



PHOTO: © MUJKA DESIGN INC.

**A FAIR COMPROMISE TO
BREAK THE CLIMATE IMPASSE**
**A MAJOR ECONOMIES FORUM APPROACH TO
EMISSIONS REDUCTIONS BUDGETING**

MARCO GRASSO

Assistant Professor of International Environmental Policy,
University of Milan-Bicocca, Italy

J. TIMMONS ROBERTS

Ittleson Professor of Environmental Studies and Sociology, Brown University
Non-Resident Senior Fellow, Brookings Institution

APRIL 2013

THE BROOKINGS INSTITUTION
1775 MASSACHUSETTS AVE., NW
WASHINGTON, DC 20036

KEY MESSAGES AND POLICY POINTERS

- Given the stalemate in U.N. climate negotiations, the best arena to strike a workable deal is among the members the Major Economies Forum on Energy and Climate (MEF).
- The 13 MEF members—including the EU-27 (but not double-counting the four EU countries that are also individual members of the MEF)—account for 81.3 percent of all global emissions.
- This proposal devises a fair compromise to break the impasse to develop a science-based approach for fairly sharing the carbon budget in order to have a 75 percent chance of avoiding dangerous climate change.
- To increase the likelihood of a future climate agreement, carbon accounting must shift from production-based inventories to consumption-based ones.
- The shares of a carbon budget to stay below 2 °C through 2050 are calculated by cumulative emissions since 1990, i.e. according to a short-horizon polluter pays principle, and national capability (income), and allocated to MEF members through emission rights. This proposed fair compromise addresses key concerns of major emitters.
- According to this accounting, no countries have negative carbon budgets, there is substantial time for greening major developing economies, and some developed countries need to institute very rapid reductions in emissions.
- To provide a ‘green ladder’ to developing countries and to ensure a fair global deal, it will be crucial to agree how to extend sufficient and predictable financial support and the rapid transfer of technology.

INTRODUCTION: SEEKING AN EQUITABLE YET FEASIBLE SOLUTION

The most urgent and complicated ethical issue in addressing climate change is how human society will share the work of reducing greenhouse gases (GHG) emissions.¹ Looking ahead to 2015 when a new international treaty on climate change should be agreed upon, we fear we are headed towards a train wreck.

Key developed countries have made it clear they will not accept any regime excluding emerging economies such as China and Brazil, and the U.S. and other ‘umbrella’ countries are calling for only voluntary, bottom-up commitments. Yet the major developing countries have made equity the *sine qua non* for any kind of agreement: they will not take on mandatory emission reduction targets with perceived implications for their economic growth and social development, unless the wealthier countries commit to deep emissions cuts and act first.²

These entrenched positions between the different blocs have led to the current impasse, but as Nobel laureate economist and philosopher, Amartya Sen pointed out, the perfect agreement that never happens is more unjust than an imperfect one that is obtainable.³

What is a fair and feasible way to break the impasse, given that all efforts are faltering?⁴ The most difficult task is determining a country’s fair share of the required emissions reductions in a way that is politically feasible. After 20 years of negotiations and gridlock, it is clear that many conflicting principles of equity are brought to the

A feasible, fair and effective climate agreement must involve the largest emitters from both the developed and developing countries.

table, so a solution will have to be based on some kind of ‘negotiated justice,’ or a ‘fair compromise,’ which will not be one preferred by just one group of countries.⁵

A few basic requirements must be met. A feasible, fair and effective climate agreement must involve the largest emitters from both the developed and developing countries. Such an agreement must find a way to engage the latter without penalizing them or the former countries too much. In order to secure progress, above all it must be acceptable to the two world superpowers and top carbon emitters, China and the U.S.; with this leadership, in fact, other emitters will likely follow. This agreement could be forged in a ‘plurilateral’ setting where a limited number of countries come together first, and then be brought into the formal U.N. negotiations as the basis for a future deal, perhaps by 2015.

How can future negotiations on emissions reductions overcome such political inertia? We suggest that taking three manageable steps to a fair compromise will unlock progress.

First, negotiate a core agreement between the 13 members in the MEF (including the EU-27), which accounts for 81.3 percent of all global emissions.⁶ This makes the negotiations feasible, where deals can be struck that would be impossible in the vast U.N. forum.

Second, use consumption-based emissions accounting, which is much fairer than the current production/territorial-based accounting that all past agreements and negotiations have been based upon. These are relatively new numbers developed by the Norwegian research center CICERO, and have been vetted by the top scientific journals and increasingly utilized by policymakers.

Third, forge a fair compromise to allocate emissions rights. We propose a compromise based on a short-horizon ‘polluter pays principle’ and an indicator of national capability (income).

This third step in particular is a genuine compromise for both developed and developing countries, but it is required to break the current gridlock. Each MEF member gives and takes something from this simple, workable framework and all gain a liveable planet in the future.

Throughout the paper we first explain why counting carbon emissions by consumption is far better and the implications of doing so, and we then introduce the MEF and why it is a promising arena for forging a bold compromise like the one so badly needed before 2015. We then calculate what the numbers actually mean for that group of countries and develop a proposal for a fair compromise that embodies a feasible but fair operationalization of

the central equity principles of the U.N. climate treaty, i.e. action by countries according to their responsibility and capability. We conclude with a discussion of how a start in the MEF could lead to a new framework being brought into those broader negotiations.

CONSUMPTION-BASED ACCOUNTING

It is a great shame that the idea of countries acting to avoid dangerous climate change according to their ‘common but differentiated responsibilities and respective capabilities’—the lofty core ethical argument in the 1992 U.N. Framework Convention on Climate Change (UNFCCC) agreed by 195 parties—has turned into a major stumbling block for reaching an agreement on emissions reduction. But for this same reason it is also the best place to forge a fair compromise to facilitate reconciliation between developed and developing nations.⁷

A promising way for recognizing equity issues between all countries involves moving from the traditional emissions accounting, which is based on the site of production, to a consumption-based one. The ‘production-based’ or ‘territorial’ approach to counting emissions is centered on “emissions and removals taking place within national (including administered) territory and offshore areas over which the country has jurisdiction” (IPCC 1996, 5).

