Performance-based formulaic resource allocation – a cautionary tale

Some Lessons for the Green Climate Fund from multilateral funding

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Table of Contents:

Executive Summary

Background

Numerous international/multilateral funding institutions are using a formula-based ('formulaic') approach to country resource allocation, setting country funding 'caps' and 'floors' (in other words, the minimum and maximum indicative amounts of funding a country can expect to receive over the funding period in question). More often than not, the reason for this is – as in the case of domestic fiscal transfers (see Müller, 2013) – the demand for ***increased transparency***. And there can be no doubt that a formulaic allocation can be more transparent than, say, the purely discretionary alternative, where allocations are at the discretion of some individuals. However, formulae can also be used to obfuscate, with a pretence to general superiority through an appeal to 'scientific objectivity'. At the same time, there seems to have been a propensity among practitioners towards 'grand unified' formulae, possibly in the belief that this would increase the 'objectivity' of the system by avoiding the need to specify different thematic funding envelopes.

This paper takes a closer look at the ***Performance-Based Allocation*** (**PBA**) system of the World Bank International Development Association (IDA), probably the longest-serving, and certainly the most influential, methodology of its kind, and two of its 'climate change progenies': the ***Resource Allocation Framework*** (**RAF**) of the Global Environment Facility (GEF), and its successor, the ***System for Transparent Allocation of Resources*** (**STAR**). The aim is to analyse these three systems and provide certain recommendations for other country resource allocations systems from the lessons learned – in particular for the performance-based allocations that are currently being considered in connection with the Green Climate Fund.

Technical Recommendations

The choices in designing a formula for a measure or an index significantly influence the outcome, and must therefore be explicitly justified.

- The weights with which different parameters are combined in such a formula are ultimately normative, in other words, they reflect the relative importance given to the respective parameters, and as such must be justified (Sections 1.2.1 and 1.4.1).[1]
- It is also advisable to avoid 'pro forma' uses of parameters – that is to say, introductions of parameters with relative weights so low that they really are irrelevant – for it can lead to undesirable situations where countries feel themselves treated unfairly (Section 1.3.3).[2]

The most serious technical lesson, however, concerns the manner in which performance indices are incorporated into all three of the resource allocation systems under consideration (Sections 1.4.2 and 1.5.2). The problem is as follows: in order to be used in a mathematical formula, performance ratings need to be translated into numbers. They need to be interpreted in terms of a numerical scale. In the case of IDA, the numbers chosen are 1 to 6. However, the performance ratings used by IDA are

[1] There are no such things as 'objective' weights in this context. They all reflect value judgements. While it is possible to generate weights reflecting the values of different stakeholders (Section 1.2.1), the fact remains that weights in this context fundamentally reflect normative judgments.

[2] Under the IDA PBA formula [1.16], for example, the resources allocated to Malawi and Cameroon are almost exactly proportional to the sizes of their population, even though the average prosperity (GDP/cap) of Cameroon is almost three times that of Malawi, which might strike the latter as somewhat unfair.

ordinal by nature. They assign levels – say in this case 'A' (highest), 'B', …, to 'F' (lowest) – and as such are not tied to being represented by a particular sequence of numbers.

While one would expect one's performance-based allocation to change if one's performance changes from one level to another, a change in allocation that is due not to any change in performance, but purely because of a switch to a different numerical scale – say to 0, 1, …, 5 – is problematic, if not unacceptable.[3] In such a situation, countries could gain or lose significant funding solely because of such completely arbitrary administrative choices. Figure A depicts the magnitude of potential gains and losses (relative to the current IDA scale) that Eritrea and Georgia – which are at opposite ends of the IDA performance spectrum – would experience if one were to shift the origin of the numerical scale from its current location at 1 to 0, or to 2, to 3, to 4, or 5. Under these ***purely administrative choices*** Georgia ***could lose up to half*** (through a shift to 5), while Eritrea (through a shift to 0) ***could almost triple its allocation*** under the IDA methodology.

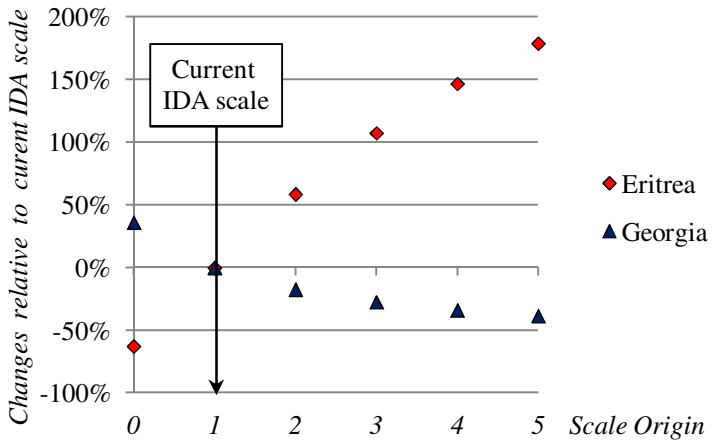

Figure A. Relative gains and losses in IDA allocations due to shifting the origin of the numerical reference scale for performance ratings

- The technical lesson is simple: avoid using ordinal magnitudes, such as the IDA Country Performance Index, in a scale-dependent manner to determine cardinal measures such as allocation shares. Instead use scale-independent alternatives (Section 1.5.2).

Substantive Recommendations

The study has also led to some lessons and recommendations of a more substantive nature.

Multiple funding objectives

The first relates to how to deal with ***different funding objectives***. It goes without saying that most funding entities are pursuing different funding purposes and objectives, even within thematic funding windows. The current resource allocation methodology of the GEF, known as STAR, for example, has four objectives: (i) to ensure maximum global environmental benefits, (ii) to provide performance incentives, (iii) to satisfy the relevant capacity building needs, and, last but not least (iv) to avoid

[3] As pointed out to me by Billy Pizer, there is of course always the possibility that all the relevant stakeholders agree ex ante and in full awareness of the problem on a particular scale which would then legitimize the outcome. However, given the existence of scale independent alternatives (Section 1.5.2), such informed agreement seems unlikely.

being seen as inequitable because of a seemingly disproportional concentration of funding, which was the downfall of the earlier RAF methodology.

In the STAR, these objectives are operationalized by the use of funding floors and ceilings – reflecting concerns in (iv) – and by a single compound allocation formula in which a first-order parameter used to estimate potential global benefits – objective (i) – is modified by a performance factor (ii) and a prosperity indicator (GDP/cap), used as a proxy for estimating capacity building needs (iii). The fact that these needs will inevitably be (judged to be) dwarfed by the global benefits measure inexorably exposes the allocation to the sort of inequity problems discussed earlier under the heading 'pro forma' uses of parameters. Moreover, it is no surprise that the introduction, in particular, of funding ceilings does limit the efficiency of the allocation as desired under the prime objective. The recommendation in this context is very simple:

- Different objectives are best served by addressing them under different funding envelopes ('pots'). In other words, abandon the idea of a grand unified formula. What is needed is funding horses for funding courses: first determine a funding envelope for each of the objectives, and then allocate each of these envelopes in the most appropriate manner.

This does, in particular, allow one to reflect judgments with respect to differences in importance of funding objectives in differently sized funding envelopes, thus avoiding the complications that can arise from the alternative of using differently sized weights in a compound formula.[4]

Appropriateness of funding estimates

The second substantive lesson is about the appropriateness of measures used to estimate the funding needs for certain objectives. The analysis of the IDA PBA (Section 1.3.2) has shown that for the objective of reducing poverty, it would have been be more appropriate to use the number of poor people as the base parameter rather than the overall population size adapted by a per capita GNI factor. This confirmed the lessons drawn in an earlier study on domestic fiscal transfer mechanisms,[5] which itself led to the proposal that the base parameter for estimates of adaptation funding needs should be the number of inhabitants exposed to climate change impacts.

The analysis of the GEF Global Benefit Index (Section 2.2.2) – used both in the RAF and the STAR methodologies as a key parameter allocating mitigation funding to countries with the aim to achieve maximum global benefit (emission reductions) for the available funding envelope – demonstrated that for certain objectives, an exogenous formulaic allocation is simply not appropriate. Efficient (most value for money) allocations, it was argued, can only be achieved endogenously through competitive financing tools such as the Quantity Performance Instruments recently discussed in the context of Enhanced Direct Access.[6] The recommendations here thus are:

- Ensure that the 'country funding needs' to attain the objective in question can actually be estimated by way of an exogenous formula.
- Ensure that the measure chosen to estimate the relevant country funding needs for the objective in question is as direct as possible and avoids the technical problems referred to earlier.

[4] This may look less 'objective' because it involves an additional judgment about the relative sizes of these envelopes, but it is not more subjective than the alternative of choosing relative weights.
[5] Müller (2013). See appended list of References.
[6] Müller, Fankhauser, and Forstater (2013).

Avoiding empty eligible hands

All three case studies (PBA, RAF, STAR) re-confirmed another lesson of the above-mentioned study on fiscal transfer mechanisms (Müller, 2013), namely the need to avoid (perceived) inequity if countries that are eligible to receive funding see themselves as being left empty handed. All three allocation systems have, or had, some funding floor. However, in the case of the GEF RAF, it was insufficient to avoid (perceived) inequity, which is why its successor followed the IDA PBA by introducing a funding ceiling with the aim of reducing the concentration of funding, but also with the effect of reducing efficiency.

In light of the above-mentioned lessons regarding multiple objectives, these equity demands – which can be interpreted as reflecting the principle of sovereign equality – could have been satisfied without compromising the efficiency objective in question by simply assigning to each of the objectives a separate funding envelope. By not mixing equity and efficiency with a single formula in a single envelope, it would have been possible, in particular, to defend more easily the idea that under a competitive distribution of funding, the outcome, no matter how concentrated, is fair as long as the competition is fair. This would not have impinged on the equity-based allocation, and the overall concentration of funding could have been managed by varying the relative sizes of the two envelopes. The recommendation in this context is thus:

- Ensure that equity considerations are adequately reflected. In particular avoid 'empty eligible hands', for example by introducing appropriate funding floors.
- If there are funding objectives requiring (globally) efficient outcomes, then it is important that there is an explicit equity-based funding envelope distinct from the envelopes concerned with efficient outcomes

Postscript

In light of the paramount importance given to 'intertemporal consistency' – that is to say the doctrine to avoid at all cost any changes in allocation shares from one year to the next (Sections 1.4.1 and 3.1.2) – it is highly unlikely that these findings, no matter how they impact the credibility of the chosen methods, will lead to any changes in the IDA or GEF allocation systems. But there is hope that they will assist in avoiding the repetition of these flaws in country allocations at the GCF.

