first might be too crude and the last too demanding which – following (4.5) – leaves an allocation proportional to population size multiplied by (something akin to) the World Risk Index as the preferred choice.<sup>17</sup> Appendix 2 gives some examples of what such risk-based adaptation funding allocations would look like for countries without economic capability.

#### 4.2.3 Other considerations

In discussing the question ‘Which Indicators Can Inform the Prioritisation of Countries Eligible for Adaptation Funding?’, Füssel et al. (2012) raise the point that ‘*all attempts to allocate adaptation funding based on aggregated national-level indices of vulnerability to climate change have been deeply unsatisfying*’.<sup>18</sup> They advocate, instead, the use of ‘*a set of sector-specific or hazard-specific indicators [an approach] exemplified by the expert group report to the Pilot Programme for Climate*

*Resilience of the World Bank (Expert Group to the Subcommittee of the PPCR)*'.<sup>19</sup> In the present context, this could be interpreted as advocating the sector-based approach in 4.2.1.

At the same time, Füssel and his co-authors also emphasize the need to take into account what we referred to as exposure headcounts: *It is obvious that a poor country with a large vulnerable population has larger needs for adaptation support than a country with comparable socio-economic and environmental conditions but with a much smaller vulnerable population. It is therefore interesting that none of the concrete proposals for determining a cap by country for funding from the AF considers the population size of a country even though population is considered in proposals for determining a cap per world region. While a uniform cap by country might be politically justifiable in a situation with extremely limited resources, in order to build capacity and trust in a large number of countries, the size of the vulnerable population in a country must be a key criterion in determining fair allocations for adaptation once the available funds are scaled up significantly.*

**Table 1. The Maghreb**

	<i>Population 2011 (million)*</i>	<i>Exposure headcount (million)**</i>
<b>Algeria</b>	37.8	6.2
<b>Egypt</b>	79.4	3.8
<b>Libya</b>	6.1	0.5
<b>Mauritania</b>	3.7	0.5
<b>Morocco</b>	32.1	4.3
<b>Tunisia</b>	10.7	1.3

\* <http://data.worldbank.org/indicator/SP.POP.TOTL>

\*\* Pop. × Exposure index, UNU-EHS (2011, 31).

In fairness, it should be pointed out that the practice of ignoring population size is not confined to using flat per-country allocations. In selecting pilot countries, the PPCR Expert Group, for one, made use primarily of per capita indicators (usually framed as percentages of the total population<sup>20</sup>). For the Maghreb region, for example, this led to the Expert Group recommending Mauritania as the principle candidate *on the basis of high exposure and a vulnerability profile that exceeds by far other countries in the region*,<sup>21</sup> even though it is the smallest country in the region, in terms of both absolute population and exposure headcount (see Table 1). Despite the fact that the aim of the exercise was not to

devise a resource allocation system in the sense used in this Brief, the recommendation of the Expert Group was ultimately rejected because it failed to take into account the absolute size of the problem, with the effect that there is no PPCR pilot country from the Maghreb region.

It thus stands to reason that Füssel et al. are right in insisting that the size of the (adaptation) funding needs, whether determined by a exposure headcount or a sectoral assessment methodology, is key not only in determining who should get priority access, but also in determining how much they get.

However, the same does not necessarily hold for their concern about needs (vulnerability) based allocations leading to perverse incentives with regards to good governance: *Using vulnerability as the only criterion for allocating adaptation funding to countries, however, can have the paradoxical outcome of 'rewarding' poor governance. This occurs because poor governance tends to increase vulnerability to climate change, assuming similar environmental and economic conditions.*<sup>22</sup>

The first question to ask oneself in this context is how real these perverse incentives are. Would a needs-based allocation really incentivize governments to create more vulnerability in their countries? Alternatively, is the argument on a par with the logic according to which per capita emission allocations would incentivize governments to encourage population growth? The authors use an interesting illustration of what they have in mind, namely the far higher cyclone casualties in Myanmar than in neighbouring Bangladesh *explained primarily by the poorer disaster preparedness and management of the military government of Myanmar. Which of these two countries should get priority funding for improving disaster preparedness: Myanmar (based on the high number of victims) or Bangladesh (based on the efficient use of funds for disaster management in the past)?*<sup>23</sup>

Would any government actually reduce its own disaster preparedness solely in order to receive additional funding to improve it? This seems highly unlikely. Having said this, the question asked with regard to the illustration does raise another more pertinent concern, namely *how to create positive incentives to reward performance*. However, as the use of performance indicators in rule-based resource allocations is discussed extensively in Müller (2013), we leave the discussion of this issue in this context with an endorsement of the authors' own view, according to which *one option is to pre-allocate adaptation funding to countries primarily based on their vulnerability, but to make payments in several batches on the condition that commonly agreed and verifiable goals have been achieved*.