The problem with this approach is that countries like China, increasingly the ‘workshop of the world,’ end up with emissions counted against them when vast amounts of the products they make are consumed elsewhere. Europe’s dropping carbon emissions are instead largely the result of ‘offshoring emissions’ generated in the production of goods and services it consumes.⁸ The problem is not solved, but some nations appear to be doing better in reducing emissions due to this current production-based accounting.

A new and much fairer ‘consumption-based’ accounting measures the amount of emissions associated with the final *consumption of goods and services*, and it is calculated by adding to territorial emissions those generated for producing imported goods and services and subtracting those associated with exported goods and services.

Accounting for emissions by the countries where production occurs—as has happened since Kyoto in 1997—merely incentivizes the offshoring or leakage of carbon from regulated to unregulated territories. Second, carbon exporting countries—in general, China, India, Russia, Eastern Europe and the Middle East—have been shown to be as a group at a systematic disadvantage in terms of the socio-economic benefits they derive from exploiting their resources, compared to the group of carbon-importing countries.⁹ Therefore to increase the likelihood of a future climate agreement, it is crucial that accounting shifts from territorial-based carbon inventories to consumption-based ones.¹⁰

There are pragmatic benefits of such a change, among which may be China’s interest in participating in such a system because it reduces that country’s obligations. The countries it most affects by increasing obligations are those who have expressed the greatest willingness to reduce emissions, and it has only modest impacts on foot-dragging ‘umbrella’ countries like the U.S., Australia and Russia. Finally, annual calculations of consumption-based estimates of emissions are now feasible and verifiable—their exclusion from the negotiations is a relic of an earlier context.¹¹

THE MAJOR ECONOMIES FORUM: THE BASIS FOR A NEW PLURILATERALISM

Whose emissions should be included in a deal to break the impasse?¹² With 195 parties in the UNFCCC negotiations, the chances of agreement on an adequate and global treaty are unfortunately very small.¹³ In relation to global climate governance, some scholars suggest that one has to select a meaningful but small group of countries based on their responsibilities, vulnerabilities and capabilities.¹⁴

The MEF was formed in March 2009 “to facilitate a candid dialogue among major developed and developing economies [and] help generate the political leadership necessary to achieve a successful outcome at the annual U.N. climate negotiations.”¹⁵ The MEF group has met 14 times since then and will next meet April 11-12, 2013 in Washington, DC. Its members considered here (Australia, Brazil, Canada, China, the EU-27, India, Indonesia, Japan, Korea, Mexico, Russia, South Africa and the U.S.) account for 81.3 percent of world’s 1990-2010 cumulative consumption-based emissions of carbon dioxide from fossil fuel combustion (see Table 1).¹⁶ According to the consumption-based emissions of the MEF, it arguably represents the most viable coalition for efficiently and adequately addressing emissions reductions, since it is a group small enough to avoid the unworkability of full universal multilateralism and at the same time “sufficiently broad to exert leverage on the global situation.”¹⁷ Consumption-based inventories make it possible to distinguish between carbon-exporting and importing MEF members (Table 2).

TABLE 1: MEF MEMBERS’ CUMULATIVE CONSUMPTION-BASED EMISSIONS, 1990-2010

MEF Member	Absolute Values (MtCO₂)	Percentage of Global Emissions (%)
U.S.	118,034.2	22.1
EU-27	101,987.9	19.1
China	79,202.7	14.8
Japan	30,171.3	5.7
Russia	26,683.7	5.0
India	23,885.9	4.5
Canada	10,952.7	2.1
Korea	10,117.0	1.9
Mexico	8,584.4	1.6
Brazil	6,788.2	1.3
Australia	6,258.9	1.2
South Africa	5,805.3	1.1
Indonesia	5,668.1	1.1
Total MEF	434,140.3	81.3
Total World	533,919.0	100

Source: Elaboration from Global Carbon Projects dataset (Internet: <http://www.globalcarbonproject.org/carbonbudget/12/data.htm>)

TABLE 2: CARBON-EXPORTING AND IMPORTING MEF MEMBERS*

MEF Member	Production Cumulative Emissions (MtCO ₂)	Consumption Cumulative Emissions (MtCO ₂)	[P – C] (MtCO ₂)	[P – C] (%)
South Africa (Exp)	8,166.6	5,805.3	2,361.3	28.9
Russia (Exp)	36,150.4	26,683.7	9,466.7	26.2
China (Exp)	93,059.5	79,202.7	13,856.8	14.9
Australia (Exp)	7,090.5	6,258.9	831.6	11.7
Indonesia (Exp)	6,141.5	5,668.1	473.4	7.7
India (Exp)	25,751.1	23,885.9	1,865.2	7.2
Canada (Imp)	10,693.2	10,952.7	-259.4	-2.4
U.S. (Imp)	114,464.9	118,034.2	-3,569.3	-3.1
Brazil (Imp)	6,492.0	6,788.2	-296.2	-4.6
Mexico (Imp)	8,129.6	8,584.4	-454.8	-5.6
Korea (Imp)	8,755.5	10,117.0	-1,361.5	-15.6
Japan (Imp)	24,907.5	30,171.3	-5,263.8	-21.1
EU-27 (Imp)	83,545.0	101,987.9	-18,442.9	-22.1

*Carbon-exporting (Exp) and carbon-importing (Imp) MEF members, based on cumulative 1990-2010 production-based [P] and consumption-based [C] emissions accounting. The final two columns show the difference between these two ways of accounting [P – C], in absolute and percentage values.

Source: Elaboration from Global Carbon Projects dataset (Internet: <http://www.globalcarbonproject.org/carbonbudget/12/data.htm>)

FORGING A FAIR COMPROMISE

To avoid dangerous climate change, soaring carbon emissions have to be capped at a given threshold within a timeframe. In this regard, the objective of staying below a 2 °C global average temperature increase from preindustrial levels by 2100 has assumed “significant international legitimacy,”¹⁸ and 2050 has emerged as a legitimate mid to long-term horizon for planning. Simply put, a global carbon budget through 2050 that would have a significant chance of limiting warming in 2100 to 2 °C above the preindustrial level needs to be established.