1 The IDA Performance-Based Allocation PBA system[7]

1.1 *Summary Introduction*

In keeping with, if not having led to a widely accepted practice, resource allocation at the International Development Association (IDA) – 'The World Bank's Fund for the Poorest'[8] – follows a two-step methodology involving a set of ***eligibility criteria*** determining which countries can apply for funding, and an ***allocation formula*** used to allocate funding to these eligible countries.

1.1.1 Eligibility Criteria

Two criteria are used to determine which countries can access IDA resources: relative poverty, defined as having a ***Gross National Income*** (GNI) per capita below an established threshold (updated annually: in fiscal year 2012: $1175) on the one hand, and lack of creditworthiness to borrow on market terms and therefore a need for concessional resources to finance the country's development programme, on the other.

1.1.2 The Allocation System

The IDA PBA is intended to *concentrate resources where they are likely to be most helpful in reducing poverty*.[9] It has had a long and lively history: since 1997 it has seen no fewer than eight incarnations. The current IDA (gross[10]) ***Country Allocation*** (ca) for a country is the sum of a (flat) country ***Floor Allocation*** (fa) – also known as 'Base Allocation' – and a performance-adjusted, needs-based ***Proportional Allocation*** (pa):

$$ca = fa + pa. \qquad [1.1]$$

The importance of country floor allocations is discussed extensively in Müller (2013). The focus here is on the proportional component, pa.

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[7] Source of quotations, if not otherwise indicated: IDA 'FAQs', http://go.worldbank.org/EEAIU81ZG0; IDA Operations Policy and Country Services, *Country Policy and Institutional Assessments: 2008 Assessment Questionnaire*, 5 September 2008; *IDA15 Replenishment Report –Annex 1: IDA's performance-based allocation system for IDA15*, http://siteresources.worldbank.org/IDA/Resources/IDA15Annex1.pdf; IDA, *IDA's Performance-Based Allocation System: IDA Rating Disclosure and Fine-tuning the Governance Factor*, IDA14, Sept. 2004.

[8] Banner heading of the IDA website: www.worldbank.org/ida/index.html (accessed November 2013).

[9] IDA 'How IDA Resources Are Allocated' www.worldbank.org/ida/how-ida-resources-allocated.html (accessed November 2013).

[10] Note that there also a number of exceptions to the strict application of the PBA formula [1.1]. However, they are not relevant for the present purposes and thus will not be considered in this paper (for more see, for example, www.worldbank.org/ida/papers/Annex_2_IDA16.pdf).

Country needs, according to IDA (2007), are *factored in by including population and GNI per capita into the allocation formula*. The ***Performance-adjusted Needs Assessment*** (PNA) measure used to define this proportional component has population size as a ***Base Parameter*** (BP), adjusted by a ***Prosperity*** (Pty) and a ***Performance*** (Per) ***factor***:

$$\text{PNA} = Per \times (Pty \times \text{BP}) \qquad [1.2]$$

The prosperity factor is defined in terms of per capita GNI (see Section 1.3) while the 'performance' in question refers to portfolio performance as well as policy performance and institutional capacity (see Section 1.2)**.**

1.2 *Country Performance Assessments*

The IDA PBA uses an assessment of country performance in implementing policies to promote economic growth and poverty reduction as reflected the World Bank's **Country Policy and Institutional Assessment** (CPIA) ratings**.**[11] The CPIA ratings, together with the **Portfolio Performance Index** (PPI), are used to determine the IDA **Country Performance Rating** (CPR)**.**

1.2.1 The Country Policy and Institutional Assessment Ratings

The Country Policy and Institutional Assessment (CPIA), according to IDA, is a diagnostic tool that is intended to capture the quality of a country's policies and institutional arrangements, and measures the extent to which a country's policy and institutional framework supports sustainable growth and poverty reduction, and consequently the effective use of development assistance. However, the CPIA is not just a diagnostic tool, for it is also used as an instrument:

1. *to help determine the relative sizes of the Bank's concessional IDA lending and grants to low-income countries*;
2. *to inform the Bank's Country Assistance Strategy program and country policy dialogue*;
3. *to assist in the assessment by the Bank's Quality Assurance Group of the degree of portfolio risk*;
4. *to help identify countries for extra attention on fiduciary standards and governance;*
5. *to provide background to the Bank's Independent Evaluation Group's Country Assistance Evaluations*;
6. *to help assess a given country's debt sustainability, and*
7. *to offer input to research on the determinants of growth and poverty reduction.*

[11] For the purposes of resource allocation, IDA refers to the CPIA as 'IDA Resource Allocation Index' (IRAI). However, to avoid even further proliferation of acronyms, this paper shall continue using 'CPIA'.

The World Bank began country assessments in the late 1970s to help guide the allocation of IDA lending resources. Even though the CPIA ratings have been instrumental in determining IDA country allocations since 1977, they were not published until June 2006, almost 30 years after they were first introduced.

The CPIA criteria have changed considerably over time, culminating in a number of substantial revisions: In 1998, coverage was expanded to include governance and social policies, the number of criteria was set at 20, and the ratings scale was changed from a 5 to a 6 point scale. However, it apparently took until 2001 – several decades after the introduction of the methodology – for written records to be established, and for all the ratings on the point scale to be explicitly defined. During the fourteenth replenishment round (2004), some Executive Directors questioned the robustness of the IDA Country Performance Ratings (CPRs), which led to an expert review of the CPIA process and methodology. The findings of this review included a number of **key recommendations**, such as the need for:

- a 'simplification' by way of reducing the CPIA from 20 to 16 criteria;
- the provision of definitions for the full range of ratings from 1 to 6;
- analytic work to inform the choice of the weights of the CPIA clusters and criteria.

Indeed, beyond the CPIA criteria proper, the expert panel recommended a review of the weight given to governance in the IDA allocation process itself.

Currently, the CPIA involves 16 criteria grouped in ***four clusters*** (see Box 1.1). For each of the 16 criteria, World Bank staff assesses the country's actual performance and assign a numerical rating on a scale of 1 (low) to 6 (high). These scores are averaged – first to yield the cluster score ('CPIA_X'), and then to determine a composite country rating as the average of the four clusters.[12]

$$[1.3] \qquad \mathrm{CPIA} = 0.25 \cdot \mathrm{CPIA}_A + 0.25 \cdot \mathrm{CPIA}_B + 0.25 \cdot \mathrm{CPIA}_C + 0.25 \cdot \mathrm{CPIA}_D .$$

It is important to highlight, in this context, that the choice of such weights will ultimately be normative. They will have to be seen as representing views on the relative importance of the respective parameters. While there are methods to generate weights so as to reflect group

[12] For the 2012 scores, see World Bank (2012).

preferences – such as the preference score method proposed in Müller (2001)[13] – it would be misleading to imply that they can somehow be statistically teased out of – or justified by – the 'raw data' (in this case the CPIA rankings), as suggested in Annex B (Determining the Weights for the CPIA Index) of World Bank (2004).[14] The fact is, that even if the weights are, de facto, generated by some statistical procedure (or even randomly), accepting them becomes a normative choice in itself, which in the case of [1.3] translates into the acceptance that all four CPIA cluster areas (Box 1.1) are of equal importance.

Box 1.1 The CPIA Criteria

A. Economic Management
1. Macroeconomic Management; 2. Fiscal Policy; 3. Debt Policy.

B. Structural Policies
4. Trade; 5. Financial Sector; 6. Business Regulatory Environment.

C. Policies for Social Inclusion/Equity
7. Gender Equality; 8. Equity of Public Resource Use; 9. Building Human Resources; 10. Social Protection and Labour; 11. Policies and Institutions for Environmental Sustainability.

D. Public Sector Management and Institutions
12. Property Rights and Rule-based Governance; 13. Quality of Budgetary and Financial Management; 14. Efficiency of Revenue Mobilization; 15. Quality of Public Administration; 16. Transparency, Accountability, and Corruption in the Public Sector.

1.2.2 IDA Country Performance Ratings (CPR)[15]

The CPIA clusters underpin IDA's CPR, but they are not the only determinants. The World Bank's *Annual Report on Portfolio Performance* is, in addition, used to determine a rating for each country's implementation performance, the ***Portfolio Performance Index*** (PPI). Starting in IDA15, the CPR is calculated as the following ***weighted arithmetic mean*** of (i)

[13] Note, however, that this method also suffers from the scale dependent discussed in Section 1.4.2, which means that it would have to rely on an ex ante agreement by the members of the group on the scale to be used (see, in particular, the discussion of "Choosing the Index base" in Müller (2001:68ff.).

[14] '*This Annex summarizes the results obtained using principal components analysis to construct indices in which the weights attached to each of the CPIA criteria are statistically derived. The question is the extent to which these indices differ significantly from the CPIA index that uses an equal weights approach. Several summary indices – based on cluster scores, on the scores for all the CPIA criteria, and on a subset of the CPIA criteria that excluded some criteria singled out by the Panel – were constructed, and the summary scores obtained from these different indices were compared with the overall CPIA scores. No significant differences were found between the results obtained from indices based on statistically derived weights and the CPIA index. The correlation between the different indices was extremely high, about 0.99, essentially rendering them interchangeable. The CPIA with its equal weights approach has, however, the additional benefit of transparency over indices whose weights are derived from a more complex statistical approach.*' [World Bank 2004:25]

[15] Main source: IDA (2007).

the average of parameter values in CPIA clusters A, B, and C, (ii) CPIA cluster D value, and (iii) the PPI:[16]

$$[1.4] \qquad CPR = 0.24 \cdot CPIA_{A-C} + 0.68 \cdot CPIA_D + 0.08 \cdot PPI.$$

All three components of the CPR are numbers between 1 and 6, which means that the CPR is dominated 'with an absolute majority', as it were, by the CPIA rating for public sector management and institutions ($CPIA_D$). In an earlier incarnation, the weights were uniform for all CPIA clusters, with a much higher emphasis on portfolio performance: $0.8 \cdot CPIA + 0.2 \cdot PPI$.[17] Again, it needs to be emphasized that choices of such weights are in need of justification if there is to be the desired transparency.