A final concern raised by Füssel et al. is the fact that distributive justice and (economic) efficiency can conflict with each other. As this is not materially different from the concern that has been extensively analysed in the context of mitigation funding in Müller et al. (2013), there is again no need to dwell further on this in the present context.

## Appendix 1. CBDR/RC entitlement transfer allocations<sup>24</sup>

Countries' Common but Differentiated Responsibilities and Respective Capabilities (CBDR/RC) can be used to define fair/just cost/burden distributions. Deviations from such equity benchmarks would lead to entitlements and obligations in terms of compensatory resource transfers. Consider, for example, the *Oxford Capability Index* ( ), used to measure a country's share of economic capability. To use this as an equity benchmark for cost/burden sharing would be to agree that the OCI defines each country's fair cost/burden shares.<sup>25</sup>

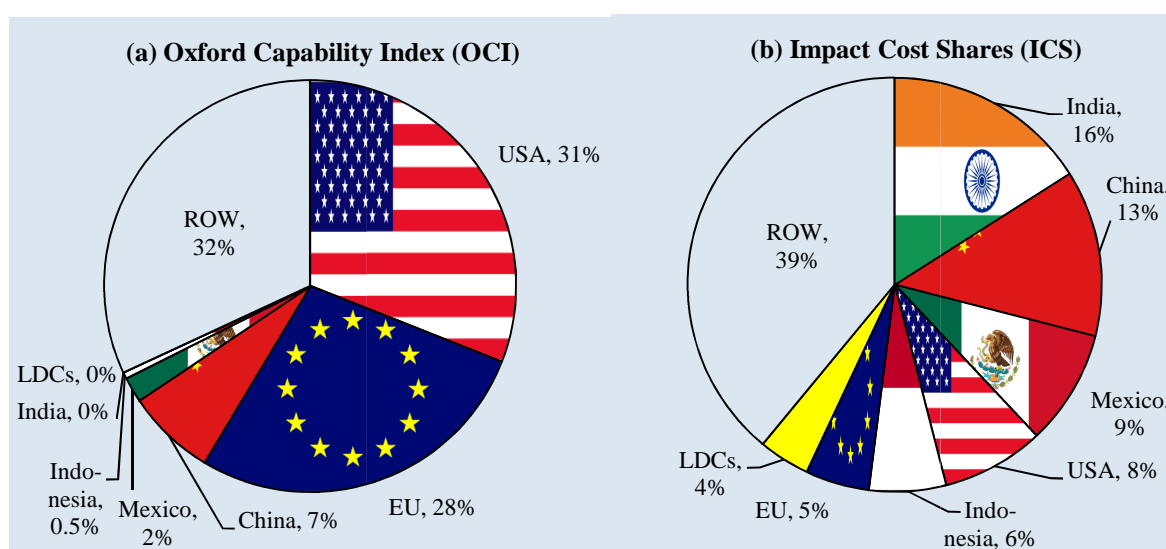


Figure 1. Impact Costs and Respective Capabilities

Figure 1.a depicts what would be the fair cost/burden share for the USA, the EU, China, Mexico, Indonesia, India, and the aggregate of the Group of Least Developed Countries (LDCs). The examples were chosen because – according to the recent (second) edition of *Climate Vulnerability Monitor* (DARA, 2012) – they were the top impacted countries/groupings in 2010: Figure 1.b depicts the respective shares of the total 2010 impact costs of \$560bn (2010 PPP) reported in CVM2.

It is obvious to the naked eye that the reported cost distribution (Figure 1.b) differs significantly from the distribution that would be fair under an OCI benchmark (Figure 1.a). Some countries/groupings have incurred a burden greater, and others less than their fair share. More specifically, if '*Excess Cost Shares*' are defined as the difference between the *Actual* (impact) *Cost Shares* and the OCI benchmark shares :

(1)

then a positive (negative) entails an *entitlement to receive* (*obligation to pay*) a transfer of per cent of the total cost (\$560bn in this case). Five countries/groupings listed in Figure 1 are burdened with more than their OCI-fair share of impact costs: India, LDCs, Indonesia, Mexico, and China. This group alone would require transfers (side payments) of \$216bn (39 per cent of \$560bn) to remedy the injustice.