As with any real compromise, a fair compromise for sharing the carbon budget must benefit each side in the current impasse and also require each to give something.

- a. For the wealthy developed countries, our proposal removes the ‘firewall’ between countries with and without obligations to reduce emissions (Annex B and Non-Annex I in Kyoto parlance), by bringing developing countries in the MEF into the leadership group in solving climate change. This addresses a longstanding grievance of players like the U.S.

In order to have a significant chance of limiting global warming to 2° C above the preindustrial level, a threshold whose crossing would likely result in disastrous and irreversible climate impacts, we calculate the 2013-2050 carbon budget for the MEF members as 408 Gt [gigatonnes] CO₂.

- b. The use of consumption-based accounting addresses a longstanding grievance of countries such as China, which have taken on the most carbon-intensive stages of global production chains. Four countries gain over 10 percent emissions by this adjustment (see Table 2, rightmost column); only South Korea, Japan and the EU lose that much.
- c. To the developing countries in the MEF, the developed world acknowledges that cumulative emissions since the 1990 baseline agreed in Rio and Kyoto should be part of how parties arrive at a fair outcome. As said, we now have solid estimates of consumption-based emissions for almost all the UNFCCC countries since 1990,¹⁹ when climate change was well understood, accepted scientifically and was the subject of global negotiations.²⁰ Some BASIC countries (Brazil, South Africa, India and China)²¹ have expressed the desire to account for ‘historical responsibility’ back to 1850, but developed countries have never accepted that approach. Taking 1990 as a baseline to sum emissions is a bold, and necessary, compromise for both sides.

FAIRLY SHARING THE CARBON BUDGET

In order to have a significant chance of limiting global warming to 2° C above the preindustrial level, a threshold whose crossing would likely result in disastrous and irreversible climate impacts, we calculate the 2013-2050 carbon budget for the MEF members as 408 Gt [gigatonnes] CO₂.

The notion of carbon budget and its application here, despite the apparent straightforwardness, involve different levels of complexity that need to be clarified. Meinshausen et al. (2009) have developed an authoritative set of estimates which have been utilized in carbon budget calculations around the world. They focus on cumulative emissions in 2050 to provide a scientific reference framework that defines, over a policy-relevant timeframe, a global emission budget to achieve the 2 °C target. Their study adopts a comprehensive probabilistic approach that takes account of the uncertainties in climate sensitivity and carbon-cycle feedbacks to determine CO₂ emission budgets in the period 2000-2050 that would limit warming in 2100 to 2 °C above the preindustrial level. They find that “limiting cumulative CO₂ emissions over 2000-2050 to 1,000 Gt [gigatonnes] CO₂ yields a 25% probability of warming exceeding 2 °C—and a limit of 1,440 Gt CO₂ yields a 50% probability—given a representative estimate of the distribution of climate system properties.”²² Here we use as a reference the 1,000 Gt with a 75 percent probability of not exceeding the 2 °C limit scenario—the illustrative case highlighted by the authors.²³

Provided as a first estimate of magnitude, the 2013-2050 MEF members' carbon budget (408 Gt) is obtained by subtracting from Meinshausen's et al. (2009) reference emission budget over the period 2000-2050 for having a 75 percent chance of limiting warming in 2100 to 2 °C above the preindustrial level (1,000 Gt CO₂), the 2000-2006 emissions (234 Gt) and the 2007-2012 ones, calculated assuming their constant rate of emission of 36.3 Gt CO₂ yr⁻¹ (217.8 Gt CO₂). Furthermore, since Meinshausen's et al. estimates include emissions from land-use change (but not from international bunker fuels), given our focus on production and consumption-based emissions, we need to also subtract from their figures this category of emissions. For doing so we refer to the German Advisory Council on Climate Change's (WGBU) (2009, Box 5.3-1, page 25) estimate of emission for 2010-2050 land-use change emissions of 50 Gt CO₂, i.e. on average 1.22 Gt CO₂ yr⁻¹. This would amount to 46.3 Gt CO₂ over our 2013-2050 time horizon. Furthermore, since we refer to the MEF members whose cumulative consumption-based emissions amount to 81.3 percent of global emissions, (see Table 1) it is eventually assumed that 81.3 percent of the total amount of permitted emissions—408 out of 502 Gt CO₂—is the carbon budget from *fossil sources* to be shared among the MEF members over the period 2013-2050.²⁴

This approach essentially grandfathers MEF members as a group to their emissions levels from 1990-2010 as a proportion of the global total. This implicitly also means that non-MEF members can in principle freely emit, since what counts here are only emissions from MEF members. This proposal hopes for, but does not wait for, pledges and actions by the rest of the world beyond MEF members. In particular, we would argue that the low-income non-MEF members should not have binding emission limits. However, to obviate the risk of being left behind by the (hopefully) emerging green tech revolution, it would be necessary to compel, and in some cases to provide financial support to, such low-income countries to pursue no-regret mitigation policies, such as improving energy efficiency and rapid deployment of clean energy.²⁵

In contrast, cumulative emissions of CO₂ in 2050 under a business-as-usual (BAU) scenario would amount for the MEF members to roughly 1,840 Gt CO₂.²⁶ Consequently, any distribution of the carbon budget implies substantial reductions, given that the budget for the MEF members through 2050 is so much smaller (408 Gt CO₂) than BAU emissions projections (roughly 1,840 Gt CO₂). We therefore must distribute a set of emission rights amongst MEF members over the period 2013-2050 in a way that can be viewed as equitable in terms of distribution of the burdens.²⁷ Indeed, the massive amount of abatements required by the carbon budget (1,432 Gt over a 38-year period, or from 2013 to 2050) and the rapidity by which they must be realized suggests the flexibility provided by intensive emission trading for efficiently and effectively achieving such ambitious mitigation objectives is probably required.²⁸

Our proposed distribution is based on cumulative emissions since 1990, following a short-horizon polluter pays principle combined with an indicator of national capability measured through income. It is worth emphasizing that the polluter pays principle—that ultimately claims that the one who made the mess should pay to clean it up—is the basis for many national regulations in developed countries, including Superfund legislation in the U.S. and Extended Producer Responsibility in the EU.

