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Alfredo Sirkis, J.C Hourcade, Dipak Dasgupta, Rogério Studart, Kevin Gallagher, B Perrissin-Fabert, José Eli da Veiga, Etienne Espagne, Michele Stua, Michel Aglietta

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Moving the trillions **a debate on positive pricing** **of mitigation actions**

Alfredo Sirkis · Jean Charles Hourcade · Dipak Dasgupta
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By Way of Preface: The Challenge of Moving the Trillions¹

Alfredo Sirkis

The biggest challenge to achieving low-carbon economies is how to pay for the transition. The solution to this will not come from the UNFCCC process, the Standing Commission for Finance, nor from the protracted negotiations on the provisioning of the Green Climate Fund. Even if the promised US\$ 100 billion were to be available by 2020 this would fall quite short of the US\$ 3 to 5 trillion/year (or maybe more) that will be needed to finance the energy and infrastructure transition, extensive reforestation, low-carbon agriculture and other critical mitigation investments. Though these figures are imprecise and need to be fine-tuned, it is now quite well established that we are talking here about trillions, not billions. The challenge therefore is “moving the trillions” towards the low-carbon transition. So where would the trillions come from?

Most governments struggle with large debts, and must face persistent deficits with limited resources. Currently, private investment is also insufficient. There are certainly enough resources globally to fund the low-carbon transition, but no adequate mechanisms or incentives are available to mobilize capital on a sufficient scale to effectuate the low-carbon transition. De-carbonization requires a

1. I wish to thank Dr. Irving Mintzer, of the Environment Program of the Johns Hopkins School of Advanced International Studies in Washington, DC, for his helpful comments to this preface.

large upfront investment and offers slower returns than does a continuation of business-as-usual. Thus, finance for mitigation actions is hard to obtain under the current fiscal, cultural, and technical circumstances in which the financial market operates. “Market forces” alone just won’t drive the system where we need it to go. This not only an obstacle for low-carbon investment but to the evolution of the productive economy in general. Big investments are needed to get the world economy again on track, huge liquidity is theoretically available in the global financial system, but somehow, we simply cannot make the two ends meet.

The new UN Climate agreement at COP 21 will bring incremental progress, but even inveterate optimists like myself don’t believe it will be capable of ‘bridging the gap’ between the maximum that 195 governments can agree upon by consensus, and the minimum the IPCC has concluded is needed to keep the average temperature increase of our planet below 2 degrees Celsius. So how do we address a challenge that may fast become insurmountable? It is high time to think out of the box and take the UN climate process for what it is: the lowest possible common denominator among 195 governments driven by their own domestic political and economic circumstances. It remains very important as a baseline, the most legitimate expression of international will directed to the problem, but is insufficient as a tool to limit the planet’s warming to the “under 2 degree” paradigm. Two additional strategies are needed: a specific and concentrated effort by the biggest greenhouse gas (GHG) emitters—both governments and corporations—and the establishment of a mitigation-friendly global financial system: a “low-carbon Bretton Woods” agreement of sorts.

A small group of countries accounts for the vast majority of emissions, China and the US together sum to 40%. These governments can negotiate specific bilateral or multilateral arrangements through, for example, a China, US and EU common effort to decommission Chinese and Indian coal plants. Or help fund reforestation and low-carbon agriculture in Brazil on an unprecedented scale. A similar effort directly involving the largest private emitters should follow. The concept of Climate Clubs, involving sub-national and city governments and the private sector, is being currently considered and is here discussed. Working on these supplementary arrangements is a commonsense and realistic way to promote additional mitigation action. It makes more sense than imagining a solution based exclusively on

‘burden sharing’ and international “command & control” commitments through treaties. Frankly, that won’t fly for well-known political reasons.

The 1944 Bretton Woods Conference established a new financial order for the world at the end of World War II. It financed the massive reconstruction under the military, political and economic power of a hegemon, the US. The current world, by contrast, is multipolar. Nation-state power is in jeopardy in various parts of the world. Most economies are slow or stagnant. National budgets are short and an enormous amount of liquidity is owned by the private financial system, kept away from the so-called “real economy.” And then there is global warming leading to climate change. This is a major game-changer: threatening the worst for many countries, aggravating most existing problems, and leading to potentially catastrophic impacts on an unprecedented scale.

A new financial order with rules and criteria compatible with the current and future challenge for humanity and for the global economy must be established in the next few years, during the post-Paris period. We need governments, the private sector, multilateral institutions and global financial markets to forge a new paradigm in which governments and multilateral institutions offer a credible set of guarantees for massive low-carbon investments and quantitative easing by Central Banks, focused on productive investments to a low-carbon economy—filling the infrastructure investment gap and not just throwing money at the economy. All of this will be needed as well as buying carbon remediation assets, not only those quasi-junk bonds.

A contemporary Bretton Woods Agreement to address climate change and economic stagnation would be certainly more complicated than the challenges faced at the 1944 conference. There is no longer one hegemon dealing the cards to all the other players and the complexity of the issues is much greater. But the spirit of a Bretton Woods-like rearrangement of the system is truly needed and certainly not impossible to build. Ideas for changes and adjustments in the existing multilateral institutions, new over-arching economic signals, along with new business models and financial products will all be needed. We must find new ways of bringing in massive investments for low-carbon infrastructure and sustainable development that have already been considered for some time. Unfortunately, the political will and the drive for this true revolution are still missing.

Three kinds of low-carbon financial mechanisms are currently being implemented or discussed: 1) “carbon markets;” 2) “real pricing” of carbon for taxation and subsidy elimination purposes; and 3) “positive pricing” of carbon reduction. The first two have been studied and discussed with spasmodic attempts at implementation since the 1997 Kyoto agreement. These efforts are now likely to be upgraded as carbon markets recover from recent blows and are developed on a national and sub-national scale. Governments are talking of eliminating subsidies to fossil fuels. Both governments and corporations are tentatively establishing carbon prices. And many countries are studying reforms of their taxation based systems based that incorporate revenue neutrality: compensating carbon taxation by reducing taxes on investment and wages. One can include in this repertoire green bonds and other similar assets.

All of these add to the purpose of decarbonizing the economies but won’t bridge the infrastructure investment gap. Carbon markets are limited by the emission “caps” within which they “trade.” As for carbon taxation, we know this is an uphill political battle, nation by nation—just like the plan to eliminate fossil fuel subsidies.

In this publication, we want to address the third kind of financial instrument, one that is just beginning to be discussed: the ‘positive pricing’ of carbon reduction (or “mitigation actions” as it has been defined in its recent UNFCCC wording). This approach is based on the recognition of carbon reduction as having intrinsic social/economic value. In 2014, as the chairman of the Joint Commission for Climate Change of the Brazilian parliament, I was able to persuade the Brazilian government to submit the recognition of “**the social and economic value of emissions reductions and the need to consider them as units of convertible financial value**” to COP 20, in Lima. This was meant to be an initial step towards the creation of a new framework for financing the transition to low carbon economies.

Our proposal didn’t fly in Lima, but in June 2015 it was included in the Brazil – US joint presidential declaration: “**The Presidents recognize the social and economic value of mitigation actions**(...)” Finally, at the last preparatory meeting of the ADP, in October 2015, in Bonn, it was approved and incorporated into the co-chairs’ workstream 2(WS2) draft for COP 21: [The Parties recognize] “**the social and economic value of voluntary mitigation actions and their co-benefits**

to adaptation, health and sustainable development.” This has been included in the SW2 draft with no brackets attached—so it is likely to become a COP 21 decision and will amount to the recognition by 195 governments that “carbon reduction equals value.”

The rationale for recognizing carbon reduction as a source of true value—not a ‘bitcoin’ kind of device—is based not only on the worldwide political recognition of its social value but also upon an undeniable economic fact: a global loss is being inflicted on the world economy by climate change, the damages are growing, and the loss can be consistently quantified. It has been estimated at being at least 5% of the global GDP in the Stern Report. Of course, there can be alternative ways of estimating this over different time frames. Nevertheless, a consensual quantification can probably be agreed upon diplomatically: “x” trillion dollars up to 2050. Once governments agree on this officially, the value of each ton of CO₂-equivalent reduction can be priced accordingly. The recognition by 195 governments that mitigation actions equal value is the political green light for the subsequent establishment of instruments that can translate this new convertible unit of value into action.

One must keep in perspective that ‘Positive Pricing’ of carbon reduction is politically a “carrot” rather than a “stick.” Carbon reduction certificates or Climate Remediation Assets can become a sort of “climate currency,” and a major booster for financing low-carbon projects or policies. One can envision them as having convertible financial value (like the Special Drawing Rights – or SDRs provided by the IMF) that can generate new financial products related to them. It can be envisioned even as a new reserve currency in the future. There is a certain symbolic analogy to the gold value established in Bretton Woods, from 1944 up to 1971. Metaphorically one could say carbon reduction certificates thus become the new “gold”.

But how would all of this work in practice? The devil, we know, always hides in the details. The authors of this publication have engaged in a lot of brain-storming and soul-searching related to the inception of these new financing mechanisms. The original Hourcade & Aglietta study envisioned the creation of “climate remediation assets” (I call them “carbon reduction certificates”). They would be issued after the completion of a certain mitigation project and its due certification—eventually by the now well-tested CDM methodologies. The private companies

or state actors who seek financing to implement their mitigation actions could use these certificates as part of their repayment to their lenders. The lenders would pass on these certificates and get reimbursed for them by a pool of central banks that would become a Fort Knox for this new “carbon currency” and would be guaranteed by governments.

A subsequent paper published by France Strategie and written by Michel Aglietta, Etienne Espagne and Baptiste Parissin-Fabert, further developed this idea and suggested that the international community limit the proportion of reimbursements in these certificates to 10%— I personally think it is too little—and raised the possibility that the governments’ guarantees be funded, on the other end, by carbon taxation. The paper was less explicit on the nature of the institution(s) that would manage these assets. Should there be one such international institution? Or should there be different international, multilateral, national and sub-national ones authorized to issue, purchase, keep and resell this “climate currency” under common and agreed-upon criteria. This is one of the first relevant discussions that must be undertaken. Personally I doubt that a number of central banks would be enthusiastic about the idea, at least at first. Also, central banks have both similar and differentiated tasks, regulations and cultures. Some would be very unlikely to want to do it, others more so.

I discussed this with the former chairman of the Brazilian Central Bank, Armínio Fraga, who clearly didn’t like the idea of this new task being given to a Central Bank that “already is doing too much other stuff.” Economist André Lara Resende thinks the idea is worth looking into but the institution should be the IMF. In the working group of the Brazilian Finance Ministry that is studying carbon taxation, the people interested in “positive pricing”—not too much concerned, as some of their colleagues, about its “inflationary and public deficit expanding consequences”—argue that in Brazil it would be eventually something for the Treasury to do, not the Central Bank. In our France Strategie seminar, in July, in Paris, Muhammad Kazemi from the Bangladesh Central Bank listed several sustainable development projects it has been financing that are very much compatible with this framework. Emerging economies’ central and infrastructure banks would perhaps find it easier to get into this kind of role. The European Central Bank could do a lot by directing future quantitative easing towards low-carbon projects.

What kinds of low-carbon investments could be boosted by this kind of mechanism? Working on a project-by-project basis, each one having to be duly certified, can turn out to be a very slow and protracted process. Or use the “certificates” to boost all investments that incorporate a previously certified and quantified mitigation methodology? In the first case we could have, for example, the decommissioning of a coal plant coupled with a company’s installation of a gas- or biomass-fired replacement. The certification process for this can profit from the CDM experience but we know that the process is slow. The second alternative could be swifter and could be conducted on a more massive scale. One could estimate the overall carbon reduction potential of a certain policy or program. Let’s say: one million solar panels in a given region or switching a whole bus system from diesel to hybrid-electric (with the electricity supplied by renewable sources) in a region. This scale increases speed but the specific calculus of carbon reduction becomes more complex. Another possible use for this kind of “climate currency” is for rewarding early and additional action. In this case a national government that anticipates or goes beyond its INDC would be rewarded in a climate currency to be used exclusively to purchase technology, services and products promoting subsequent carbon reductions. In the future, sub-national governments and companies with INDC-like goals could also be rewarded.

One of the main features discussed by our contributors is related to reducing perceived risks and offering guarantees. They have been unanimously considered as the fundamental conditions to move the international financial system to a more cooperative posture towards low-carbon investments. It has been noted that risk evaluation has been highly inadequate in a financial sector that prizes itself so much for its alleged capacity of dealing with risk and playing it safe. In fact, there are two risks at stake for the financial sector: the impact on financial investments of new government regulations and public awareness campaigns concerning greenhouse emissions, of the kind incurred lately by coal and oil companies. And then of course there is the risk of climate change itself and the medium- and long-term consequences of it. It is astonishing how little of this risk has so far been incorporated into the different projections by most financial giants. Most stick to a five-year projection based upon the past. The insurance and reinsurance sector in particular will be exposed to catastrophic loss, more so every year.

The risk we are considering here, though, is something else. It is the perceived risk by financial institutions that their loans to a carbon reduction project or program will not produce the alleged returns or at least will not be as good investment as, say, more speculative ones. In this culture, at this time, this is a fact of economic and political life and there doesn't seem to be a way of protecting ourselves from it. So their perception of risk and needed guarantees must be addressed in some ingenious way. The guarantee proposal most of our authors agree on is having a group of willing governments provide guarantees for the carbon reduction certificates for a specific level of carbon assets in conjunction with the IMF, the WB, a coalition of institutions, or new multilateral institutions.

Companies, national governments, sub-national governments, and nonprofits implementing mitigation actions could pay back their banks with carbon reduction certificates. These would be accepted as convertible assets. The presence of willing governments, banks and multilateral institutions offering guarantees would help to bring in resources from the global financial system. These kinds of mechanisms do not replace carbon pricing for taxation purposes, though they tend to offer an easier path. In fact, both kinds of mechanisms can be complementary, offering different possible arrangements in combination with the carbon markets. Each of these three mechanisms: carbon markets, taxation and positive pricing, will have its own specific role in the transition process towards low carbon economies. Carbon markets—if managed with integrity, without double counting— can help meet legally established emission caps. Carbon taxation and the end of fossil fuel subsidies confront the scourge of externalities, impose on the market the real cost of carbon emissions and condition economies towards the low-carbon transition. Positive pricing, by contrast, helps unlock investments on a massive scale for mitigation actions. One of the interesting things that was raised in our RCC 2015 brain-storming was the possibility of this proposal being implemented initially on subnational and local levels. There have been some interesting experiences with local currencies. To create one related to mitigation actions doesn't seem that hard to do.

In 2012, I had the opportunity to organize a side event at the Rio + 20 UN Conference, the Rio Climate Challenge(RCC), with climate leaders from 14 different countries, dedicated to scenario building related to a 2 degree pathway. The following year we focused on low-carbon economy issues and this year on both

carbon taxation and positive pricing. With the support of the Foreign and Commonwealth Office of the UK, this year we were able to commission these papers by Dipak Dasgupta, Jean- Charles Hourcade, Rogério Studart, José Eli da Veiga, Etienne Espagne, and Michele Stua debating positive pricing and some closely related issues of low-carbon finance. They discuss, from different angles and approaches, “positive pricing” at its genesis. Our authors have different views and opinions: some are more assertive, others more skeptical.

Hourcade along with his partners of CIRED and France Strategie presents us with his latest and upgraded vision. Along with Aglietta, he is a pioneer in this debate. Dipak Dasgupta, a former Principal Economic Adviser, Ministry of Finance of India, who worked at the World Bank for 28 years, brings us an historical vision of infrastructure finance and the perspective of his current experience at the GCF. Rogério Studart, former Executive Director to the World Bank Group, representing Brazil and eight other countries, presents us with new ideas on how to finance infrastructure on a massive scale establishing the guarantees capable of bringing in the trillions. José Eli da Veiga, is simultaneously an original thinker, a rigorous critic of economic theory and currently focused on climate finance. He reminds us of the shortcomings and hurdles we must overcome. Michele Stua, also an early researcher and proponent of positive pricing mechanism, tackles the issue from a different point of view, more in sync with a global governance vision some may find too top-down. Etienne Espagne gives us an insight of one of the mechanisms that can relate to positive pricing as well as other mitigation actions: voluntary climate clubs. Together our authors give us several perspectives of a lively debate.

Our intention here is to reach out to other networks, groups and individuals discussing similar issues essentially related to how to “bring in the trillions” for low-carbon transition. Translating the UNFCCC recognition that “carbon reduction equals value” into workable financial tools will require an impulse outside the UNFCCC, most likely at the level of the G20. Eventually the governments of some of the big economies, central banks, the Bretton Woods institutions, and new multilateral Asian and BRICs development banks could envision a “Climate Club” that will unite to establish guarantees for carbon reduction assets or certificates and a set of rules to empower institutions for this purpose. Guarantees, backed by this Climate Club and all its members, will enable subsequent mobi-

lization of resources from the private financial system. Central banks operating quantitative easing can buy a large share of these mitigation assets, a wiser way than buying dubious bonds indiscriminately. Quantitative easing will then boost job creation, and technology innovation, while stimulating low carbon investments.

There are numerous questions that still need an answer. For example:

- What is the nature of the agreements and institutions that would manage the “carbon reduction certificates”?
- How would these be originally allocated?
- How would their price be established? Would the price be fixed or floating?
- Would the price be the same for all mitigation actions or differentiated by sectors?
- Would the certificates fund individual projects, big policy programs, or both?
- What will the road map be for this following the COP 21 “recognition of value”?
- How could one deal with the concern that “this adds to public deficit!” kind of opposition? Can it become a future currency?

There are possible clues in this publication for some of the answers, others will remain to be addressed in the future. What is certain is that all this will demand further research, lots of theoretical and practical work and political and diplomatic resolve and expertise in a post-Paris agenda. The purpose of this publication is to present our early brainstorming and initial debates on ‘positive pricing.’

I am not an economist and leave the theoretical and technical analysis to our well-prepared and experienced collaborators—whom I hope one day will receive the Nobel Prize for this work! However, in my long career as a (green) politician, both in executive and parliamentary positions, local and national, I have developed some instinct for strategies that can make a difference in the future. I can feel that we are up to something here and that it could eventually become groundbreaking. So it is worthwhile to push this forward even when it seems way above our current power and influence.

Our challenge is to figure out how the drive towards low-carbon economies can be scaled into an unstoppable movement. We need this if we are ever to get onto the under 2 degree pathway, leading to a future carbon-neutral scenario where humanity is able to prevent at least catastrophic levels of climate change and, in doing so, also move the global economy past its current stagnation mode.

Rio de Janeiro, November 2015.

The low carbon transition between the animal spirits of finance and the fault lines of the world economy

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Although transitioning to a low-carbon economy is acknowledged to be urgent to avoid entering the *terra incognita* of a global warming of +4°C or more over preindustrial levels, there is a temptation amongst ‘climate agnostic’ decision-makers to postpone action until after the end of the current economic doldrums. This paper supports the view that succumbing to this temptation deprives the international community of a tool to respond to today’s challenges of finding robust sources of growth, reducing debt, creating jobs, preventing ‘currency wars’ and alleviating poverty.

Many scholars and practitioners recognize the insufficiency of final demand and the gap between real growth and potential growth due to chronic excess of savings over investments and a gap between the propensity to save and the propensity to invest². Imposed after a period of excessive leverage, fiscal austerity tends to fuel an

2. On this interpretation of the current economic slump see Blanchard (2015), Lewis C. (2014), L.Summers (2015)

inverse Say's Law in which local demand creates its own lack of supply. Yet reverting to lax fiscal and monetary policies would carry the risk of reigniting speculative bubbles, financial instability and non-sustainable growth as long as the fundamental mechanisms leading to a misallocation of savings are altered.

This paper argues that the low-carbon transition is actually an opportunity to increase the propensity to invest by indicating where savings should go. It shows why reducing the uncertainty attached to low-carbon investments requires targeted financial devices. The paper then suggests that recognizing the social value of mitigation activities can be the cornerstone of a financial intermediation that bridges long-term assets and short-term cash balances. It concludes by sketching out the potential macroeconomic benefits, both short- and long-term, of redirecting savings towards low-carbon projects in infrastructure sectors (e.g., energy, buildings, transport) that are essential for inclusive growth and have strong leverage effect on the rest of the economy.

Finance and carbon pricing: two tools for two market failures

The mental map behind a Kyoto-type cap & trade system is a set of technical abatement cost curves for each region of the World, connected by a worldwide carbon market. This market selects the mitigation opportunities that are cost-efficient for the carbon price emerging from the supply and demand of carbon emissions allowances. Extensive literature has already been dedicated to the difficulties associated with this scheme, notably a) the uneven general equilibrium effects of higher energy prices on countries in different development phases and with different fiscal systems, and b) the uncertainty and the efficiency issues (the windfall revenues problem) linked to the compensatory transfers needed to meet the Bowen-Lindahl-Samuelson condition for the provision of a public good. This condition states that, because of the decreasing marginal utility of income, the individual contributions should be invert correlated to the income levels [Samuelson 1954].

Less attention has been paid to the absence of finance in a mental map in which technologies are selected based on their levelized costs, regardless of the time

profile of cash flows profile. This is equivalent to assuming unlimited access to financing. Figure 1 pictures the operating accounts profiles of a low-carbon (A) and standard project (B). (I_A) and (I_B) denote the upfront investment costs; (R_A) and (R_B) the revenues at second period. If i is the discount factor, and if X is the amount of additional emissions that B has to pay relative to A, the net present value of project A is superior to the net present value of project B if the price of carbon P is such that:

$$E(-I_A) + iE(R_A) + X > E(-I_B) + iE(R_B) - iE(P) \cdot E(X) \text{ (Equation 1)}$$

Even if inequality (1) holds, however, project A might not be selected because its upfront costs might cross a “danger line”—i.e., a level of operating accounts deficit that the decision-maker does not want to cross. This danger line underpins households’ demand for very short payback periods for investments in energy efficiency. It explains why firms may have limited access to finance beyond self-finance (be it *via* debt or equity): onerous debt servicing lowers their operating surpluses and poses a threat to dividend payments to their shareholders. If the lender and/or a significant amount of shareholders lose confidence, the value of the firm might be affected with risks of bankruptcy or of hostile takeover.

Cost curves based on leveled costs overlook how much the impacts of uncertainty on future revenues differ from the impacts on upfront costs. A bad surprise on future revenues only makes the investment less profitable, whereas a bad surprise on upfront costs put firms at risk of crossing the danger line. This risk is higher in low-carbon projects that have higher and more uncertain upfront costs than regular ones. Thus, carbon prices can only improve the merit order of a subset of low-carbon projects, those that have not been discarded because of the ‘danger line’.

Firms with no high self-financing have then to consider that, if the upfront costs follow the dotted line of Fig 1, they will need to apply for new loans at higher interest rates and, beyond an upper limit D_{max} of negative cash flow will face a risk of bankruptcy. The costs to be consider thus incorporate the costs e of approaching the ‘danger line’. These costs are function of the distance d between D_{max} and the maximum deficit of operating accounts of the project, with $e(d) \rightarrow \infty$ when $d \rightarrow 0$. Equation 1 rewrites into equation 2: $E(-I_A) + iE(R_A) + e(d_A) > E(-I_B) + i$

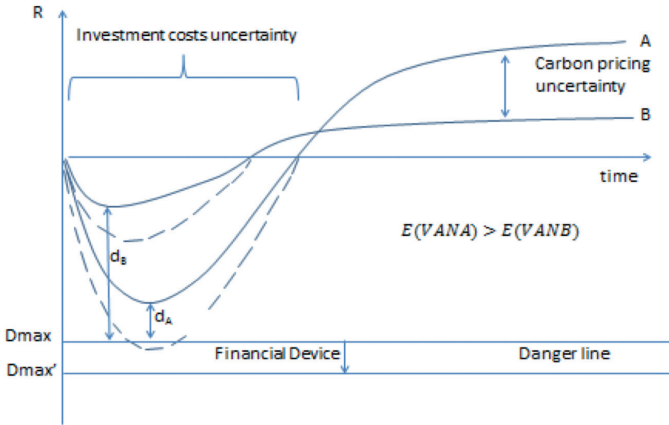
$E(R_B) - i \cdot E(P) \cdot E(X) + e(d_B)$. Even without considering risk aversion, the sequence of carbon prices apt to incite decision-makers to select A has to be such that it imposes a penalty on B with a higher present value that the differences between the costs of approaching D_{max} :

$$E(P) \cdot E(X) > (e(d_A) - e(d_B)) * 1/i \text{ (equation 3).}$$

We will come back later to this equation. At this stage, the takeaway point from the analysis is that financial devices are needed to push the ‘danger line’ farther away. With D_{max}' instead of D_{max} the risks arising from overruns of upfront investment costs decrease and carbon pricing can leverage more projects.

Figure 1

Project selection under financial constraints



Why and how to create Climate Remediation Assets³

Reducing the investment risks on low carbon projects is good for the control of global warming but not necessarily for the economy in general. This is the crowding out argument: to invest to foster technical change in one area of activity crowds out investments and technical change in other activities. But this argument has to be revisited in a context where the world economy is far from its production frontier and where the ‘danger lines’ do not characterize only low-carbon projects. They constrain firms’ behavior in a business environment in which managers, paying attention to the daily evolution of the shareholder value, are cautious with regard to long-term investments. For their part private savers hesitate to maintain investment rates in the industry and prefer speculative or liquid assets.

A financial intermediation device is thus needed to bridge long-term assets and short-term cash balances so that savings are invested productively without risks of excess leverage, maturity mismatch (illiquid long-term assets financed by short-term) and interconnectedness (unsecured liabilities of money market funds) which foster systemic crisis.

Climate finance can provide such an intermediary. To understand why, let us remember the example of the railways revolution which was unleashed by both country specific forms of public guarantees on investments and by the creation of attractive assets through the increase of the price of the lands adjoining the lines. This combination reassured investors about uncertainty on the economic viability of each specific line. An equivalent combination for the low-carbon transition is a public guarantee on a new carbon-based asset, which allows the Central Bank to provide new credit lines refundable with certified reduction of CO₂ emissions (CC) instead of cash and to swap them into carbon assets.