While it is highly unlikely that transfers of this order of magnitude would be forthcoming, it stands to reason that, in fairness, any transfers to this group should be in proportion to their ECS, that is to say in accordance to the '(OCI) ECS Allocation' (see Table 2).

(a)	<i>OCI Shares (2009)</i>	<i>DARA Actual Cost Shares (2010)</i>	<i>ACS Allocation</i>	<i>(OCI) Excess Cost Shares</i>	<i>(OCI) ECS Allocation</i>
<b>India</b>	0.0%	16%	33%	16%	42%
<b>LDCs</b>	0.0%	4%	8%	4%	10%
<b>Indonesia</b>	0.5%	6%	13%	5.5%	14%
<b>Mexico</b>	2.0%	9%	19%	7%	18%
<b>China</b>	7.0%	13%	27%	6.0%	16%
<b>Total</b>	<b>10%</b>	<b>48%</b>	<b>100%</b>	<b>39%</b>	<b>100%</b>

(b)	<i>OCI Shares (2009)</i>	<i>DARA Actual Cost Shares (2010)</i>	<i>ACS Allocation</i>	<i>(OCI) Excess Cost Shares</i>	<i>(OCI) ECS Allocation</i>
<b>India</b>	0.0%	16%	80%	16%	80%
<b>LDCs</b>	0.0%	4%	20%	4%	20%
<b>Total</b>	<b>0%</b>	<b>20%</b>	<b>100%</b>	<b>20%</b>	<b>100%</b>

**Table 2. OCI Entitlement Transfer Allocations**

It is important to keep in mind that such an allocation in proportion to unfair costs – that is to say, to (positive) Excess Cost Shares – reflects the capabilities of individual countries, and is therefore generally not the same as an allocation in proportion to the actual impact costs, under which countries with no or low capability would be considerably worse off (see Table 2: ‘ECS Allocation’ vs ‘ACS Allocation’). At the same time, it is clear that an allocation in proportion to incurred costs would be more straightforward. What to do?

One option that might be capable of harnessing (some of) the fairness of an ECS Allocation and combining it with the practicality of an ACS Allocation would be to focus on those countries without capability: in their case, the two allocations are identical, as illustrated in Table 2.b. The ‘only’ problem for this option is that of identifying countries with no such capability. Ideally, this should be done by way of some methodology, such as that proposed in the Oxford Approach. In practice, however, it may be less controversial – as suggested by Müller and Mahadeva (2013) – to define a threshold in more ‘objective’ terms, such as the ‘Poverty Intensity of the Economy’ ( $PIE_k$ ) – in other words, the number of poor people per unit of GDP – which is proportional to the level of poverty (percentage of population that is poor) and indirectly proportional to the general level of prosperity (per capita GDP):

$$PIE_k = (PH_k/P_k):(GDP_k/P_k) = PH_k/GDP_k^{26}$$

The idea, therefore, would be to specify a PIE threshold, above which it is assumed that countries do not have capability (or responsibility). This would imply that all costs are to be treated as excess costs, and that consequently, for these no-capability countries, the ACS Allocation is the same as the ECS one. The question that would remain, of course, is: how to deal with those eligible countries with a PIE below the chosen benchmark, which are thus meant to have some capability?

The simplest solution would be to regard them as an ‘equal capability level category’ of their own, in the sense that the use of the ACS Allocation between them would be considered sufficiently fair. Alternatively, one might need to introduce further PIE thresholds to divide ‘medium-’ and ‘high-capability’ countries. This would need to be looked into further.<sup>27</sup>

## Appendix 2. Risk-based resource allocations

Fairness – or rather tolerable unfairness – is key to the viability of any (exogenous) resource allocation scheme. With respect to a CBDR/RC equity benchmark, the viability of the needs-based methodology proposed in Section 4.2 depends, as mentioned in Appendix 1, on whether CBDR/RC considerations can be ‘bracketed’ for the recipient group in question. In other words, it depends on whether it is acceptable to ignore CBDR/RC differences between the members of the recipient group in question and instead focus solely on their funding needs. As also mentioned, this should be legitimate if the countries in question are deemed to have neither responsibility for climate change, nor capability to deal with it, for in that case all climate change costs should in fairness be covered by external funding.