What does a responsibility and capability-based distribution of the carbon budget mean for MEF members and in particular for the U.S. and China? In this regard, we envision the operationalization of the polluter pays and capability principles through a two-step approach. First, we determine a distribution of the carbon budget calculated by the application of the 'equal per capita-based historical responsibility' criterion formulated in Grasso

2012. In particular, the operationalization of the polluter pays principle in the context of the carbon budget is obtained through the application of a parameter of contribution to the problem. This is determined as the MEF members' share of 1990-2010 cumulative consumption-based CO₂ emissions in relation to total MEF members' cumulative consumption-based CO₂ emissions, to a distribution of the carbon budget based on an equal per capita principle. We argue, in fact, that the latter distribution, given its popularity among most southern policy-makers and activists, as well as its ethical authoritativeness,²⁹ is the most appropriate quantitative reference for the application of the parameter of contribution to the problem. This indirect operationalization of the polluter pays principle is due to the unavailability of estimates of future consumption-based BAU emissions.³⁰

Second, we applied to this polluter pays principle-based distribution a parameter of capability, based on MEF members' 2010 per capita GDP (U.S. dollars in purchasing power parity), and calculated, consistently with the operationalization of the 'ability to pay' criterion in Grasso 2012, as the share of countries' GDPs on total MEF members' GDP. A lower value of this ratio indicates a proportionally higher incidence of, and a larger correction to, the polluter pays principle-based distribution calculated in the first step. All in all, therefore, the production and consumption-based distributions of the carbon budget of the first two columns of Table 3 derive from the application of the parameters of contribution to the problem and capability specified above to an equal per capita reference distribution.

TABLE 3: DISTRIBUTION OF THE CARBON BUDGET AMONG MEF MEMBERS*

MEF Member	2013-2050 Million Emissions Rights under 1990-2010 polluter pays principle and capability (1 Emission Right = 1 Mt CO ₂)		Differential (C – P)	
	Production-Based	Consumption-Based	Δ (C-P) Mt CO ₂	Δ (C-P) %
Australia (Exp)	2,133.0	2,123.5	-9.5	-0.45
Brazil (Imp)	20,748.8	20,612.6	-136.2	-0.66
Canada (Imp)	3,231.1	3,210.1	-21.0	-0.65
China (Exp)	120,510.6	123,552.1	3,041.5	2.46
EU-27 (Imp)	42,314.7	40,338.3	-1,976.5	-4.90
India (Exp)	123,370.1	123,079.5	-290.6	-0.24
Indonesia (Exp)	25,339.2	25,209.7	-129.5	-0.51
Japan (Imp)	12,033.7	11,837.8	-195.9	-1.66
Korea (Imp)	4,834.7	4,793.2	-41.5	-0.87
Mexico (Imp)	11,349.3	11,271.4	-77.9	-0.69
Russia (Exp)	13,802.7	13,980.8	178.1	1.27
South Africa (Imp)	5,319.4	5,311.3	-8.2	-0.15
U.S. (Exp)	23,012.5	22,679.7	-332.8	-1.47

*Distribution calculated according to the Polluter Pays Principle and to an indicator of national capability. Million of Emission rights (1 Emission right = 1 Mt CO₂) over 2013-2050 for production-based [P] and consumption-based [C] accounting. The final columns reflect the differential between Consumption-based and Production-based accounting.

Source: Elaboration from Global Carbon Projects dataset (Internet: <http://www.globalcarbonproject.org/carbonbudget/12/data.htm>)

The approach suggested here leaves it to each MEF member under their own sovereignty to decide how to reach their country's emission rights targets, by whatever trajectory they choose, and to jointly decide whether rights can be purchased internationally through transfer of technology and finance. Earlier discussions in the MEF meetings have suggested that technology and finance flows will be an important part of future agreements.

Since emission rights represent the share of permitted emissions in Mt CO₂, Table 3 shows that, for instance, Australia would have 2,123 Mt CO₂ (or 2.1 Gt CO₂) of permitted emissions from 2013 to 2050. This is 0.5 percent lower than if Australia's share of the carbon budget was calculated with production-based accounting. The U.S. has a 23 Gt quota, only about 1.5 percent lower than with production-based accounting. China's emissions rights, on the contrary, are 123 Gt CO₂, about 2.5 percent higher with the consumption-based approach. This sizeable quota is due to China's very recent rise in emissions and its huge population. With a bit of 'headroom' compared to the permitted emissions that would be calculated according to the current production-based carbon accounting approach, China would have somewhat less stringent abatement targets.

To better understand the implications of the allocation of the carbon budget synthesized in Table 3 for the discussion on emission reductions, it is useful to point out also current (i.e. 2010, the last year available) absolute and

TABLE 4: MEF MEMBERS, 2010 CONSUMPTION-BASED EMISSIONS (TOTAL AND PER CAPITA) AND NUMBER OF EMISSION RIGHTS OVER 2013-2050 PER CAPITA

MEF Member	Total Consumption-Based 2010 Emissions (Mt CO₂)	Per Capita Consumption-Based 2010 Emissions (t CO₂)	Per Capita Emission Rights over 2013-50 (1 Emission Right = 1 t CO₂)
Australia (Exp)	331.5	14.9	95.2
Brazil (Imp)	452.9	2.3	105.8
Canada (Imp)	569.9	16.7	94.1
China (Exp)	6,982.6	5.2	92.3
EU-27 (Imp)	4,826.0	9.6	80.3
India (Exp)	1,909.6	1.6	105.1
Indonesia (Exp)	491.3	2.1	108.4
Japan (Imp)	1,461.7	11.5	93.0
Korea (Imp)	624.5	12.8	98.0
Mexico (Imp)	483.0	4.5	103.9
Russia (Exp)	1,301.6	9.2	98.6
South Africa (Imp)	375.2	7.5	106.2
U.S. (Exp)	5,791.2	18.7	73.2