To be operationalised, this combination demands a commitment by Governments to back a predetermined quantity of carbon certificates priced at a given face value that can be allocated to low-carbon projects. This face value would translate the

3. The overall rationale of this device is described in Hourcade et al. (2012) and a version centered on the European Context is developed in Aglietta et al (2015)

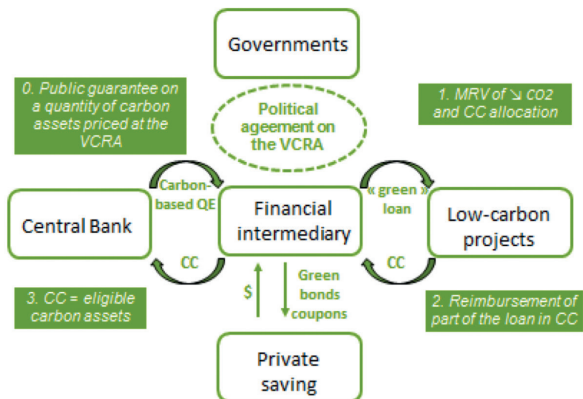
social value of climate remediation activities (VCRA), a positive price which recognizes both the social cost of climate change damages and the various co-benefits of mitigation activities ((air pollution, benefits of the recycling of the revenues of carbon pricing, energy security) (IPCC 2015).

On this basis the mechanism described in Fig 2 can be triggered:

1. An independent international Supervisory Body, similar to the CDM Executive Board, secures both the environmental integrity of the investments (rules for attributing the CC, MRV process) and its developmental effectiveness (consistency with the NAMAS selected by the countries to secure the alignment of mitigation actions with their development policies).
2. Building on this guarantee, the CCs are accepted by financial intermediaries as repayment because they can be either converted into climate remediation assets eligible for quantitative easing programs launched by central banks, or be used as guarantee to the refinancing by the central banks of low-carbon loans up to their carbon value.
3. After carbon emission reduction being testified, the “carbon certificates” (CCs) are converted into climate remediation assets (CRAs) and enter central bank’s balance sheet.

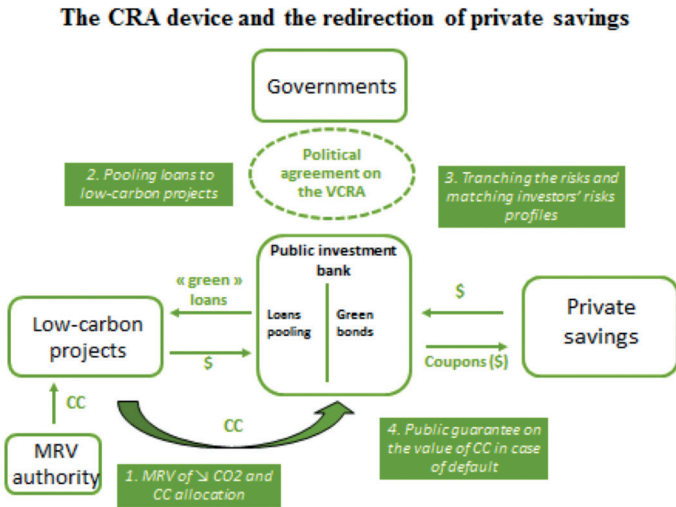
Figure 2

Components of a climate friendly financial intermediation



Banks or specialized funds can then build upon this mechanism to back highly rated climate-friendly financial products (“AAA” climate bonds) and attract savers. Institutional investors could be interested in safe and sustainable bonds instead of speculative financial products for both ethical and regulatory purposes⁴. The way to do it is pooling low-carbon credits sold by banks and bought by securitization platforms managed by public financial agencies. They would be pooled by types of certified investments (building renovation, urban mobility, local energy generation, etc.) and securitized to create new types of green bonds that could be sold to institutional investors.

Figure 3



The key pillars of this device are the quality of the MRV process and the adoption of a VCRA. The quality of the MRV depends upon its capacity of determining a statistical additionality of projects to avoid the high transaction costs of project-based additionality (Belasem et al 2014). The VCRA has three critical roles: (i) it offsets the penalty imposed by discount rates on long lived equipment because it incorporates a flow of social values which increases over time (ii) it hedges

4. Although this not central for this text, it matters to stress that part of the CC should be used to scale up the Green Climate Fund in order to secure multilateral cooperation and to fund the Nationally Appropriate Mitigation Actions without crowding out overseas assistance

against the risk of lax monetary creation and of carbon bubbles because it gives a nominal face value to the CC from which secondary bond markets cannot depart too much (iii) it hedges against the fragmentation and arbitrariness of low carbon initiatives and has the same efficiency effect than a carbon price.

Controversies about the Social Cost of Carbon (SCC) can cast the doubts about the possibility of agreeing on such a value. But, contrary to the SSC, a VCRA is not used to weigh climate change damages over the long run against the costs of mitigation. It is the marginal social cost of an agreed emissions ceiling. There are three reasons why an agreement on a VCRA is easier than on a carbon price

- The range of uncertainty is far lower⁵ and countries might agree similar VCRA for different views of the domestic co-benefits of climate mitigation
- A VCRA does not hurt directly existing capital, has less distributive impacts and carries a lesser risk of blockage by vested interests. It is not linked to an adversarial exercise about the sharing a carbon emission budget but to a cooperative exercise giving access to financial tools.
- The magnitude of public support for triggering the same amount of LCIs would be lower than through carbon pricing. In equation 3 the relation between the tax level T and the displacement d of the danger line is highly non-linear: e is non-linear, $E(P)$ growth more slowly than P because the political acceptability of P decreases with the level of P , $1/i$ magnifies these two effects like would do, in a more complex model, the incorporation of risk-aversion.

What makes such a system apt to provide the intermediation between savings and low-carbon investments at the needed level is the involvement of Central Banks and governments' guarantee. However, Central Banks might be concerned by the credibility of such a government's guarantee in a context of sovereign debt. Part of the response depends on the quality of the MRV process which secures that

5. See the relatively narrow likelihood space of carbon prices given by the IPCC [28\$/tCO₂ - 50\$/tCO₂] in 2020 and [110\$/tCO₂ - 190\$/tCO₂] in 2050 for a 450 ppm concentration target (Edenhofer et al 2015). The controversies over the SCC are actually over the pure time preference (Stern 2006 versus Nordhaus (2007) and Weitzman (2007) and the reliability of integrated assessments of climate change damages (Pyndick, 2013). Their role is less important in cost-efficiency analysis and in sequential decision-making frameworks in which the dates of arrival of information about damages and technologies matter as much as the pure time preference (Ha-Duong et al. 1998, Ambrosi et al. 2003).

the liquidity generates immediately its collateral in the form of equipment and infrastructure. Another part can be in the form of fiscal backing through small carbon levy⁶. What must be understood is the absence of price uncertainty because the VCRA is not a market price. Furthermore the measure of abated carbon in any investment is ex post. The only source of error this lies in deficiencies of individual certification operations. There is no risk of losses becoming systemic via interdependencies. Therefore a small fiscal backing would be enough to fulfill the government guarantee if needed.

Harnessing the animal spirits of finance to drag the world out of climatic and economic turbulences

The primary outcome of a CRA device would be a wave of low carbon investments even in the absence of significant carbon prices. A lot of such investment exist which are blocked by their upfront cost in an uncertain context and the leverage effect of a public guarantee incorporating a VCRA might be high⁷. It could be all the more high that the positive prices could reach very quickly levels out of reach through real carbon prices since they don't hurt vested interests and raise no distributional issues.

In a second step, this device would facilitate the deployment of price-based mechanisms: higher amount of viable low carbon investments for a given carbon price, VCRA and MRV process making easier to turn the product of mitigation activities into financial assets, governments interested in deploying carbon pricing to generate carbon assets and facilitate the balancing of public finance.

However, the decisive argument for climate-agnostic decision-maker joining the fight against climate change is the overall benefit of a climate friendly reform of financial intermediation. Other reforms are conceivable but this one has a specific rationale: the mitigation of climate change can contribute to a sustainable world economic recovery because it implies a wave of 'green' innovation (Stern 2010, Stern and Rydge 2012) and because this wave will take off only when its promises

6. This levy should not be confused with the 'pigouvian taxes' needed to pricing carbon at the required level for a low carbon transition. These taxes require non marginal reforms in the fiscal systems and confront political obstacles which can be overcome only at the national level.

7. For an analysis of this leverage for a low carbon development facility see De Gouvello & Zelenco (2010)

will be supported by what Keynes called the ‘animal spirits of finance’. Like after WWII this wave can trigger a long term growth cycle and, being grounded on the building and reshaping of infrastructure sectors which are currently under-invested (IMF 2014), support an inclusive development (energy access, buildings, transportation) (World Bank 2010).

Currently these spirits work in a totally different direction and generate long-term investment shortfalls and risks of repeated speculative bubbles. The saving glut diagnosed by Ben Bernanke and the difficulties of maintaining sufficient demand to permit normal levels of output explain the alerts about the ‘depression economics’ by Krugman (Krugman, 2009) or about the secular stagnation by Larry Summers (Summers 2014).

A low-carbon transition supported by a CRA device would boost investments and final demand by backing credits facilities with equipment and infrastructures as collateral. Its macroeconomic impact might be important because it implies incremental investment efforts (around 0,5% of the GDP over the forthcoming decades) with a high ripple effect is because of the level of redirected investments is around 8-9% of the gross capital formation⁸. This redirection entails inevitable tradeoffs and choices but does not mean sacrificing social priorities. It puts of the economy closer to its potential growth by reducing the saving glut.

Modern monetary and banking systems rely on the commerce of promises with a potential significant disconnection between the scale of the promises behind economic initiatives, the existence of pre-existing counterparts and the fulfilment of these promises. The only strongbox behind these promises is the working capacities of Nations and the guarantee that something of value is eventually created when the money spent. The low carbon transition provides such a guarantee though a universal objective.

An indirect but important outcome would be to meet the concerns about the sustainability of export-led growth strategies especially developing countries (R. Rajan (2010)). Exportations are both a source of growth and of excessive dependence

8. These figures come from simulations carried out by the CIRED on the basis of the World Energy Outlook of the International Energy Agency (2014) and published in Hourcade et al. 2014.

on the ability to pay of foreign consumers. It forces to constrain the domestic demand and to under-value the currency, at risk of launching a currency war and reinforcing the export led bias.

Governments of emerging economies hesitate to changing this strategy because of the uncertainty about recuperating on more inward oriented activities the jobs lost in the export-led activities and the risk of an excess reliance on domestic oriented and less exposed activities resulting into inefficient sectors. A CRA device would facilitate a strategic change towards a more inward oriented growth pattern thanks to important North-South flows (including through the inward redirection of savings of emerging economies) in support of the NAMAs which are dominantly directed towards domestic markets.

Ultimately, the risk of currency war would be decreased because carbon-based reserve assets would become de facto a common numeraire for interbank settlement payments and would decrease the need of ‘war chest’ of official reserves in foreign currencies.

Conclusion

This paper does not propose a full-fledged program. Because COP21 might be one of the last opportunities to trigger credible climate policies and because the world security is threatened by the structural economic turbulences, it sketches the perspective of a new forward world contract.

Harnessing the animal spirits of finance towards a low-carbon transition is necessary both for ambitious climate policies and for reducing some of the fault lines of the current economic globalization, clearing the current foggy business environment and dragging the world out of the economic doldrums. An *“equitable access to sustainable development”* (COP15 Cancun) would then be possible to protect future generations from the tensions of a + 4°C world without sacrificing the access to decent living standards of current generations. It would also allow the developed countries to meet the Common but Differentiated Responsibility Principle by assuming their historical responsibility in the climate affair and in the

financial crisis without putting huge pressure on their weakened taxpayers.

Linking two sensitive issues, climate and the future of economic globalization, may appear a ‘diplomatic nonstarter’. But world security is a systemic problem and cannot be addressed by fragmented policies. If a form of positive carbon pricing reorients part of the world’s savings towards low carbon infrastructure, triggers a wave of growth less exposed to financial ups and downs and to tensions on currencies and contributes to energy security in addition to slowing global warming the perspectives sketched in this paper are worth to be further explored.

The CRAs and Central Banks post 2008 practices

Central banks have been doing Quantitative Easing (QE) to ward off the curse of secular stagnation. They have mostly bought existing public bonds. The effectiveness of the huge buyouts has been mixed at best. According to the IMF, aggregate productive investment in real terms was 25% lower in advanced countries end-2014 than what it would have been along the pre-crisis path (WEO April 2015, hap.4). It means that effective demand stimulation via central bank balance sheet expansion is indirect and hazardous, because the transmission process is indirect with much leakage due to lukewarm expectations and liquidity hoarding.

It would have been more effective had central banks bought assets generated by new real investment that would have directly created incremental real income. Such a direct link is the gist of our proposal, linking climate policy to growth via a flurry of innovative decentralized investments. Since carbon remediation is the unifying source of value in the diversity of those investments, central banks can usefully embody CRAs in broadening the scope of their QE. They can do it either directly in buying up Carbon Certificates and subsequently transforming them in CRAs, or indirectly in buying securitized bonds if a securitization mechanism is set up over the pooling of low-carbon credits.

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‘De-Carbonizing The World’: Reviewing Recent Proposals on Positive Pricing of Carbon and Large-Scale Climate Finance⁹

Dipak Dasgupta

Abstract: This paper reviews and evaluates the main propositions and institutional and investment practicality of some recent proposals to accelerate financing for carbon reduction investments. These proposals are contained, among others, in a paper by Hourcade and Aglietta with others (2015) hereafter referred to as the HA paper. Other recent papers include that by Bhattacharya, Oppenheim and Stern, hereafter referred to as the BOS (2015) paper, and a paper by Sirkis on positive pricing of carbon, hereafter referred to as the PPC (2015) paper. They all propose to enable very large targeted carbon reduction investments by reducing pricing and investment uncertainties. The details are different, but the main directions broadly similar. At the heart of the proposals are social value attached to such carbon reducing investments, and incentivizing global institutional financial flows to jump-start such investments—including access to reimbursement of some costs, public guarantees and central banks supporting the financing of such invest-

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ments. With the current scale of investments running at about only one-fifth of levels needed to achieve a safer de-carbonized world, a surplus of savings and available technology, something like these proposals will need collective action, soon. Transformative change now, as in history, requires no less—a calculated departure from the usual. The mobilization of large-scale climate finance through public support looks urgent and feasible.

Keywords: Climate finance; positive pricing of carbon; willingness-to-pay; financial innovation; public guarantees; central banks; climate remediation assets; political economy.

Introduction

This paper reviews and evaluates the main propositions and institutional and investment practicality of some recent proposals to accelerate financing for carbon reduction investments. These proposals are contained, among others, in a paper by Hourcade and Aglietta with others, entitled “Transition to a low-carbon society and sustainable economic recovery, A monetary-based financial device” (2015), hereafter referred to as the HA paper. Other recent papers include that by Bhattacharya, Oppenheim and Stern, “Driving Sustainable Development Through Better Infrastructure: Key elements of a transformation Program,” hereafter referred to as the BOS (2015) paper, and a paper by A. Sirkis on positive pricing of carbon, “Positive Pricing of Carbon Reduction: A Low Hanging Fruit” (2015), hereafter referred to as the PPC (2015) paper. They propose to enable very large targeted carbon reduction investments by reducing pricing and investment uncertainties through the agreed positive value attached to such carbon reduction investments, and allowing global institutional financial flows to jump-start such investments—including access to reimbursement of some costs, public guarantees and central banks swapping and refinancing some part of such assets and investments.

The HA (2015) paper proposes a novel approach to financing de-carbonization investments globally. The proposal essentially rest on four major planks: (1) creating a new class of bankable carbon reduction based assets, termed Climate Remediation Assets (CRAs); (2) CRAs assets to be certified and verified by an indepen-

dent international Supervisory Body (similar to a CDM Board) to ensure both the environmental integrity of the investments (rules for attributing the CC, MRV process) and its developmental effectiveness (consistency with NAMAs selected by the countries to secure the alignment of mitigation actions with development policies); (3) a commitment by countries to back a large quantity of these CRAs at a given face value, which then allows banks, financial entities to finance such activity at much lower risk; and (4) central banks to finance and hold these assets as part of their quantitative easing and other heterodox monetary policy to stimulate real economic activity in such carbon reducing areas.

The BOS (2015) paper proposes a similar but slightly different ‘concerted action’ approach to massively increase climate and sustainable development investments. It rests on the following proposals: (1) Over the coming 15 years, the world will need to invest around \$90 trillion in sustainable infrastructure assets, with the bulk of it in developing countries; (2) The world appears to be caught in a vicious cycle of low investment and low growth and there is a persistence of infrastructure deficits despite an enormous available pool of global savings; (3) the capacity of national and international development banks to invest in infrastructure and agricultural productivity needs to be substantially augmented in order for them to support needed for better infrastructure; and (4) central banks and financial regulators should take further steps to support the redeployment of private investment capital from high- to low-carbon, better infrastructure, while official public funds (G-20, OECD and others) could also augment through standardized contracts, guarantees, taxation benefits and other ODA concessional financing of such investments—centered around a significant reduction in ‘policy risks’.

Finally, yet a third strand of complementary proposals is a ‘positive pricing of carbon’ proposal, as outlined in Sirkis (2015). The idea is that a smaller number of important countries in ‘Climate Clubs’ such as in the G-20 might agree to the positive value of carbon reduction, and guarantee some portion (say ten percent) of the monetary value of these investments as internationally reimbursable—through future carbon taxation.

Our paper evaluates the practicality and operationalization of these proposals, focusing on the following questions:

1. How do investors demonstrate credibly that carbon reduction (under the CRAs or similar instruments) equals value and what steps will legitimize this? Implicitly or explicitly, this will require international consensus. We know that reaching such a consensus has been very difficult. Different countries may attach different social values. So, what are the possible routes out of this dilemma? UNFCCC and COP21 process, G20 agreement, carbon clubs, or something else?
2. It will also require specific metrics of valuation, a price or value for such carbon reduction. Is this feasible, and can countries agree to such a common valuation, or are there other alternatives: should we settle for individual countries deciding a minimum price within a ‘band’ rather than a price or value, and why?
3. The nature of the institutions that would best placed to refinance the “carbon remediation assets”: individual central banks? A pool of central banks? The IMF? A fund linked to the GCF? A pool of development banks? National or international fiscal actions?
4. Because there will be potential risks to the central banks and other refinance institutions of losses in such investments, there has to be a defined relationship of these CRAs to some public guarantees against such possible losses if some proportion of investments turn insolvent. Therefore, some kinds of guaranties would need to be given by governments. In addition, issues will arise on how credible these guarantees might be and the loss-compensating mechanisms and recovery in the context of high levels of existing public debt in many countries. Are future taxes credible?

This review paper looks at the advantages and disadvantages of the HA, BOS and PPC proposals over some others, such as the traditional proposals of public and private financing of climate change, and carbon taxation and cap-and-trade proposals in this light. The paper also briefly assesses their political economy feasibility. The review concludes that while there are some technical areas that may need fine-tuning, the proposals are right. With the current scale of investments running at about only one-fifth of levels needed to achieve a safer de-carbonized world, a surplus of savings and available new technology, something very much like these proposals—building on them—will need collective agreement and action, soon.

We know what needs doing. Transformative change now, as in history, requires no less—a carefully calculated departure from the usual. The mobilization of large-scale climate finance, through enhanced public support, looks urgent and feasible.

‘De-Carbonizing The World’: Reviewing Recent Proposals on Positive Pricing of Carbon and Large-Scale Climate Finance

1. The Question

In a recent paper (Dasgupta 2015), I argued that a shift to *massive climate finance*—trillions not billions—needs to be a crucial instrument of a successful shift towards a de-carbonized world. Without such a shift in institutional finance, the pace of change may not be fast enough to avoid the danger of tipping points.

The world is not short of savings, nor is it short of needed technological investments and opportunities to redirect it out of fossil fuels—if we are to avert the ongoing speed of global warming. Financial innovations, and the role of the state in fostering these shifts worldwide, is the challenge.

A rapid shift from a fossil-fuel dependent economy to a renewables based one requires a “*disruptive shift*”: one that drastically displaces an established technology and shakes up the industry or creates a groundbreaking product that establishes a completely new industry. History of previous such technological shifts (from railroads in the 19th century to mobile telephones in the 21st) suggests that in order for this to happen, three things need to occur in a recursive loop: (1) dramatically falling costs of new technology (in this case, renewables from solar, wind and others); (2) increasing social and customer acceptance of the new technology as a vastly superior product (in this case, scale of renewables energy); and (3) financial innovation that causes a large shift in finance towards adoption of the new technology.

We know that this required shift in climate finance is not yet in place. Even central bankers are contemplating this change. Mark Carney, the Governor of the Bank of England, has (famously) recently gone on record to say:

Financing the de-carbonisation of our economy is a major opportunity for insurers as long-term investors. It implies a sweeping reallocation of resources and a technological revolution, with investment in long-term infrastructure assets at roughly quadruple the present rate. For this to happen, “green” finance cannot conceivably remain a niche interest over the medium term.... The more we invest with foresight; the less we will regret in hindsight (Carney 2015).

Carney was speaking, of course, about assessing the contingent risk that would come into play were such a massive shift in climate finance to occur: out of fossil-fuels to renewables, there might be large-scale financial risks to ‘stranded’ fossil-fuel assets in the transition to a 2 degrees de-carbonized world.

But before we get to the risk of such financial instability, the prior question is what mix of public policy would trigger such a shift to massive climate to a low carbon economy? That is the fundamental question in this paper.

Several recent proposals, in the run up to the COP21 meetings in Paris, have started grappling with this question of financial innovation and the role of public policy. The urgency is clear. If we are to have a real successful outcome of the Paris meetings—of countries committing voluntarily committing towards such a transition to a 2-degree world—then those commitments have to be backed up by necessary technology and finance. Otherwise, COP21 would be an empty ‘shell.’ The need for large-scale financing is especially important for large developing countries such as India, but also everywhere. Households will not invest, companies cannot invest, and financial intermediaries will hesitate in all settings—despite the promises. Without the means of implementation, technology and finance, the challenge of transition to a low-carbon world cannot be met.

The recent proposals to enable such financial innovation and public policy to enable such a massive shift in climate finance are therefore important and timely. As indicated in the Introduction, the ones reviewed in this paper include: (1) a paper by Hourcade and Aglietta with others (2015), “Transition to a low-carbon society and sustainable economic recovery, A monetary-based financial device,” hereafter referred to as the HA paper; (2) a paper by Bhattacharya, Oppenheim and Stern, entitled “Driving Sustainable Development Through Better Infrastructure: Key elements of

a transformation Program,” hereafter referred to as the BOS (2015) paper; and (3) a paper by A. Sirkis on positive pricing of carbon, “Positive Pricing of Carbon Reduction: A Low Hanging Fruit,” hereafter referred to as the PPC (2015) paper. These are not the only ones. In an earlier paper on fossil fuel subsidies, (Dasputa 2013), I had proposed that an opportunity existed for using global bond markets and public sovereign guarantees to credibly back up global climate finance flows.

2. Finance in the Low-Carbon Transition: Three Approaches

Before we review the proposals for their feasibility, it might be useful to review first how we got here: to finance. The story begins with climate change negotiations, a collective effort to reach social and political consensus on the dangers and objectives. To get to that consensus on the importance of keeping global warming below 2 degrees, the first approach was not on finance, but on information, science, discussion, and agreements on targets and goals. Then follows the second approach, a discussion of how people should pay and how incentives might be set for achieving the targets and goals: through public taxation and transfers and optimal carbon prices and taxes. It becomes evident that public pricing and taxation of the scale needed are going to be politically difficult. Then the time comes to look at the third option: finding the links between public policy to trigger large-scale transformative change through finance. These are the three sequential steps.

The Climate Negotiations Track (1). A first approach, the oldest one, the Climate Negotiations Track, rests on trying to achieve a global consensus and voluntary or otherwise pacts among countries to agree on how different countries might commit themselves to such a transition to lower carbon. Added up, if these commitments were possible, we might arrive at a safe global transition to a 2-degree world. Included within this, nevertheless, was the idea of a public financing scheme that would commit to transfer public resources from rich to poor countries, and/or from those who had contributed most to earlier carbon emissions to those who currently had the least per capita emissions of greenhouse gases (but in the future might grow so as they developed)—the case for equity in low-carbon transition globally. Equity also included the consequences of a globally warming world on countries who had contributed little but would face the worst effects of a

warming world—through access to adaptation funds for developing countries and especially small islands and least developed countries.

This global Climate Negotiations Track approach is the familiar approach that countries have been negotiating under the United Nations Framework Convention on Climate Change (UNFCCC) approach ever since the Earth Summit in Rio in 1992. The problem with such treaty based negotiating process is that they contain no legally binding agreements nor any mechanisms for enforcement. In addition, reaching a consensus among some 190 plus members has never been easy. The annual Conference of Parties meetings assess progress and try and sign new protocols and processes.¹⁰

On the other hand, the UNFCCC negotiations process have yielded some crucial gains: (a) a political and social process of global engagement, negotiations and targets; (b) an universality of such agreement at a multilateral forum which ensures wide global ownership among countries; (c) much greater information, tools, specialized institutions and processes, including most importantly, the periodic scientific assessment of global warming and climate change risks under the Intergovernmental Panel on Climate Change (IPCC); (d) a principle of Common but Differentiated Responsibility (CBDR) and equity; and (e) some funding agreements, including establishing the Global Environment Facility, special climate funds, the Global Adaptation Fund, and more recently, the global Green Climate Fund, as well as other national and bilateral channels—with an overarching agreement that developed countries Parties would commit to provide US\$100 billion annually of funds for mitigation and adaptation of developing country Parties by 2020, even though we remain far from that goal and with no means or even an agreement on firm parameters to measure and verify the accuracy of the stated funding (is it public or private? Is it grants or loans? Is it to be converted to grant-equivalent terms? How will burden-sharing be enforced?).

Almost by definition, the Climate Negotiations Track has been slow. Some 23 years later, outside observers have even termed it as a ‘theatre of the absurd’ (The Economist 2012). Yet others have pointed to significant achievements, despite the

10. After the initial inking of the Treaty, these have included the Kyoto Protocol (1997), the Bali Action Plan (2007), the Copenhagen Accord (2009), the Cancun agreements (2010), and the Durban Platform for Enhanced Action (2012)

‘despair with outcomes’: the setting and measurement of goals, political engagement, and credible progress on the ground with renewables technologies, slowing deforestation and at least a start on climate finance (Ryding 2012).