### A.2.1. The Methodology

As explained in Section 4.2.2, the idea would be to allocate the funding (over and above any country floors) in proportion to a vulnerability-adjusted exposure headcount  $N''_k = EH_k \times v_k$ . In other words, a country would be allocated (additional) funding in proportion to the number of its inhabitants that are exposed to climate change, weighted by the country’s vulnerability. Since the World Risk Index is defined as the product of such an exposure and vulnerability index:

$$WRI_k = e_k \times v_k,$$

it is easy to see that the proposed allocation is proportional to the population multiplied by the risk index (hence ‘risk shares’):

$$N''_k = P_k \times e_k \times v_k = P_k \times WRI_k.$$

It is also worth noting that these risk shares are identical with population shares for groups of countries with the same WRI,<sup>28</sup> which is why population shares can be used as a comparative benchmark, as illustrated in Figures 3 and 4.

### A.2.2. Allocating LDC Fund resources

It can be argued that Least Developed Countries (LDCs) should not be assigned (economic) capability to deal with climate change – indeed the Oxford Capability Index was calibrated to ensure that this would (in general) be the case – and *ipso facto* that the proposed needs-based methodology should be viable for resource allocations between LDCs. As such, the proposed method would obviously be of particular relevance to the UNFCCC Least Developed Country Fund (LDCF).

At present, the LDCF uses a flat per country allocation system,<sup>29</sup> as discussed in Section 4.1, but it stands to reason that if there were significantly more funding available this system would cease to be seen as fair, particularly by the larger LDCs. Following the present proposals, the ‘ceilings’ would have to be converted into ‘floors’ (minimum amounts), augmented by funding allocated in a more differentiated manner. In the case of adaptation funding, this could be done in proportion to funding needs, estimated in terms of ‘risk shares’

To illustrate this risk-based resource allocation methodology, consider the group of 45 LDCs for which there are World Risk Indices (LDC-45).<sup>30</sup>