As it happens, the CPR has been the focus of an extensive simplification drive, specifically in order to enhance the transparency of the PBA formula, *thus making it easier for partner countries and country teams to better understand what drives changes in their allocations.* The alternative to [1.4] that had been put forward by the management was a ***weighted geometric mean***, with the same weights as those seen in [1.4]:

$$[1.5] \qquad CPR' = (CPIA_{A-C})^{0.24} \times (CPIA_D)^{0.68} \times ARPP^{0.08}.$$

The IDA management, however, favoured the adoption of the weighted arithmetic formula [1.4] because it is simpler and more transparent. It could be understood easily by policy makers in IDA countries, which is the aim of the simplification exercise.

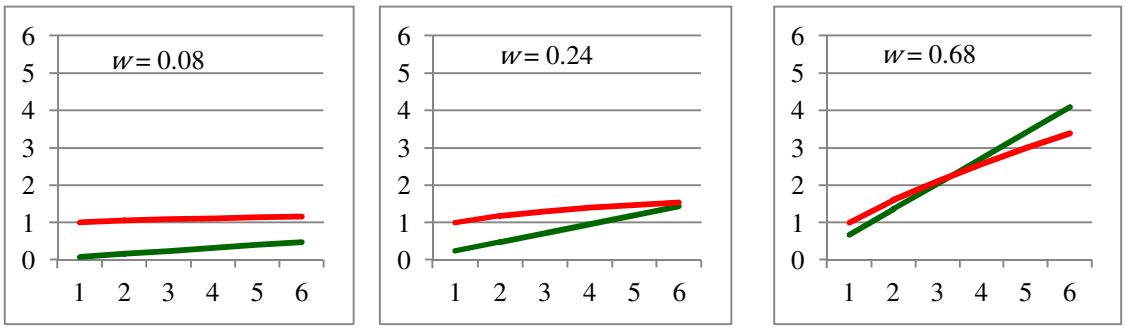


Figure 1.1 Arithmetically (green) versus geometrically (red) weighted parameters

Yet 'policy maker-comprehensibility' is not the only difference between these additive and multiplicative formulae. For one, the two models differ significantly in their 'performance reward structure'. Consider an arithmetically weighted parameter: $A = w \cdot X$ and its

[16] For the 2012 scores, see www.worldbank.org/ida/CPR/ICPR_2012Alpha_table1a.pdf.
[17] See IDA (2007):21.

corresponding geometrically weighted counterpart: $G = X^w$. For small weights (w) A (the green line in Figure 1.1) has much lower values than G (red line), but it provides greater marginal incentives (that is, it has a steeper slope). The differences diminish with increasing weight and disappear altogether for $w = 1$. Furthermore, the multiplicative treatment of these weighted parameter values in the geometric formula means that a single parameter value can have a much greater effect on the overall outcome. Indeed, if any of the parameters is 0 then the geometric average is necessarily 0, which is not the case for the arithmetic formula. These are effects that should be part of the design considerations, and as such explicitly acknowledged in the construction of measures such as the IDA CPR.

1.3 *First-order Parameters and Allocations*

1.3.1 First-order Parameters

The proportional allocation used in the IDA PBA (see Section 1.1) has a ***Needs Assessment*** measure – estimating a country's need for funding to achieve the primary IDA objective of reducing poverty – as its '***first-order parameter***'. This IDA funding need is estimated by adjusting population size (Pop) as base parameter with a factor reflecting average prosperity, measured by the ***per capita Gross National Income*** (gni):

$$[1.6] \qquad Pop \times gni^{-0.125} = Pop \times (1/gni)^{0.125}$$

It is important to note that here, unlike in the cases discussed in Section 1.2, the point is not to take some type of average (arithmetic or geometric), but to adjust a base parameter so that it serves as a better estimate for, in this case, the country need for IDA funds. Müller and Mahadeva (2013) have used a very similar methodology to define a measure for 'differentiated (economic) capabilities' which has an interesting feature in this context. Following an income tax model, they define the ***Oxford Gross Capability*** (OGC) measure by progressively adjusting GDP (as measure of overall economic size) with a prosperity factor given in terms of the per capita GDP (gdp) relative to the world average:[18]

$$[1.7] \qquad GDP \times (gdp/gdp_{\text{world}})^{0.5} = GDP \times \sqrt{gdp/gdp_{\text{world}}}.$$

The interesting feature in question is that the exponent of 0.5 was not arbitrarily chosen, but empirically derived from the progressiveness of domestic income tax systems. The IDA value

[18] Note that the prosperity factor in [1.6] is inversely proportional to the one in [1.7], reflecting the intuition that with increasing prosperity, needs should decrease and capability increase.

of 0.125 is not only much lower, leading to much less progressivity, but there is no readily available justification as to why that figure was chosen, nor for that matter why in FY99 the value was halved from its previous value.[19] The next Section will look at the effect of choosing this more progressive rate, but first consider a possible alternative methodology to the sort of adjustments of populations figures used in the IDA formula.

The idea is very simple and is based on the study regarding lessons learned from fiscal transfer mechanisms (Müller, 2013), which suggests that ***Adaptation Funding Needs*** can be roughly estimated on the basis of ***Exposure Headcounts*** (EH), that is to say the number of people exposed to climate change impacts, adapted by a measure of ***Exposure Intensity*** (EI) as given in the ***World Risk Index*** WRI of the World Risk Report (UNU-EHS, 2011)

$$[1.8] \qquad EH \times EI = Pop \times WRI.^{20}$$

Given that the problem to be addressed by IDA funding is poverty, the idea accordingly is to use a measure that captures the size of this problem more directly than can be done by using total population and average prosperity figures – namely by using a ***Poverty Headcount*** (PH), adapted by a measure of ***Poverty Intensity*** (PH), as given in the UNDP Multidimensional Poverty Index MPI

$$[1.9] \qquad PH \times PI = Pop \times MPI.^{21}$$

1.3.2 First-order Allocations

For the present purposes, the relevant first-order allocations are needs-based allocations determined by the two needs assessment methods discussed in the preceding section:

$$[1.10] \quad INA^{\alpha} = Pop \times (GNI/cap)^{\alpha} \ (\alpha < 0) \text{ ('IDA Needs Assessment');}$$

$$[1.11] \quad MPA = Pop \times MPI \qquad \text{('Multidimensional Poverty Assessment');}$$

The resulting allocations are determined as usual by:[22]

[19] See Annex 1. Evolution of the IDA Performance-Based Allocation Formula in IDA (2007).

[20] The World Risk Index is the product of an exposure index (i.e. the share of the population that is exposed) and a vulnerability index: $WRI = e \times v$. Hence $EH = Pop \times e$, and thus $EH \times EI = Pop \times WRI$.

[21] The Multidimensional Poverty Index (MPI_k) is 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): $MPI_{\text{k}} = h_k \times a_k$. For more on this method of measuring the size of poverty, see, Müller and Mahadeva (2013), Section II.2. Net Capabilities: Poverty Allowances and Poverty Adjusted Capability.

[22] $\sum X$ is the sum total of all Xs.

[1.12] $ina^{\alpha} = INA^{\alpha}/\sum INA^{\alpha}$ ('IDA needs-based allocation');

[1.13] $mpa = MPA/\sum MPA$ ('MPI-based allocation').

For comparability, consider the 61 IDA-eligible countries for which there is an MPI value.[23] Table 1.1 lists the share of India (as the main beneficiary), together with the aggregate percentage shares of the countries less prosperous and those that are more prosperous than India under the (a) 'actual' ($\alpha = -0.125$) and (b) 'empirical' ($\alpha = -0.5$) IDA needs-based allocations, as well as (c) the MPI-based allocation, together with (d) the benchmark overall population shares.

Table 1.1. Aggregate needs-based allocation shares

	[a] $ina^{-0.125}$	[b] $ina^{-0.5}$	[c] mpa	[d] pop
MPI > India	35.4%	43.6%	41.2%	33.0%
India	43.9%	36.9%	45.5%	46.0%
MPI < India	20.7%	19.5%	13.3%	21.0%
	100%	100%	100%	100%

It shows that the IDA needs assessment estimate $\text{INA}^{-0.125}$ leads to an allocation [a] which is only marginally more progressive than one purely in proportion to population [d]. However, it is clear that to judge the (relative) 'progressiveness' of these allocations more adequately, one needs to look at the individual country shares. To do so, consider the ratio between allocation and population shares – tantamount to considering the allocation in per capita terms:

[1.14] $ina^{\alpha}{:}\,pop = INA^{\alpha}/\sum INA^{\alpha} \;:\; Pop/\sum Pop = ina^{\alpha}/cap \;\times\; \sum Pop.$

In Figure 1.2 the per capita allocation results for the three listed allocations are scattered relative to the relevant MPI values. The Figure shows that there is an upwards trend with increasing MPI for all three series, although the correlation with the series based on the IDA methodologies is, not surprisingly (see below) rather weak. The progressiveness 'trend-levels' are given by the slopes of the respective trend lines, i.e. 0.4 for $ina^{-0.125}$, 1.8 for $ina^{-0.5}$, and 2.9 for mpa.

[23] The model is that of Müller and Mahadeva (2013), using GDP instead of GNI, with data available at www.oxfordenergy.org/publications/oxford-capability-data-2009/.

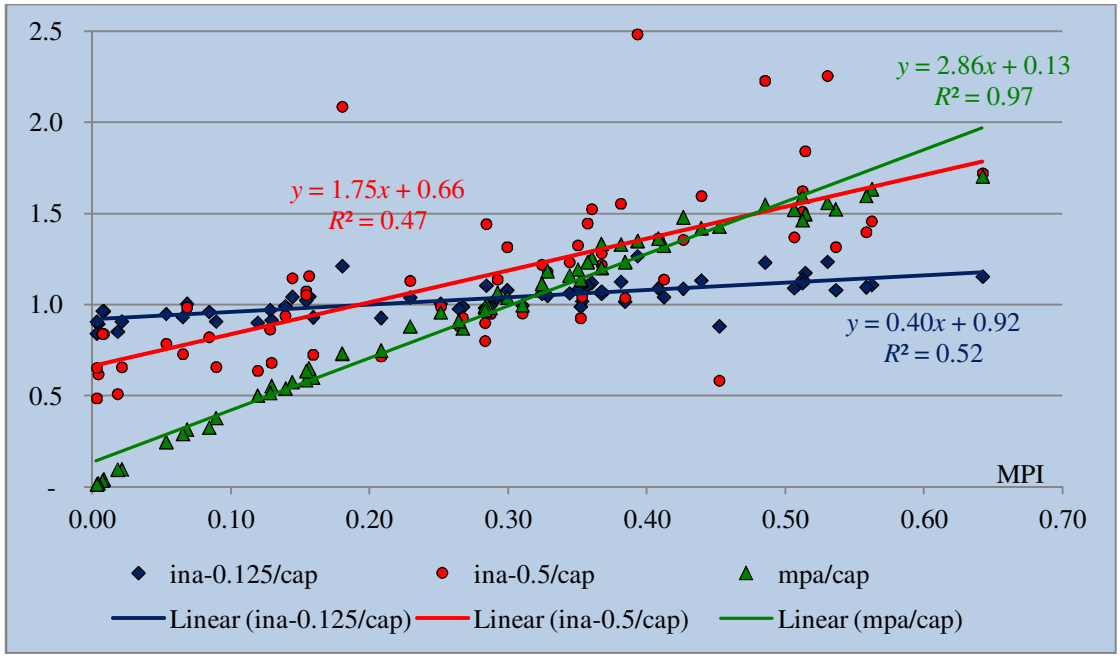


Figure 1.2. Per capita allocations versus MPI

The strength of the correlation between the Multidimensional Poverty Allocation and the Multidimensional Poverty Index is, of course, not coincidental but due to the latter being part of the definition of the former. The picture changes radically if we consider correlations with respect to per capita GDP, as shown in Figure 1.3.