As we approach the Paris COP21 process, two areas of crucial importance have become clearer: a universal agreement to produce credible progress through INDCs and national plans and goals, and the means of implementation including finance. The INDCs are making progress, although there is still need to make them much more ambitious to reach a 2 degree world. The finance issues remain unresolved—and painfully inadequate to reach the outcomes. For example, the Green Climate Fund has only raised some US\$10 billion in commitments to public finance after three years of being established as the main multilateral fund for climate finance, while others are still struggling, such as the global Adaptation Fund. We remain far from the US\$100 billion annual commitment of funding target, even as the actual amounts needed for climate finance are conservatively four times larger for developing countries. Globally, the need for investments to reach a 2 degree target are in the order of about US\$1 trillion a year or more, whereas the actual investments are some one-fifth or less, counting all finance, public and private.

The Carbon Pricing and Taxation Track, and the Social Cost of Carbon (2).

There are two reasons why the second track—carbon pricing and taxation—has become important. The first is that as countries begin to think about implementing a low-carbon transition goal, it makes sense to set a social value to the costs of emitting carbon: the price of carbon emissions. Once set, it establishes a benchmark for governments to reduce such emissions, for example, by imposing tight standards and regulations on such emissions, and incentives for companies to avoid such carbon emissions. The second is equally important: since markets left to themselves will not price the costs, the economic price of carbon can only be set by effectively imposing a tax on emissions. Revenues from such Pigouvian taxes help directly pay for the investments needed (Dasgupta, Ray, Menon 2011). This ‘doubly’ beneficial effect of taxing a negative externality—setting incentives and collecting public revenues—makes it attractive. There were some early attempts to propose some international sector specific taxes, such as on aviation and maritime bunker fuels. But these attracted much criticism as being highly distortionary to specific sectors, and grave imbalances in their incidence.

The larger problem with a carbon tax, however, is its political economy costs (broader class of consumers); the intense lobbying by the carbon-emitting established industries (narrower and well-organized producers); and the differences between countries in different circumstances (fossil-fuel abundant versus scarce countries, and rich versus poor countries in terms of capacity and willingness to pay).

The case made against such general carbon tax are familiar (Murphy, Michaels, Knappenberger 2015): how do we know what the damages really are from future climate change (information difficulties) based as they are on ‘models,’ even a revenue-neutral carbon tax might be distortionary (hurt some producers more and lower aggregate growth), and finally, the actual ‘failure’ of carbon taxes in many countries. Numerous articles and papers reflect intense lobbying exercises against carbon taxes. However, of late, even the more conservative ones are beginning to suggest that it may be better to go with a general carbon tax than tighter and deepening emissions control (Taylor 2015); the Congressional Budget Office in the USA has also recommended such a carbon tax (starting at US\$20 per ton of CO₂, 2013) as desirable—equivalent to just a few cents per gallon of gasoline.

A more neutral and better assessment comes from ‘willingness to pay’ studies. In the US, such studies have found significant willingness to pay (US\$60-100 per year per consumer per ton of CO₂), without much distinction between types of instruments chosen (a straight carbon tax versus a cap-and-trade system or a GHG emission regulation). In Europe, the willingness to pay is up to 4 times higher (Tsang, Burge 2011). Not unexpectedly, the opposition to carbon taxes is generally greater among older citizens, and finds more favor among younger generation, more educated households and higher income classes (Kotchen, Boyle, Leiserowitz 2011). Numerous other studies now show a range of relatively high willingness-to-pay for carbon reductions across countries and regions, including in developing Asia.

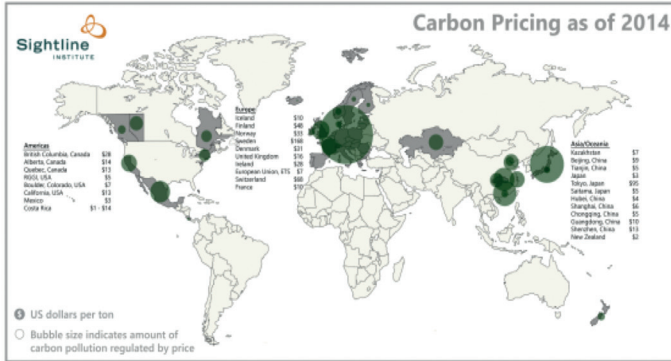
Partly because of the formidable political economy constraints to carbon taxes, many have advocated an alternative **emissions trading system (ETS)** or cap-and-pay systems. Under such an ETS scheme, carbon emissions regulations are set to cap the level of emissions of particular industries, and then trade is permitted which effectively ends up with a ‘market’ price for carbon. It is of course an artifi-

cial market that depends entirely on public policy. When policy is lax, prices can collapse (as currently is the case). The advantage of the system is that it is more flexible and more directly linked to emissions reduction than are straight carbon taxes.

The World Bank (World Bank 2014), a key proponent of this idea, reports that the total value of the emissions trading schemes (ETSs) globally in 2014 was about US\$32 billion—a minuscule fraction of costs. Despite the repeal of Australia’s Carbon Pricing Mechanism in July 2014, and mainly due to the launch of the Korean ETS and the expansion of GHG emissions coverage in the California and Quebec ETSs, the value of global ETSs as of April 1, 2015 increased slightly. The International Energy Agency reported that Carbon markets covered just 11% of global energy-related emissions in 2014 and the average price was only \$7 per ton of CO₂. (In contrast, 13% of CO₂ emissions were linked to fossil-fuel use supported by consumption subsidies, equivalent to an implicit subsidy of \$115 per ton of CO₂). In addition, carbon taxes around the world, valued for the first time in this report, are reported to be about US\$14 billion.

Combined, the value of the carbon pricing mechanisms globally in 2015 is estimated to be just under US\$50 billion (International Energy Agency 2015). Overall, “... there are 39 different programs that collectively put a price on 12 percent of all the greenhouse gas (GHG) emissions in the world. And when China’s national program starts in 2016, almost a quarter of global GHG pollution will carry a price tag to speed the changeover to clean energy.” The map below shows carbon pricing programs around the world (with the size of the bubbles indicating the amount of pollution priced).¹¹ Note that the map and coverage omit some significant countries such as India, which also has introduced significant carbon taxes, such as on coal.

11. Kristin Eberhard (@KristinEberhard) on November 17, 2014 at 6:30 am *SightLine Daily*. <http://daily.sightline.org/2014/11/17/all-the-worlds-carbon-pricing-systems-in-one-animated-map/>



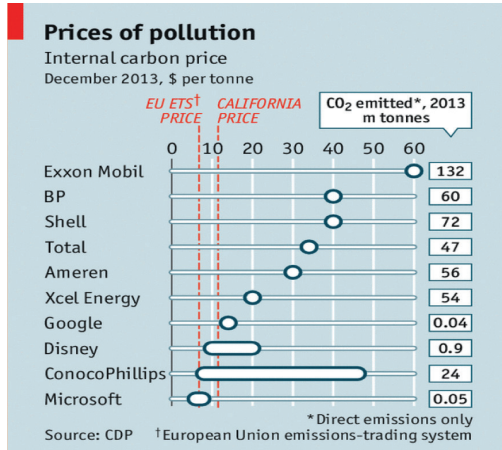
Source. Sightline Institute.

The next stage in the carbon tax initiative by some proponents is for countries to agree to a minimum global carbon tax, which would avoid the problem of ‘free-riding.’ Joseph Stiglitz, the Nobel laureate, has argued that it would involve something like “a commitment by each country to raise the price of emissions (whether through a carbon tax or emissions caps) to an agreed level, say, \$80 per ton.” Each country could decide to make it revenue-neutral, raising these taxes and reducing taxes on capital or labor. Some significant part would also be transferred to developing countries to make sure that equity is preserved.¹²

It is interesting to note that large private corporations, some heavily engaged in fossil-fuel economy, already use shadow carbon prices in their own internal assessments. According to the Global Price on Carbon report 2014, at least 150 companies are using an internal price on carbon ranging from \$6 to \$80 per ton with one outlier at \$324. These companies represent diverse sectors, including consumer goods, energy, finance, industry, manufacturing, and utilities. Six of Europe’s largest oil producers have recently announced a call for a plan to price planet-warming greenhouse gas emissions, citing climate change as “a critical challenge for our world.”¹³

12. Joseph Stiglitz, Carbon-pricing. <http://carbon-price.com/joseph-stiglitz/>

13. Matt Ramos, 2015. “Europe’s Oil Giants Call For Carbon Pricing.” The Huffington Post.



Source. The Economist¹⁴

Although different in concept from a price on carbon, it is also important to note that some governments have been making use of the ‘social cost of carbon’ (SCC), in deciding when and where to set regulations and standards on curbing GHG emissions. The Stern review, estimated the social cost of carbon at \$86 in 2006. Much of the variation between estimates is driven by the discount rate applied but other factors are also relevant, such as the climate model used and the approach to valuing damages. (Evison, Grant 2015). From 2002 to 2009, the UK used a SCC approach. The EPA in the United States and other federal agencies have used the SCC approach—estimating the economic damages associated with a small increase in CO₂ emissions, conventionally one metric ton, to estimate the benefits of new rules: about US\$37 per ton in 2013 as the mean cost estimate. A key issue in making such calculations is the discount rate to discount the effect of future damages. Using a low discount factor (valuing the future more) would raise costs, and vice-versa when a high discount rate is used. Apart from this sensitivity is also the counting of true costs of climate change. Stanford researchers have recently estimated that the EPA’s use of US\$37 per ton was a serious underestimate of the true SCC, which should be as high as US\$220 per ton. The reason: there are persistent economic damages from higher carbon emissions that were not factored in (Than 2015; Moore, Diaz 2015). Extreme weather changes, for example, would

14. The Economist, 2013. Some firms are preparing for a carbon price that would make a big difference. December 14.

cause serious damage necessitating rebuilding of assets to return to past growth and which would raise the social costs far higher than the conventional model estimates used by the EPA.

However, in conclusion, the political economy opposition against such carbon taxes (and social costs of carbon) remains formidable—from concentrated industrial owners of assets which would lose value to concerted public action against such taxes, and from the general reluctance of consumers to pay taxes as levels of such taxes start to rise—reducing these politically feasible taxes to much lower levels (Jenkins 2014). The collapse of Australia’s carbon tax is also seen as evidence why such opposition can mount quickly as carbon taxes are imposed. The collapse of the European carbon market EU-ETS is also similar pointer: carbon prices are now far lower than the expected Euro 30 per ton. Therefore, despite such a growing move towards carbon pricing, whether in taxes or ETS or in internal pricing, the political economy issues remain formidable. The argument now is that second-best approaches might work better than outright first-best carbon prices or taxes: starting with low taxes, slowly increasing them over time, targeting the uses towards generating more employment and production, and showing the ‘co-benefits’ of such taxes or pricing. The differences in willingness to pay and differences in country settings and the political economy constraints are seen to be such that only progressive increases in a second-best policies may appear to make the most sense.

The Transformative Track: Finance-cum-Technology-cum-Public Policy (3).

A third approach to dealing with climate change takes the argument, I believe, to large-scale financing of the costs of adopting new technology: mitigation of GHG emissions will need massive shifts in investment, and providing public support for such investments is a key issue.

What factors would justify such a potential role for public policy support? After all, the use of public monies or backing carries its own problems: governance failures, potential losses, and policy mistakes. Three factors are probably important. The first is the size and scale of threat from the negative externality of continued reliance on carbon-based fossil-fuel economies. The second is the risk of imminent permanent negative effects without public policy action—and the absence

of near-term forward risk and insurance markets. And the third is the need for ‘coordinated’ public policy action, since the negative externality crosses borders.

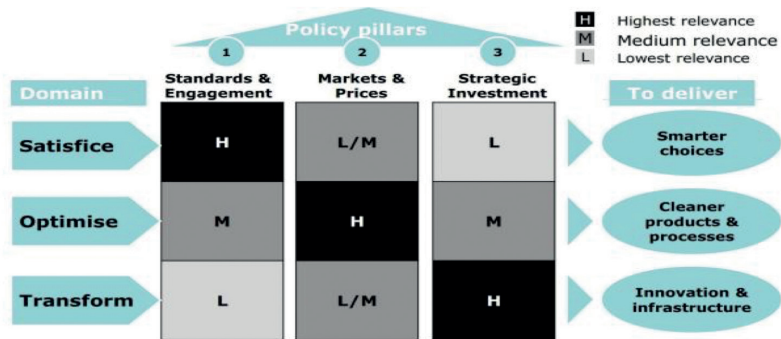
Are these three factors compelling enough to justify such action? The narrow ‘technical’ answer lies ultimately in the calculus of balance of costs versus benefits. If the scale of public monies that might have a sufficiently positive effect is, we’ll say, ‘X’, and the probable inherent or unavoidable inefficiency losses of use of public monies is, say, ‘a’, those are the associated costs of public action. The benefit, on the other hand, is the positive effect of inducing, the expected ‘Y’, the anticipated necessary scale of private institutional finance flows to new carbon reducing investments and technology, to avoid the cost of inaction, say, ‘Z’ (an event with a rising probability, converted to certainty equivalent value, discounted to present value terms). Then, public action is justified, if:

$$a.X \leq Z \text{ ----- (1)}$$

Let’s try to put some possible numbers behind this calculus. Suppose the stream of additional investments ‘Y’ over the next decade supported by institutional finance needed to avert the risk of exceeding 2 degrees warming is some US\$10 trillion (US\$1 trillion additional a year). Say, on the other hand, that this sum would be forthcoming if it were to require committing ‘X’ of US\$2 trillion (US\$200 billion annually) in public guarantees (20% public guarantees, to offset expected institutional risk-aversion and uncertainty)—of which the expected losses, ‘a’, may amount to one-fifth, and the size of the loss, ‘a.X’ is therefore some US\$400 billion (or US\$40 billion a year at some future point of time). Then, so long as the size of ‘Z’, the expected net present value of losses from global warming exceeding 2 degrees, is higher than the loss, then the benefit-cost calculus justifies such public action. There is also an additional public finance consideration: how to pay for the expected losses, which because they will occur at a future time, require a credible commitment now to raise future carbon taxes to fund these losses. Since future generations benefit more than current generation, this transformation of committing present generation public funds to avert losses in the future, and taxing future generations to pay for expected losses may make sense.

By any yardstick, the value of ‘Z’ far exceeds the cost ‘a.X’ as calculated from these numbers, since the size of global losses from a more than 2.5 degrees world are at least 2 percent of world GDP annually,¹⁵ and rising catastrophically higher as the temperature exceeds that threshold, and the probabilities are climbing. As far as the funding of losses through future carbon taxes are concerned, the implicit tax burden is relatively small. The benefit-cost ratios of public policy to encourage accelerated institutional climate finance remain overwhelmingly positive, and the main issue is of governance (to keep actual public finance losses from the call on guarantees well defined and limited to publicly tolerable levels from the public risk and fiduciary perspectives) and the political willingness to act, as in many other areas of public decision.

Michael Grubb at Cambridge, along with Jean-Charles Hourcade and Karsten Neuhoff, in this context, argue that there are three distinct domains of human decision-making. No one domain as a center of attention is right or wrong. But excessive attention to only one or two domains such as ‘optimal market pricing’ and new ‘standards and regulations’ has ignored a third key pillar of behavioral change in climate change: how to induce rapid large-scale technological change (Grubb, Hourcade, Neuhoff 2014).



Source. Adam Whitmore, 2014. “A new framework for climate policy. Why carbon pricing is not enough.”

15. Current size of world GDP is about US\$75 trillion, and expected rise much further by 2050. With a conservative cost of 2% of world GDP, the annual losses alone from global warming using current world GDP would amount to at least US\$1.5 trillion a year. Over ten years, even with discounting, the sums of ‘Z’ are massive, compared to the expected costs of public action.

Grubb and his colleagues base their book on three pillars of change or domain, each affecting outcomes differently. In the first domain people seek to satiate their needs, and do not necessarily go much further. This is akin to the Climate Negotiations Track (1) outcome that we described, as well other national measures such as energy efficiency standards and information campaigns: it is slow, takes time, usually starts unambitious and will settle for the minimum change that is needed. The design of policies here is informed by disciplines such as psychology, the study of social interactions, and behavioral economics. A second domain looks at what Grubb and colleagues describe as ‘optimizing behavior,’ where companies and individuals will respond most to market incentives and instruments, and prices and neo-classical economics matter. This is akin to our second track on Carbon Pricing and Taxation. Yet a third domain they suggest needs to look at transformative change that warrants a much larger role for government to drive change. The shift to large-scale finance possibly plays a critical role, to enable new investments, technology, and other wholesale changes that draws on governance, technology and industrial policy, and institutional economics. Why? Because there are considerable uncertainty and risks, much larger impacts than the market can handle, and bigger shifts that are required than can be accommodated by the other two domains. Finance is particularly crucial as an enabler.

Having set out what I believe are the 3 main approaches to thinking about finance for climate change, we can now turn to the specific review of the proposals.

3. Recent Proposals on Large-Scale Climate Finance

Some recent proposals have been made to dramatically accelerate financing for carbon reduction investments (summary in Table 1). These proposals are contained, among others, in a paper by Hourcade and Aglietta with others (2015), referred to as the HA paper.¹⁶ Other recent papers include that by Bhattacharya, Oppenheim and Stern, referred to as the BOS (2015) paper, and a paper by Sirkis on positive pricing of carbon, referred to as the PPC (2015) paper. They propose to enable very large targeted carbon reduction investments by reducing pricing and investment uncertainties, and allowing global financial flows to jump-start such investments—including central banks swapping and refinancing such assets

16. See also, Jean-Charles Hourcade & Priyadarshi Shukla, 2013. Triggering the low-carbon transition in the aftermath of the global financial crisis. *Climate Policy*. Volume 13, Supplement 01, 2013.

and investments. Of all three proposals, the most carefully thought-out one is the HA paper—dealing extensively with the possible downsides and questions on the design of governance and risk management. The BOS paper is much more reliant on mainstream mechanisms and internalization of scheme management (for example, advocating use of MDBs and development banks), so that risk and governance issues are given relatively light attention. The PPC proposal, on the other hand, is the simplest, arguing for a social valuation and a very modest level of public resource transfer.

The HA (2015) paper proposes a novel approach to financing de-carbonization investments globally. The proposal essentially rest on four major planks: (1) creating a new class of bankable carbon reduction based assets, termed Climate Remediation Assets (CRAs); (2) CRAs assets to be certified and verified by an independent international Supervisory Body (similar to a CDM Board) to ensure both the environmental integrity of the investments (rules for attributing the CC, MRV process) and its developmental effectiveness (consistency with NAMAs selected by the countries to secure the alignment of mitigation actions with development policies); (3) a commitment by countries to back a large quantity of these CRAs at a given face value, which then allows banks, financial entities to finance such activity at much lower risk; and (4) central banks to finance and hold these assets as part of their quantitative easing and other heterodox monetary policy to stimulate real economic activity in such carbon reducing areas.

The BOS (2015) paper proposes similar but slightly different ‘concerted action’ approach to massively increase climate and sustainable development investments. The proposal is not exclusively about climate finance, but much of its proposals would apply. It rests on the following proposals: (1) Over the coming 15 years, the world will need to invest around \$90 trillion in sustainable infrastructure assets, with the bulk of it in developing countries; (2) The world appears to be caught in a vicious cycle of low investment and low growth and there is a persistence of infrastructure deficits despite an enormous available pool of global savings; (3) the capacity of national and international development banks to invest in infrastructure and agricultural productivity needs to be substantially augmented in order for them to support needed for better infrastructure; and (4) central banks and financial regulators should take further steps to support the redeployment of private investment capital from high- to low-carbon, better infrastructure, while official

public funds (G-20, OECD and others) could also augment through standardized contracts, guarantees, taxation benefits and other ODA concessional financing of such investments—centered around a significant reduction in ‘policy risks.’

Table 1. The Three Proposals, in Summary

Proposals / Characteristics	Carbon Rem. Asset (CRA) /Positive Value of Carbon	CRA Verification.	Large Scale Financial Backing to Climate Projects / Refinance of CRAs	Agency	Role of Central Banks	Other Policy Actions
HA (2015)	Yes.	Yes. Independent Supervisory Board.	Yes	Central banks. Monetary Authorities. Public Finance.	Yes	Future Carbon taxes to back up fiscal guarantees.
BOS (2015)	No. National strategy for sustainable infrastructure. Targeted climate finance, scaled up, through GCF.	No. Norms for sustainable infrastructure.	Yes	G-20. Development Banks MDBs	Yes	Standard contracts, govt. guarantees, other,
PPC (2015)	Yes. Agreed positive price of Carbon. 10% of monetary value of investments internationally reimbursable.	Yes	Yes	G-20. ‘Climate Clubs’	Yes	Agreed Social Price of Carbon. 10% of value to be guarantee provided to projects.

Finally, yet a third strand of complementary proposals is a ‘positive pricing of carbon’ PPC proposal, as outlined in Sirkis (2015). The idea is that a smaller number of important countries in ‘Climate Clubs’ such as in the G-20 might agree to the positive value of carbon reduction, and guarantee some portion (say ten percent) of the monetary value of these investments as internationally reimbursable—through future carbon taxation. One small but recent important step towards such a recognition of the positive value of carbon reduction is the inclusion of a statement in the recent discussions leading up to COP21 that parties might agree on: “*Recognizes* the social and economic value of voluntary mitigation actions and their co-benefits to adaptation, health and sustainable development.”¹⁷

17. Workstream 2 Draft Decision Text, Ad-hoc Working Group on the Durban Platform for Enhanced Action, pp.2 para 4 under Mitigation. ADP.10.2015. Informal Note. <http://unfccc.int/resource/docs/2015/adp2/eng/10infnot.pdf>

4. Assessing their Practicality and Feasibility

We consider in this section some elected issues for examination of the practicality and feasibility of the proposals. These are by no means exhaustive, but point to some of the issues that arise.

Establishing the Credibility of Carbon Reduction Under Investments Financed (1). How do investors demonstrate credibly that carbon reduction (under the CRAs or similar instruments) proposed to be financed equals value and what steps will legitimize this? Implicitly or explicitly, this will require international consensus. We know that reaching such a consensus has been very difficult in many areas. Different countries may attach different social values. So, what are the possible routes out of this dilemma? UNFCCC and COP21 process, G20 agreement, carbon clubs, or something else?

The carbon offsets market is the closest we can get to the real-life credibility and certification process for investments that reduce carbon. However, the size of the current market is very small. Over the past decade, voluntary offsets totaled some US\$4.5 billion (Economic Marketplace 2015). The largest part originated in the USA, followed by Brazil, Turkey, India, Kenya and China. Some 87 million tons of CO₂ were traded in 2014—only a fraction of 1% of global GHG emissions—with an average price of US\$3.8 per ton (a new low). Avoided deforestation and landfill methane use accounted for half, while renewable wind energy, clean cook stoves, and water were some of the most popular uses. There were 4 major voluntary standards that were applied, accounting for about a third of all transactions. The highest prices were paid for the two biggest, ‘VCS’ and the ‘Gold Standard’ (US\$4.4/ton), suggestive of the ‘credibility’ premium to these standards. Virtually all were project-based, with third party verification—based on project proposed baseline, with third-party validation at that baseline and verification afterwards once project is functioning. Offset project registries then issue the tradeable certificates, which are resold before being retired. Brokers and retailers bring buyers and sellers together, while some direct buyer-seller transactions are also done. An exchange traded system in the USA (CCX) collapsed in 2010 because of little demand and no cap-and-trade system. A government-to-government ‘pay for performance’ system was initiated recently (REDD) for avoided deforestation between

Germany and Brazil, which Norway has joined on the donor side, and Colombia and Ecuador on the contributor side. Generally, voluntary demand has stagnated. Finally, most transactions dealt with projects already in stream, with very little going to new starts.

More formal or regulated offset markets—such as under the UNFCCC and the European EU ETS—require much more stringent technical standards for certification. Under the CDM mechanism of the UNFCCC, projects generate certified emissions reductions (CERs) or certified emission units (CEUs). Under the EU ETS, similar arrangements apply. Validation is done by certified third parties, as well as monitoring. Both the CDM and EU ETS have been under considerable stress and prices have fallen sharply.

There are several broad lessons: (1) relatively proven methods exist to certify emission reductions, by using third-party validation and monitoring, with considerable experience having been built up over time; (2) the process can however be quite cumbersome and costly, making sense only for larger and more middle-income settings, with the capability to bear the costs; (3) because all current systems tend to be project-based, moving to much larger volumes of financing as anticipated will inevitably require the entry of ‘aggregators’ or financial intermediaries that consolidate and package, otherwise the system will be unworkable; (4) compliance with high standards has to move away from 100% project-based verification and third-party audits, towards more risk-based systems and ex-post random compliance and performance audits, and strong financial penalties for non-performance; (5) it is inevitable by the very nature of such regulatory systems of compliance, as we have seen in the financial system, that some significant defaults in credible performance will tend to occur; therefore, the credibility of the whole system will depend greatly on how well the compliance system is regulated by an official body, and how swiftly any deviation is found and penalized so that such credibility is quickly established and maintained over time; and (6) there is no experience of international regulation of this size and order that is anticipated with massive climate financing; only the global financial system and its regulation is analogous, and there, the regulatory structure depends fundamentally on national regulatory systems with strong cross-border standards and sharing of information. In sum, the move to a credible carbon reduction system will require enormous national and cross-border regulatory arrangements—inevitably

requiring central bank and financial system regulation and supervision by national entities. Since we do not have such an architecture in place, it is likely that progress will be slow and credibility only established carefully over time, with pilots starting with a few large countries with the capability to manage the system, and ratings systems that regularly assess compliance and capability of such national systems with international standards.

It is certain, conversely, that neither the current voluntary offsets market nor the regulated markets will prove to be robust enough to handle the challenges of massive carbon financing envisaged under the HA system. To be feasible, more thought may have to be given to the design of the system to establish the credibility of carbon reductions. The HA proposal explicitly acknowledges this and suggests that the reliability of the certifying system is critical, yet it must do so without imposing very high or impossible transaction costs. Too much accuracy and the system would grind to a halt; too little, and the system would lose credibility. A ‘learning by doing’ process to navigate between the two is envisaged, with elaborate technical proposals. Our discussion above points to similar issues, but proposes that more discussion may be needed (for example, risk-based systems and ex-post audits) to arrive at the best solution. It is possible to improve on these suggestions?