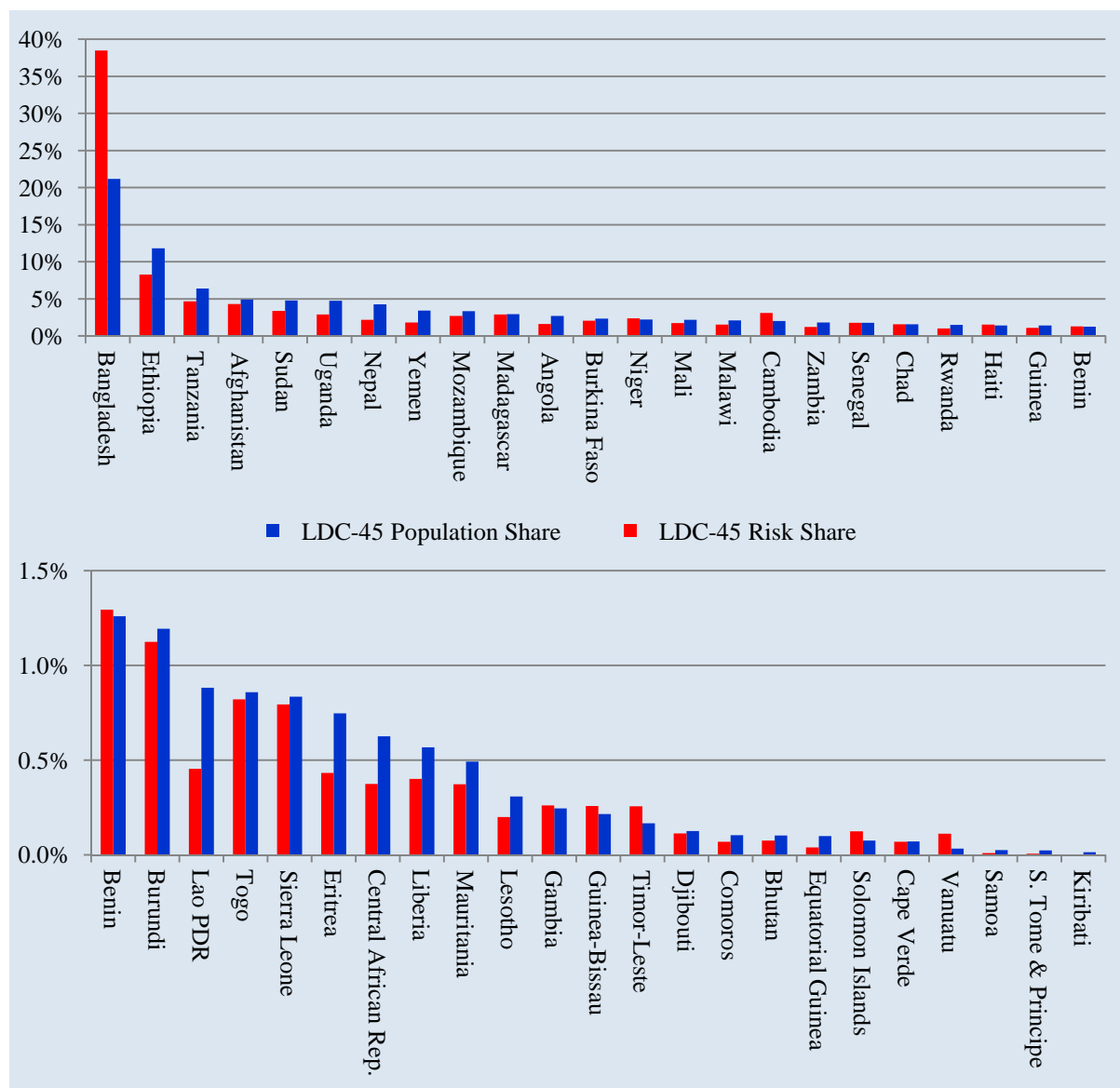


Figure 2. LDC-45: Population and Risk Shares

Figure 2 forcefully illustrates the fact that there are considerable size differences between LDCs (blue bars). This by itself suggests that adaptation funding needs will also differ significantly. Whether the risk-based estimates of these needs – reflected in the risk share allocations (red bars) – adequately reflect these needs may need further analysis.

To avoid misunderstandings, the different risk levels should not be confused with vulnerability differences. The WRI vulnerabilities, as illustrated in Figure 3 are uniformly high among LDCs. The differences are chiefly due to the size of exposed population, both in absolute and in relative terms: Figure 3 also shows the ratio between the risk share and the population share, illustrating the effects of exposure rates – ranging from 63 per cent (Vanuatu) and 32 per cent (Bangladesh) of the population to 6 per cent (Sao Tome and Principe) and 3 per cent (Kiribati).