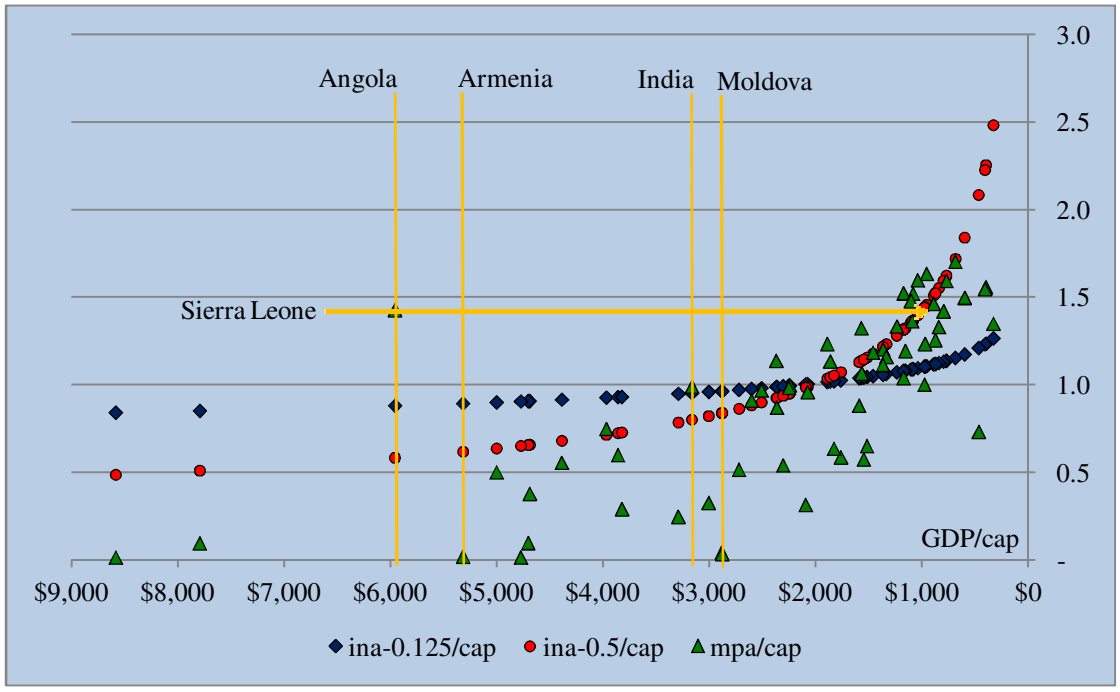


Figure 1.3. Per capita allocations versus per capita GDP

The two IDA sequences are, by virtue of their definition, maximally correlated with per capita GDP (albeit not in a linear fashion which means that they have different degrees of progressivity depending on prosperity levels). What is interesting in the context of the MPA sequence is not so much the fact that it is only weakly correlated with per capita GDP, but that some of the 'outliers' illustrate that poverty might not be usefully addressed in terms of average prosperity levels (per capita GDP, or per capita GNI, for that matter).

With a per capita GDP of $5960, Angola may well have an average prosperity level higher than Armenia ($5320), but as concerns poverty, the situation is clearly not the same (MPI 0.45 and 0.004, resp.): If anything, it is in the situation of Sierra Leone (MPI 0.44). Similarly India ($3167) may on average be more prosperous than Moldova ($2882), but they are extremely dissimilar in terms of their poverty situation (MPI 0.28 and 0.007, resp.). The question therefore has to be: what is the purpose of IDA funding? Is it to increase average prosperity levels, or to address poverty. The answer will then determine the appropriate needs assessment methodology.

1.3.3 An Aristotelian Problem

The way in which prosperity levels are factored into the IDA first-order methodology – namely with very low relative weight – carries with it a further problem which needs to be highlighted in this context. The problem can be illustrated by comparing the relative situations of Bangladesh and Pakistan, or of Cameroon and Malawi (see Table 1.2).

Table 1.2 First-order IDA Allocations

	$ina^{-0.125}$	*GDP/cap*	*Pop*
Bangladesh	6.1%	$1,569	147m
Pakistan	6.6%	$2,606	170m
Cameroon	0.8%	$2,254	19m
Malawi	0.6%	$843	14m

Data Source: Müller and Mahadeva (2013)

Under the *modest bias towards countries with lower GNI per capita*[24] of the IDA weighting ($\alpha = -0.125$), Pakistan and Bangladesh (which have similar population sizes) are allocated almost exactly the same share, even though the latter is significantly less prosperous (when measured on a GDP/cap scale) than the former. The problem becomes even clearer if one considers that the ratio of the shares allocated to Cameroon and Malawi is almost exactly the

[24] Paragraph 6 in IDA (2007:3).

same as that of their population figures, even though Cameroon is almost three times as prosperous as Mali.[25]

Why are these juxtapositions problematic? Because they appear to contravene a sense of fairness encapsulated in a principle of distributive justice generally attributed to Aristotle: '*What is just* […] *is what is proportional, and what is unjust is what violates the proportion*'.[26] While it is not generally possible to apply this to multi-parameter allocations such as the IDA needs-based allocation [1.12], there are specific situations ('juxtapositions') where it can be applied, namely if recipients agree in all but one of the parameters. In the context of the IDA methodology, this means that if two countries have the same population size, then Aristotle's dictum can be read as implying that ina^{α} is fair/just only if it is (inversely) proportional to their prosperity levels. In other words, ina^{α} [1.12] is fair if, and only if:

[1.15] $ina_i^{\alpha} : ina_j^{\alpha} \approx gni_i : gni_j$, for all countries *i* and *j* with $Pop_i \approx Pop_j$.

Consequently, if there are juxtapositions of countries with similar populations, similar allocations, but (strongly) dissimilar prosperity levels, as in the cases discussed above, then ina^{α} would have to be deemed to be unfair. Indeed, the only allocations of the multiplicative type considered here which are immune to such unfair juxtapositions are those with a unit exponent ($\alpha = -1$), see Box 1.2.

Box 1.2 Aristotelian proportionality

$$\text{If } f_i = \frac{p_i \cdot (g_i)^k}{\sum_m p_m \cdot (g_m)^k} \text{ and } f_j = \frac{p_j \cdot (g_j)^k}{\sum_m p_m \cdot (g_m)^k} \text{ then } \frac{f_i}{f_j} = \frac{p_i}{p_j} \cdot \left(\frac{g_i}{g_j}\right)^k$$

If $p_i = p_j$ then $f_i : f_j = (g_i : g_j)^k$. Hence

$f_i : f_j = g_j : g_i$ iff $k = -1$ (inverse proportional)

$f_i : f_j = g_i : g_j$ iff $k = +1$ (proportional)

For any other exponent other than ±1, there is the possibility of problematic juxtapositions.

[25] Note that, since they both have the same CPIA rating [3.2], this disproportionality would be carried over to the Performance-adjusted Needs Assessment [1.2].
[26] Aristotle *Nicomachean Ethics*: Bk V: Ch.3.

The lesson here must be that if one is to use this sort of (weighted) multiplicative allocation, one should avoid introducing parameters 'if one does not mean it', in other words, with a weight which is disproportionately small relative to those of other parameters.[27]

1.4 *IDA Variable Performance-adjusted Needs Allocations*

1.4.1 The Allocation Formula

The next step in the IDA resource allocation methodology is an adjustment of the IDA Needs Assessment $INA = Pop \times (GNI/cap)^{-0.125}$ with a performance factor Per – see [1.2] – based on the IDA Country Performance Rating CPR (Section 1.2.2) by defining the ***Performance-adjusted Needs Assessment*** measure (PNA) and resulting allocation (pna):

$$[1.16] \qquad PNA = CPR^5 \times INA; \qquad pna = PNA/\sum PNA.$$

In light of the discussion regarding the justification of exponent choices in the preceding section, one might also wonder why this performance factor should have been given the extraordinary power of 5, 40 times larger than the power of the prosperity factor Pty [1.2]. Indeed, in the version preceding this latest incarnation of the methodology, the CPR was only squared. As pointed out in IDA (2007:3): *a country's performance is the dominant determinant of IDA allocations – a score twice as high would result in four times the allocation, other things remaining constant.* The explanation as to the effect of a doubling of a performance score – although not completely accurate[28] – can be used to formulate the issue at hand: why was this dominance of the country performance increased to the effect that twice the score would yield 32 times the allocation?

The answer turns out to be straightforward. The terms of reference for this simplification of the allocation system were based on two guiding principles, provided by the IDA Deputies: first, simplified options were *to retain a weight of governance similar to the current formula*. Second, they were *to track closely the allocations from the current formula to minimize disruptions at the country level*.[29] The problem is that these principles could not really both be satisfied simultaneously. Indeed it is difficult to see how the performance ('governance')

[27] Note that this is not the same as the issue of whether first-order parameters are actually appropriate measures for the intended objective, although using a first-order parameter which – as in the case for the IDA needs assessment $INA^{-0.125}$ – allows for such unfair juxtapositions no doubt exacerbates the problems discussed in Section 1.5.1.

[28] The actual allocation is given not by [1.16], and the statement would only be true if a doubling of performance score did not influence the denominator.