The BOS scheme is less likely to create such a problem, because it relies much more heavily on large-scale ‘infrastructure’ projects and is financed primarily by large financial entities such as development banks nationally and MDBs, globally. As such, they can ‘internalize’ the credibility of these investments much more than can the HA system and seem more acceptable.

Finally, the PPC system is also likely to be much more easily implementable, as it would rely primarily on a G-to-G system to be organized among a smaller group of countries under the Climate Clubs envisaged, and reasonably amenable to forums such as the G-20 and OECD. Equally, only the largest and more middle-income countries would be able to comply with the requirements of credibility of carbon reduction investments under all three of the proposals. It is highly unlikely therefore that the UNFCCC or COP process would apply to these schemes; instead, it would be a smaller and more tractable group working under the G-20 or similar current arrangements.

Establishing the value of Carbon Reduction (2). How will the specific metrics of valuation, a price or value for such carbon reduction be determined? Is this feasible, and can countries agree to such a common valuation, or are there other alternatives: should we settle for individual countries deciding a minimum price within a ‘band’ rather than a price or value, and why?

As we have already discussed, there can be a very wide range of social value of carbon reduction. There is virtually no current agreement on the appropriate social price of carbon, with enormous variation across countries, from Sweden which has valuation of over US\$150 per ton to as little as US\$3.5 per ton in some large developing countries (such as Mexico). The calculations in the US for the social cost of carbon similarly range from US\$16-150 for the year 2025, depending on the discount rate used from 5% to 2.5% (the lower the discount rate, the higher the social cost), and not all costs have been factored in. Agreement on a common price will therefore be politically very difficult, if not impossible. Instead, the most feasible approach may be to agree to set values within a band. Political economy second-best considerations suggest that such a band may have to start with relatively low initial values—probably about US\$25-50 per ton, and then move upwards over time as the investments financed gain more traction and demonstrate their use for growth and jobs and a substantial fall in carbon emissions.

The key question is whether such a social value to carbon attached to investments that reduce GHG emissions will be sufficient incentive to attract large-scale new investments in renewables and related infrastructure (energy efficiency projects, clean transport, smart cities and the like). It is likely that the near-term marginal costs of abatement (MCA) for some large projects may be well within this range. However, there are trade-offs. One recent article suggests that because measures required to implement ambitious targets for carbon reduction may need time to implement, choosing the cheapest carbon abatement projects can be sub-optimal. Instead, the best strategy, for example in Europe, may be to implement some expensive, high-potential and long-to-implement options to reach more ambitious medium-term targets (Vogt-Schilb, Hallegatte 2014). Therefore, some flexibility may well be required in setting a wider band or a sufficiently high minimum value for valuing specific projects which have the highest long-term potential and impact rather than the least-cost short term options which can ‘lock-in’ options.

As far as the different proposals are concerned, there is little to choose between the HA proposal versus the BOS proposal in this regard. Both will demand relatively similar and high valuations, although the BOS proposal will probably demand higher values given the envisaged longer gestation and larger size of projects. There is an explicit valuation requirement for the HA proposal, but none for the BOS proposal. How the latter will value investments from a carbon reduction potential is mainly through development of agreed ‘norms’ at G-20, which are not yet detailed.

For the PPC proposal, however, because the proposal starts out with a transfer/reimbursement of just 10 percent of the agreed social value of carbon reduction—or about US\$2.5-5 per ton benefit for cross-border investments if we use our likely initial rates—is perhaps unlikely to attract substantial investments in carbon mitigation projects, except those that are the cheapest ‘low-hanging’ fruits. Remember, that a substantial part of these receipts will also have to reimburse the risks of financial intermediaries. Therefore, the lower the valuation attached to carbon, the lower the incentive to investors and a 10 percent share may be too small—except for a G-to-G transfer mechanism rather than project specific mechanism. One solution would be obvious; raise the share of transfers much higher, to say at least 30 percent under the PPC scheme. By contrast, under the HA proposal, the entire carbon assets is reimbursable or refinanced by the central banks at 100% of value set. This makes it far more attractive for the investor, and especially is relatively neutral in terms of size and may even favor larger size but high-impact projects—as opposed to business as usual risk profiles that would favor lower up-front capital costs even if more, limited in terms of carbon remediation.

Institutions best placed to refinance the “carbon remediation assets” (3). What institution should refinance the carbon assets being financed? Individual central banks? A pool of central banks? The IMF? A fund linked to the GCF? A pool of development banks? National or international fiscal institutions?

The idea under all three schemes, but most prominent under the HA proposal and less so for the other two proposals, is that the carbon mitigation investments being financed should be ‘refinanced’ or guaranteed by some financial institution, so that the first-line banks and other long-term financing intermediaries can reduce their risk and uncertainty of holding on to these assets. The HA proposal is also explicit

that central banks are envisaged to play the most prominent role, by using their monetary policies to acquire such long-term assets (the CRAs) on their balance sheets—even using it as part of their quantitative easing or similar policies to encourage revival of real economic activity.

To the extent that most of the investments fall within national boundaries, central banks can do so. Two problems arise. First, will central banks be willing to do so? And second, will central banks take on obligations outside national boundaries? The answer to the first is unknown. Several central banks, mostly in developing countries, have been far more willing to enter into such selective prioritization of assets that banks can lend against, and the treatment of what constitutes priority lending and/or reserve assets. We don't know whether central banks will be willing to do in the case of developed countries. The most likely scenario is experimentation. The quantitative easing policies of the US Fed is one recent example that if persuaded by the merits of the case, central banks can do much. On the second question, however, it is highly improbable and politically infeasible that central banks will want to take on such assets outside of their national jurisdictions. For that, the International Monetary Fund is a better option and can do so by issuing SDRs and acquiring such assets as part of a move to provide greater global liquidity. But it is clear then that the mandate of the IMF would have to change—no easy task given what we know from past history. The GCF or similar multilateral institution such as the World Bank can also do so, but are less likely, because this ties up their expensive capital base, which has probably far more immediate uses. National development banks have similar problems. Fiscal institutions can also play a role, by providing judicious guarantees?

Covering the Risks of Losses to Public Guarantee Agencies and Central Bank Refinance Institutions (4). Inevitably, there will be potential risks to the central banks and other refinance institutions of losses in such carbon remediation assets (CRAs) investments. Since no central banks or other refinance institutions will want to take these risks on their balance sheets, there has to be a defined relationship of these CRAs to some public guarantees against such possible losses, if some proportion of investments were to turn insolvent. Therefore, some kinds of counter-guaranties would need to be given by governments. In addition, issues will arise on how credible these guarantees might be and the loss-compensating mech-

anisms and recovery in the context of high levels of existing public debt in many countries. Future carbon taxes are an obvious possibility. But can future taxes be credible? How will the market value these guarantees?

This is the most difficult and contentious of all the issues. The idea that some proportion of (strictly, some projects that comprise such) CRAs will default raises some serious ‘moral hazard’ problems, first of all. Moral hazard will be likely because some other party is carrying the risk of default. Adverse selection (rigged trades) is also likely because of asymmetric information—first line banks and financiers will be tempted to dump more of the risky projects to refinancers. Careful design of refinancing of such CRAs will therefore be essential. There is no easy way to avoid these problems, because the tighter the refinancing options to guard against such risks, the less likely it is that more such projects will be financed. The likely answer is that the asset build-up has to be done gradually, and refinancing only done for the best projects (relying on ratings by third parties) and only for some part of the assets. Nevertheless, there will be inevitably some risks remaining on the balance sheets of the central banks or others who refinance the assets. That also means that some funds will need to be created to guard against the risk-based likelihood of such losses by some fiscal agency—presumably collected by some carbon taxes. Future carbon taxes for this purpose raises problems of credibility, and it is better that some amount of carbon taxes be started immediately and pooled into such funds now. As experience is gained and the pool of such funds grows, more lending and ‘safer’ refinancing can then proceed.

Tackling the Problem of ‘Free-Riding’ (5). A big problem in global schemes is the chilling effect of countries, particularly large ones, which may decide not to participate, partly for their particular political economy reasons at home. This has bedeviled earlier agreements in climate negotiations, such as the Kyoto protocol. This problem is skirted by all three proposals. None of them considers the problem of free-riding if one or more large countries decided they would not wish to participate in the scheme. It is free-riding, only because the benefits of any significant carbon reduction investments are global, so that others in effect may end up paying for someone else who does not participate.

There is a need to carefully consider how to deal with such possible ‘free-riding.’ One answer is to make sure that every large country has an incentive to join. This may be partly possible in the proposals, by setting up the schemes such that institutions in non-participating countries would (by definition) not be eligible to participate. Their financial institutions would not be able to participate, nor would their investments at home be eligible for cross-border financing from the scheme. In other words, it would be a ‘closed club’ of participating countries. Characteristically, the prospective losses both to business and to investments, and hence to jobs and incomes, would be such as to crowd-in more countries which may be otherwise hesitant to join—which is a good incentive. However, the world is more complicated. Strategic reasons suggest that conversely, it might be difficult for such schemes to get off the ground if there were ‘blocking’ tactics of some prospective big country participants. The G-20 and IMF therefore has to play a significant role to smooth over these issues and to make sure that all large players can be brought on board. Even more crucial is perhaps the lobbying power of major global financial firms and corporations, who stand to benefit from the scheme. At one extreme, a small ‘club’ to start with might become essential to start the scheme and demonstrate the value of membership benefits. However, the smaller such clubs are, the less impact on the global carbon economy, so that in the end, it is better to have as many of the large countries and emitters participate in the schemes.

Political Feasibility (6). Finally, the larger question to assess is whether the political economy of public support generally to carbon remediation of the scale suggested under all three proposals will be supported and under what conditions. Here, the biggest hurdle is that public support will be lukewarm to the extent that the risks of climate change are seen to be modest and far into the future—not enough to worry the present generation of electors and taxpayers. There is no avoiding this problem. To the extent that climate change is seen to be a risk for future generations, the present generation will not want to share in the costs (Gardiner 2006). Then, under what circumstances can a change happen? To the extent that the burden of risks start to shift to the present generation—for example, through a larger series of natural disasters that are at least in some way commonly ascribable to ongoing global warming—we might see greater political feasibility of more decisive collective action as envisaged in the three proposals. In a sad way, we may probably have to wait for some more disasters before there is a political

impetus to act more willfully. ‘Fortunately’ for the proponents of the proposals, there is growing evidence of such larger scale of disasters happening, everything from the warmest summer temperatures to ice-map melt, droughts and wildfires, storms and hurricanes, and growing insurance losses. These might turn the tide.

Going back in history, the few times that large scale investments, backed by public finance, were carried out decisively to seize opportunities were typically something like the railroads construction boom of the 1840-70 period. We have looked at that episode in another study. Characteristically, it was the transformative impact of that technology—opening up the transport corridors of nations—that paved the way for large-scale public support to the investments needed. In this case too, the political support that may emerge for large-scale investments in carbon remediation in all three proposals might well also rest on whether the technological improvements that are ongoing—in solar, wind, energy storage, smart grids and other technologies—manage to excite the imagination of the public, policy-makers and investors. Then, public policy might well be able to pick up the slack and lean with rather than against the global winds of change.

Conclusions

Finance has to play a much bigger role if large-scale and faster de-carbonization is to occur (Pisani-Ferry 2015). The scale of climate investments needed is simply too large a transformation that can be achieved by the two tools currently in play: slow, protracted climate negotiations, limited public monies and hesitant carbon pricing. There is no shortage of savings to finance the needed investments, nor a paucity of technologies. Private investors are waiting for the announcement of some bold public policy frameworks to mitigate private risks and uncertainty. The three proposals reviewed in the paper are all in that direction: how to enable massive climate finances.

The specific ideas in the proposals are the right one: attaching social or public value to these carbon remediation assets; backing up the financing of these assets with some public guarantees and refinancing; future carbon pricing to make these guarantees and financing credible; and central banks and financial regulators di-

rectly ‘nudging’ investors to take the plunge with new investments. Transformative change cannot happen by relying only on attempts at ‘optimal’ prices and cap-and-trade markets or on unenforceable and un-implementable promises at climate negotiations. A start seems to be in the making by at least recognizing the social value of mitigation actions.

We conclude that while there are some technical areas that may need fine-tuning, the proposals are firmly in the right direction. The areas that may need more attention are all doable: re-working the credibility of certifying the climate remediation investments; agreeing decisively on the starting ‘social’ value of carbon reduction that must be a minimum level; raising the share of global reimbursements (from 10% proposed to more like 30%) from such investments; a decisive role for central banks and the IMF (in the case of cross-border investments) in refinancing some part of the assets being financed; credible public guarantees against the risk of some failures that will be inevitable, with some starting public funds from a minimum levels of carbon taxes, tackling the problem of free-riding and incentivizing all large countries to join the scheme; and finally, building the political support needed by pointing to the rising enormous scale of immediate costs of inaction.

With the current scale of climate investments running at about only one-fifth of levels needed to achieve a safer de-carbonized world, a surplus of savings and available technology, something like these proposals—building on them—will need collective agreement and action, soon.

We know what needs doing. Transformative change, as in history, requires no less: a calculated departure in public policies from the usual. The mobilization of large-scale climate finance, through enhanced public support, looks urgent and feasible.

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Private Financing for Decarbonization

José Eli da Veiga

Abstract: All of a sudden, the financial system began to frantically grasp the inevitability of the transition to low carbon. In addition to discussing what could be the best interpretation of such a sudden uproar after such a prolonged lack of attention, this paper seeks to identify what the main obstacles to such dynamics are, as well as proposals to resolve the situation. I conclude that private financing of the decarbonization process will be very slow if the incremental institutional innovations suggested by all available official reports are relied on. Even if the alternative—called “positive pricing carbon”—still needs to mature to become more convincing and persuasive, it surely points to a dramatic acceleration towards finding a solution.

Keywords: Decarbonization; financing; private financing; carbon pricing; energy transition; transition to low carbon.

Introduction

For over twenty years, the financial system hesitated regarding the role it would play in the decarbonization process. Suddenly, however, both the public and private sector embarked on a frenetic, labyrinthine search for innovations that would allow them overcome such brutal alienation.

The practical results of this welcome turnaround can only be viewed as preliminary. On the other hand, there are no clear reasons, much less clear responsibilities, for this disparity. And more effective results can only arise if and when timely and appropriate proposals are selected to overcome the obstacles. Only this would accelerate the evolution of the system in the desired direction of sustainable development.

This paper explores four questions that seem crucial to clarifying this immense challenge: 1) What are the evidences that the financial system is assimilating the inevitability of the transition to low carbon?; 2) How to interpret this outburst of attention after such long neglect of the issues involved?; 3) What seem to be the main obstacles confronting a transition?; and 4) Are there good proposals to overcome these obstacles?

1. The evolution of “climate financing”

In the context of the Earth Summit, the United Nations Environment Programme (UNEP) decided to establish, in Geneva, a division dedicated to mobilizing the financial sector for sustainable development. In 1992 the UNEP Finance Initiative (<http://www.unepfi.org/>) took on the mission “to bring about systemic change in finance to support a sustainable world.”

To do this, the Initiative endeavored to convince organizations of the financial system to be part of the initiative via adherence to its principles. First, specifically directed to banks or insurance companies, for example, and afterwards unified into a single statement, today signed by more than two hundred entities in forty countries.

Paragraph 1.5 of this statement asserts:

We recognize that the sustainable development agenda is becoming increasingly inter-linked with humanitarian and social issues as the global environment agenda broadens and as climate change brings greater developmental and security challenges. (emphasis mine)

Of course, there is almost always an immense distance between declarations of principles and the actions that would make them effective. And this case was no exception: nothing really relevant can be cited regarding the financial sector's behavior in the two decades that followed the Rio-92 with respect to the main challenge to sustainable development: the climate imbroglio.

This situation has only really begun to change since 2012/2013 when various multilateral articulations simultaneously managed to awaken not just interest, but a surprising “hustle and bustle” in several market players to pursue innovations that would enable private financing in projects designed to reduce greenhouse gases emissions (GHG).

It should be remembered that, in the context of financial sector reforms that followed the big scare of September 2008, and the subsequent start of the G20 summit as the most favorable instance to a global governance of the crisis, there were many political statements, especially from heads of State or governments, but also from leaders of international organizations in favor of a shift towards “green growth” as a possible way out. But, in the absence of convincing and persuasive proposals on this kind of reorientation, the rhetoric of these leaders in favor of sustainability produced, at the best, requests for lengthy studies whose final reports were barely publicized, if at all.

However, this situation surely began to change through the fruitful work of the High-level Advisory Group appointed by UN Secretary-General Ban Ki-moon on February 12, 2010, with twenty participants, including Lawrence H. Summers, Nicholas Stern, George Soros, Christine Lagarde and Caio Koch-Weiser. Anticipating the COP16 negotiations in Cancun in less than nine months, this group presented a 66-page document, known as the *AGF Report*, which became the basic reference for all subsequent elaborations.

The principal message from the AGF was as follows:

The Advisory Group found that raising US\$100 billion per year by 2020 is challenging but feasible.

However, with at least four considerations that could not be more symptomatic: This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance.

The Advisory Group emphasized the importance of a carbon price in the range of US\$20-US\$25 per ton of CO₂ equivalent in 2020 as a key element of reaching the US\$100 billion per year. The higher the carbon price, the steeper the rise in available revenues and the stronger the mutual reinforcement of abatement potentials and different measures.

There were different perspectives within the Advisory Group on the role of public and private capital flows in meeting the goal of US\$100 billion per year. Some members focused on public financing as the primary source, covering incremental costs and complemented by private flows. Others emphasized that private financing would be the primary source, inter alia, because of the important role that private investments already play in climate-relevant sectors in scaling up technology deployment and catalysing entrepreneurship, and because of its predictability and scalability.

The Advisory Group did not seek an agreed formula on which financing flows should count and which should not count towards the US\$100 billion per year. There were different perspectives within the Advisory Group as to whether and how to measure revenues in terms of gross and net metrics, particularly regarding private and non-concessional flows. (emphasis mine).

In a few words, at the same time as it served to legitimize the challenge taken on in 2009, in the COP15 of Copenhagen, regarding the “US\$100 billion per year by 2020” along with the corresponding creation of the Green Climate Fund (GCF), the AGF Report emphasized the inevitable tension between the roles to be played by public and private financing, as well as the necessity of pricing GEE emissions.¹⁸

18. In September 2011, UN Secretary-General Ban Ki-moon launched Sustainable Energy for All (SE4All) as a global initiative that would mobilize action from all sectors of society in support of three interlinked objectives: i) providing universal access to modern energy services; ii) doubling the global rate of improvement in energy efficiency; and iii) doubling the share of renewable energy in the global energy mix. In December, at COP 20 (Lima), Parties welcomed with appreciation the successful and timely initial resource mobilization process of the GCF that led to the mobilization of USD 10.2 billion to date by contributing Parties, enabling the GCF to start its activities in supporting developing country Parties of the Convention, and making it the largest dedicated climate fund.

Certainly, it was because of the influence of this report that, right afterwards, two events occurred that perhaps can be seen, jointly, as the watershed moment leading to private finance's process of engagement in decarbonization. In April 2012, the finance Ministers of the G20 constituted a Climate Finance Study Group, the initiative behind the meeting promoted by the US Department of State in Washington DC on April 10-11, 2013, with a very select group of invited guests:

The meeting, which was convened and chaired by the US, was attended by representatives from Australia, Canada, Denmark, the EU, France, Germany, Italy, Japan, New Zealand, Norway, Poland, Switzerland, the UK and the US, as well as from development finance institutions and export credit agencies.

This meeting resulted in one of the most important current vectors for private financing of decarbonization: The Global Innovation Lab for Climate Finance (The Lab): <http://climatefinancelab.org/>

The Lab is a global initiative that aims to drive billions of dollars of private investment into climate change mitigation and adaption projects in developing countries. The Lab supports the identification and piloting of cutting edge climate finance instruments that can drive this investment and unlock new opportunities for action.

Three other important vectors for the private financing of decarbonization are those that The Lab presented as its principle partners: CPI, BNEF e FiRe. However, a mapping of the great vectors should include many others, beginning with at least three more: Climate Bonds Initiative, NCE e GCI.¹⁹

19. CPI's mission is to help nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a crucial role. BNEF (Bloomberg New Energy Finance) has been contributing to the conversation on the future of energy for more than ten years. Leading journalists from around the world rely on analysis, data and research from BNEF. FiRe, (Finance for Resilience), is an open and action-oriented platform that collects, develops and helps implement powerful ideas to accelerate finance for clean energy, climate, sustainability and green growth. **The Climate Bonds Initiative** is an international, investor-focused not-for-profit. It's the only organization in the world focusing on mobilizing the \$100 trillion bond market for climate change solutions. NCE, (The New Climate Economy), is the flagship project of The Global Commission on the Economy and Climate. The Commission is a major international initiative to analyse and communicate the economic benefits and costs of acting on climate change. CIGI, (The Centre for International Governance Innovation), is an independent, non-partisan think tank focused on international governance.

The immense volume of information, principally new ideas and proposals, being generated only in the context of this sample formed by the seven mentioned entities (The Lab, CPI, BNEF, FiRe, CBI, NCE e GCI) makes it impossible, at this moment, to see clearly which will be the most probable tendencies for private financing of decarbonization.

In fact, this is exactly the problem that seems to have had a strong impact on an ingenious project devoted precisely to taking stock of the situation: UNEP's *Inquiry*. More precisely, "The inquiry into the Design of a Sustainable Financial System" established by UNEP in January 2014.

The final result of this effort can be found in the 106-page report published in October 2015, entitled *The Financial System We Need - Aligning the Financial System with Sustainable Development*. Its authors did not hesitate in describing what has been happening with the financing system as a phenomenon akin to an "incomplete quiet revolution:"

The Inquiry's core finding is that a "quiet revolution" is underway, seeking to increase the internalization of sustainable development factors into financial decision-making. The Inquiry found over 100 examples of policy measures across 40 countries encompassing new policies, institutions, regulations and collaborative initiatives targeting each of the main asset pools and actors, as well as the underlying governance of the financial system.

The emerging revolution, however, is incomplete. Developed countries' financial systems are adaptive and highly innovative in some respects, but continue to trend towards greater levels of "financialization", where financial returns increasingly arise from transactions that are disconnected from long-term value creation in the real economy. Despite, and in some respects because of, major regulatory developments in the wake of the financial crisis, financial and capital markets are today delivering even less investment in long-term infrastructure. Instead, they continue to reward highly liquid, leveraged trading over the prospects of greater, but less liquid, longer-term returns (emphasis mine).

Ultimately, it does not seem necessary to go further to demonstrate the very large evidence that the financial system has surrendered to the inevitability of the low carbon transition, the first of the four issues addressed in this text. Much more difficult is the second: the resulting need to interpret this sudden and growing uproar of the last three years after such a profound neglect in the previous two decades.

2. Two almost concurrent clashes

With the crisis of 2007-2009, the financial system came under pressure to abandon the vision until then absolutely dominant: that its sole purpose should be in the incessant expansion of its shareholders' gain. That is, only "to maximize shareholder wealth." Instead, it should at least merge this view with its well-known rival, according to which the system would need to be related to, and accountable to all stakeholders, which obviously requires it to admit to intense government regulation, as well as a substantial commitment to the controversial self-regulation.

The literature about the dispute is vast, as shown by McCarthy and Morling (2015). So it seems essential to at least take into account the serious restriction that was recently revisited by Joel Bakan in *The Cornell International Law Journal*:

The private regulation movement effectively abandons that project, prescribing instead alternatives to public and democratic governance that elevate market values and actors to governing status. The result is to make regulation an "adjunct to the market," in Polyani's words, and thus to create a global economy in which "social relations . . . [are] embedded in the economic system" rather than the "economy . . . embedded in social relations.

The case for private regulation is unconvincing because it depends upon ignoring, thereby making invisible, the real and robust role law plays in enabling and protecting multinational corporations. Bringing that role to light is important not only for revealing the true and disturbing vision underlying private regulation—a world where public power promotes private interests, while public interests depend on private power for protection—but also for making visible the urgent need and many possibilities for finding better ways forward.

In addition to the path of self-regulation being at the least doubtful—and before reasonable institutional outlets for the clash provoked by the 2007-9 crisis could come into play—at about the same time, a second clash was generated by an important political fact also directly related to global governance.

As already mentioned, already in late 2009, the COP15 in Copenhagen adopted the constitution of the Green Climate Fund (GCF), which was to be designed by an interim committee of forty members, including 15 from core countries, considered “developed,” and 25 from peripheral countries, which are tossed into the “mixed bag” of “developing countries.”

Thus began join the clash “shareholders vs. stakeholders:” a new pressure in the sense that the financial system also began to have concerns about the sustainability of development; as well as feeling pressure to attend to the vision usually designated by the acronym ESG, which expresses environmental, social and governance concerns in the jargon of those most involved.

In this sense, it is very significant that the first foray of the IPCC on the topic of investment and finance only occurred in 2014, with a specific chapter by the Working Group III in the Assessment Report-5.²⁰

This second clash might even have been less “harsh” than the first, but it had an impact on decisive instances of global governance since 2011. For instance: at the request of G20 Finance Ministers, The World Bank Group, in close partnership with the IMF, the OECD and the Regional Development Banks prepared the

20. These are the chapter’s key findings: a) Scientific literature on investment and finance to address climate change is still very limited and knowledge gaps are substantial; there are no agreed definitions for climate investment and climate finance. b) Total climate finance for mitigation and adaptation is estimated at 343 to 385 billion USD (2010/11/12 USD) per year using a mix of 2010, 2011, and 2012 data, almost evenly being invested in developed and developing countries (*medium confidence*). c) The total climate finance currently flowing to developing countries is estimated to be between 39 to 120 billion USD per year using a mix of 2009, 2010, 2011, and 2012 data (2009/2010/2011/2012 USD) (*medium confidence*). d) Emission patterns that limit temperature increase from pre-industrial level to no more than 2 °C require considerably different patterns of investment. e) Resources to address climate change need to be scaled up considerably over the next few decades both in developed and developing countries (*medium evidence, high agreement*). f) Public revenues can be raised by collecting carbon taxes and by auctioning carbon allowances (*high confidence*). g) Within appropriate enabling environments, the private sector, along with the public sector, can play an important role in financing mitigation (*medium evidence, high agreement*). h) A main barrier to the deployment of low-carbon technologies is a low risk-adjusted rate of return on investment vis-à-vis high-carbon alternatives often resulting in higher cost of capital (*medium evidence, high agreement*).

paper “Mobilizing Climate Finance,” published on October 6, 2011.