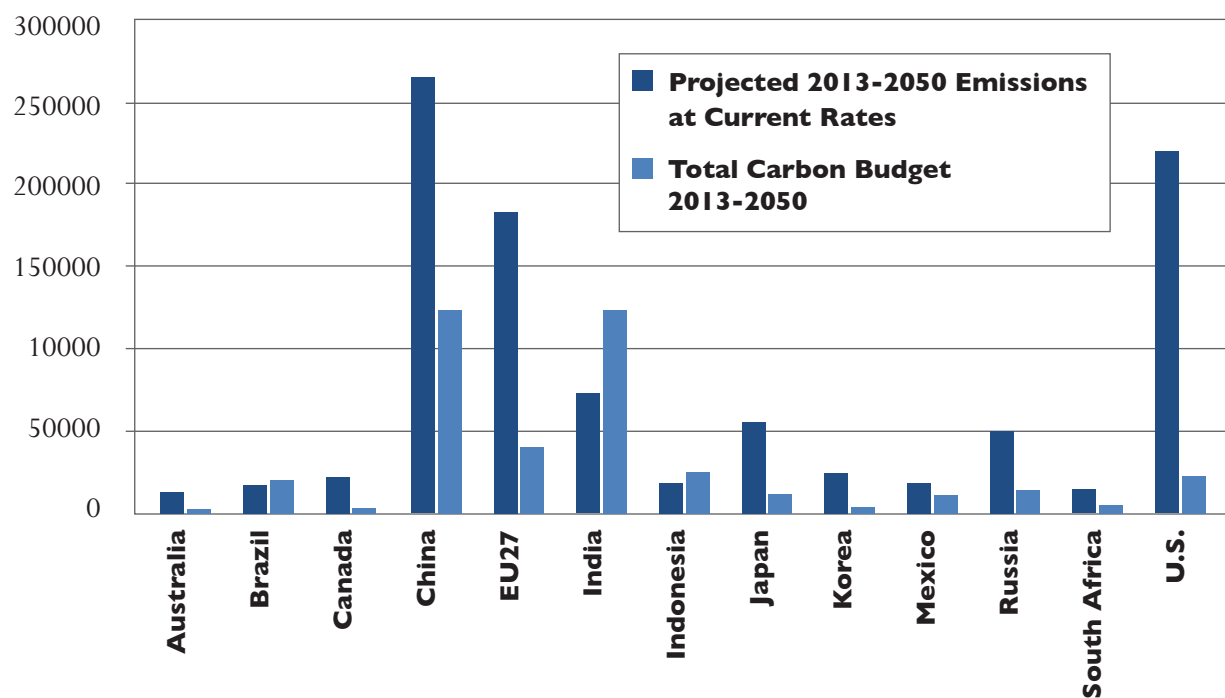
Source: Elaboration from Global Carbon Projects dataset (Internet: <http://www.globalcarbonproject.org/carbonbudget/12/data.htm>)

per capita consumption-based emissions, as well as to calculate the shares of emission rights (representing also the shares of permitted emissions) that would pertain to average citizens of MEF members.

On the basis of the figures delineated above we also juxtapose in Figure 1 the MEF members' BAU emissions in 2050 to their respective quotas demanded by the carbon budget calculated in Table 3. It is worth specifying that for calculating their BAU emissions, given the unavailability of estimates of future consumption-based emissions already pointed out, we assume that MEF members will have for the 38 years of the 2013-2050 period the same consumption-based emissions that they had in 2010 (reported in Table 4, first column).

It should be noted that emissions reductions of the many emitters required by the carbon budget are highly ambitious, especially for the U.S. and to a lesser extent for the EU, even though there is still time for greening these economies. However, in this brief we are simply attempting to develop a science-based theoretical approach for justly sharing the carbon budget and striking a fair compromise to break this impasse. Furthermore, assuming the unavoidability of intensive emission trading under a carbon budget scenario highlighted above, it would in principle be possible for the most penalized subjects to carry out part of their mitigation commitments in other countries also not belonging to MEF, as alternative ethical frameworks also suggest.³¹

FIGURE 1: TOTAL MEF MEMBERS' 2013-2050 CARBON BUDGET VS. NATIONAL EMISSIONS PROJECTED AT CURRENT RATES



Source: Authors' calculations based upon data from previous tables.

FORGING A NEW WAY FORWARD

Twenty years of climate negotiations make clear that efforts by some parties to win have resulted in inadequate agreements, imperiling the stability of the climate system that supports humanity. Current expectations for the reductions from Copenhagen and Cancun's 'bottom up' Pledge and Review system point to a 3-5 °C temperature increase by 2100, far above nearly any expectation of what is safe. A new approach is needed.

We propose a fair compromise based on three steps. First, countries should count their 'differentiated responsibility' by emissions caused by that country's consumption of carbon-based products, not by the production that goes on within their territories. Second, the MEF has been created to do what now seems unavoidable to move talks forward: narrowing the core negotiations to a manageable number of subjects. After striking a deal covering 81.3 percent of global emissions, this 'plurilateral' deal can then be brought into the wider universal forum of the UNFCCC. Third, 1990 can be set as a baseline year to calculate the shares of the carbon budget, determined on the basis of the polluter pays principle and of an indicator of national capability, pertaining to MEF members.

Each MEF member would achieve and give up some of their short-term goals in this simple, workable framework. Each will have to relax some of their hard-line positions: no one will win if they do not. We acknowledge the importance of national sovereignty, but to secure progress in tackling climate change, each country must cede something to stabilise emissions levels. The main thing that all will gain by doing so is a viable future, the very core of national security.

Following the prime principle of sovereignty, MEF members will decide for themselves how emissions rights will be apportioned within their borders. Some might adopt carbon taxes, cap-and-trade schemes, cap and dividend approaches, sectoral regulations, individual, household or corporate carbon allocations, or set off in entirely new directions. What will have to happen is to establish and maintain transparent systems to measure, report and verify that countries are meeting their emissions rights budgets, as was agreed in Bali in 2007. Further, each MEF member could lay out a curve for slowing, stopping and reversing its emissions, creating their own year-by-year national schedules (as proposed in 2009 by Australia) to meet their overall 2013-2050 budget.