[29] IDA (2007:9).

factor in the new simplified formula could be deemed to have the same weight as in the old one. While it is understandable that 'something had to give', it is particularly unfortunate that this meant having a very significant increase in the weight of a factor the use of which, as will be shown in the following section, is flawed.

Before turning to discuss that flaw, it may be worth highlighting the fact that, due to the multiplicative nature of [1.16] the effects of the country performance ratings on the PBA are first and foremost ***relative*** – in other words, what counts is not how well one performs, but how much better or worse one performs relative to the others: the PBA remains exactly the same if everybody is given *n*-times more/less of a CPR score. In particular, if everyone has exactly the same score, no matter at what level, there is no performance-based modification of what we called the first-order allocation. Whether or not such a relativist performance assessment is desirable is a political decision, but it is important to be aware of the issue.

1.4.2 A Cardinal Fallacy

While one could argue about the weight of the performance factor in the IDA resource allocation methodology, there is a much more serious problem which flaws the way in which the Country Performance Ratings CPR are used in the IDA methodology.

The CPR, as explained above (Section 1.2.2), is based on the World Bank's Country Policy and Institutional Assessments (CPIA), in which 16 aspects of 'country performance' (see Box 1.1) are assessed and ranked into six levels, say 'A' (highest) to 'F' (lowest). In order to form an 'index', a numerical scale – in other words, a strictly increasing sequence of, in this case, six numbers – is chosen to aggregate the sixteen rankings mathematically into a single figure, be it the CPIA rating index, or the CPR. The scale chosen to do so is the first six natural numbers: 1, 2, 3, ... 6. While doing so is, as the name suggests, 'natural' it is important to realize that there is no other reason for choosing that particular sequence. For example, one might equally well have used the sequence 0, 1, 2, ... 5, or for that matter 1.0, 1.1, 1.2, ... 1.5. Indeed, any strictly monotonously increasing sequence of numbers would have been equally adequate, because the rankings to be reflected are ordinal magnitudes.

Why is this problematic? Because the IDA methodology commits the 'cardinal fallacy' of using an ordinal magnitude (the CPR) in defining a cardinal measure, namely allocation

shares in a scale-dependent manner.[30] To explain this, consider the said three alternative scales, defined in terms of an 'Origin' (O) and constant increments (i):

[1.17]
$$\begin{aligned} <1, 1> &= 1, 2, 3 \ldots 6; \\ <0, 1> &= 0, 1, 2, \ldots 5; \\ <1, 0.1> &= 1.0, 1.1, 1.2, \ldots 1.5. \end{aligned}$$

Considering then the *2012 Country Policy and Institutional Assessments* given in terms of the 'natural' scale <1, 1>:

$$CPIA_n^{<1,1>} \text{ with } n = 1, 2, \ldots 16,^{31}$$

it is easy to transform these ratings to what they would be when using the other scales:

[1.18]
$$CPIA_n^{<O,i>} = O + i\left(CPIA_n^{<1,1>} - 1\right).$$

Given these alternative $CPIA_n^{<O,i>}$ values, it is possible to calculate the corresponding Country Performance Ratings $CPR^{<O,i>}$ and Performance-adjusted Needs Allocations $\text{pna}^{\langle O,i\rangle}$ by following [1.4] and [1.15], respectively.[32] Given that there is no real reason for choosing any of these scales over any other (any of them is as good as any other), the soundness of the IDA resource allocation methodology depends crucially on how a change of scale affects these allocations. Consider first the allocation based on the first alternate series starting at zero and increasing in integer steps (i.e. $\langle 0,1\rangle = 0, 1, 2, \ldots 5$). Figure 1.4 illustrates how the resulting allocation $pna^{[0,1]}$ differs from the IDA allocation $\text{pna}^{[1,1]}$, and it is striking how large the differences can be: ranging from Zimbabwe being allocated 73 per cent less, to Georgia with 36 per cent more, in comparison with the IDA allocation based on the $\langle 1,1\rangle = 1, 2, 3, \ldots 6$ scale.

[30] Note that the same arguments apply to the use of the Portfolio Performance Index (PPI), but given its minimal weight in the CPR, it was not included in the model.
[31] See Box 1.1 for a listing of the 16 parameters and World Bank (2012) for the actual numerical scores.
[32] The 'model' employed simply transforms the CPIA scores in accordance with (1.17), and applies the OIES data referred to earlier in Section 1.3.2. Note that the Needs Assessments NA do not depend on these scales

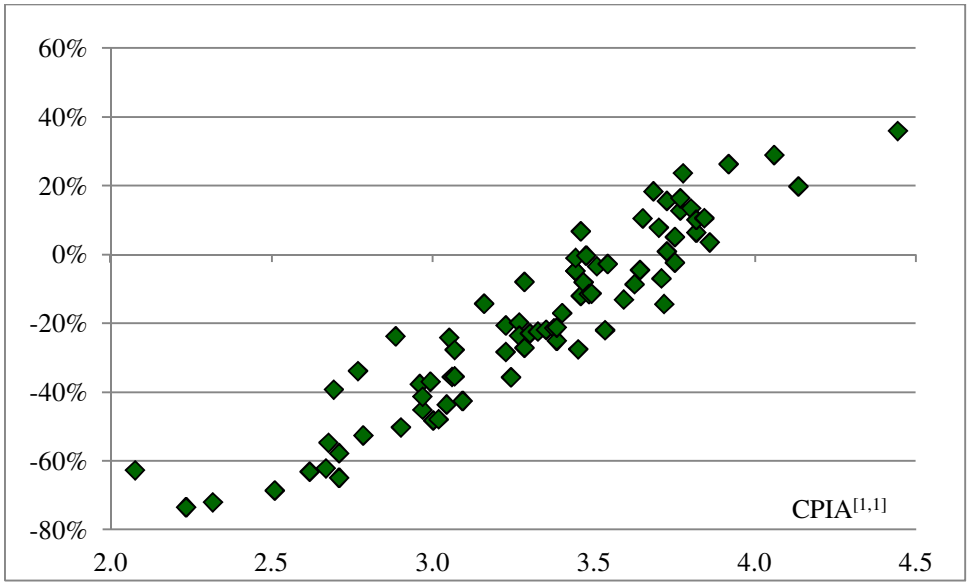


Figure 1.4. PNA<0, 1> changes relative to PNA<1, 1>

What about the scale beginning at 1 with 0.1 increments? As depicted in Figure 1.5 the differences between the resulting allocation ($pna^{\langle 1,0.1\rangle}$) and the IDA formula would be even greater: ranging from Zimbabwe being allocated more than five times as much as under the IDA formula, and Georgia losing half.

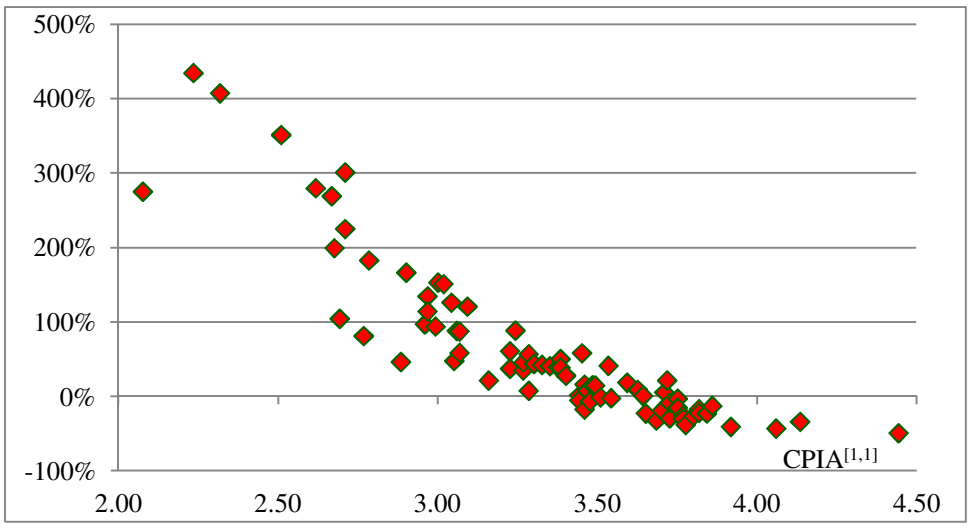


Figure 1.5. PNA<0, 0.1> changes relative to PNA<1, 1]>

The IDA performance-adjusted allocation methodology, in other words, is mathematically[33] flawed because its outcomes depend on a completely arbitrary choice of numerical scales to represent the performance assessments. Having said this, it is again important to stress that

[33] The flaw exists regardless of what one thinks about the feasibility of the rankings themselves.

this does not affect the needs-based element of the formula, but only the way in which performance was 'factored in', something which could show the way forward.

1.5 *Lessons*

There are two fundamental lessons to be learned from the IDA Performance-Based Allocation (PBA) framework. The first relates to the way in which countries' funding needs are estimated, the second to the manner in which performance is incentivized.

1.5.1 Estimating funding needs

IDA aims to reduce poverty.[34] The PBA framework estimates the funding need of an IDA-eligible country for this aim by reference to its overall population size and its average prosperity level (GNI/cap). The latter is used to introduce a (small) degree of progressiveness favouring less prosperous countries.

However, it has been argued that these parameters are sub-optimal for estimating the funding needed to reduce poverty. Population size – progressively adjusted or not – is not a good indicator of the magnitude of the poverty problem facing a country. It has been suggested that a more appropriate method would be to start with the number of poor people in a country, adjusted by a measure of the intensity of the poverty they are facing (as given, say, in the UNDP Multidimensional Poverty Index). This has the added advantage of not having to select the degree of progressiveness one wishes to apply.

The general lesson is thus about the importance of finding the right base parameter for an allocation formula relative to the intended purpose of the funding.

Before turning to the second lesson, it should also be noted that the PBA framework supports the need for country funding floors, a lesson that can also be drawn from national fiscal transfer mechanisms (see Müller 2013).

1.5.2 Incentivizing Performance

As to the application of performance ratings in formulaic allocation methodologies; the analysis has a sobering cautionary tale, particularly for methodologies, such as the IDA, which give extraordinary weight to these performance ratings.

[34] www.worldbank.org/ida/what-is-ida.html

The problem is as follows. In order to be used in a mathematical formula, performance ratings need to be translated into numbers as they need to be interpreted in terms of a numerical scale; in the case of IDA, the numbers from 1 to 6. However, the performance ratings used by IDA are ordinal by nature. They assign levels, say in this case 'A' (highest), 'B', to 'F' (lowest), and as such are not tied to being represented by a particular sequence of numbers.