In comprehensive annual reports to their finance ministers, the G20 Climate Finance Study Group (CFSG / G20)²¹ has been stressing that:

... a growing number of private financial operators throughout the world are getting involved in order to redirect capital towards a low-GHG emission and resilient growth.

However, in their report of September 2015, this group recognized that:

Lack of knowledge on opportunities for climate-related investments is still a great drawback to potential interested investors.

The logic and psychology driving private finance is very different from the motivations for public finance. For areas where private investments are in the lead, firms will seek opportunities based on the reasonable expectation of profit, which is driven by two fundamental variables: risk and return. Individual firms cannot be told where to invest and will rarely pre-commit long-term resource allocations beyond the boundaries of specific projects. They require flexibility in order to adjust their long-term strategies in step with the constant evolution of market competition. They do not pre-commit in the same manner as governments.

As general arithmetic, **public sector measures will need to decrease their perceived risk**, with the latter forming a particularly pervasive barrier in many sectors and geographies.” (emphasis, in the report).

21. The G20-mandated platform “GreenInvest” has the objective to mobilize private capital, especially from institutional investors, for inclusive green investments. GreenInvest has been launched in June 2015 at the G20 Development Working Group Meeting in Turkey. In 2015 the GIZ (Deutsche *Gesellschaft für Internationale Zusammenarbeit*) also launched the global Practitioners’ Dialogue on Climate Investments (PDCI) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). And the Capital Markets Climate Initiative (CMCI) was established by the United Kingdom in 2010 and created a strong public-private partnership to help mobilize and scale up private finance flows for low carbon technologies, solutions and infrastructure in developing economies.

This seems to summarize “the opera” regarding the current perspectives of private financing for decarbonization projects. It could only be more uncertain if it included the challenge of adaptation plans.

For this reason, it is imperative here to emphasize that all the theories about the financing system converge to explain the murky situation previous to 2012/2013, but they are not sufficient to interpret this recent picture characterized by the almost coincidental two clashes. Moreover, Joakim Sandberg’s article of October 2015, “Towards a theory of sustainable finance,” demonstrates this with crystalline clarity.²²

Sandberg central thesis is simple, and relates to the long-term:

The centrality of one particular kind of reform of the financial system: reformation of the fiduciary duties of financial institutions towards their beneficiaries and society.

However, as a matter of fact, fiduciary duties are still seen as antithetical to ESG, primarily because ethically-motivated investing is stereotyped as sacrificing financial returns.

3. What are the main obstacles?

For the many authors who collaborated on the chapter about finance in the latest IPCC Report, the major obstacle resides in risks that certainly could be reduced with credit insurance, premiums and concessional finance:

A main barrier to the deployment of low-carbon technologies is a low risk-adjusted rate of return on investment vis-à-vis high-carbon alter-

22. Sandberg is one of the editors of *The Cambridge Handbook of Institutional Investment and Fiduciary Duty*. “A central question in the wake of the crisis has been whether to support external regulations – such as capital reserve requirements, bans on bonus programs, or financial taxation – or more internal solutions – such as an increased focus on social responsibility and ESG factors in financial management. Both options can be problematic without the proper balance between them. External regulations risk being ineffective and unsustainable over the long run without some level of support from the industry. At the same time, financial agents themselves cannot be expected to become “surrogate regulators”, burdened with the task of balancing financial and social obligations in almost every decision”.

natives often resulting in higher cost of capital (medium evidence, high agreement). This is true in both developed and developing countries. Dedicated financial instruments to address these barriers exist and include inter alia credit insurance to decrease risk, renewable energy premiums to increase return, and concessional finance to decrease the cost of capital. Governments can also alter the relative rates of return of low-carbon investments in different ways and help to provide an enabling environment (emphasis mine).

Whereas, in the approach of the G20 Climate Finance Study Group, the advance of private financing of decarbonization would depend on possible enhancements in “three new financial instruments” (*sic*): i) green/climate bonds, ii) risk-sharing tools, and iii) GHG emissions pricing approaches.

O CFSG/G20 also mentions—but only in passing—a fourth institutional innovation that would greatly influence the others: the necessity for “new methods to develop more accurate assessments of the risks and opportunities.” And—without emphasis—it adds an even more significant finding:

The application of **GHG emissions pricing** approaches has been considered by some countries, in their domestic circumstances and preferences, as a cost-efficient means of achieving emission reductions and uncovering opportunities for GHG mitigation. On the other hand, some countries have indicated that GHG emissions pricing would not be an appropriate policy option for implementation in their national circumstances (emphasis mine).

An even more extensive list of problems had already been elaborated in 2013 by the Private Sector Facility of the Green Climate Fund (GFC), a list that was taken up again and amplified in the recent report, *Canfin-Grandjean*, that was delivered to the President of France in June 2015.²³ At least two obstacles call particular attention among the dozen mentioned:

23. The report “proposes to the President of the French Republic paths of action to mobilize increased public and private funding in the fight against climate change. It also forwards proposals on how the French government could advance the ‘innovative climate finance agenda’ in the various international forums in which it participates (G7, G20, IMF, OECD, etc.). It covers the financial instruments identified more than a decade ago as ‘innovative’ (financial transaction tax, carbon market auctions revenues, etc.). It, however, goes further to also look at the means of finding ‘innovative’ ways of using existing tools in the ‘toolboxes’ of both private and public actors to scale-up financial flows for the low-carbon economy.”

Institutional investors in high-income countries have a fiduciary duty vis-à-vis their clients who have entrusted them with the management of their capital. They are therefore obliged to invest prudently to respect this duty. Given the low level of interest rates in high-income countries, several institutional investors express their interest in the opportunity to invest in low-carbon assets in developing countries – even with a relatively low multi-sector average of returns of 2 to 4%. These investors are currently not deterred by the modest returns of low-carbon investment in developing countries, but rather by what they perceive as high risks. These include political, institutional and regulatory instability; technological risk; and country exposure to other external factors. In order to cover those perceived risks, an infrastructure project in the developing world must often generate a higher return than it would in a developed economy. This is a critical barrier to development (emphasis mine).

The challenge of transforming needs into bankable projects: in the barriers mentioned so far, there is the assumption that projects are available to finance, whether a low-carbon power plant, or a public transport network. However, many experts point out the lack of projects in developing countries in general, and in particular those aligned with a low-carbon transition. (emphasis mine)

This last observation directly contradicts the perception that seems to be largely dominant among specialists, since, in general, they start from the supposition that the technological revolution that will permit a transition to low carbon is much more advanced than the evolution of the finance system that will enable resulting, and indispensable, investments. Moreover, there is at least one important proposal made by senior officials of the World Bank that emphasizes exactly the opposite: the plethora of decarbonization projects in countries not a part of the Annex 2 of the Kyoto Protocol. Starting from this premise in 2010, Christophe de Gouvello and his colleagues came forth with the idea to constitute a Low-Carbon Development Facility (LCDF):

[...] many low carbon investment projects do not materialize because they have restricted access to financing, even though the projects may offer low or negative GHG abatement costs. In fact, many projects validated under

the Clean Development Mechanism (CDM) of the Kyoto Protocol cannot achieve financial closure, even though they are eligible for carbon finance. Carbon finance alone cannot support the full GHG emission abatement potential in non Annex I countries. Therefore, removing the Investment financing barrier should be a priority, independent of the evolution of the carbon finance market.

Be that as it may, the obstacles listed are so many that it becomes impossible to point to some degree of convergence among the diagnostics of the four reports cited: GFC 2013, IPCC 2014, CFSG G20 2015, e Canfin/Grandjean 2015. This would seem to impose five observations:

1. There are G20 countries that continue to reject the eventual pricing of costs of GEE emissions, whether because of rights/quota commerce (“cap and trade”), whether for taxation concerns (“carbon tax”).
2. There are some that contest the premise that a large number of decarbonization projects already exist whose realization would be coming up against the lack of financing, especially from the private sector.
3. Whether numerous or not, when these projects exist they customarily involve risks that are perceived as far too high, particularly in the case of the more peripheral countries, but also in emergent ones as well as in some of the so-called “developed” countries.
4. The methods available to evaluate risks and opportunities for investment in decarbonization projects seem still precarious.
5. In such circumstances, real stimuli toward the reduction of GEE emissions would depend much more on insurance/guaranties than on subsidies.

4. Are there good proposals for overcoming these obstacles?

The defining tone of all these reports is to propose incremental innovation, as if prescribing homeopathic treatments for the identified obstacles. These documents contain a large number of suggestions for improving the effectiveness of emission “climate bonds,” or to what size insurance / guaranties should be:

Guaranties and insurance can help close the gap between perceived risks and real risks without creating market distortion, as long as an in-depth sectorial work has been performed to design the proper incentives. The development of risk-sharing tools to facilitate investments in mitigation and adaptation should take into account the experience from private capital markets, in particular the risks associated with securitization.

But, besides these reports cited here, there are proposals that aim to go beyond the necessary improvement of existing mechanisms and instruments. That is, they imagine disruptive (or revolutionary) innovations that aim to promote a qualitative leap in the private financing of decarbonization.

Proposals with these ambitions have been discussed mainly in France, even though they have already attracted the attention of economists from various other countries. Following this momentum, they began to tend to titles such as “Proposals on pricing carbon positive” or “Proposals on positive pricing of carbon and large-scale climate finance.”

The basic idea is to create interest in financial intermediation anchored in an active carbon, capable of attracting even the most agnostic agents on the climate issue. To do so, it could suffice that governments define two categories of amounts: a “social value for carbon not emitted” (VSC), and a volume of emissions that would no longer occur. That would be enough to promote a new asset, “climate remediation” or, as it was called, a CRA: “Climate Remediation Asset.”

Once this asset existed, central banks could open credit lines equal to the amount of the product of CRAs volume through VSC and its loans could be repaid with “Carbon Certificates” (CC) validated by authority similar to that which already operates the CDM (Clean Development Mechanism), created by the Kyoto Protocol.

Thus, banks could offer more credits to low-carbon investments, which would be only partly refundable in cash, thanks to the CCs. And investment funds could then issue bonds attractive to both institutional investors and to individual savers. In this model, the main role of central banks would be the transformation of CCs

into CRAs, which in turn would become recorded by them as assets along side of gold and foreign exchange. In this way, there no blind injection of liquidity would occur and the increase in carbon stocks would be correlated to a properly controlled production of wealth. Thus, much of the private savings today devoted to speculative investments would be channeled to “climate friendly” financial products with strong guaranties.

The logic of this proposal is to prevent carbon pricing from causing more stress to savings while guiding choices regarding capitalization. After a learning phase, the VSC could be increased much more quickly than would be possible with a possible carbon price formed by markets “cap and trade” and / or “carbon taxes.” And with lower transaction costs.

Another major advantage is that this plan would make it unnecessary to apply sanctions to countries that did not comply with the legally binding commitments, since they would already be punished by not having access to the available new financing. Moreover: under this model, governments would gain a great incentive to adopt climate policies, particularly through taxation that would reinforce the attractiveness of investments in low-carbon initiatives.

Strictly speaking, this would be a strategy to arrive, later, at a broad and general pricing of carbon emissions, but without the labor pains that require immediate “carbon tax” and / or complex engineering that required inefficient “cap and trade” markets.

This proposal first surfaced in a 2011 CIRED working-paper (Centre International de Recherches sur l’Environnement et le Développement) by Jean-Charles Hourcade, Baptiste Perissin Fabert and Julie Rozenberg, published in 2012 in the *International Journal Environmental Agreements: Politics, Law and Economics*, and entitled “Venturing into Uncharted Financial Markets: an Essay on Climate-Friendly Finance.” Since then, the central idea has been taken up and discussed by many other scholars of finance and / or the climate issue, including: Michel Aglietta, Vincent Aussilloux, Dipak Dasgupta, Etienne Espagne, Camille Feron, Carlo Jaeger, Romain Morel, and Alfredo Sirkis.

What most distinguishes this proposal from all others, is that it is a monetary innovation that seems extremely appropriate to the objective conditions in the euro zone, in which investments have fallen over 20% since the beginning of the 2007-09 crisis. In this case, the adoption of technological innovations aimed at energy transition to low carbon could engender a solution to take this zone out of almost economic stagnation, and ward off the threat called “secular stagnation.”

At a time when central banks are fighting deflation and at the same time, a reluctance to lend for productive investment persists, this quite virtuous monetary innovation could act as an appropriate economic tool toward decarbonization, constituting a sort of new currency that would give a hortatory price signal on carbon not emitted. A strong signal to be given by government for investors to dare to invest despite uncertainties.

One of the main merits of this proposal is to depart radically from the technocratic illusion that the goal would be possible to calculate a “social cost of carbon.” In contrast, it provides a political negotiation concerning what can be referred to as the “social and economic value of carbon.”

Another merit is that such a plan would complement and reinforce efforts already made by forty countries and over twenty subnational entities in national and local carbon precificações.

The main constraint that can be made to this monetary innovation proposal is that it maintains that guaranties would be provided by national governments. While this does not pose a problem in some European countries such as Germany, the United Kingdom and France, or even outside, as is the case of Japan, it is very doubtful that it can work in the so-called “European South,” not to mention the example of the BRIC countries.

This does not, of course, impede such a plan from being deployed by a small group of central banks in stronger countries, subsequently passing on to be gradually imitated by others. Thus, at some point this monetary innovation would eventually join the IMF agenda, which would make its generalization more likely among the nations that emit the most GEE.

Of course, a good shortcut could be the adoption of the proposal by the G20, which brings together nearly forty countries responsible for over 90% of these emissions. However, given its composition, it is more likely that such a proposal of global governance will have a long wait before even being introducing in its Summit agendas.

Some of the participants of this discussion come to hypothesize a “low carbon Bretton Woods” as Alfredo Sirkis explains:

The willing governments offer guaranties for theses certificates and eventually use carbon taxation to cover their exposure. This new value, covering up to ten percent of these carbon reduction investments, can become a tipping point for low carbon finance. Along with carbon markets and carbon taxation, positive pricing of carbon reduction will help establish a more stimulating worldwide financial environment for a new era of low carbon economies and a path to net zero emissions in the second half of the century. We need a low carbon Bretton Woods. In fact, a major but not that complicated adjustment in the global financial system, on a globally agreed upon premise: carbon reduction recognized as a convertible unit of value.

If, on the one hand, the idea that at some point an overall adjustment of the financial system will be necessary is correct; on the other, that it would evoke the memory of Bretton Woods is disputable. For various reasons, among which the most important is surely the permanent and inevitable tension—already of seventy years duration—between the democratic multilateralism architected by the 55 countries that created the United Nations in San Francisco in June 1945 and the distorted multilateralism put together a year earlier by the 44 allied nations who participated in the negotiations held at the famous ski resort in the mountains of New Hampshire. This may not be the case with the transformation of GATT into the WTO, but the modus operandi of other two offspring of Bretton Woods, the IMF and the World Bank, continue to cause many problems.

By way of conclusion

This paper addresses four key issues: a) the evidence that the financial system is assimilating the inevitability of the transition to low-carbon; b) an interpretation of the sudden uproar after such long hesitancy or neglect; c) the main obstacles of this dynamic; d) proposals for overcoming these obstacles. So, strictly speaking this is not the place, here, to present a conclusion because the narrative followed very much a *démarche* of analytical description rather than the presentation of an answer to a problem, or the defense of a thesis.

Even so, there are two observations that seem relevant to a possible synthesis of the four questions.

First, it seems to have been clear that the private financing of the decarbonization process will be much slower if it relies on incremental institutional innovations suggested by all of the examined reports. Even if the alternative proposal—mainly formulated by French economists—still needs to mature to become more convincing and persuasive, surely it points to a serious acceleration of this process.

Second, both the proposals for incremental innovations, such as the proposal for a “revolutionary” innovation, would require a serious political investment in greater regulation of the financial system. The difference is that the second is more skeptical about the evolutionary potential of the ESG perspective, and therefore is a more direct option to the possibility that the agents of this system will be committed to all “stakeholders,” even if they remain skittish regarding the idea of an alignment to the sustainable development project stamped in Agenda 2030, accepted in September 2015 by 196 countries.

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Guaranteeing Finance for Sustainable Infrastructure: A Proposal

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Abstract: There is an urgent need to transform the world economy into one that raises living standards in a manner that is socially inclusive and environmentally sustainable. Perhaps the most effective way to trigger such a transformation is through scaling up investment into sustainable infrastructure. Paradoxically, the “supply of private capital” is not lacking for this task, given the rapid expansion of global liquidity that has swelled the balance sheets of pension funds and other institutional investors. However, due to the numerous market and policy distortions in the world economy, financial markets are skewed away toward longer-term sustainable investment. A new financial architecture is needed that “connects the dots” better between private financial markets and global public needs—particularly in emerging and developing nations. Industrialized nations and Multi-Lateral Development Banks have begun to pledge billions of dollars toward meeting the climate challenge. Such funds are welcome but do not match the scale of the problem and seldom grant developing countries ‘ownership’ over projects and broader goals. In addition to earmarking finance for actual green projects, we propose a global guarantee fund that would allow emerging market and developing countries to finance the sustainable transition themselves.

Key words: infrastructure; sustainability; financing gaps; global guarantee fund.

Introduction

The international community is facing at least three simultaneous crises. The first is the fragile recovery of the global economy, in its seventh year after the great recession. A second crisis is the lack of structural transformation and job creation in the world economy that, in part, is responsible for the decline of opportunities particularly for youth and the poor. A third one is the climate crisis and the urgent need for a path toward lower carbon growth and development in developing and industrialized countries alike.

Investing in global infrastructure offers a rare opportunity to mitigate these crises and transform the global economy into one that is more sustainable and inclusive. Investing in infrastructure could help reverse the economic downturn in emerging market and developing countries. According to the International Monetary Fund (IMF) infrastructure spending has the highest multiplier impact during a downturn (IMF, 2014). Investment in infrastructure cannot be business as usual, however. If infrastructure finance is steered toward low carbon and inclusive development, the economic and employment benefits of infrastructure could also raise the standards of living of the world’s poor and lay the foundation for a 21st Century economy. Such a transition is outlined in Table 1.

Table 1. Shifting to Sustainable Infrastructure

<u>From business as usual outcomes</u>	<u>To sustainable and inclusive infrastructure outcomes</u>
Inadequate investments in sustainable infrastructure in most countries constraining growth and development	Scaled investment in sustainable infrastructure globally, leading to improved economic development and growth
Inadequate provision of affordable infrastructure for the poor, creating the risk of serious reversals in the fight for development and poverty reduction	Increased infrastructure access and affordability for the poor, leading to improved development outcomes
High proportion of high-carbon infrastructure investments and inefficient use of infrastructure, creating danger of lock-in and irreversible climate change	Increased preference for investments in low-carbon infrastructure, mitigating climate change risks and increasing probability of a 2 degree scenario
Low resilience infrastructure, creating vulnerability to risks of climate change (especially among the poor)	More resilient infrastructure that accounts for climate risks and protects

Source: Bhattacharya et al, 2015

There is great momentum toward meeting this demand, through the United Nations Sustainable Development Goals (SDGs) and the global climate talks. As shown in Table 2, at least five of the SDGs directly discuss this challenge:

Table 2. Sustainable Development Goals and 21st Century Infrastructure

- Goal 6: Ensure access to water and sanitation for all
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation
- Goal 11: Make cities inclusive, safe, resilient and sustainable
- Goal 13: Take urgent action to combat climate change and its impacts

Source. United Nations, 2015

In order to meet these goals the world needs to double its annual investment over the next 15 years to make this transition—an increase of \$2-3 trillion per year, \$ 1 trillion of which will have to be toward making infrastructure sustainable (Bhattacharya et al, 2015; IEA, 2012). Fortunately, though paradoxically, we are in a moment of excessive supply of capital, in the order of US\$ 70 trillion, in the balance institutional investors, such as pension funds, insurance companies and wealth management funds (OECD, 2014b; Della Croce et al, 2011) The problem is that even though these institutions need long-term assets that can match their long-term contingent assets, financial markets remained “locked in” short-term fixed income assets. A new green financing architecture can “connect the dots,” attracting potentially available private capital to green investment projects— particularly in emerging and developing nations.²⁴

24. For any country, at any developmental stage, it is a huge challenge to fill the green investment gap by mobilizing private finance through the smart use of limited public finance. However for developing nations the challenge seems to be of a higher nature than for industrialized nations – for at least two reasons. First because fiscal resources in developing nations are often absorbed by “basic needs” – such as the development of basic social safety nets and social infrastructure. And if their public resources are relatively scarcer, the level of financial development lags in relation to industrialized nations.

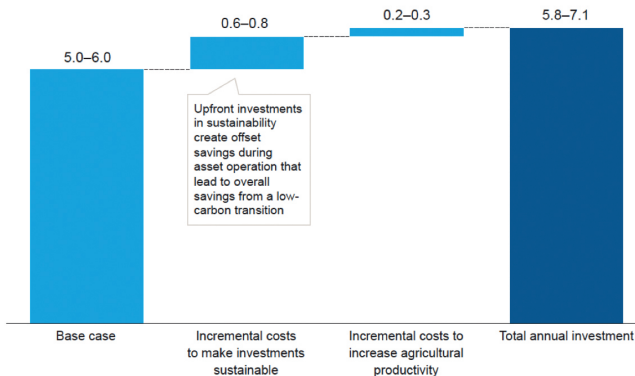
This short paper presents a preliminary proposal for a possible architecture. This could be anchored in the creation of a global green infrastructure fund, backed by the pledges of international donors, that would support direct and indirect lending, and the issuance of bonds, in both international and domestic markets issued, by multilateral and national development banks. The paper is organized as follows:

Section 1 presents the paradox that characterizes current financing for sustainable infrastructure; Section 2 provides an analytical framework that will guide the remaining of the paper; and Section 3 will present an overview of the opportunity that can be created by an architecture based on the implementation of a global guarantee fund for long-term green financing. The conclusion summarizes our findings.

1. The paradox

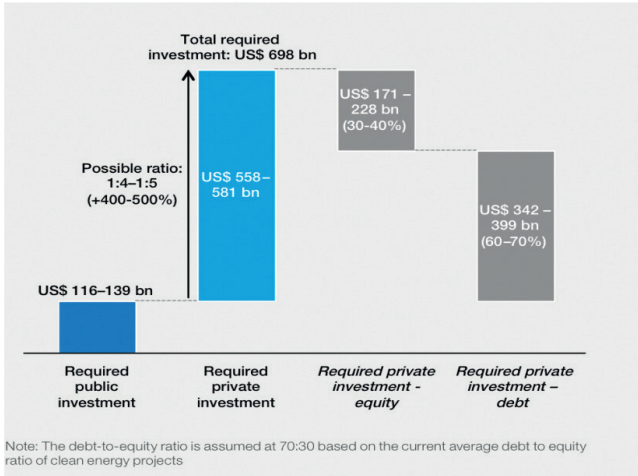
According to current UNPA projections, the global population will reach eight billion by 2024, and will likely reach around nine billion by 2037. In order to meet these goals the world needs to double its annual investment over the next 15 years in order to make this transition—an increase of \$2-3 trillion per year, \$ 1 trillion of which will have to be toward making infrastructure sustainable (Bhattacharya et al, 2015; IEA, 2012).

Figure 1. Total estimated investment requirements under business as usual and estimated additional costs under a 2°C scenario.



Source: Global Commission on the Economy and Climate, *New Climate Economy report 2012*

Figure 2: Potential public-private finance mobilization to close the cost gap for climate-specific investment.

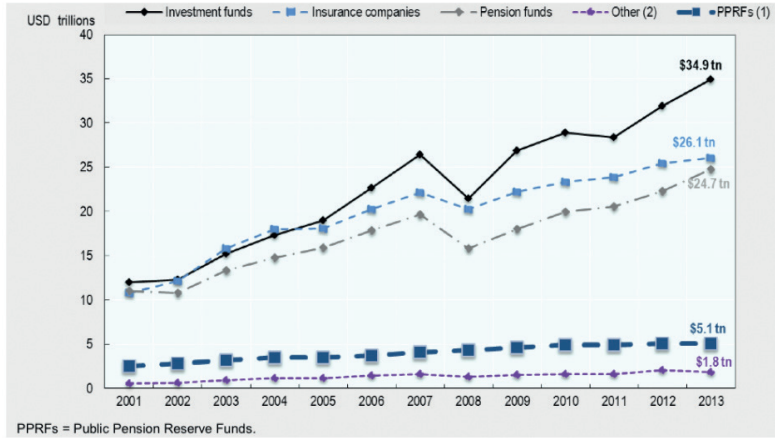


Source: World Economic Forum (2015:5).

For any country, at any developmental stage, filling the green investment gap by mobilizing private finance is a smart use of limited public finance. However for developing nations the challenge seems to be of a higher nature than for industrialized nations— for at least two reasons. First, because fiscal resources in developing nations are often absorbed by “basic needs” — such as the development of basic social safety nets and social infrastructure. And if their public resources are relatively scarcer, the level of financial development lags in relation to industrialized nations.

Potential supply of capital is nonetheless a problem. Indeed, institutional investors, which are often the main source of long-term funding, have accumulated balances of over US\$ 80 trillions (figure 3).

Figure 3. Total assets by type of institutional investor in the OECD, 2001-2013. In USD trillions.

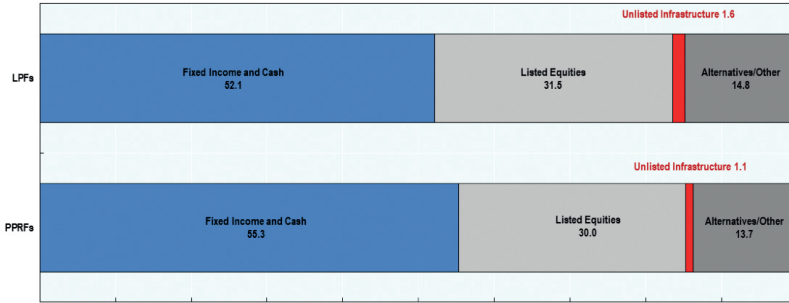


Source: OECD (2014a).

This significant increase in the value of the assets is directly associated with the “quantitative easings” around world, which boosted the prices of assets, particularly those purchased by central banks: government and corporate bonds.