Other details of this framework will have to be worked out by the MEF and then by the broader set of parties negotiating under the UNFCCC. While the MEF captures 81.3 percent of global emissions, this proposed framework could be extended in steps to all countries—the other UNFCCC parties accounting for the other 18.7 per cent of global emissions (over 1990-2010). In particular, the wealthier smaller

Twenty years of climate negotiations make clear that efforts by some parties to win have resulted in inadequate agreements, imperiling the stability of the climate system that supports humanity.

countries not in the MEF should be brought in nearly immediately, and other developing countries might graduate to having obligations after reaching some global ‘middle class’ national per capita income.³²

Not much is left in the global carbon budget that we can safely emit to the atmosphere, and the countries least responsible for the problem are also those least able to cope with the impacts. Therefore all the wealthier countries—led by the major MEF players—should have the obligations to extend a ‘green ladder’ to developing countries, so they can quickly realize their right to sustainable development with low-carbon technologies. Article 4.3 of the UNFCCC suggests that such financing should be extended according to “the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country parties.” The current framework may suggest a way to consider how this appropriate burden sharing should work.

But in the short-term, and especially with the 2015 deadline to structure a deal under the Durban Platform for Enhanced Action approaching quickly, the MEF can constructively lead the way.³³

REFERENCES

- Allen, M.R., Frame, D.J., Huntingford, C., Jones, C.D., Lowe, J.A., Meinshausen, M. and, Meinshausen, N. (2009). Warming caused by cumulative carbon emissions towards the trillionth tonne. *Nature*, 458, 1163-1166.
- Axelrod, R. (1970). *Conflict of interest: A theory of divergent goals with application to politics*. Chicago, IL: Markham.
- Baer, P., Fieldaman, G., Athanasiou, T. and Kartha, S. (2008). Greenhouse Development Rights: towards an equitable framework for global climate policy. *Cambridge Review of International Affairs*, 21(4), 649-669.
- Biermann, F. (1999). Justice in the greenhouse: perspective from international law. In: F. Toth (ed) *Fair Weather? Equity concept in climate change*. London, UK: Earthscan, pp. 160-172.
- Birdsall, N. and Subramanian, A. (2009). *Energy needs and efficiency, not emissions: re-framing the climate change narrative*. Washington, DC: Center for Global Development, Working Paper 187.
- Bunker, S. (1985). *Underdeveloping the Amazon: extraction, unequal exchange and the failure of the modern State*. Urbana, IL: University of Illinois Press.
- Caney, S. (2005). Cosmopolitan justice, responsibility and global climate change. *Leiden Journal of International Law*, 18, 747-775.
- Carin, B. and Mehlenbacher A. (2010). Constituting global leadership: Which countries need to be around the summit table for climate change and energy security? *Global Governance*, 16, 21-37.
- Davis, S. and Caldeira, K. (2010). Consumption-based accounting of CO₂ emissions. *PNAS*, 107(12), 5687-5682.
- Eckersley, R. (2012). Moving forward in the climate negotiations: Multilateralism or minilateralism? *Global Environmental Politics*, 12(2), 24-42.
- Gardiner, S. (2010). Ethics and climate change: An Introduction. *Wiley Interdisciplinary Reviews: Climate Change*, 1(1), 54-66.
- Grasso, M. (2012). Sharing the emission budget. *Political Studies*, 60, 668-686.
- Huang, J. (2009). A leadership of twenty (L20) within the UNFCCC: Establishing a legitimate and effective regime to improve our climate system. *Global Governance*, 15, 435-441.
- International Panel on Climate Change (IPCC), (1996). *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (3 volumes)*, Intergovernmental Panel on Climate Change.

- Jamieson, D. (2005). Adaptation, mitigation and justice, in W. Sinnott-Armstrong and R.B. Howarth (eds.), *Perspectives on climate change: science, economics, politics, ethics*. Oxford, UK: Elsevier, pp. 217-248.
- Jamieson, D. (2010). Climate, nature and ethics: an editorial essay. *Wiley Interdisciplinary Reviews: Climate Change*, 1, 621-623.
- Keohane, R.O. and Victor D.G. (2011). The regime complex for climate change. *Perspectives on Politics*, 9(1), 7-23.
- Knight, S. (2013). The thin green line: The global response to climate change is worse than most people think—and better. *Prospect*, March, 38-41.
- Le Quéré, C., Andres, R.J., Boden, T., Conway, T., Houghton, R.A., House, J.I., Marland, G. Peters, G.P., van der Werf, G., Ahlström, A., Andrew, R.M., Bopp, L., Canadell, J.C., Ciais, P., Doney, S.C., Friedlingstein, P., Huntingford, C., Jain, A.K., Jourdain, C., Kato, E., Keeling, R., Levis, S., Levy, P., Lomas, M., Poulter, B., Raupach, M., Schwinger, J., Sitch, S., Stocker, B.D., Viovy, N., Zaehle, S. and Zeng, S. (2012). The Global Carbon Budget 1959 – 2011, *Earth Syst. Sci. Data Discuss.*, 5, 1107-57, doi:10.5194/essdd-5-1107-2012.
- Meinshausen, M., Meinshausen, N., Hare, W., Raper, S., Frieler, K., Knutti, R., Frame, D.J. and Allen, M.R. (2009). Greenhouse-gas emission targets for limiting global warming to 2° C, *Nature*, 458, 1158-1162.
- Meyer, L.H. and Roser, D. (2010). Climate justice and historical emissions. *Critical Review of International Social and Political Philosophy*, 13(1), 229-253.
- Miller, D. (2008). Global justice and climate change: how should responsibilities be distributed? The Tanner Lectures on Human Values, delivered at Tsinghua University, Beijing, March 24-25, 2008, 119-156.
- Moellendorf, D. (2009). Treaty norms and climate change mitigation. *Ethics & International Affairs*, 23(3), 247-265.
- Muradian, R., O'Connor, M. and Martinez-Alier, J. (2002). Embodied pollution in trade: Estimating the “environmental load displacement” of industrialized countries, *Ecological Economics*, 41(1), 51-67.
- Parks, B.C. and Roberts J.T. (2010). Climate change, social theory and justice. *Theory, Culture & Society*, 27(2-3), 134-66.
- Peters, G.P and Hertwich E.G. (2008). Post-Kyoto gas inventories: Production versus consumption. *Climatic Change*, 86, 51-66.
- Peters, G.P. (2008). From production-based to consumption-based national emission inventories. *Ecological Economics*, 64, 13-23.