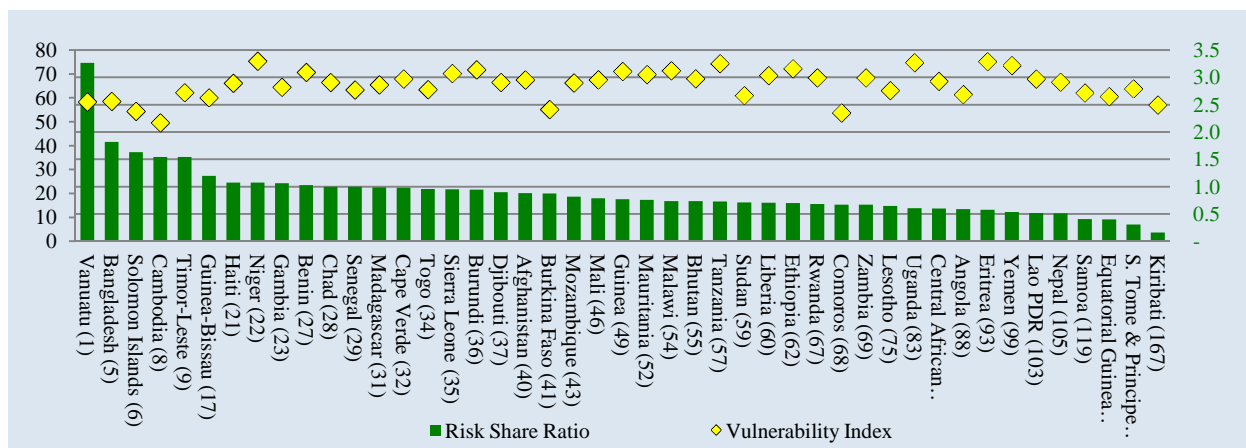


Figure 3. LDC-45 Risk-share Ratios and vulnerability indices

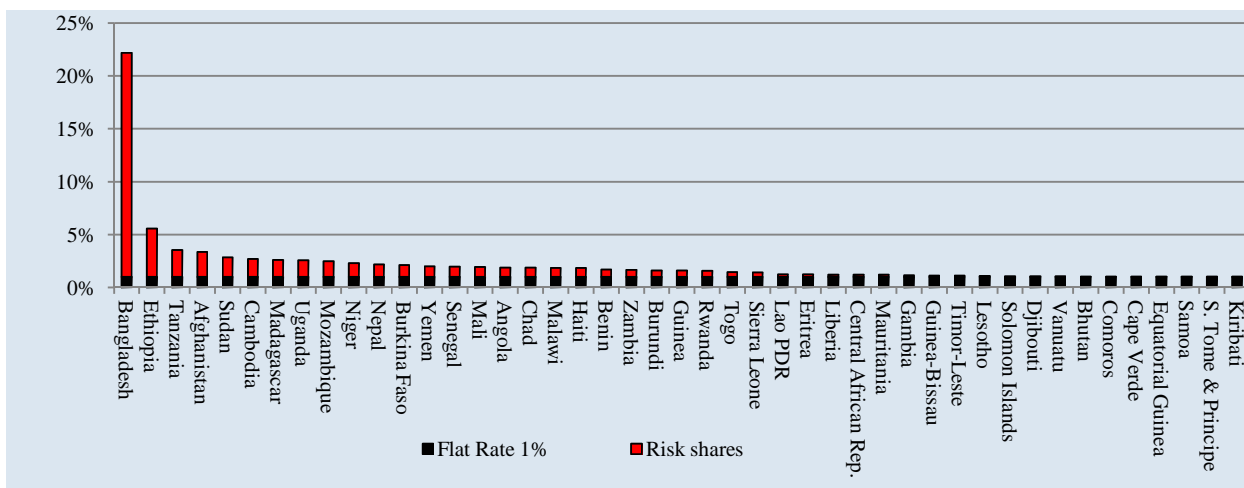


Figure 4. LDC-45 Allocation with 1% floor

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## Endnotes

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<sup>2</sup> The lessons are based on fiscal transfer precedents. For a principle-based analysis of adaptation funding, see Grasso (2010).

<sup>3</sup> 50. *The Board will balance the allocation of resources between adaptation and mitigation activities under the Fund and ensure appropriate allocation of resources for other activities.*

51. *A results-based approach will be an important criterion for allocating resources.*

52. *In allocating resources for adaptation, the Board will take into account the urgent and immediate needs of developing countries that are particularly vulnerable to the adverse effects of climate change, including LDCs, SIDS and African States, using minimum allocation floors for these countries as appropriate. The Board will aim for appropriate geographical balance.*

<sup>4</sup> Müller et al. (2013).

<sup>5</sup> Müller (2013).

<sup>6</sup> Thus it may well be possible (although not very likely) that the sort of Quantity Performance Instruments looked at in the first paper could also be applied to adaptation funding, and it stands to reason, as argued in Müller et al. (2013), that the type of rule-based exogenous allocation will also be needed in the context of mitigation funding.

<sup>7</sup> Müller (2013) thus looks in more detail at exogenous, rule-based allocations, and how they could incorporate performance measures given the experience of certain other multilateral funds.

<sup>8</sup> The USA, Canada, the United Kingdom, Australia, Germany, Japan, Korea, India, and Indonesia.

<sup>9</sup> *Equal per capita transfer cannot fully equalize but can mitigate regional disparity in fiscal capacity. To see this, suppose there are only two regions, region A and region B, with per capita tax revenues of \$1000 and \$2000 respectively. An equal per capita transfer of \$1000 reduces the ratio of region B's per capita tax revenue to that of region A from 2 to 3/2. But unless the per capita transfer is infinite, the ratio is always less than one (full equalization).*(Ma, 1997, 36)