While one would have to expect an effect on one's allocation if one's performance were to change from one level to another, a change in allocation that is due not to any change in performance, but purely because of a switch to a different numerical scale – say 0, 1, …, 5 – would seem to be problematic if not unacceptable, a situation which is aggravated by the fact that, as shown in Section 1.4.2, countries could gain or lose significantly solely because of such arbitrary administrative choices.

It could be argued that given this, there is really nothing to be done other than to choose a particular scale and live with the consequences. This might indeed be valid if there were no alternative ways of incorporating (CPIA-based) performance measures into resource allocations. Fortunately, however, there are better – namely scale-independent – alternatives.

For example,[35] it is possible to define distinctions between CPIA scores which are scale-invariant, say whether they are in the top or the bottom half of the respective score range: the general rule for transforming a CPIA component score $CPIA_n^{\langle O_1,i_1\rangle}$ based on the scale $\langle O_1, i_1\rangle$ (with origin O_1 and step-increment i_1) into the score based on a scale $\langle O_2, i_2\rangle$ is:

[1.19] $CPIA_n^{\langle O_2,i_2\rangle} = O_2 + i_2(CPIA_n^{\langle O_1,i_1\rangle} - O_1)/i_1$. For n = 1 ... 16

Given the linear nature of these transformations and the arithmetic nature of the CPIA aggregation it is easy to see that the same transformation rule applies for the CPIA aggregate figures:[36]

[1.20] $CPIA^{\langle O_2,i_2\rangle} = O_2 + i_2(CPIA^{\langle O_1,i_1\rangle} - O_1)/i_1$.

The half-way point of the range of CPIA values based on a given scale $\langle O, i\rangle$ is:

[1.21] $CPIA_{½}^{\langle O,i\rangle} = O + 2.5i$,

[35] I owe the idea for this example to Samuel Fankhauser.
[36] Key to this is that the weights of the CPIA formula add up to 1: $CPIA = \sum(w_n \times CPIA_n)$ with $\sum w_n = 1$

and given the linearity of [1.20] it is easy to see that:

[1.22] $CPIA^{\langle O_2, i_2\rangle} \geq O_2 + 2.5i_2$ if and only if $CPIA^{\langle O_1, i_1\rangle} \geq O_1 + 2.5i_1$.

Thus is makes sense to say, without having to refer to a particular scale, that the CPIA score of a country is in the bottom or top half of the range. Accordingly, it would, for example, make sense to stipulate that if the score is in the top half, the country gets an additional percentage to its first-order share $ina^{-0.125}$ (Section 1.3.2) as a (scale-independent!) performance bonus. More formally, one could increase the country needs assessment estimate INA (Section 1.3.2) by some performance bonus percentage *x*:[37]

[1.23] If $CPIA$ is in the top half, then $PNA = (1 + x/100) \times INA$,

leading to a ***scale independent*** version of a performance-adjusted needs-based allocation:

$$pna = PNA/\sum PNA. \quad ([1.12])$$

Note that this performance bonus system could, of course, be more fine-grained than this two-category (top versus bottom half) version.

[37] Note that both the criterion and the magnitude of the bonus '*x per cent*' are independent of the CPIA scales.

2 The GEF Resource Allocation Framework RAF (2005–10)[38]

Given the proximity, at least logistically, between the Global Environment Facility (GEF) and the World Bank,[39] it is not very surprising that the resource allocation methodologies for the GEF Trust Fund turn out to be quite similar to that employed by IDA. Accordingly many of the issues, particularly in relation to performance adjustments, are the same as for the IDA PBA and thus need not be discussed further in the present context.

There have been two such methodologies used by the GEF thus far. The first one, discussed in this Section, was the GEF ***Resource Allocation Framework***, commonly known under its acronym 'RAF', used between 2005 and 2010. It was superseded by the current methodology, known as ***System for Transparent Allocation of Resources*** (STAR) which will be discussed in Section 3.

The RAF was approved by the GEF Council in August 2005. It was used to calculate ***indicative maximum amounts*** of funding over a replenishment period from the GEF Trust Fund for projects in the focal areas of climate change and biodiversity to eligible recipient countries. The RAF has been controversial from the very outset. It was tabled by the US as a precondition to future contributions and almost led to an unprecedented vote in the GEF Council.

The policy recommendations of the third replenishment of the GEF Trust Fund requested the GEF Secretariat to work with the Council to establish a system for allocating scarce GEF resources within and among focal areas with a view towards:

- *maximizing the impact of* [GEF] *resources on global environmental improvements and*
- *promoting sound environmental policies and practices worldwide*.[40]

The GEF Council's endorsement of these recommendations in October 2002 led to the creation of the RAF for the GEF Trust Fund, and it was adopted at a special Council meeting in August 2005.

[38] ***Main Sources***: Müller (2006), and Müller (2007:5)
[39] Not only through a common address (1818 H Street Washington D.C.), but also due to the fact that GEF staff are formally World bank employees.
[40] GEF/C.20/4, Summary of Negotiations on the Third Replenishment of the GEF Trust Fund, Annex C, §16.

2.1 *Summary Introduction*

2.1.1 Eligibility

Eligibility for GEF Trust Fund funding is determined by the following ***eligibility criteria:***

a. GEF grants made available within the framework of the financial mechanisms of the UNFCCC should be in conformity with the eligibility criteria decided by the Conference of the Parties.
b. A country is an eligible recipient of GEF grants if it is eligible to borrow from the World Bank or if it is an eligible recipient of UNDP technical assistance through its country Indicative Planning Figure (IPF).
c. GEF concessional financing in a form other than grants that is made available within the framework of the financial mechanism of the conventions shall be in conformity with eligibility criteria decided by the Conference of the Parties of each convention. GEF concessional financing in a form other than grants may also be made available outside those frameworks on terms to be determined by the Council.

2.1.2 The Allocation System

The GEF RAF had different allocation formulae for each of its focal areas, all involving two 'indices':

- a ***GEF Benefits Index*** (GBI) estimating *the potential of each country to generate global environmental benefits in a particular focal area;* as ***first-order parameter*** (Section 1.1.2), and
- ***GEF Performance Index*** (GPI): reflecting *each country's capacity, policies and practices relevant to a successful implementation of GEF programs and projects*, as a performance factor.

For the climate change focal area, the GBI was defined in terms of total country carbon emissions adjusted by a ***Carbon Intensity Adjustment Factor*** (CIAF), while the GPI was largely (70 per cent) based on the World Bank CPIA *evaluations of (i) the existence of supportive policies; and (ii) the capacity to implement and enforce policies in areas that are at best tangential to the climate change problem.*[41]

The RAF allocation was based on a weighted product of these two measures, used as a ***Performance-adjusted Global Benefit-based*** (PGB) measure:

[2.1] $$PGB = GBI^{0.8} \times GPI^{1.0}.$$

[41] Air pollution, water pollution, solid and hazardous waste, ecosystem conservation and biodiversity protection, marine and coastal resources, freshwater resources, and commercial natural resources.

The weights of 0.8 for GBI and 1.0 for GPI proposed in the paper were determined based on replicating historical allocations to countries.[42]

2.2 *First-order Parameter and Allocation*

2.2.1 The Allocation Formula

In terms of the terminology used in our analysis of the IDA PBA methodology (Sections 1.1.2 and 1.3), the ***GEF Climate Change Benefit Index*** GBI^{cc} clearly lends itself to be interpreted as ***first-order parameter***, in which overall country carbon emissions in 2000 (C^{2000}) as ***base parameter*** are adapted by a factor reflecting past relative changes in carbon intensity in order to create a measure of funding needs to achieve the primary GEF objective – the greatest global benefit:

[2.2] $$GBI^{cc} = C^{2000} \times CIAF, \text{ with}$$

[2.3] $$CIAF = (C^{1990}/GDP^{1990}) : (C^{2000}/GDP^{2000}),$$

[2.4] $$gba^{cc} = GBI^{cc}/\sum GBI^{cc}$$

Where gba^{cc} is the resulting first-order ***Global Benefit-based Allocation***. The first thing to note in this context is that [2.2] can be re-written as:

[2.5] $$GBI^{cc} = C^{1990} \times (GDP^{2000}/GDP^{1990}),$$

which means that the global benefit-based allocation for the GEF climate change focal area (gba^{cc}) favours large, fast-growing emitters. Indeed, a model of these first-order allocations[43] shows that the ten top allocations amount to over 80 per cent of the total (Box 2.1), while the 40 Least Developed Countries in the model have to share a grand total of 1.7 per cent among them. Reality was not quite so unbalanced, at least at the top end: *almost two-thirds of the … climate change money allocated to individual countries goes to the ten largest recipients (among them three OECD countries) and 1 per cent to the LDC members on the list.*[44]

[42] Paragraph 6 in GEF (2005a:2).
[43] The model used to illustrate the RAF first-order allocation defined in [3.2] and [3.3] is based on the countries eligible for STAP climate change funding, and the following data from WRI's Earth Trends: 1990 and 2000 GDP in constant US $, 2006 GDP per capita, current US $; 2000 total CO_2 emissions. (More precisely, it models the 120 (out of the 144 STAB eligible) countries for which these Earth Trends data were available)
[44] Müller (2007:5).