- Peters, G.P., Minx, J.C., Weber, C.L and Edenhofer, O. (2011). Growth in emission transfers via international trade from 1990 to 2008. *PNAS*, 108(21), 8903-8908.
- Prins, G. and Reyner, S. (2007). Time to ditch Kyoto, *Nature*, 449, 973-975.
- Riker, W. (1962). *The Theory of political coalitions*. New Haven, CT: Yale University Press.
- Roberts, J.T and Parks, B.C. (2009). Ecologically unequal exchange, ecological debt, and climate justice: The history and implications of three related ideas for a new social movement. *International Journal of Comparative Sociology*, 50(3-4), 381–408.
- Schnellebauer, J.S., Cramer, W., Nakicenovic, N., Wigley, T.M.L. and Yohe, G. (2006). *Avoiding dangerous climate change*. Cambridge: Cambridge University Press.
- Sen, Amartya. (2011). *The idea of justice*. Cambridge, MA: Belknap/Harvard.
- Shue, H. (1994). After you: may action by the rich be contingent upon action by the poor? *Indiana Journal of Global Legal Studies*, 1, 343-366.
- Singer, P. (2002). One atmosphere, in P. Singer, *One world: the ethics of globalization*. New Haven, CT: Yale University Press, Chapter 2, pp. 14-50.
- Steinberger, J.K, Roberts, J.T., Peters, G.P. and Baiocchi, G. (2012). Pathways of human development and carbon emissions embodied in trade, *Nature Climate Change*, 2, 81-85.
- Vaughan, N.E., Lenton, T.M. and Sheperd, J.C. (2009). Climate change mitigation: trade-offs between delay and strength of action required. *Climatic Change*, 96, 29-43.
- Victor, D.G. (2005). A Madisonian approach to climate policy, *Science*, 309, 1820-1821.
- Victor, D.G. (2006). Toward effective international cooperation on climate change: numbers interest and institutions, *Global Environmental Politics*, 6 (3), 90-103.
- WGBU – German Advisory Council on Global Change (2009). Solving the climate dilemma: the budget approach, Berlin: WBGU, Special Report.
- Zickefeld, K., Eby, M. Matthews, H.D and Weaver, A.J. (2009). Setting cumulative emissions targets to reduce the risk of dangerous climate change. *PNAS*, 106 (38), 16129-16134.

ENDNOTES

1. Keohane and Victor 2011. Some other critical ethical issues surrounding climate change, not dealt with here, are its uncertain onset and locations of impacts, unequal vulnerability, the need for adaptation and compensation for past and future harms, intergenerational justice, unequal scientific and technical resources across countries, governing geo-engineered solutions and the threats of climate change to non-humans (Gardiner 2010, Jamieson 2010).
2. Spencer 2011. The acknowledgment of the priority of the historical contribution to the climate crisis and poverty eradication—more specifically, the Convention principle of ‘common but differentiated responsibilities and respective capabilities’ (CBDRRC) and the right to sustainable development—was reaffirmed in the recent 2012 Bonn Climate Change Conference and COP18 in Doha. U.S. climate envoy Todd Stern spoke in his ministerial level speech at Doha of the need for a serious discussion on equity for talks to advance. In February 2013 the BASIC ministers in Chennai, India affirmed the principle of CBDRRC and of differentiation between wealthy and poor countries in obligation of actions now, as did the ‘Like-Minded Developing Countries in Climate Change (LMDC)’ in Geneva on 27-28 February 2013, in a meeting attended by representatives of Bolivia, China, Cuba, Ecuador, Egypt, India, Mali, Malaysia, Nicaragua, Philippines, Saudi Arabia, Thailand, and Venezuela.
3. Sen 2011.
4. See e.g. Knight 2013.
5. What we mean by this term is that ideal worlds are not possible, but some compromise will need to be made between differing systems of values. See Biermann 1999; Parks and Roberts 2010; Sen 2011.
6. The MEF includes the EU and also four of its member countries – France, Germany, Italy and the UK. All data on emissions are taken from the Global Carbon Budget 2012 and described in detail in Le Quéré et al. 2012 (<http://bit.ly/UY8GTQ>). All datasets contributing to the Global Carbon Budget 2012 have been integrated in one single file archived at CDIAC (doi: http://dx.doi.org/10.3334/CDIAC/GCP_V2012). We used this file. Le Quéré’s et al. data, though, are expressed in thousand tonnes of carbon per year (ktC/yr). We preferred to rely on carbon dioxide (CO₂) both for its role as dominant ‘currency’ of greenhouse gases emissions in the UNFCCC and in the broader debate on climate change, and, mostly, for the sake of consistency with Meinshausen’s et al. (2009) work, on whose basis we calculated the carbon budget. For converting carbon to carbon dioxide, it is necessary to multiply the first by 3.67: therefore since, unless otherwise specified, we use as unit million tonnes of CO₂ (MtCO₂), we multiplied Le Quere’s et al. figures by 3.67 and divided them by 1,000 (for, as said, the former are expressed in thousand tonnes).
7. Muradian et al. 2002; Peters and Hertwich 2008; Davis and Caldeira 2010.
8. There is now a substantial literature documenting this point, among others Peters and Hertwich 2008; Steinberger et al. 2012. The UK government has also acknowledged it.
9. See Steinberger et al. 2012. The situation is complex: many very low-income countries also are net carbon importers, as are nearly all wealthier OECD countries.
10. Peters 2008; Roberts and Parks 2009; Peters et al. 2011; Steinberger et al. 2012. Bunker 1985 described this as the result of being in the ‘peripheral’ condition of exporting resources, not gaining the benefits of combining them in more diversified, stable and better paid manufacturing and provision of services.
11. Peters and Hertwich 2008; Davis and Caldeira 2010.