<sup>10</sup> *'Fiscal capacity equalization transfer payments' include – apart from general transfer payments – non purpose-specified funds called 'ethnic region transfer payments' made to certain ethnic regions such as Tibet and the Xinjiang Uygur Autonomous Region, 'wage adjustment transfer payments' whereby the central government partially bears the cost of salaries for local government employees, and 'tax-for-fee reform transfer payments' whereby the central government alleviates the impact of reduced revenue for local governments resulting from the rural tax reform.*[*'Fiscal Transfer System Reinforced to Correct Regional Disparities'*, [www.rieti.go.jp/en/china/05110701.html](http://www.rieti.go.jp/en/china/05110701.html)]

<sup>11</sup> Sources:

USEPA, *Drinking Water Infrastructure Needs Survey and Assessment*,

[www.epa.gov/safewater/needssurvey/basicinformation.html](http://www.epa.gov/safewater/needssurvey/basicinformation.html)

USEPA, *Fact Sheet*, [www.epa.gov/safewater/needssurvey/factsheet.html#one](http://www.epa.gov/safewater/needssurvey/factsheet.html#one)

USEPA, *Past Needs Surveys*, [www.epa.gov/safewater/needssurvey/needssurvey.html](http://www.epa.gov/safewater/needssurvey/needssurvey.html)

<sup>12</sup> Note that exogenous resource allocations need not be based on equity-based entitlements. The Resource Allocation Framework (RAF) of the Global Environment Facility (GEF), for one, was based on the premise that the allocation should lead to an 'efficient' use of the available funds, i.e. that it should lead to the 'biggest bang for the buck'. Having said this, equity ultimately had to be taken into account anyway (see Müller, 2013).

<sup>13</sup> This methodology would also permit an *ex ante* determination of these exogenous allocations to be used either as country 'caps' – i.e. upper limits on how much (adaptation) funding countries could maximally draw during the period – or as earmarked country adaptation funding, to be drawn, say, by national funding entities as lump sums.

<sup>14</sup> General in the sense that it does not depend on the funding purpose.

<sup>15</sup> Note, however, that in light of the large number of eligible countries, the flat per country component would have to be in absolute figures, as is the case for the GEF Trust Fund, the LDCF, and the Adaptation Fund.

<sup>16</sup> Note that the WRR includes people exposed to earthquakes – something that would need to be rectified for climate change adaptation needs estimates.

<sup>17</sup> For a comprehensive discussion of vulnerability indices, see: Klein and Möhner (2011).

<sup>18</sup> Füssel et al. (2012, 323).

<sup>19</sup> Op.cit., 324.

<sup>20</sup> Such as percentage of population in low elevation coastal zone, percentage of population with access to improved water source, and percentage of population undernourished.

<sup>21</sup> EGS (2009, 28).

<sup>22</sup> Füssel et al. (2012, 323).

<sup>23</sup> Ibid.

<sup>24</sup> This Appendix is based on Müller and Mahadeva (2013, Section IV).

<sup>25</sup> Note that, in general, respective capabilities alone would not be sufficient for this purpose, but for illustrative purposes, let us simply focus on a capability based equity benchmark.

<sup>26</sup> For more on this use of poverty intensities, see Müller and Mahadeva (2013, Section IV.3).

<sup>27</sup> See, for example, Benito Müller, 'Loose ends: regarding "graduation" and domestic "inequity"', Oxford Energy and Environment Brief, 2013.

<sup>28</sup> If by a 'homogeneous group' we mean a group of countries with exactly the same  $WRI_k = w$  then the total vulnerability-adjusted exposure headcount is:  $N'' = \sum_k N''_k = \sum_k (P_k \times w) = P \times w$  – with  $P_k$  the population of  $k$ , and  $P$  the total population of the group. This in turn implies that the risk share is same as the population share:  $N''_k / N'' = P_k / P$

<sup>29</sup> 'The ceiling for funding under the LDCF was US\$3.5 million in 2006. As additional resources became available, the ceiling was increased, to US\$6 million in 2008, and to US\$8 million in 2010. This means that, as the ceiling increases, an LDC that had used up all the resources under the old ceiling in 2006 was subsequently able to access the difference.' [GEF, *Accessing Resources under the Least Developed Countries Fund*, May 2011:15; [http://www.thegef.org/gef/sites/thegef.org/files/publication/23469\\_LDCF.pdf](http://www.thegef.org/gef/sites/thegef.org/files/publication/23469_LDCF.pdf)]

<sup>30</sup> Those for which there are unfortunately no World Risk Indices are: DRC, Maldives, Myanmar, Somalia, and Tuvalu.