This sudden growth of the value of these investors’ portfolios came with two inter-related undesirable and undesired consequences: on the one hand, they increased the participation of cash and fixed income assets (figure 4) in the overall portfolio of institutions that, by their nature, need to keep most of holdings in the form of long-term assets. Second, because quantitative easing implied very low returns of (short and long-term) assets in the yield curve, the average return of institutional investors, and particularly, pension funds have fallen to unsustainable levels.

Figure 4: Average asset allocation of Large Pension Funds (LPFs) and Public Pension Reserve Funds (PPRFs), 2013 (1,2) (% of total assets).



Note: (1) The value is a simple average of the share invested in unlisted infrastructure investments for all LPFs (respectively PPRFs) for which actual asset allocation was available in 2013, independently of their size in terms of assets. Totals may not add to 100% due to rounding (2) Both OMERS and FUNCEF changed the way that their asset allocation is reported compared to previous years. OMERS moved to a factor-based asset allocation approach and reported traditional investments such as stocks and bonds in the “other” category. FUNCEF reported fixed income in the “other” category compared to previous years.

Source: OECD (2014b)

The bottom line, therefore, is that the modern international financial architecture lives a great paradox. On the one hand, there is significant appetite for long-term assets on the part of large institutional investors, which would recompose the match between assets held in their portfolios and their long-term contingent balance, and do so by maintaining a relative balance between “risk” and return. And on the other hand, there is a significant, and urgent need for long-term financing for investment in greening our economies, our productive sectors and our transport and energy matrixes.

Crowding-in private capital in order to pursue these transformations needed towards a low-carbon world growth and development will require a new architecture that “connects the dots” in a way necessary to overcome this paradox. This is what we will discuss in the next sections, starting with a brief theoretical discussion.

2. An analytical framework

In most market economies, both wealth and financial institutions are privately owned, investment financing can only occur if there is an alignment of the interest of wealth holders and private financial institutions with those that want to invest. This alignment is often difficult to achieve because portfolio allocations of the former are based on what is perceived to be a good balance between return and risk.

This alignment is even more difficult when it comes to those that are likely to introduced innovations— such as in the case of a number of green investments. In addition, long-term and/or transformational investments are often perceived as very risky undertakings. As described in WEF (2015a), private investment in green technologies faces a number of risks:

- *Political risks*, including changes in government that affect the legal system, and the risk of civil unrest;
- *Macroeconomic risks*, such economic fluctuations, shifts in commodity prices, interest hikes and exchange rates volatility.
- *Policy risks* entail regulatory changes, such as those to feed-in tariffs or fossil-fuel subsidies that can alter a project’s economic viability.
- *Technology and operational related risks*, ranging from performance-related risks, where revenues might be lower than expected, to risks resulting from the lack of or unreliable supporting infrastructure, such as electrical and water-grid networks. Moreover, many low carbon technologies are relatively new and there is a perceived risk about their transferability.
- *Capacity risks*, encompassing particularly capacity of institutions and governments to manage own or transferred resources (oversea development assistance, for instance) in order ensure funding is disbursed to projects and utilized.

Mobilizing private finance for green investments requires these risks be reduced to about the same levels as those faced by conventional, “brown” investments.²⁵ The fact that development finance institutions, multilateral development banks, and domestic governments often have to deal with these risks makes them important candidates to be crucial, catalytic actors towards this green financing architecture.

25. For example, in generating fossil fuel-based energy or environmentally sub-optimal infrastructure.

In order to understand why, it is important to discuss why and how it is possible to share risks and de-risk green projects.

Risk-sharing and de-risking

Risk, which is the basic pillar of modern finance theory, is based on the projection of probability distribution functions obtained from the frequency of past events. In an overwhelming part of economic theory risk and projected return go hand-in-hand in the process of creating the resources needed to transfer resources from surplus economic agents (“savers”) to deficit ones (“investors”).

To a certain extent it makes sense to use this simplification to describe how financial intermediaries and markets work. After all, a reasonable track record of potential clients is essential to evaluate risks in providing credit and negotiating equity positions. But one needs to be cautious of the limitations of such a conceptual framework: information tends to be unavailable in too many significant financial and productive investment decisions— either because (i) they are too costly to obtain or (ii) because they simply do not exist. The former applies more easily to problems and consequences of asymmetric information. The latter is the case of uncertainty, which paradoxically is the most common information problem in the development context and the seemingly least explored by mainstream literature.

Indeed uncertainty is not an uncommon problem, neither should it be associated with any stage of development or with transformative undertakings. Take the case of a startup in any market economy. Early stages of firm development are often more associated with relatively high levels of investment and higher events of “uncharted waters.” They are also associated with lack of track records of the owners, and sometimes with businesses represented by the startup.²⁶ This is of particular concern with newer, low carbon technologies that do not have as long a track record in particular economies. Market unfamiliarity with low carbon technologies can create irrational risk aversion (World Bank, 2012).

26. Because of the uncertainty surrounding such investments, it is not a coincidence then that even in highly developed economies, access of finance to startups and MSMEs often comes from special institutions - such as business angels and venture capitalist. These use completely different parameters to assess potential performance of companies. Business angels and venture capitalists often develop investment strategies based on non-risk individual assessment. The variance (and thus the risk) is so significant, that investments are made in startups with significantly different sectors and activities.

In addition to the early stages of the life cycle of a company (i.e. startup) or a project (development and construction of a infrastructure investment), there are at least three cases where uncertainty prevails. First, when there is a significant time-span between the decision to undertake a project and their final operationalization (long term investments). Second, when new products are introduced fundamentally and have not been tested in existing current markets (innovation). And finally, when the project produces substantial sectorial or macro environments (transformational projects).

Uncertainty, as used here, should not be confused with another common information-related problem associated to credit rationing to MSMEs, particularly in informal/unregulated markets: poor quality of information caused by inappropriate accounting or governance systems. These shortcomings make the information provided of very little use to private financial intermediaries, or create an imperative search cost for private intermediaries.

Distinguishing these two types of uncertainties are crucial for policy reasons (as we shall see below). Certainly in the cases of asymmetric information, uncertainty and poor quality of information, government policies may have an important role in producing risk-sharing and even de-risking certain types of investments that are “perceived” as excessively risky by private investors; and national development (NDBs hereafter) may be crucial in implementing such policies.²⁷

To understand better how risk sharing and de-risking can be produced, it is useful to have a framework about the relationship between information availability, market development, risk and uncertainty. This is summarized in the table below:

27. As a matter of fact, this role is often highlighted by reports on the financing of MSME, infrastructure and innovation in developed economies. For an interesting analysis of special public mechanisms to finance MSME and innovation, see respectively OECD (2013a), and Mazzucato (2013).

Table 1: Information problems, financial market development and financing consequences.

	Complete information	Asymmetrical information	Uncertainty	Poor quality information
Highly developed financial systems	Markets provide full access to finance	Credit and equity rationing	Access to finance to high risk and/or long-term projects often limited to specialized private arrangements (e.g. angel investors and venture capital)	Rationing is determined by transaction cost in supplying/obtaining information
Partially developed financial systems	Credit rationing affecting mostly smaller and new clientele	Credit and equity rationing, often more acute for smaller and new clientele	Access to finance to "strategic" sectors and activities often provided by specialized public agencies	Overall poor access to finance
Poorly developed financial systems	Very selective access to finance	Credit rationing pervasive, particularly acute for smaller projects	Access to finance nonexistent	Credit rationing pervasive
Source: produced by the author.				

What the table above indicates is that a significant part of the information problems described are not states of nature. More likely they can be “resolved” with persistence and by using resources to produce, obtain and even create information.²⁸

But for long-term green investments this table raises some difficult policy issues. For these investments often embed innovative technology and are transformative of social and productive structures. In such cases, the past and present can only be a very poor guide to the future, which makes conventional risk analysis ill suited to provide a guidance for allocation of capital and/or supply of loanable funds. For those you need policies that can both improve the risk-profile of investments,

28. This is important: Being scarce almost by definition, public resources can only be a small part of the financing required even for this seemingly small list of actors and activities. That is why, even in most developed economies NDBs have to be selective and often leverage private resources to complement their own (public) funds. In addition, because some information-related constraints to access private funds can be mitigated if enough time and resources are used, NDBs can develop mechanisms to leverage and even crowding-in private resources. This should be an essential part of their financial strategies, but the potential of doing so will depend on the level of development of domestic financial markets. More on this later.

which can be achieved by different types of policies —which for lack of better generic terms, can be labeled “market-improving” and “market-enhancing.” This is what we discuss next.

Market improving and market-enhancing strategies

Many economists believe that all market activities need to thrive is a good business environment and sustained macroeconomic stability (low inflation and low growth volatility). These are indeed important necessary conditions, but they are not sufficient ones: most of the successful cases in industrialized and emerging economy nations have involved appropriate regulation and “strong doses” of public policies. These policies are basically of two types:

- Business environment, or market-improving policies - that create a safe and stable environment for the development of different types of instruments, financial institutions and markets. These policies range from the development of appropriate regulations and oversight mechanisms to sound low-interest-rate macroeconomic management.
- Market-enhancing policies²⁹ - that stimulate the emergence of new instruments, institutions and markets specialized in specific types of risks. Since institutional investors are vital for the consolidation of such markets, these policies also have to offer incentives (regulatory and otherwise) that increase the attractiveness of the securities concerned. They also include promoting the negotiation of new types of assets and instruments.

There is a lot written, and a lot of advocacy for the need for market improving policies, but market-enhancing policies —which try to overcome different types of “market-failures” — need to be better understood.

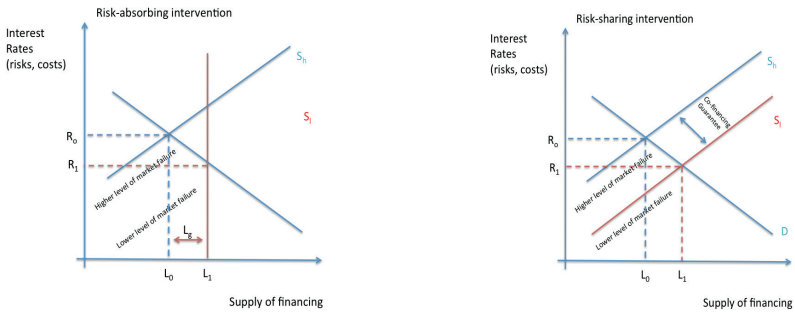
Government interventions in order to address these failures are of three types: *risk-absorbing*, *risk-sharing* or *de-risking*. In the first case, the government overcomes existing failures in the private provisioning of finance by directly financing

29. For a discussing of market-enhancing policies in a much wider context than used here see Stiglitz (1994) Aoki, Murdock and Okuno-Fujiwara (1997) and Stiglitz and Uy (1996). Market enhancing policies are in a nutshell meant to create new information and make it possible for agents to organize themselves and plan for the future on the basis of optimizing behavior. More on this below.

the whole investment or by fully guaranteeing against any risk surrounding the investment. In the second case, the government can be a subordinated partner or can offer partial guarantees to projects perceived as too risky by the private sector. In the third case, a series of government interventions are meant to *change the risk perception* by private investors, which makes it possible for crowding-in of private capital.

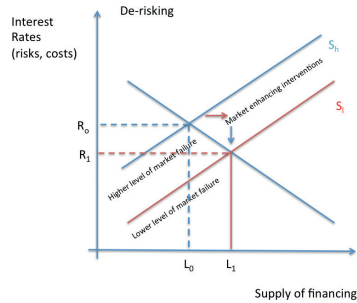
An analytical visualization of these three types of policy can be seen in the three graphs below in Figure 5:

Figure 5. Risk absorbing and risk-sharing interventions.



In the first case, a credit offered by a public financial institution (L_g) reduces the financing gap created by the market failure. In the second case, a guarantee is offered to the private lender and allows the latter to be more likely to accept lending. If these interventions are a one-off situation, they do not correct the market failure because they do not change the risk as perceived by the market, nor do they create a flow of information that allows reducing the problem of informational asymmetry.

A third type of policy requires acting simultaneously on the source of informational asymmetry, de-risking of investment projects and the creation of a new asset class. This can be visualized in graph below:

Figure 6. De-risking interventions.

For instance, if a public credit guarantee can be made conditional on the improvement of accounting practices by the participating borrowers. This will lead simultaneously in the creation of a track record of some investors and types of investments. In this case, an incentive is created for private lenders to finance these investments, while it opens an opportunity for the MDBs and NDBs to securitize their loans of these specific investors and sectors.

3. Towards a global guarantee fund and a new architecture to crowd-in private capital for sustainable infrastructure investments

The multilateral development banks and industrialized nations are ‘pledging’ to bring new climate finance to developing countries, aiming for \$100 billion for 2020. Such financing will be a welcome addition toward pressing global needs, but is limited for at least three reasons. First, such pledges seldom are met. Second, they are very small relative to the need; and third, they don’t spur emerging market ‘ownership’ over the process because the multilateral development banks (MDBs) often dictate the terms and hold on to the expertise and technology.³⁰

This arrangement is clearly not in the least sufficient to address the gaps discussed in section 2 above. That is why the recent OECD *Green Investment Report*

30. Worse, this could be just one more thing to bog down an already slow system—World Bank loans for instance take 14-16 month to deliver. *If we want the effort to be effective there is a desperate need to leverage current public resources by crowding-in private capital.*

includes two out of the four recommendations as meant to suggest a framework to crowd-in private capital.³¹ We cite several here:

3. Effective policy pathways and the efficient deployment of public finance to green investment is well understood, tried and tested, and must now be scaled up. The G20 governments must accelerate the phasing-out of fossil-fuel subsidies, enact long-term carbon price signals, enable greater free trade in green technologies, and expand investment in climate adaptation. Investment-grade public policy is an important prerequisite to engage the private sector. Public financial institutions need to more actively engage private investors through scaling up deployment of proven instruments and mechanisms, while also designing new funds and tools to attract private finance for new investment opportunities. [...] 4. Private investors will need to take a new approach to benefit from green investment opportunities. Green infrastructure investment can provide attractive long-term, risk-adjusted returns. Private investors should not wait for perfect public policies to remove any reasonable risk. They can enhance comparative risk analysis of green investment by making greater use of investor forums and engagement with public finance agencies to advance new financing solutions that open up an attractive, sustainable market (OECD *Green Investment Report*).

The same report goes even further in detailing the possible bases for such architecture (ibid idem):

While leverage ratios are difficult to compare across projects, countries and instruments, ratios of 1:5 and above are not uncommon, and there are some cases of instruments—such as grants—delivering much higher ratios. There is strong potential for increased lending, advancing and rolling out de-risking instruments, using carbon credit revenues, and targeting grant money combined with technical assistance to attract much greater private investment.

31. The other two are just references to urgency of dealing with the climate problem and the green investment gaps” 1) Greening investment, and thereby the economy, is the only option. Building from the 2012 G20 Summit, G20 leaders should reaffirm that greening the economy is the only route to sustained growth and development. 2) The transition is financially viable. The incremental costs of greening growth are insignificant compared with the costs of inaction. To accelerate and guide the green growth transformation, governments, investors and international organizations must improve efforts to overcome barriers and improve global tracking, analysis and promotion of green investment.

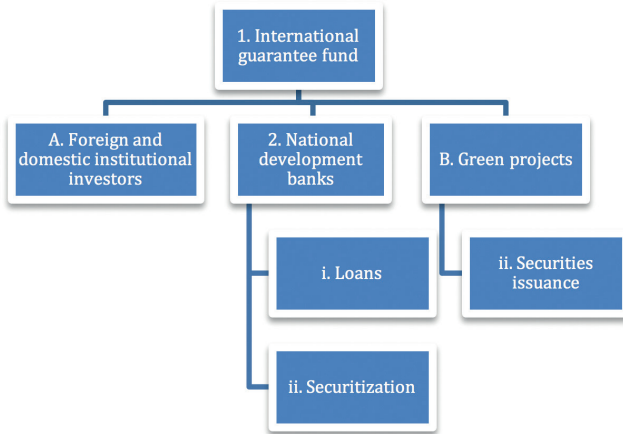
The green investment gap can be addressed through the use of such instruments. If public-sector investment can be increased to US\$ 130 billion and be more effectively targeted, it could mobilize private capital in the range of US\$ 570 billion. This would come close to achieving the US\$ 0.7 trillion of incremental investment required to move the world onto a green growth pathway. However, greening the remaining US\$ 5 trillion in infrastructure investment will remain a major challenge requiring policy reform and a stronger push toward investment-grade policy.

An architecture such as that requires at least four blocks: (i) a regulatory framework to allow climate assets (both loans and securities) to be held in the balance-sheets of any financial institution or investors - particularly of institutional investors such as pension funds; (ii) risk-sharing and de-risking mechanism; (iii) policies to promote the creation of new markets and instruments; and, (iv) specific policy instruments that can implement such policies.

In most of the cases, the emerging architecture involves the allocation of public resources (pledges) into different types of green funds that are managed through multilateral institutions (World Bank, Asian Development Bank, Inter-American Bank). In some case, national development banks have received donations that are earmarked for green investments. In addition to poor leveraging, this type of architecture seems to be inadequate in fostering risk-sharing and de-risking instruments that can produce sustained crowd-in of private capital.

An additional way to use the existing public resources— either in the form of pledges from donors or domestic dedicated funds—is to create architecture around a global green guarantee fund. This fund could be described through the following organogram:

Figure 7: A preliminary view on architecture to crowd-in private capital for sustainable infrastructure financing



This architecture involves the use of public resources (pledges and voluntary contributions) to constitute an international green guarantee fund. Guarantees are used to mitigate the risks involved in infrastructure investments, and can include risks related to default, currency risk, technology performance, and more.

This fund could be administered by a set of (multilateral and national) development banks that adopt international methodologies defining sustainable infrastructure investment – such as that of the International Development Finance Club (IDFC).³²

In addition to the membership of the national development bank in IDFC, the adherence to this fund should be conditioned to the governments of the recipient nations toward mitigating political (changes in government that affect the legal

32. As the name indicates, this is a “club” constituted by national development banks that dedicate part of the operations to green investments, and that have agreed upon an standard methodology to classify their own projects. See <https://www.idfc.org>. Using the IDFC as a governance platform for this type of arrangement would reduce significantly the governance problems often addressed by the funds managed by multilateral institutions, such as the World Bank. These “governance problems” emerge from the perception by developing nations of asymmetric voice and representation in these institutions, often reflected in the policy orientation of its senior and regular staff.

system, and the risk of civil unrest) and policy risks (entail regulatory changes, such as those to feed-in tariffs or fossil-fuel subsidies that can alter a project's economic viability). Donors contributing to the fund could commit to untied technology and knowledge transfers that would mitigate *technology and operational related risks*, as defined above. In the same spirit, donors and recipient government should commit to providing both resources and technical assistance needed to reduce *capacity risks*, also as defined above.

Architecture of this type could have the advantage of promoting access to both domestic and international institutional investors, particularly of pension funds. And at the same time, it could promote a significant leveraging capacity for both national development banks through higher levels of lending and through securitization of their green portfolios; as well as for infrastructure investors, through the possibility of issuing green-infrastructure-backed securities directly to international and domestic markets. Moreover, it would allow emerging market and developing countries themselves to mobilize and monitor finance for sustainable development.

Conclusion

The world has ambitious goals to transform the world economy in a sustainable inclusive manner. Laying a foundation of sustainable infrastructure will be pivotal to achieving these goals. Paradoxically, while there is an abundant supply of finance that could be channeled toward meeting these goals, the current financial system rewards short-term finance over long-term sustainable finance. Development banks will play a crucial role in connecting the dots to match supply with demand—and many of the MDBs that have committed finance to this goal should be commended. We propose a global guarantee fund that would further channel finance into sustainable infrastructure, but on the terms of developing countries.

Crowding-in private capital to help fill the investment gaps in a way that is consistent with a low-carbon growth path will require an architecture meant to reduce the perception of risk while maintaining long-term returns that are acceptable for wealth holders and financial institutions. This is technically possible, but it

requires the creation of a whole new “green financing architecture” where public resources are used as risk-sharing and de-risking instruments

We propose a new green global finance architecture whereas, firstly, a hard-currencies-denominated green guarantee fund that can be used to guarantee loans and issuances of green bonds, both in domestic markets of developing nations and internationally. Second, this fund would have a stand-alone governance structure centered on the members of the International Development Finance Club.

This institutional setting allows for a unique platform to compare their actions towards a sustainable growth path. The global guarantee fund backed by commitment from industrialized and emerging economies could use IDFC standards as eligibility criteria, and it would be open to both domestic and international infrastructure consortia. Finally it could also include some incentive mechanisms for capacity building for developing nations, so much needed to produce green bankable projects to be financed/guaranteed by this new architecture; and also to stimulate technology transfers to make some of potential projects economically feasible.

Certainly an initiative like this requires both political will and innovative capacity. Whereas the latter seems to be abundant in the modern world of finance, the former seems to be a much scarcer commodity. Nonetheless, in a moment when we all want quick solutions, but few are capable of expanding the use of their own public resources to deal with the climate change threat, it is worth it to analyze any propose that can crowd-in private capital that is nowadays sitting idle in the balance-sheets of multi-billionaire institutional investors, or at the service of de-stabilizing speculation.

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COP21 and Beyond: Challenges for a Fair Agreement and the Significance of the Social and Economic Value of Carbon Mitigation Actions and Related Positive Carbon Pricing

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Abstract: On the eve of the 21st Conference of Parties (COP21) a shared optimism is registered among policy-makers, academics and key stakeholders. Six years after Copenhagen a new international agreement on climate change appears now at hand. Yet reaching an effective and strong agreement requires the solution of several open issues, with the recognition of the ‘social and economic value of mitigation actions’ (SEVMA) being at the top of them. This paper aims at framing this recognition both within and beyond the agreement, thus providing evidence of its relevance for the future of climate change mitigation. In doing so, the paper looks at the current state and possible developments of the more practical aspects of the

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SEVMA proposal, in order to avoid that it become an ‘empty shell.’ The analysis of these practical aspects primarily focuses on the understanding of two different proposals designed within the SEVMA framework and its correlated concept of ‘positive carbon pricing’: the proposal to finance low carbon investment in Europe, advocated by France Stratégie; and the proposal to establish a global carbon mechanism developed by a team of researchers at the University of Sussex.

Keywords: social and economic value of mitigations; positive carbon pricing; carbon finance; carbon mechanisms; reductions allocation; global carbon budget; intended nationally determined contributions; transparency; equity.

Introduction

The year 2015 has seen huge advances concerning the international negotiations on climate change. The relevance of the 21st Conference of Parties, considered the ultimate option for a global accord since COP15 in Copenhagen, has coupled with a widespread effort to stress climate change as a priority at global level. While Parties continue to submit their voluntary pledges to the United Framework Convention on Climate Change (UNFCCC) in the form of Intended Nationally Determined Contributions (INDCs),³⁷ a new draft agreement was finally released on the 23rd of October.³⁸

Aside the formal commitment taken by the Parties to reach a compromise by the end of 2015, different elements representing civil society everywhere around the world are simultaneously pushing for the establishment of durable and effective agreements. Socio-environmental movements and non-governmental organizations are now flanked by institutional and private investors foreseeing the huge potentials of a well-established mitigation system, by industrial associations and companies involved in the mitigation processes and by a variety of public institutions and international and regional level.

37. UNFCCC, INDCs submission page: <http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx>.

38. UNFCCC ADP Draft Agreement. 23 October 2015. <https://unfccc.int/files/bodies/application/pdf/ws1and2@2330.pdf>.

The high interest towards December has contributed to raise different themes of discussion within the framework of the negotiations in the most recent months. Among the core themes discussed during 2015 a proposal made by Brazil during the COP20 in Lima³⁹ has stood out: the introduction of the recognition of the SEVMA within the new climate agreement. The request for recognition was included in the joint Brazil-United States statement at the end of June,⁴⁰ and further reiterated by both the BASIC (Brazil, South Africa, India and China) and the G77+China during the tenth part of the second session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), held in Bonn between the end of August and the beginning of September.⁴¹ The proposal has been finally included in the draft decision on workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action in Bonn on October 2015.⁴²

Despite its relevance and the interest raised about it, uncertainty still surrounds the future of the SEVMA recognition. This uncertainty stems from the novelty of the proposal and a corresponding lack of widespread understanding of its potential. The aim of this paper is to provide evidence for a more in-depth understanding of the meanings, objectives and potentials of the SEVMA proposal and the interrelated idea of a ‘positive carbon pricing.’

To understand the importance of recognizing the SEVMA within and beyond the international climate change agreement a three-step analysis is required: firstly, the construction of a brief history of the development and final aim of the recognition; secondly, a framing of the recognition within the wider framework of the negotiations and of its most recent trends; thirdly, an understanding of the extent

39. Views of Brazil on Accelerating the Implementation of Enhanced Climate Action. Document Presented to the UNFCCC ADP, 2014. http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/73_98_130606973461270094-BRAZIL%20WS2%20Early%20action.pdf.

40. U.S.-Brazil Joint Statement on Climate Change. The White House, Office of the Press Secretary, Washington, D.C. June 30, 2015. <http://iipdigital.usembassy.gov/st/english/texttrans/2015/06/20150630316393.html#axzz3opMkdF9B>

41. Statement by China on Behalf of BASIC at the opening session of ADP2.10, Bonn, August 31 2015. http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/213_149_130854954434772208-BASIC_State-ment_AD2-10.pdf.

42. UNFCCC, 2015. Draft decision on workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action, 23 October 2015. http://unfccc.int/files/meetings/bonn_oct_2015/application/pdf/ws_2.pdf.

to which a practical implementation of the recognition has already been designed; finally, an evaluation of the interactions between the proposal and the current and future systems of allocation of mitigation contributions/commitments.

1. A brief history of the SEVMA proposal and its related ‘positive carbon pricing’ idea

The starting point for the proposal can be identified within the framework of the United Nations Conference on Sustainable Development (UNCSD), also known as Rio+20, held in Rio de Janeiro in 2012. A relevant side event held there served to launch the so-called ‘Rio Climate Challenge’,⁴³ a platform meant to gather like-minded policy actors, academics and other key stakeholders to discuss new pathways and solutions to climate change.