12. The size of a legitimate and effective coalition has been quite extensively debated in the literatures on international governance (e.g. going back to Riker 1962 and Axelrod 1970).
13. This is true even with the Cancun round development where consensus no longer requires absolute unanimity. One blocking country or a small number can still gridlock the talks for years.
14. E.g. Carin and Mehlenbacher 2010, so that such a coalition can respond to the demand of inclusive minimalism (Eckersley 2012). This federation, furthermore, should be limited to no more than 20 members and be embedded in the UNFCCC (Huang 2009).
15. Internet: <http://www.majoreconomiesforum.org/about.html>.
16. To avoid double counting, we exclude from our calculations, as said, the EU member countries (France, Germany, Italy and the UK) that are also individual members of the MEF. We also use the less controversial indicator of cumulative emissions of CO₂ 1990-2010, excluding those from land-use change, which are more disputed. Among MEF members, including those would increase emissions especially of Brazil and Indonesia.
17. Victor 2005, 1821. In the same vein it is argued that the Kyoto-like inclusion of additional countries would, in fact, be scarcely significant in terms of contribution to solving the problem, yet extremely onerous in terms of transaction costs and negotiation complexity (Victor 2006; Prins and Rayner 2007). The smaller countries objected when the G8+5 in Gleneagles proposed action on this smaller scale, outside the U.N. process. Five years of failure to reach a compromise mean it is time to allow the MEF forum to serve as a place to develop an initial deal which can then be brought into the UNFCCC negotiations.
18. Moellendorf 2009, 249, emphasis in the original. The 2 °C objective is an indication of the scale of the problem that, given the wide and growing support gained in the political debate, as well as the increasing attention of climate science (Schellnhuber 2006), seems to have assumed the normativeness demanded by Zickefeldt et al. (2009) in shaping understanding of what constitutes dangerous climate change. For instance, according to Vaughan et al. (2009) the scientific prominence of the 2° C target is mainly due to studies that point out that the last interglacial (Eemian) was 1-2° C warmer than now, causing significant losses in the Arctic and Antarctic ice sheets with consequent sea-level rise of 4 ± 2 m.
19. Peters et al. 2011; Le Quéré et al. 2012.
20. Since these gases accumulate in the atmosphere, cumulative emissions are a good measure of 'differentiated responsibilities', a concept agreed by all parties to the UNFCCC. 1990 represents a fair compromise between countries who wish to account for full responsibility over a half-century or more, and those who would only discuss current emissions or those since 2005.
21. BASIC countries, an emerging powerful bloc in climate negotiations, are: Brazil, South Africa, India and China
22. Meinshausen et al. 2009, 1158.
23. Specifically, Meinshausen et al. model for the 1,000 Gt class of scenarios 19 marginal probability density functions (PDFs) of climate sensitivity, whose probability of exceeding 2 °C ranges from 10 to 42 percent; the one we picked, that gives a 75 percent chance of avoiding the 2 °C increase in temperatures in 2100, is the illustrative case highlighted by the authors based on the 25 percent PDF, and is in their study the average result for the class of scenarios considered. Internet: www.primap.org at *THE PRIMAP 2 °C Check Tool* [Accessed 29 March 2013]. Due to the extreme complexity, and consequent controversiality, of estimates about future emission trends, it is important to underline that a study by Allen et al. (2009), though using different units, base periods, and experimental design, arrives at broadly consistent estimates of available cumulative emissions over the same period 2000-2050.

24. The implications in distributive terms of the different trajectories of emission reductions to achieve the 2 °C objective demanded by the carbon budget which we estimated are not dealt with here, for two reasons. First, this is an extremely complex issue that would extend too much the argument. Second, Allen et al. (2009, 1164) provide evidence that what counts in achieving the 2 °C target is more the total amount of CO₂ emissions than their trajectories of abatement. The goal of the current paper is to provide indicative estimates only.
25. Such categories of actions, that in fact according to Shue (1994, 343) generate savings, belong to the 'no-regret budget' and are juxtaposed to the 'true mitigation budget', applying to MEF members, i.e. to actions that generate costs that are shouldered for no other reason than combating climate change.
26. Estimates based on the IPCC SRES-A1 (A1B) Scenario-AIM.
27. It should be noted that our figures, though derived in a rigorous, science-based manner, are only indicative of the scale of the issue at stake. In fact, the precise calculations of shares of the carbon budget (expressed in emission rights) over the period 2013-2050 given in Table 3 are subject to value judgments, both on the data used, and on how they are employed to operationalize the distribution principles and criteria adopted here.
28. We refer readers to the WGBU 2009 study for excellent demonstration of why carbon budgeting makes this the case.
29. See, for instance, Singer 2002 and Jamieson 2005.
30. In fact, the direct operationalization of the polluter pays principle would have required the application of the contribution parameter to the carbon budget recalculated based on the unavailable MEF members' future consumption-based BAU emissions.
31. E.g. the 'Greenhouse Development Rights' approach in Baer et al. 2008; WGBU 2009.
32. One threshold for a global middle class is in the 'Greenhouse Development Rights' framework (Baer et al. 2008; and see updates at EcoEquity.org).
33. We mention here one backstop measure in case the MEF becomes itself too cumbersome to manage such a fair compromise. The top three emitters (the U.S., China and the EU, Table 1) make up 56 percent of emissions; the top six total 71%. Failing to gain consensus in the MEF, coming to a leadership deal among the top two or three players would itself make an important contribution to breaking the impasse. This is especially the case given that the second commitment period of the Kyoto Protocol covers only 15 percent of emissions. Serious commitments of the full MEF would constitute a five-fold improvement in adequacy of a regime; even just an ambitious deal among the top three emitters would constitute a three-fold improvement.