Box 2.1. The Top Ten in the RAF First-order (GBI) Allocation Model

	GBI %	GDP/cap $		GBI %	GDP/cap $
China	47%	$2002	South Africa	2%	$5285
Russian Federation	11%	$6891	Ukraine	2%	$2287
India	8%	$792	Brazil	2%	$5638
Mexico	3%	$7966	Iran	2%	$3101
Kazakhstan	3%	$5289	Indonesia	2%	$1594

Data Source: WRI Earth Trend. GDP/cap: 2006, current US$

2.2.2 Parameter Appropriateness

The inevitable question in light of this was, not surprisingly: is that fair? It was certainly controversial, and ultimately led to the replacement of the RAF (see Section 3). However, as the (un)fairness and how it was dealt with in the subsequent STAR methodology will be discussed in Section 3, let us focus here on the appropriateness of this base parameter; in other words, let us focus on whether GBI^{cc} really was an appropriate way in which *to measure the potential global benefits that can be realized from climate change mitigation activities in a country*.[45]

The relevant GEF RAF information paper gave the following reasons for adopting the index: *Baseline GHG emission levels provide a broad measure of the scale of the mitigation potential of a country, while avoiding perverse incentives that result from using current level emissions. …. Including baseline GHG emission levels in the GBI results in a larger GEF Benefit Index for larger emitters. There are two reasons for using GHG emission levels. First, in general, countries with larger emissions have lower abatement costs, which increase less rapidly with abatement than those in countries with smaller emissions. Second, projects are likely to have greater demonstration and learning effects in high emitting countries than in countries with smaller levels of emissions. … There are two reasons for using change in carbon intensity. First, reducing emissions will be less costly in countries that have already demonstrated willingness and/or ability to reduce carbon intensity. Second, it rewards countries that have reduced their carbon intensity levels.*[46]

The claim that ***country-wide emission levels*** provide 'a broad measure of the scale of the mitigation potential of a country' could be interpreted as stating no more than the obvious: the more there is, the more there is to reduce. Yet, this clearly is not the intended reading. The claim, in light of the reasoning put forward, is rather meant to be about the cost-effectiveness of abatements: the larger the emissions of a country, the more emissions can be abated *for the same amount of money*. The problem is that this reading is by no means as self-evident as the first: after all, it would be surprising if factors such as the structure of the economy and the

[45] Paragraph 7 in GEF (2005c).
[46] Paragraphs 7 and 8 in GEF (2005b:2-3).

level of development did not have an influence on the abatement potential in this second sense.

As a matter of fact, the claim that 'in general, countries with larger emissions have lower abatement costs, which increase less rapidly with abatement than those in countries with smaller emissions' *is simply not true*, at least if one takes into account the cost estimates by the Massachusetts Institute of Technology[47] (MIT) (see Figure 2.1). Consider the US (with 5.7GtCO_2 in 2000[48]), China (3.2Gt), Russia (1.5Gt), Japan (1.2Gt), and India (1.0Gt). Even

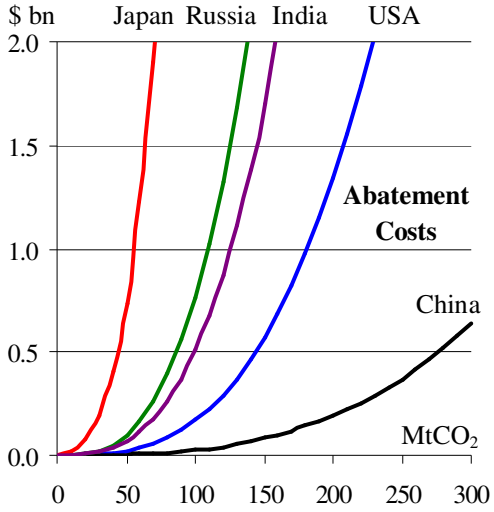


Figure 2.1 Marginal Abatement Cost Curves

though the USA has among the largest emissions, it clearly does not have the cheapest abatement costs in the group. And even if one were to focus only on the GEF eligible countries by removing the USA and Japan, the situation persists: abatement in Russia is more expensive than in India, even though its emissions are one and a half times greater.

The inclusion of ***carbon intensity growth figures*** in the allocation formula turns out to be equally problematic, if not more so. For one, it has been pointed out that they are liable to vary in magnitude purely because of accountancy choices, such as the choice of base year.[49] Second, the MIT cost estimates also show that reducing emissions is actually not always less costly in countries that have already managed to decrease their emission intensity: Japan, which managed to reduce its carbon intensity by 2 per cent over the 1990s, is nonetheless

[47] Ellerman and Decaux (1998).
[48] IEA (2004); Electronic database available online at: http://data.iea.org/ieastore/default.asp. Paris: Organization for Economic Cooperation and Development (OECD).
[49] Müller and Müller-Fürstenberger (2003:59-74).

much more expensive to abate than India, which kept its intensity level, or Russia, which *increased* its by 8 per cent.

2.3 *RAF Preliminary and Final Allocations*

As indicated, the RAF allocation involved a performance adjustment of the first-order global climate change benefit index GBI^{cc} with the ***GEF Performance Index*** GPI to get the ***Performance-adjusted Global climate change Benefit-based*** measure:

$$PGB^{cc} = (GBI^{cc})^{0.8} \times GPI^{1.0}$$

The GPI itself is composed of the GEF ***Portfolio Performance Index*** PPI, the ***Country Environmental Policy and Institutional Assessment Index*** $CEPIA$, and the ***Broad Framework Indicator*** BFI, the latter two both being based on the World Bank's Country Policy and Institutional Assessment (CPIA), see Section 1.2.1:

$$[2.6] \qquad GPI = 0.1 \times PPI + 0.7 \times CEPIA + 0.2 \times BFI$$

The relevant GEF RAF information paper provides the following reasoning for the choice of indicators and weights:

The GEF Performance Index will guide future decisions on GEF projects; as such, it should provide greater weight to factors relevant to future projects. Indicators in the Portfolio performance Index reflect the relative success of GEF projects in the past. Past performance while providing a good basis for forecasting future performance is not as strong an indicator as a country's current policies and institutions. Given this understanding, portfolio performance is included in GPI with a proposed weight of 20% while current policies and institutions are included with a weight of 80%. These weights are consistent with the portfolio performance weights used in the resource allocation frameworks in place at other international financial institutions.[50]

While knowing this does help transparency, the fundamental problem with the use of ordinal magnitudes (such as CEPIA and BFI) discussed in Section 1.4.2 of course remains, rendering the RAF allocations, like those of IDA, dependent on ranking scale choices and thus highly problematic, not to say unacceptable.

The allocation based on PGB^{cc} was preliminary in that *for each country whose preliminary country allocation is less than $1 million, a targeted supplement will be provided so that the country will have a minimum adjusted* [final] *allocation of $1 million. Resources needed for*

[50] GEF (2005b:2-3).

the targeted supplement [are] *obtained by adjusting the preliminary country allocations of the remaining countries in proportion to the respective country shares*.[51]

2.4 *Conclusions of the Scientific and Technical Panel (STAP)*

In November 2008, the GEF Evaluation Office presented the ***Midterm Review of the Resource Allocation Framework***. On the basis of this, the GEF Council decided to request the GEF Secretariat to develop options for improvements in the design of the resource allocation system and indices for the Fifth Replenishment. The STAP formally commented on the Mid-Term Review of the RAF in December 2008. It noted, in a first instance, that its own expertise is limited to the ***Global Environmental Benefit Indices*** (GBIs) and came to the conclusion that:

a. *The RAF indices have not been subject to sufficient scientific scrutiny to conclude that they can be used to assess potential Global Environmental Benefits (GEBs); and*
b. *The design and rules of the RAF should be simplified, and need to be verified and independently supported.*[52]

In early 2009, the GEF Secretariat requested the assistance of the STAP in developing indicators ***to better reflect the potential for delivery of Global Environmental Benefits*** (GEBs) in the climate change focal area. Responding to the request, the STAP commissioned a Technical Report (Michaelowa 2009) which concurred with the above-mentioned result and concluded that theoretically, in order to reflect the country mitigation potential, the GBI would need to be based on marginal abatement cost (MAC) curves for the GEF recipient countries.[53]

The STAP summary of the findings also stated that the shortcomings of the current GBI could be reduced by reforming the GBI through the inclusion of a number of additional parameters, such as weighting per capita and absolute emissions equally in the baseline emissions component, or the integration of a per capita emissions adjustment factor, the differentiation of the intensity factor into a long- and short-term component, and the addition of a Kyoto Mechanisms utilization factor. These parameters, it was claimed, would allow a

[51] Paragraph 13 in GEF (2005c).

[52] See STAP response to the Mid Term Review of the Resource Allocation Framework at http://stapgef.unep.org/docs/Guidance/STAP_MTR_RAF.pdf

[53] *The theoretically ideal GBI would be based on marginal abatement cost curves for the GEF recipient countries. As the quality of MAC curve data on the country level is doubtful and there are no regular updates, this approach does not have sufficient scientific soundness to be applicable in practice. However, in the long term this might change and GEF should support attempts to calculate reliable MAC curves for its recipient countries.*(Michaelowa, 2009:16-7)

more appropriate reflection of global environmental benefits in the climate change focal area. This may be true, but it would not have simplified the RAF design, nor would it have made the resource allocation formula more intelligible.

2.5 *Lessons*

There are at least two lessons to be learned from the GEF RAF experiment. Concerning the appropriateness of the first-order allocation, the lesson is again – as in the case of the IDA methodology – that it is highly unlikely that the chosen formula was actually appropriate in achieving the intended aim of ensuring the globally most efficient funding use (the biggest GEB 'bang for the buck'). Indeed, as highlighted in Michaelowa (2009) it is difficult to see how a 'top-down' formula – based on macro parameters – could ever do that job appropriately, particularly if it were to remain simple enough to command general buy-in. This is why for this aim it might be advisable to conduct 'resource allocations' for mitigation on an *ex post* basis, by simply buying emission reductions from the cheapest supply, such as suggested in recent literature on Quantity Performance Instruments (see, for example Müller, Fankhauser, and Forstater, 2013).

The second, and probably more important, lesson to be learned is from the fact that the main cause for the strong rejection of the RAF methodology among many developing countries – which ultimately led to its demise and replacement – was not its inability to guarantee the most efficient use of the allocated money, but the previously mentioned concentration of the allocation, or rather, its absence among the poorest countries. Even though this situation was completely compatible with the aim of the RAF allocation, the fact that a large group of countries (or to be more precise, a large group of the poorest countries) was left more or less empty handed was the principal reason for the reputational damage, not only to the RAF, but to resource allocation frameworks in general.

3 The GEF System for Transparent Allocation of Resources STAR[54]

3.1 *Summary Introduction*

The Policy Recommendations for the Fourth Replenishment of the GEF Trust Fund that called for the GEFSEC to develop a GEF-wide RAF also called for an independent mid-term review of the RAF. The GEF Office of Monitoring and Evaluation was asked to carry out this review. It submitted its report in November 2009.[55]

The GEFSEC developed various options for a revised resource allocation methodology which were discussed by the GEF Council in various meetings between March and November 2009, where consensus was reached on all the main elements of a new System for Transparent Allocation of Resources (STAR). As clarified in GEF (2010), *the overall objective of an allocation system for the GEF has not changed since it was first introduced through the policy recommendations of the Third Replenishment, as '… a system for allocating resources to countries in a transparent and consistent manner based on global environmental priorities and country capacity, policies and practices relevant to successful implementation of GEF projects'*.