The following year, the ‘Rio Climate Challenge’ initiative led to an ad-hoc conference (Rio, October 28-29, 2013) where personalities from Brazilian institutions and other national international stakeholders (e.g. universities, the World Bank, the International Monetary Fund and the International Panel on Climate Change) discussed various issues related to climate change policy.⁴⁴ One of the key debates of the conference focused on the feasibility of the establishment of a ‘Green New Deal’ and the opportunity for the institution of a ‘low carbon Bretton Woods’ system.

The year 2014 saw further steps forward in the design and definition of a reliable ‘low carbon Bretton Woods’ system. Interest within and beyond Brazilian borders grew quickly, thanks to a set of policy efforts aimed at both promoting and further developing the up to date but still abstract concept of the system, which had primarily originated as a result of the 2013 Rio Climate Challenge Conference. A key aspect of this evolution is represented by the new support generated from work

43. Citizenside, 2012. Rio Climate Challenge launched in Rio de Janeiro. 21 May 2012. <http://www.citizen-side.com/en/photos/environment/2012-05-21/60601/rio-climate-challenge-launched-in-rio-de-janeiro.html#f=0/467669>.

44. The Rio Climate Challenge – Rio Clima, 2013. Pagina 22, 24 October 2013 (Portuguese). <http://www.pagina22.com.br/en/2013/10/24/the-rio-climate-challenge-rio-clima/>.

done by academic institutions like the International Research Center on Environment and Development (CIRED), under the guidance of Professor Jean-Charles Hourcade, and the Science Policy Research Unit (SPRU) of the University of Sussex, led by the work of Dr. Michele Stua.

Having independently developed similar proposals (Hourcade, Aglietta, Perissin-Fabert 2014; Stua 2015) based on the idea of monetary-based devices to facilitate the development of a low-carbon economy, the two research institutions initiated an active collaboration with their Brazilian counterparts to establish the most reliable pathways for the development of a new system. What these pathways have in common is the concept of ‘positive carbon pricing,’ which implies the financial recognition of the value of mitigation, and of the interrelated definition of a SEVMA, as explained in a recent article by Alfredo Sirkis (2015.)

Having established the key elements for the development of the ‘low carbon Bretton Woods’ project Brazil followed with the official proposal for the introduction of the definition of a SEVMA within the new international agreement on climate change on October 2014.⁴⁵ Brazil publicly introduced the proposal in a special side conference held during the COP20 in Lima on December 10, 2014 (Sirkis 2015).

The year 2015 has become the key year for the development of the entire project, from the definition of a SEVMA to the framing of a ‘positive carbon pricing’ concept and the further development of the key elements to envisage a ‘low carbon Bretton Woods’ initiative. The Brazilian proposal generated increasing interest and support worldwide,⁴⁶ while a new think-tank, Brazil Climate Centre⁴⁷ which is entirely focused on the project, has been created and renewed efforts on the proposal were set up during the new ‘Rio Climate Challenge’ Conference held in Rio

45. Views of Brazil on Accelerating the Implementation of Enhanced Climate Action. Document Presented to the UNFCCC ADP, 2014. http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/73_98_130606973461270094-BRAZIL%20WS2%20Early%20action.pdf.

46. See: U.S.-Brazil Joint Statement on Climate Change. The White House, Office of the Press Secretary, Washington, D.C. June 30, 2015. <http://iipdigital.usembassy.gov/st/english/texttrans/2015/06/20150630316393.html#axzz3opMkdF9B;>

and: Statement by China on Behalf of BASIC at the opening session of ADP2.10, Bonn, August 31 2015. http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/213_149_130854954434772208-BASIC_Statement_AD2-10.pdf.

47. Centro Brasil no Clima. <http://centrobrasilnoclima.blogspot.com.br/>.

on October 26-27, 2015. Gathering again high level representatives of national and international policy-makers, academic institutions and key stakeholders, the conference added critical mass to the approval of the SEVMA in the COP21 negotiations, and to refine the ‘positive carbon pricing’ idea in a post-Paris setting. Amid the existing uncertainty, what looked like a visionary perspective just one year ago has now become a feasible reality.

2. Framing the proposal within the wider perspective of the international negotiations on climate change

To understand the potential and long-term objectives of the ‘low carbon Bretton Woods’ proposal it is important to place it within the wider framework of the international climate change debate. Such a contextualization relates not only to the current international negotiations, but also aims to provide a perspective that goes beyond the Paris objectives.

Far from being just technical wordings the recognition of the SEVMA and the related ‘positive carbon pricing’ have been designed as tools to actively promote mitigation at the global level. Their main objective can be identified in the factual and shared recognition of a real value in mitigating actions, therefore implying that it be ‘expendable’ within and beyond the framework of climate finance. Recognizing the SEVMA and related ‘positive carbon pricing’ implies offering to those who act in mitigation to obtain real financial assets in exchange for their actions.

Different forms of practical implementation of the principles can be envisaged and they will be analyzed in the following section. Here, we will discuss the adherence of the SEVMA and the ‘positive carbon pricing’ proposals with the main principles, objectives and targets currently governing the policy debate related to mitigation.

In broader terms, the recognition of the SEVMA is first of all in line with the globally renowned ‘Stern Review on the economics of climate change,’ a 700-page report released by the British government on October 30, 2006 by the economist Nicholas Stern, discussing the effect of climate change on the world economy.⁴⁸ In particular,

48. United Kingdom Economic and Finance Ministry, 2006. Stern Review on the economics of climate change. http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm.

the proposal is consistent with the quantitative definition of the economic and social costs related to climate change, as introduced by the Stern Review and estimated at a loss of at least 5% of global gross domestic product (GDP) each year.

The adoption of the SEVMA concept serves to potentially counterbalance such costs, demonstrating that any action aimed at reducing GHG emissions compensates for the loss forecasted by Stern. Thus similar to a balance sheet, the estimated climate change costs represent the liabilities side, while the SEVMA represents the assets side.

Moving to the more specific climate mitigation strategies and policies related to the climate negotiations, the proposal aims to help ‘bridge the gap’ between the maximum that Parties can agree upon by consensus and the minimum the International Panel on Climate Change (IPCC) states as needed to keep GHG concentrations below 450 ppm and the average temperature below 2 degrees Celsius compared to pre-industrial levels, better known as the ‘2°C Target’.

The result of a multi-decade process of research developed by a group of key scientific experts of the IPCC, the 2°C Target has been explained and quantitatively defined in the 5th Assessment released in 2014.⁴⁹ Unlike previous reports, the 5th Assessment offered for the first time a proper quantification of the 2°C Target, in terms of limits on GHG emissions and related burdens of global emissions reduction.

The introduction of the ‘global carbon budget,’ defined by the IPCC as “the area under a GHG emissions trajectory that satisfies assumptions about limits on cumulative emissions estimated to avoid a certain level of global mean surface temperature rise,”⁵⁰ served to offer this quantification. As a result, a carbon budget of 1 trillion tons of carbon dioxide (CO₂) was established, to be further reduced when including greenhouse gases (GHGs) other than CO₂. By 2011, 52% of the global carbon budget had already been exhausted.⁵¹

49. IPCC, 2014. Climate Change 2014: Mitigation of Climate Change. IPCC 5th Assessment, 2014. <http://www.ipcc.ch/report/ar5/wg3/>.

50. IPCC Glossary of Terms. http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_annex-i.pdf.

51. World resource Institute. Understanding the IPCC Reports. <http://www.wri.org/ipcc-infographics>.

By establishing the worldwide limit of anthropogenic GHGs required to meet the 2°C Target, the ‘global carbon budget’ concept links directly with the SEVMA, the ‘positive carbon pricing’ idea and the wider ‘low carbon Bretton Woods’ system. These latter ones aim to leverage the investments required to fulfill with the budget, and therefore with the 2°C Target, recently estimated in trillions of dollars per year for the next decades.⁵²

Finally the proposal discussed here is in line with the most advanced academic discussions in the field of climate change, such as the “Earth Statement.”⁵³ Written by seventeen of the world’s leading scientists,⁵⁴ the Earth Statement warns of the unacceptable risks of climate change, identifying eight essential elements of climate action to safeguard human development. The Earth Statement has already been supported by more than 30 internationally renowned personalities, including policy-makers, business managers, civil society representatives, scientists, religious leaders and media stars. Table 1 offers a visual comparison between the eight essential elements of the climate action proposed by the Earth Statement and the corresponding elements of the proposal.

Table 1: comparison between the Earth Statement 8 points and the key elements of the proposal

8 points of the Earth Statement	Corresponding elements of the proposal
Governments must put into practice their commitment to limit global warming to below 2°C	The proposal as a whole is completely aligned to and driven by the 2°C Target
The remaining global carbon budget must be well below 1,000 Gt CO2 to have a reasonable chance to hold the 2°C line	The proposal offers a viable and economically sustainable solution to keep emissions well below the ‘Global Carbon Target’ and 1,000 Gt CO2 represents the demand-side of the proposal

52. World Bank, 2015. Mobilizing the Billions and Trillions for Climate Finance, April 2015. <http://www.worldbank.org/en/news/feature/2015/04/18/raising-trillions-for-climate-finance>.

53. Earth Statement website: <http://earthstatement.org/statement/Document6>.

54. Johan Rockström (Stockholm Resilience Centre), Guy P. Brasseur (Max Planck Institut für Meteorologie), Ottmar Edenhofer (Mercator Research Institute), Sir Brian Hoskins (Grantham Institute), Pavel Kabat (International Institute for Applied Systems Analysis), Mario J. Molina (Centro Mario Molina), Jennifer Morgan (World Resources Institute), Nebojsa Nakicenovic (International Institute for Applied Systems Analysis), Carlos Nobre (Instituto Nacional de Pesquisas Espaciais), Veerabhadran Ramanathan (Scripps Institution), Jeffrey Sachs (Earth Institute), Hans Joachim Schellnhuber (Potsdam Institute), Peter Schlosser (Earth Institute), Youba Sokona (South Center), Leena Srivastava (TERI University), Lord Nicholas Stern (Grantham Institute), Guanhua Xu (Chinese Academy of Sciences).

We need to fundamentally transform the economy and adopt a global goal to phase out greenhouse gases completely by mid-century	With the establishment of a 'low-carbon Bretton Woods' system the proposal aims at a radical transformation of the global economy
Equity is critical. Every country must formulate an emissions pathway consistent with deep decarbonisation	An equitable, transparent and effective allocation of the mitigation contribution if a key element for the proposal's potentials to be completely unleashed and options for a similar allocation are discussed within the proposal
We must unleash a wave of climate innovation for the global good, and enable universal access to the solutions we already have	The proposal by itself represents a radical wave of climate innovation for the global good
We need a global strategy to reduce vulnerability, build resilience and deal with loss and damage of communities from climate impacts	The opportunity to effectively link the proposal with adaptation strategies can support the development of such a strategy
We must safeguard carbon sinks and vital ecosystems, which is as important for climate protection as the reduction of emissions	The effects of the proposal's implementation shall serve to safeguard vital ecosystems worldwide. Carbon sinks may become active elements for the proposal's implementation
We must urgently realize new scales and sources of climate finance to enable our rapid transition to zero-carbon, climate-resilient societies	The proposal aims to establish a radically innovative finance system to enable a rapid transition to zero-carbon societies

Serving also to introduce some of the key implementation aspects of the proposal—which will be discussed in-depth in the next section—the table demonstrates its strict correlation with the Earth Statement, therefore confirming the high transformative potentials of the whole idea. Having set out the key themes of the proposal within the overall framework of climate negotiations and of the most advanced climate change debate, it is important, now, to analyze what are the possible implications of its factual implementation. Thus, the next section will describe current ideas developed within the SEVMA and ‘positive carbon pricing’ framework, while identifying their limits and the opportunities for additional contributions to enhance the same framework.

3. Social and economic value, positive carbon pricing and low carbon Bretton Woods: where we are and what next?

Along with the aspects introduced in section 1, the year 2015 registered relevant advances in the design of potentially effective and practical mechanisms based upon the concept of SEVMA and the related ‘positive carbon pricing.’ Culminated with the new ‘Rio Climate Challenge’ Conference held at the end of Oc-

tober, where these advances were publicly proposed and discussed, the number of proposals related to SEVMA recognition registered a sharp increase, with new institutions actively involved in their design and previous ideas further improved and enhanced.

Concerning the original ideas based on the SEVMA and ‘policy carbon pricing’ model, the most relevant efforts for their improvement were registered within the academic teams led, on one hand by Professor Hourcade, and on the other, by Doctor Stua. As a consequence of these efforts the idea originally promoted by CIRED (Hourcade, Aglietta, Perissin-Fabert 2014) has become a proposal directly supported and further developed by France Stratégie in 2015.⁵⁵ the French Prime Ministry institution responsible for establishing the main medium- and long-term strategies for the economic and social development of the country. In the UK, the work initiated by SPRU (Stua 2014), gained interest and support allowing for a wide extension of the team involved on its development within and beyond the University of Sussex.

From the proposals advocated by France Stratégie and the University of Sussex, stems a set of considerations concerning the further implementation of mechanisms based upon the SEVMA recognition and the interrelated ‘positive carbon pricing,’ with special reference to the establishment of a ‘low carbon Bretton Woods’ system. Despite some differences in their interpretations, the proposals share two key principles: a) the need to certify emissions reductions; b) the need for a widespread acceptance of carbon certificates as a tool to promote the investments required for mitigation actions.

The certification system for emissions reductions is required in order to establish a sound and effective supply-side of carbon mitigation actions. In doing so, the certification system provides an effective and empirical meaning to the concept of ‘social and economic value of mitigation.’ Both France Stratégie and the University of Sussex agree that the experience accumulated with the Clean Development Mechanism (CDM), the most relevant mitigation tool adopted in the Kyoto

55. Aglietta, M., Espagne, É., Perrissin Fabert, B., 2015. A proposal to finance low carbon investment in Europe. France Stratégie Policy Brief N°24, February 2015. <http://blog.en.strategie.gouv.fr/2015/02/policy-brief-proposal-finance-low-carbon-investment-europe/Document6>.

protocol,⁵⁶ should be a key element in determining the most effective system for the certification of emissions reductions. Similar considerations have been made concerning the experience accumulated throughout the adoption of the European carbon trading scheme (EU-ETS).⁵⁷

A widespread acceptance of carbon certificates as a financial tool for GHG mitigation actions is a key step towards a comprehensive and effective development of a 'low carbon Bretton Woods' system. Only once most of the stakeholders possibly involved in the system have accepted and started to use the certificates as a mean of value exchange, will it be possible for the system to evolve towards a new low-carbon economy.

Given these principles as converging in the works of both France Stratégie and the University of Sussex, it is now possible to analyze the key elements of both the proposals, identifying by this their main discriminants. A first diverging aspect is represented by the different geographical width of the proposals, with the French idea oriented towards a regional perspective and the British one aiming at a global approach.

While discussing the European climate mitigation agenda and the need for an economic recovery of the whole continent, the proposal advocated by France Stratégie envisages a mechanism able to simultaneously cope with both these key issues. The proposal is focused on a European Central Bank (ECB) led strategy, where the financial leverage at the disposal of the ECB, represented by the quantitative easing system, would be applied as a support tool for the deployment of mitigating actions throughout Europe.

Under this framework, European governments would serve as guarantors for the issuance of the mitigation certificates in the form of carbon assets. Based upon the governments' guarantee the ECB would then distribute 'green loans' to financial intermediaries (investment banks), which in turn would use the loans to support mitigating actions. To establish the value of the mitigating actions, required for the loan-based system functioning, the proposal envisages for the different governments to recognize a social costs of emissions. This definition is perfectly in line with the SEV-MA concept, thus representing a viable pathway for its practical implementation.

56. UNFCCC CDM portal. <https://cdm.unfccc.int/>

57. European Commission portal on EU-ETS. http://ec.europa.eu/clima/policies/ets/index_en.htm Document6.

While it would be impossible to apply a similar system on a global scale, due to major differences between the norms and institutions currently governing the financial and monetary systems around the world, the ECB-based proposal can be easily replicated by entities operating within other clusters of countries, such as the Asian Development Bank or the New Development Bank.⁵⁸ The proposal can also be adopted within some national settings, such as the United States of America under the management of the Federal Reserve.

The proposal designed within the University of Sussex team explicitly aims at a more comprehensive, global perspective. Based on previously developed studies focused on the feasibility of a global carbon market (Stua 2014), its objective is to introduce the minimum elements for a new ‘climate economy’, where GHGs emissions reductions are stimulated through a direct incentives system. Based on the issuance of ‘certificates’ corresponding to actual mitigations the system aims to become the reference for any mitigation action, equally, worldwide. However, a dynamic and flexible certification mechanism is required to guarantee the efficacy of the system. Its efficacy will correspond to its capability to attract actors pursuing their own interests, while directly and indirectly acting to mitigate climate change.

The functioning of the proposed mechanism is based on a framework similar to the one regulating the Clean Development Mechanism (CDM). Despite the harsh debate on its effectiveness during its implementation years, the multi-annual experience granted by its application and the international width of its action offer valid tools for the design and establishment of a renewed mechanism.

The experience gained in terms of methodologies for the identification and certification of the mitigating actions represents the key factor of the CDM experience as the reference-point for the proposed mechanism. A recent study developed by the World Bank⁵⁹ analyzed the potentials of mitigation actions based on the CDM methodologies. Focusing on Brazil, the study reports a potential of 18,480 projects, 12,102 of which related to electricity. An emissions reduction/avoidance

58. New Development Bank website: <http://ndbbrics.org/>.

59. World Bank, 2015. Levantamento de Oportunidades Concretas de Projetos de Baixo Carbono no Brasil (in Portuguese), World Bank Document, 29 May 2015. http://www-wds.worldbank.org/external/default/WD-ContentServer/WDSP/IB/2015/05/29/090224b0828ca91c/1_0/Rendered/PDF/Levantamento0d0xo-0carbono0no0Brasil.pdf.

opportunity of 450,000 Mt CO₂e and an interrelated rise of 450GW in the national electric capacity correspond to these projects.

The key element of the proposal lies in the aggregate global potential of a similar mechanism. By applying the World Bank models globally, the numbers would likely overcome the constraints imposed by the ‘global carbon budget.’ The proposal suggests adopting recognized methodologies to certify the actual reduction of emissions at a global level. This has the double aim of introducing a viable instrument to verify happened mitigation actions worldwide, and of demonstrating the efficacy of the ‘positive carbon pricing’ principle.

Recognizing already occurring mitigation actions means offering to Parties the tools to fulfill their (voluntary) pledges. An equally global recognition of these actions would correspond to a global certification of the different emissions reductions. As a consequence, the adoption of a global certification mechanism based on recognized methodologies would offer a viable opportunity for the Parties to demonstrate their accomplishment with the pledges.

While no exclusiveness regarding what tool represents the mitigation actions is required, the mechanism has with no doubt great potentialities, combining top-down, bottom-up and other intermediate approaches. Due to its unique global nature, the mechanism requires a management primarily at international level. One or more international institutions should be in charge of: a) the mitigations certification and corresponding issuance of credits; b) monitoring for the correct system’s functioning; c) collection/acceptance of the credits to verify the compliance of the pledges by the Parties.

Institutes like the World Bank have already promoted research in this sense, with a recent study introducing the concept of ‘International Carbon Asset Reserve’ (ICAR).⁶⁰ The Sussex proposal is perfectly functional within the ICAR concept. The emphasis given by the World Bank report to the CDM experience and to

60. World Bank, 2015. Design Options for an International Carbon Asset Reserve. Networked Carbon Markets, Knowledge Series, July 2015. <http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/7/693001437421708911/Design-Options-for-an-ICAR-compressed.pdf>.

its reference role for future carbon mechanisms confirms an increasing interest towards similar solutions. Its suggestion for the institution of elements to increase the connectivity of the climate change mitigation system at a global level corresponds to the objective of the mechanism, as does its rationale for an international framework governing the system.

Secondarily, the variety of sectors embedded within the methodologies of the mechanism demonstrates its relevance in terms of spread and diffusion in a bottom-up approach. By rewarding emissions reductions in this variety of sectors, the mechanism could trigger a race for mitigation. Stimulating the participation of business-oriented, social and environmental actors, the mechanism could promote mitigation initiatives at any level.

Simultaneously, its wide scope and the connectivity originated by the suggested international framework can grant an adequate degree of accountability and effectiveness of the system. A similar accountability will be instrumental for the generation of a sound environment to attract the relevant investments required to develop the mitigation actions. Under this perspective, the proposed mechanism would become an ideal instrument in the development of carbon markets and emissions trading schemes (ETS) all over the world.

The articulate functioning of the system could finally overcome the boundaries embedded in the establishment of market mechanisms and ETS, becoming functional to more governance-oriented strategies. As demonstrated by different studies addressed to the CDM (Newell 2014; Lim, Lam 2014; Stua 2013), despite a usually identified market-based origin, similar mechanisms can turn into powerful governance tools of governments, international and regional institutions, and local administrations. By potentially interacting with the policies designed by similar actors, the proposed mechanism can become an effective instrument for their own implementation. Mitigation supportive norms, including fiscal legislation, can largely benefit from the adoption of a globally recognized carbon mechanism, which could become the reference for the establishment of carbon taxes, subsidies, mitigation programs and other forms of public intervention against climate change.

The proposals set up by France Stratégie and the University of Sussex converge once more when focusing on the need to establish a definite and assured demand for certified reductions, and on the interrelated need to identify a social and economic cost of carbon. The establishment of a definite and assured demand for the certified reductions reflects the need to stimulate the necessary flow of investments required to set up mitigation actions by offering certainty to the application of a ‘positive carbon pricing’ idea. Only through this establishment it is possible to ensure that the mitigations certified through the proposed mechanisms maintain a ‘real’ economic value. These pre-determined emissions reductions requirements will serve to quantify the demand-side of carbon mitigation actions identified through the definition of a social and economic cost of carbon.

The definition of the social and economic cost of carbon stems from the need to create a carbon liability as a counterbalance to guarantee the practical recognition of the SEVMA as a carbon asset from a financial perspective. The establishment of such a cost/benefit structure makes it possible to foresee the definition of a new economic and financial system based upon carbon mitigation actions. The social and economic cost of carbon serves also to define the concept of demand in the development of a system based upon the exchange of carbon reduction certificates, as implied by the concept of ‘low carbon Bretton Woods.’ By defining this cost it is possible to identify who is responsible for it and in which proportion, therefore establishing who shall be accountable for the corresponding abatement. These abatement responsibilities will represent the demand-side for mitigation actions.

To fully understand the relevance and significance of a clear definition of the demand-side for the certified reductions, one must frame it within current and future perspectives to allocate mitigation contributions at a global level. Focusing on this framing, the following section also introduces those aspects of the France Stratégie and University of Sussex proposals that explicitly address the issue.

4. Mechanisms to allocate mitigation contributions: present reality and future perspectives

Giving certainty to the definition and allocation of the mitigation contributions to be put in place under the umbrella of a new climate agreement, and therefore establishing a clearly quantified demand of mitigation actions, is a key point under discussion at the current stage of the negotiations. As established in the most recent versions of the UNFCCC ADP Draft Agreement (2015), the global mitigation strategies for the post-2020 phase will be based upon voluntary pledges independently defined by each Party. Defined as Intended Nationally Determined Contributions (INDCs), or Nationally Determined Mitigation Contributions/Commitments/Components (NDMCs), they will thus serve to self-allocate the mitigation contributions within the Parties.

Designed as tools to enhance ambitious mitigation actions, the INDCs should in theory be consistent with both the 2°C Target and the ‘global carbon budget’, hence possibly also compatible with the framework of the ‘low carbon Bretton Woods’ system. However, a first analysis on the already submitted INDCs demonstrates to what extent such a consistency is far from being reached. With 123 submitted INDCs,⁶¹ an analysis of both the aggregate and the individual submissions raises some questions (Stua 2015).

While the different methodologies adopted by the Parties in designing their INDCs limit the following analysis to just 74 INDCs, with 49 INDCs excluded due to technical impossibility to provide reliable comparison data, its relevance is still maintained both in terms of international representation and aggregate GHG emissions. The 74 INDCs account for 101 Parties,⁶² and represent about 85%⁶³ of the global GHG emissions of 2010.⁶⁴

61. INDC submission portal. UNFCCC, updated 16 October 2015. http://unfccc.int/focus/indc_portal/items/8766.php.

62. The European Union adopted a single INDC for all its 28 member states.

63. Most of the remaining emissions are related to the members of Organization of the Petroleum Exporting Countries (OPEC) that altogether represented more than 7% of 2010 global GHGs emissions both including and excluding LUCF. 10 out of 12 OPEC members have not yet submitted their INDCs. The two OPEC members that submitted their INDCs (Algeria and Ecuador) have been excluded by the analysis.

64. CAIT Climate Data Explorer Tools. World resource Institute. <http://cait.wri.org/>.

The most immediate finding of the analysis of the 74 INDCs is that, taking 2010 as reference year and 2030 as target year for the INDCs pledges, the aggregate emissions of the involved Parties may potentially increase by between 20% and 23% based on the same pledges. To understand this result better, a quick but detailed review of the pledges within these INDCs is needed. However, one must first identify the main typologies of comparable submissions as identified by the analysis of the INDCs. The three main typologies of pledges identified are: (a) pledges based on historical baseline scenarios (23 INDCs referring to 50 Parties); (b) pledges based on 2030 baseline scenarios (44 INDCs); (c) pledges based on carbon intensity (7 INDCs). Having established the different pledge typologies, a review of their key elements provides a better understanding of the reasons for the surprising aggregate outcome.

With reference to the 23 INDCs adopting a baseline historical approach to calculate their pledges, it is remarkable to observe that only in one case are 2010 emissions levels greater than those corresponding to the baseline year. With four Parties having chosen 2010 as baseline, the remaining 18 Parties adopted baseline years registering emissions levels higher than 2010, therefore having already accomplished at least part of their pledges by that time. Moreover, three Parties had already fully achieved their pledges by 2010, therefore potentially having granted themselves the right to increase their emissions compared to 2010 levels. On aggregate, the 50 Parties using historical baselines in their INDCs pledged an average reduction of one third of their emissions by 2030 compared to their baseline scenarios. However, the calculations reveal that the quota of pledges to be reduced between 2010 and 2030 falls to less than one fifth of the Parties' aggregate emissions in 2010.