3.1.1 Eligibility, Floors and Ceilings

Country eligibility for GEF funding is defined in paragraph 9 of the GEF Instrument, and as such it remains the same for STAR as for RAF (see Section 2.1.1).

As to the allocation formula, the STAR model follows an iterative process to compute country allocations.[56] A preliminary proportional allocation ('Preliminary Country Allocation' pca) is calculated and any country with less than a minimum indicative amount ('allocation floor', $2million for the climate change focal area) is allocated that amount, while any country with more than 11 per cent is capped at that level. The funds that remain after subtracting these preliminary cap and floor allocations from the total available funding are then allocated proportionally among the remaining eligible countries by recalculating an Adjusted Country Allocation aca for them.

[54] Main Source (italic quotations): GEF (2010).
[55] GEF EO (2009). The remit of the GEF Office for Monitoring and Evaluation is generally monitoring and evaluation of activities contracted by the GEF (i.e. activities carried out by implementing and executing agencies). It does seem a somewhat curious choice to carry out an *independent* internal review.
[56] This account is based on GEF (2010).

It goes without saying that this aca is even less likely to fulfil the GEF's primary objective: to allocate funds to countries in a manner that, if properly used, will generate the maximum global benefit (the maximum emission reduction that can be achieved with the sum of the allocated funds). The reason for introducing the additional constraints was, of course, to avoid the sort of concentration of funding that occurred under the RAF. However, this could also have been achieved by introducing two distinct funding envelopes, one for GEBs and one for other mitigation-related objectives, such as capacity building. Indeed, by introducing such a division of envelopes, it would be possible to use the only way in which the GEB objective could be efficiently achieved, namely through an endogenous allocation by some form of competitive instrument, such as those discussed in Müller, Fankhauser, and Forstater (2013).

3.1.2 The Proportional Allocation Formula

As in the case of the IDA PBA,[57] the measure used to define these proportional allocations has a ***Base Parameter*** (BP) – based on the ***GEF Global Benefit Index*** (GBI)[58] – which is adjusted by a performance factor (Per) – based on a modified version of the ***GEF Performance Index*** (GPI) – and a prosperity factor (Pty) – referred to as ***GDP-based Index*** ($GDPI$) and measured in terms of per capita GDP (gdp):

$$[3.1] \qquad CS = BP \times Per \times Pty = GBI^{0.8} \times GPI^{1.0} \times gdp^{-0.04}.$$

The weights of the base parameter and performance factor are the same as in the RAF[59] *with the same reasoning for the exponential to balance performance against potential with respect to global environmental benefits.*[60] As usual, the proportional country allocations are then given by the proportions of these country scores:

$$[3.2] \qquad ca = CS/\sum CS.$$

3.2 *The Performance and Prosperity Factors*

Given the similarities between the GEF STAR, RAF, and the IDA PBA approaches, it will not be surprising to find that the issues identified in the relevant earlier sections are still problematic in the present context.

[57] See Section 2.2.
[58] Note that in STAR, the GBI is modified with an indicator for forest-related emissions.
[59] See Section 3.2.
[60] Paragraph 66 in GEF (2010). The reasoning referred to was simply intertemporal consistency (see Section 1.4.1).

Take the ***GEF Performance Index*** (GPI)[61] as revised for STAR. In a similar way to its RAF predecessor [2.6], this revised index is a weighted arithmetic average of (a revised version of) the ***GEF Portfolio Performance Index*** PPI and two indicators based on the World Bank CPIA (see Section 2.2.1): the ***Country Environmental Policy and Institutional Assessment Index*** (CEPIA), and the ***Broad Framework Indicator*** (BFI)

$$[3.3] \qquad GPI = 0.2 \times PPI + 0.65 \times CEPIA + 0.15 \times BFI.$$

The weights in this formula are almost the same as those in the RAF version, indeed the changes are so minimal, that it could give the impression of being a fine-tuning of the earlier formula, but it is simply a different value judgment on the part of whoever proposed the numbers. However, much more important is the fact that, by using the ordinal CPIA figures to construct an index which is then used to define cardinal country scores [3.1] and country allocations [3.2], the STAR methodology is committing exactly the same cardinal fallacy as discussed in Section 1.4.2. In short, the only way to salvage the performance-based element of the STAR methodology is to use separate performance incentive bonuses/penalties as suggested in Section 1.5.2.

As to the new ***GDP-Index*** ($GDPI$), GEF (2010) explains why it was deemed necessary to introduce such an adjustment of the RAF scores:

The fourth overall performance study of the GEF makes the case that, historically, there have been relatively few GEF investments in least developed countries (LDCs). Moreover, there are often multiple barriers to working in these countries such that the delivery of a unit of global environmental benefits can come at a higher cost. To better address these concerns, a premium is introduced, to take into account country capacity, derived from the per capita nominal value Gross Domestic Product (GDP), in addition to the floors. This is in line with the practice of all multilateral development banks' concessional funds. Nevertheless, recognizing that the mandate of the GEF is different from the mandate of these development organizations, the weight of this GDP-based index (GDPI) is set relatively low.[62]

However, 'relatively low', in this context, is still much too low to avoid the 'Aristotelian Problem' of Section 1.3.3, in other words, giving rise to juxtapositions of countries under which the allocation could be perceived as being unfair. In trying to find a remedy for this, it is important to highlight a significant difference in the use of this prosperity parameter to the one used in the IDA methodology: the latter was used to define what we called the 'first-order parameter' – a quantitative measure pertaining to the primary objective of the funding

[61] See paragraphs 35 to 45, and Annex 3 in GEF (2010).
[62] GEF (2010):§46.

(Section 1.3.1) – while in the case of the STAR, the prosperity parameter $Pyt = \text{gdp}^{-0.04}$ is used to adjust the first-order parameter $GBI^{0.8}$ (Section 1.1.2) in order to achieve a secondary capacity building objective. This, in turn, opens the option, discussed in Section 1.5.2 to resolve the issue by untangling objectives through the use of single-objective funding envelopes (pots).

3.3 *Capacity Building and Sovereign Equality Allocations*

Instead of trying somehow to adjust a measure, in the present case of Global Environmental Benefit, in order to accommodate the funding needs for capacity building, the idea is simply to introduce a separate Capacity Building Budget CBB, and to distribute it say, in inverse proportion of the prosperity levels:

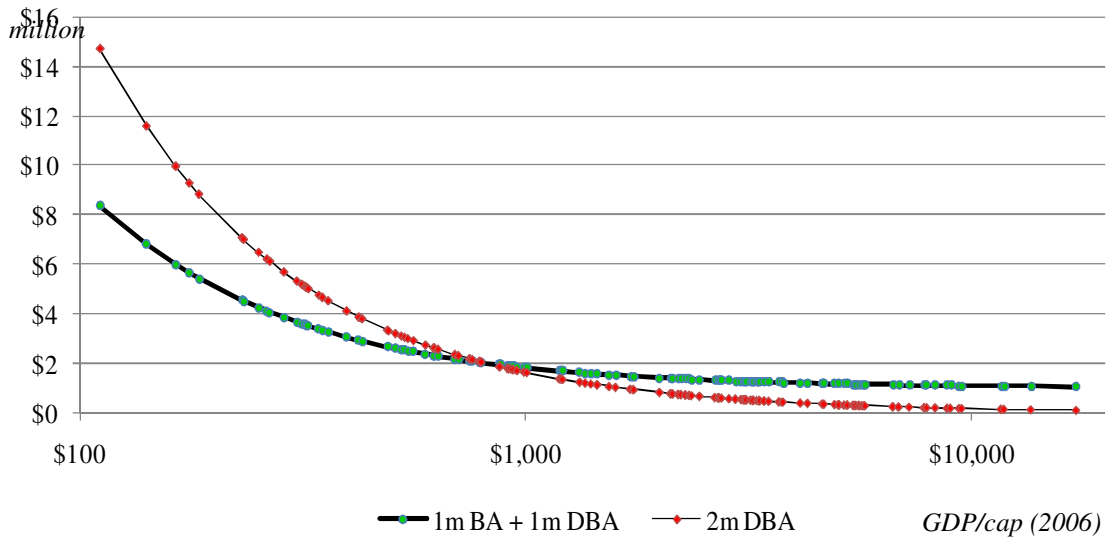
[3.4] $cba = gdp^{-1}/\sum gdp^{-1}$ (capacity building allocation)

[3.5] $CBA = cba \times CBB$ (capacity building amount)

To be noted, in this context, is that this allocation would not pose the above-mentioned Aristotelian Problem, as it would retain the intended inverse proportionality:

[3.6] $CBA_k : CBA_m = gdp_m : gdp_k.$

Figure 3.1. Capacity Building and Sovereign Equality Allocations for GEF eligible countries



Legend:
1m BA = $1m per (GEF) eligible country, flat Base Allocation
1m DBA = $1million per (GEF) eligible country, total disbursed inversely proportional to GDP/cap
2m DBA = $2million per (GEF) eligible country, total disbursed inversely proportional to GDP/cap

GDP/cap Source: EarthTrends (http://earthtrends.wri.org) Searchable Database Results

Moreover, the capacity building allocation could be made as (im-) modest as desired simply by varying the relevant budget envelope CBA. The result of the GEF having such a capacity building allocation for the 144 GEF eligible countries with a budget of $288 million[63] is depicted in the '2m DBA' line of Figure 3.1. The other line depicts the situation if half of this budget is instead used for a flat $1 million allocation per country, say on grounds of sovereign equality.[64]

3.4 *Lessons*

Funding may need to be used for a number of different purposes. While the main objective (such as achieving maximum global environmental benefits, or alleviating poverty), other factors such as incentivizing performance, meeting capability needs, or addressing basic equity needs may need to be considered for the process to be acceptable. It is possible to address any such number of different purposes in an allocation methodology. What needs to be avoided is the temptation to do this though a single compound index applied to a single pot of money.

Instead, the way forward should be to extend the traditional two-step schema – one: establishing eligibility, and two: allocating through compound formula – with an additional intermediate step, namely a division of the task in hand into a number of sub-tasks, each associated with a single funding purpose, and a dedicated funding envelope. In the case of the STAR, for example, this could involve three different sub-allocations, namely (i) for the main objective (GEB), (ii) for capacity building, and (iii) for establishing funding floors.

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[63] The GEF STAR funding floor of $2 million times the number of eligible countries.
[64] For more on the importance of such flat per country allocations, see Müller (2013).

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