Moving to the INDCs based on future baseline years, the selection of case studies has been limited to those Parties that defined the Business as Usual (BAU) 2030 emissions scenario as a parameter for their pledges. Thirty-nine out of forty-four selected INDCs included two kinds of pledges: a first unconditional one and a second, usually much less conservative, conditional pledge dependent on external financial, economic and technological support. The remaining five INDCs expressed only conditional pledges. As a consequence, two scenarios have been established, the first based on the unconditional pledges and the second based on the conditional ones.

All the Parties that adopted the BAU 2030 scenario for their pledges belonged to the non-Annex I Parties under the Kyoto protocol and typically opted for this choice to reaffirm their right to growth and development, and hence their right to increase their GHG emissions over the coming decades. Elements of fairness, justice and historical responsibility support this view, with special regard for the least developed countries (LDCs). While the recognition of this perspective's legitimacy is unquestionable, the aggregate outcome as provided by the submitted INDCs leads to a substantial increase in their emissions.

The 2030 emissions projections for these 44 Parties predict an increase on aggregate of about 47% in the unconditional-based scenario, and about 26% in the conditional-based one, compared to 2010 levels. Only four Parties will reduce their emissions by 2030 compared to 2010 in the unconditional scenario, rising to nine in the conditional one. Under the unconditional scenario the other 40 Parties will register emissions increases ranging from a minimum of 1.8% up to 750%. By analyzing the pledges of the thirteen Parties that registered GHG emissions higher than 100Mt CO₂ equivalent in 2010 it is possible to verify that four of them are allowing themselves the opportunity of increasing their emissions in a range included between 40% and 70%, and three of them in a range between 150% and 250% by 2030. The situation slightly changes when adopting the conditional scenario, with only three out of the thirteen Parties registering the same INDCs in their unconditional and conditional scenarios.

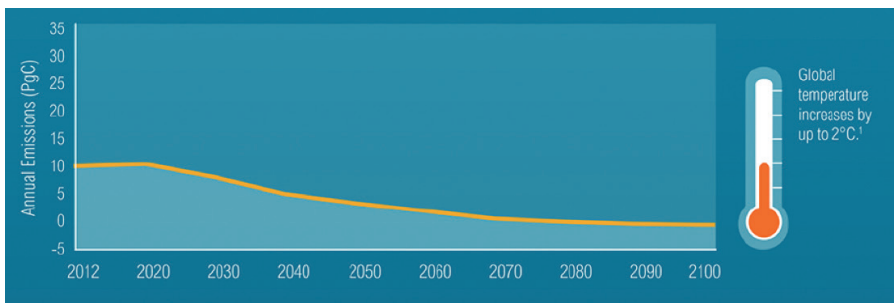
Focusing on the group of Parties that chose a carbon intensity-based approach it is possible to estimate that the emissions of these six Parties will potentially increase by more than 220% on aggregate by 2030 compared to 2010.⁶⁵ Moreover, it is important to emphasize that, with the exception of one Party that identified its baseline year as 2010, all the examined Parties had already accomplished significant portions of their carbon intensity pledges by 2010.

As described above, the aggregate impact of the analyzed INDCs may lead to an increase of up to 23% of their Parties' emissions in 2030 compared to 2010. Based on the findings of the IPCC, a mitigation strategy consistent with the 'Global Carbon Budget' and able to meet the requirements of the 2°C Target shall lead to

65. Estimation are based upon GDP projections data available on: www.tradingeconomics.com/.

a drop of 66% of GHG emissions below 2010 levels by 2050 (see Figure 1). A 20% to 23% rise in global emissions by 2030 is clearly inconsistent with such requirements, as already forecasted by some relevant scientific literature (Den Elzen, Hof, Roelfsema 2011; Tavoni et al. 2015). Given the links between the 2°C Target and the general proposal discussed above, the pledges-based strategies as proposed at the present stage appear thus inconsistent with the latter as well.

Figure 1. graphic visualization of the emissions reductions pathway in line with the 2°C Target (17)



Skepticism regarding the INDCs approach is widely spreading and, while the UNFCCC estimates a capacity for the INDCs to contain the rise of temperature below 2.7°C, other influential sources identify their impact within a range of 3.1 to 5.2°C (MIT Joint Program, 2015). New solutions must be adopted to re-align INDCs with the 2°C Target. Based on this element some technical considerations concerning the methodologies used within the INDCs framework may be functional to a more efficient use of the INDCs-based allocations at the present stage.

It is a general understanding that one of the biggest limits of the INDCs as currently organized lies in the lack of homogeneity between them. The adoption of differing methodologies, reference years, duration of the programmed actions and sectors of intervention, all strongly limit the feasibility of a proper aggregate analysis of the various INDCs.

These limits undermine the accountability of the voluntary pledges-based system as a mechanism to support global objectives such as the 2°C Target and its related

global carbon budget. A harmonization of the methods defining the rules for the INDCs design would facilitate this accountability, therefore enhancing the whole framework of the new agreement. As a direct consequence, a higher harmonization of the INDCs would reduce uncertainty on mitigating actions, thus stimulating a sharp increase in the flow of investments addressed to them.

A second and similarly relevant element affecting the effectiveness of the INDCs is represented by their timings. Despite being structured as voluntary-based based pledges and despite the absence of penalties tools for Parties unable to accomplish them, most of the submitted INDCs foresee a long-term implementation phase, generally including five years of gap until their entry to force (2016-2020) and ten years of proper implementation. While options to review the INDCs over the years are previewed, a proper analysis of the efficacy of the voluntary-based pledges system based upon similar timings would not take place before fifteen years from now.

Similar deadlines appear unsustainable when compared to the urgent needs of reliable mitigation actions; therefore an acceleration in the implementation of the INDCs is required. The establishment of less ambitious but shorter-term-based pledges covering the very next five years gap could produce a double-winning effect. It could, on one hand, reduce the timings for a proper evaluation of the INDCs system's efficacy while on the other it could accelerate the process of implementation of effective and durable mitigation strategies, policies and actions.

Viable alternatives to the current approach of INDCs have already been identified, mainly based upon two different approaches: a regional or multi-national 'pool of stakeholders' acting under more stringent allocation rules on one side, and a 'top-down' framework involving an international allocation system on the other. Here, the elements of the France Stratégie and the University of Sussex proposals concerning the allocation of mitigation contributions diverge, with the former following a 'pool' method and the latter being based on a 'top down' approach.

The France Stratégie approach is mainly designed in terms of the role of governments within the proposed system. Being in charge to guarantee for the issuance of the mitigation certificates in the form of carbon assets, while simultaneously

establishing the social cost of carbon, the involved governments would be entirely responsible for the quantification and allocation of the mitigating contributions within the system. The proposal implies that, based on the flow of loans provided by the ECB, the system would push for the governments to aim at increasingly ambitious levels of mitigation contributions, therefore generating a virtuous circle of emissions reductions and related investments.

The immediate feasibility of the proposal within the framework of the INDCs represents by far the most interesting element of a similar approach. Allowing for the participating governments to freely determine both the amount of accessible guarantees and the social cost of the carbon, the mechanism would be entirely functional to a voluntary pledges-based organization of the mitigating contributions.

Such a system would possibly incur different limits. Based on the same considerations of the previous section it would be unlikely for the system to be extended at a global level, limiting its efficacy to the process of reproducibility envisaged for the entire France Stratégie proposal. Additionally, the high level of political discrimination in establishing the parameters to determine quotas and allocations of the mitigation contributions would dramatically reduce the accountability of the system. As a consequence, it might register higher degrees of uncertainty, thus discouraging the flow of the investments necessary for an effective implementation of the mitigating actions.

The section of the University of Sussex working group proposal focused on the allocation of mitigation contributions can be embedded within the framework of the ‘top down’ approaches. Central in the climate debate since its origins (Bradford 2004; Hohne, den Elzen, Weiss 2006; Grubb 2012; Winkler, Rajamani 2014), the idea of a ‘top-down’ framework regulating the distribution of mitigation contributions/commitments is seen by many scholars as the only and most viable solution for the achievement of the global 2°C Target.

To be in line with the 2°C Target while recognizing a fair and equitable allocation, alternatives based on a similar approach should take into account a broad set of requirements related to the different Parties’ realities. These requirements are often summarized within the concept of ‘Common But Differentiated Responsibilities

and Respective Capabilities (CBDR-RC),’ which stresses the greater historical responsibility and capacity of certain Parties to reduce emissions while also advocating universal participation in the required effort.

Recognized by the UNFCCC and representing the cornerstone upon which any reduction agreement shall be built (Honkonen 2009), the principle has yet to be formulated both in terms of its legal nature and practical implementation (Deleuil). Nonetheless any mechanism based on CBDR-RC should simultaneously account for a broad set of attributes, including equity, action, justice, responsibility, capability, integrity and efficiency (Garibaldi 2014; Kanie, Nishimoto, Hijioka, Kameyama 2010), while also meeting the 2°C target in a specified amount of time and safeguarding Parties’ development rights (Baer, Ahtanasiou, Kartha, Kemp-Benedict 2008).

The introduction of a CBDR-RC regime applicable to all (Winkler, Rajamani 2014) has been central in the climate debate since 1990, when the Global Commons Institute first introduced the concept of ‘contraction and convergence’. This ‘egalitarian’ approach, based on the idea of universal participation in emissions reductions and convergence of per capita emissions of the different Parties, is often contrasted with the ‘increasing participation’ approach, suggesting an exemption for the lowest emitters and typically a gradual increase in the number of involved Parties according to defined differentiation rules (Berk, den Elzen 2001). Several attempts to reconcile the two positions have been made, (Baer, Athanasiou et al. 2008; Bohringer, Welsch 2006; Raupach 2014), yet a definitive solution has been found neither at an academic nor a policy-making level.

Based on these considerations, technical mechanisms able to merge elements of egalitarianism and increasing participation and therefore instrumental to the establishment of a CBDR-RC regime applicable to all must be identified in the future years. Stemming from the above described elements and based on a gradual approach to increasing participation, the proposal advanced by the team of the University of Sussex represents a viable pathway in this direction (Coulon, Stua 2015).

Per capita emissions levels are used as the fundamental threshold for distributing reductions through time in the development of the University of Sussex proposal

global. Given a global reduction target established for a specific timeframe, the mechanism will then operate via a set of smaller sub-targets referring to specific time periods within the overall timeframe.

Only Parties registering a per capita emissions level above the global average at the beginning of each time period shall have defined quantities of reduction pledges for that period. All other parties are therefore potentially free to increase their emissions during the period, to accelerate their development processes. Using per capita emissions to determine Parties’ participation in reduction commitments is supported by its significant correlation with the Human Development Index (HDI) (Costa, Rybski, Kropp 2011), the most widely recognized indicator for different countries’ capabilities (Den Elzen, Hohne, Brouns, Winkler, Ott 2007; Davis, Kingsbury, Mer-ry 2012). Parties registering a higher HDI tend to possess higher capabilities and historical emissions, and are consequently more accountable for reductions.

The mathematical formula below defines the corresponding or minimum reduction pledge (MRP), for each Party $j = 1, \dots, N$, set at the end of period t (but for period $t + 1$), and given as a function of its current population $P_{j,t}$ and emissions $E_{j,t}$. The first half of the equation captures the global reduction target, while the second half of the equation provides an equitable distribution of this target among Parties with higher than average per capita emissions:

$$MRP_{j,t+1} = \underbrace{(C_{t+1} + V_t)}_{\text{total reductions}} \times \underbrace{\frac{(PC_{j,t} - PCW_t)P_{j,t}}{\sum_{i:PC_{i,t} > PCW_t} (PC_{i,t} - PCW_t)P_{i,t}}}_{\text{split among parties}}, \quad \underbrace{\text{if } PC_{j,t} > PCW_t}_{\text{reduction criterion}}$$

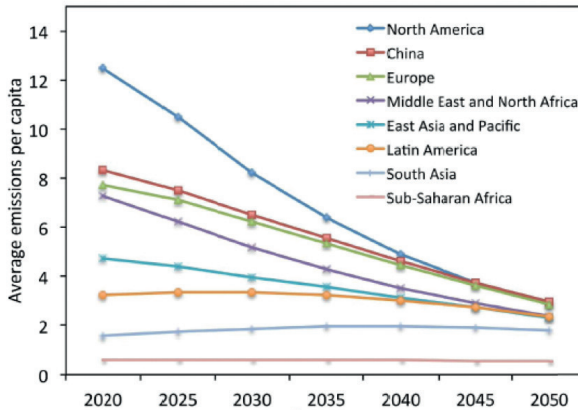
where $PC_{j,t} = E_{j,t}/P_{j,t}$ is Party j ’s per capita emissions rate, PCW_t is the world-wide rate, and lastly, the total reductions term consists of two components: (i) a predetermined common target C_{t+1} matching an agreed emissions trajectory to limit global average temperature increase; and (ii) a dynamic ‘variations’ term V_t .

V_t represents the variations determined by the increase of emissions for those countries that registered a per capita below the global average in the time period prior to the one to which the formula is applied. The presence of the shared V_t term in the formula for MRPs thus safeguards the environmental integrity of the process,

ensuring that emissions increases by Parties with MRPs are automatically compensated for in overall future pledges. Furthermore, the dynamic reapplication of the equation allows the system to adapt to changing conditions and accomplishments by Parties over time, while encouraging all Parties to aim for ambitious emissions trajectories to avoid accumulating large reduction pledges in future periods. Such long-term incentives may potentially induce further actions to help shift the aggregate emissions trajectories from minimum pledges towards more ambitious levels.

Based on a scenario analysis of the formula's application (Coulon, Stua 2015), Figure 2 offers a clear visualization of the mechanism's potential in terms of 'contraction and convergence', thus demonstrating its efficacy as a tool for the achievement of the 2°C Target.

Figure 2. per capita reductions pathways per main geographic areas based on the mechanism application



Some additional elements concerning both the countries registering an emission per capita above the global average and those having it below the global level and their relationship with the INDCs system can be established. As for those Parties registering a per capita emission level above the global average, the reductions assigned by the formula would represent their minimum pledges for the determined time period, therefore allowing them to further increase their reductions ambitions through their own INDCs.

Parties registering a per capita emissions level below the global average would still be requested to submit voluntary INDCs. Their voluntary pledges should be organized on a common future baseline system (see the second typology of analyzed INDCs in this section), corresponding to the end year of each agreed time period in order to harmonize their INDCs and facilitate a shared understanding of expectations for the Vt term.

Both groups of Parties would still be entitled to freely propose their own strategies, policies and key intervention areas within their INDCs. This latter measure aims to grant the highest possible degree of freedom to the Parties, while at the same time safeguarding the overall mitigation targets. Based on the elements introduced in this and the previous sections it is now possible to open up the discussion about the current reality and possible future of the Brazilian-led proposal's practical implementation.

The biggest limit of the University of Sussex proposal, as well as of all the alternatives stemming from a 'top-down' framework approach, is represented by time. Whatever these necessary solutions will be, it is unlikely for them to be adopted within the framework of the COP21. While a window of opportunity to discuss about similar solutions is offered by the 5-year gap between the Paris conference and the forecasted entry to force of the new protocol, INDCs still represent the most likely mechanism allocating mitigation contributions for the very next years.

Conclusions

Rather than being an 'empty shell' of beautiful words, the concept of SEVMA represents the first and fundamental step for the development of a new global climate strategy. The strategy aims to shift, in a medium to long-term perspective, the global economy towards a new low-carbon regime. Several key elements for the strategy's implementation have already been designed, envisaging the opportunity and need to establish a 21st century 'low carbon Bretton Woods' international system.

These key elements, analyzed and discussed in this paper, represent a solid and viable solution for the world to finally adopt an effective and efficient roadmap

to face the challenges posed by global warming and climate change. At the same time the roadmap established by the proposal can guarantee an economically and socially sustainable alternative to the current development models.

While several efforts are required both at the policy-making and academic level for a complete and correct implementation of the idea's framework, the proposal may represent the most viable strategy to guarantee a sustainable future to the next generations.

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Climate Clubs and Cop21: Foes Or Allies? ⁶⁶

Etienne Espagne

Abstract: Alarm signals are multiplying on the possibility of a failure of the COP21 in Paris December 2015. The risk is great on a purely nominal agreement that would push back any serious effort. Facing these dark omens, the notion of climatic “coalition” or “clubs” has recently made a re-appearance in academic as well as expert debates as a diplomatic approach susceptible to get around the difficulties experienced by the UN process on climatic negotiation. This approach implicitly admits a rather inherently inevitable failure of the COP21 to engage in a sufficiently credible trajectory of emission limiting the increase of temperature to 2°C above pre-industrial times. It runs the risk of making a 20-year old institutionalized process insignificant at the benefit of coalitions with cloudy objectives. This article brings up a reading grid of the different types of climatic clubs before aiming at bringing together the seemingly opposing approach of said clubs with the global approach of the UN. In order to do this it proposes a new kind of club, based not on geographical criteria but on a socio-economical one, disposed to actively participate—or not—in projects associated to the low-carbon transition. The milestones of such a club could be laid down within UN settings. A new insert in the last version of the agreement protocol first negotiated ahead of the Paris Conference in Bonn on October 23, 2015 encourages us to do so, appealing to the acknowledgement of the social and economical value of voluntary actions of attenuation (or “positive carbon pricing”) and their mutual benefits in terms of adaptation, health and sustainability.

66. I wish to thank Simon Lugassy for his kind translation. (simonlugassy1@gmail.com).

Keywords: positive carbon pricing; climate club; COP21; social value of carbon; climate finance.

Introduction

The UN process of climatic negotiation is often deemed inefficient. The discussions would namely aim at progressively emancipating ourselves from our climatic constraints as pointed up by the scientists of the IPCC (Intergovernmental Panel on Climate Change), to finally reach the defense of national interests in the short term. The negotiation as a whole would therefore result in the smallest common denominator, which, on the global scale of the UNFCCC (United Nations Framework Convention on Climate Change), inevitably comes down to a very limited output.

The usual approach of international climatic negotiations is that of a “prisoner’s dilemma” with as many players as there are countries. In such a setting, the players collectively benefit from acting against climate change. However one player can choose to profit from the efforts of other countries without himself lowering his emissions (“clandestine passenger” problem). Aware of this issue, most countries prefer to abandon any effort, at the expense of global optimum. This is also referred to as the tragedy of the “commons.”

The temptation then becomes great for certain governments to put in place unilateral or multilateral actions among a restricted number of nations, especially when this type of approach could benefit from support from national public opinions (Bernauer, Gampfer 2015). We call “club” this type of coalition of countries who together decide to accelerate the setting-up of measures aiming at mitigating climate change or adapting to its effects parallel to the incentive of joining the initial group.

This type of approach is increasingly considered as a potential resolve to the blockage of climatic negotiations, which, effectively, bypasses and discredits the UN process that stemmed from the UNFCCC. First, we will see that the idea of climate clubs actually dates as far back as the UNFCCC itself. We will then draw out the theoretical foundations of recent works on climate clubs before offering a

classification according to the concerned players. Finally we will bring forward a specific club proposal, coordinating the players of the transition around the social value of carbon, and its potential inclusion to the UN process.

1. Climate clubs, the graceful return of an old idea

The idea that a negotiation conducted by too great a number of participants in order to regulate a global public commodity runs a high risk of failing to fulfill its objectives of coordination is not new. From the Conference of Rio in 1992 through the following years setting-up the Conference of Parties at the UNFCCC (later referred to as COP), it was already clearly demonstrated that a multi-state cooperation on climate change could only be guaranteed if every state benefitted from it and could only be stable through time if the condition of such a cooperation went beyond the matter of global climate, by extending it to a technology transfer protocol for example (Carraro, Siniscalco 1993). The ingredients of country clubs are already present: a group of volunteer countries as well as a strong incentive to join the club, uncorrelated to the climate issue.

The signature of the UNFCCC in 1992 in Rio and the subsequent ritual of the COP gives, however, the impression (if not the illusion) that the Convention acts as the well-meaning dictator dear to the neo-classic economic model.⁶⁷ Thus begins the golden age of macro-economic models integrating highly simplified economical and climatic modules, fashioned after the first of the kind, the model DICE developed by William Nordhaus of Yale University (Nordhaus 1993). These models give the illusion of the possibility of a single optimal trajectory of carbon value, which could be reached only by a global tax system or a global market of emission quotas.

With the signature of the Kyoto Protocol in 1997 at the COP3, this approach almost seemed to work. A global mechanism of emission regulation was adopted, on the basis of a tradable permits market between states. But the Kyoto negotiation did not achieve the control of global emissions it was aiming for: developing countries would manage to be free of any constraint on their emissions, in the

67. http://www.lemonde.fr/economie/article/2015/06/23/le-dictateur-bienveillant-et-le-climat_4660071_3234.html

name of the principle of “shared but differentiated responsibility.” The American Senate then refused to ratify the Protocol. China, a developing country at the time of the signature, became, in the first decade of 2000, the biggest emitter in the world while still receiving massive financing within the frame of the Clean Development Mechanism, the structural embryo of redistribution from rich countries to “non-Annex 1” nations. Global emissions were therefore only partially regulated from the official start of the Protocol following the ratification of Russia in 2004 up until 2012.

The UNFCCC did not manage to play the part of the well-meaning planner of the DICE model. It was only the reflection of contradictory interests between economies at highly unequal levels of development, who were unable to make similar commitments in the transition towards a low carbon development (Hourcade, Mathy, Shukla 2005). The strategic game between emerging and developing countries can only function if the developed countries consent to important transfers. Such a financial transfer structure only emerged in 2009 following the Copenhagen Conference, despite the fact that Brazil had already proposed it in 1998 during the COP4. But developed countries have also experienced years of weakened growth and political difficulties justifying such transfers (de Perthuis, Jouvet 2015). The UN process then finds itself in a dead-end.

The obstinate repetition of calls for a global agreement on a single carbon price (de Perthuis, Jouvet 2015; Gollier, Tirole 2015), will not solve this structural contradiction. Similarly, models inherited from the DICE model will not deliver the tools susceptible to break this contradiction (Pindyck 2013). One must analyze, conjointly, the reasons for the COP’s repeated failures to provide a more thorough follow-up to the Kyoto Protocol (Espagne 2014) and the difficulties of economy-climate models to clearly discern and describe the links between economical factors and climatic impacts. Maybe then will we be able to bring forth a strategy of alliances aiming at high climatic control over the medium term.

2. Climate clubs 2.0, what foundation?

The return of recommendations from nation clubs in environmental economy research, symbolized by William Nordhaus' conversion to this idea, is therefore a natural reaction after the disappointment of 20 years of UN negotiations that turned out relatively unfruitful. The different arguments in their favor assume the dispelling of certain hypotheses of the reference model of the “prisoner’s dilemma.” Through increasing levels of critical analysis, they therefore progressively move from the idea of a “common’s tragedy” to that of “climatic co-benefits.”

The first level of criticism rests on the uncertain nature of climate change, which fatally leads to a failure of coordination efforts on the sole issue of climate. Climate change is indeed susceptible to incur non-linear damages on economies. Put differently, from a certain threshold of temperature rise, economic losses would brutally increase due to particularly violent climatic phenomenon. The fear of exceeding a non-linear threshold is an incentive to transform the theoretically non-cooperative game of international climatic negotiation into a collective game in which the optimum predominates. But this favorable result to a climatic negotiation within UN frames fails as soon as is added an uncertainty concerning the level of temperature increase at which such a threshold is reached, an uncertainty which re-establishes a tendency towards an individualistic strategy (Barrett, Dannenberg 2012). The apparent paradox of a global agreement not to exceed 2°C (theoretically certain threshold) in parallel of the absence of a cohesive collective strategy in order to reach that goal (doubts concerning the level of said threshold) could be explained this way. Here, it would not be so much the “prisoner’s dilemma” and the risk of clandestine passenger in the absence of agreement causing the failure of negotiation, but the scientific uncertainty concerning the impacts of climate change, which makes the individualistic or club strategy (Barrett, Dannenberg 2014) more appealing for the players involved.

The second level of criticism admits the impossibility of a constraining agreement for political economic reasons (and not of a difference of beliefs regarding the effects of climate change, as in the first case). The overly great diversity of development levels, the impossibility of agreeing on the sharing of attenuation efforts, the power of lobbies in place constitute as many valid reasons to consider as realistic such

a source of blockage.⁶⁸ The negotiators should therefore turn to negotiation strategies other than an agreement on a temperature threshold, such as, for instance, the use of credible threats (trade barriers) for countries refusing to participate in an ambitious climatic coalition. This approach is the one held by William Nordhaus (2015) in a proposition in 2015 aiming at setting-up a club of countries acting against climate change and imposing a commercial tax on imports to other nations.⁶⁹

The third level of criticism considers that it is namely the framework of the “common’s tragedy” which lead to the failure of regulating emissions on a global scale. Discussions on the sharing of the “climate burden” (Stern 2015) in the name of the “principle of shared but differentiated responsibility” lead to a dead-end between states and ultimately to agreements lacking actual constraining power, such as the Kyoto Protocol. This criticism brings forwards the mutual benefits associated to the actions of emission reduction, in terms of induced innovation, of pollution reduction and human development (Ürge-Vorsatz, Herrero, et.al. 2014). From there on any coalition of players, any club whose objective consist of the mutual benefits of a reduction of emissions must be seen favorably and even receive support (Stewart, Oppenheimer, Rudyk 2013). A great number of small-sized coalitions could even contribute to better climatic policies than the search for a global consensus (Hannam, Vasconcelos, Levin, Pacheco 2015). This new schema of climate policies is *de facto* the most dynamic in the world today, which sees a great number of deals being made on themes in which the topic of attenuation is only a small component, if not an indirect consequence. The initiative of the Climate and Clean Air Coalition launched by the UNDP,⁷⁰ the G7 report of June 2015 on fossil fuels, the conjoint announcement of China and the United-States on climate change in November 2014, and the one between Brazil and the United-States in June 2015 participate in the trend of looking for agreements between a restricted number of countries inserting the issue of climate within a larger set of political and economical stakes. This being said, the sum of all the potential mutual benefits from the measures of environmental mitigation crosses the objective of a temperature rise inferior to 2°C compared to pre-industrial times (Calderon, Stern 2014).

68. The probability that the 2°C threshold will be respected decreases very fast in the current decade (See Fabert, Pottier, Espagne, Dumas, and Nadaud, 2014).

69. And not a carbon tax on trade, which is considered to complicated to put in place for a limited result as an incentive to join the club.

70. United Nations Development Program.

3. Climate clubs 2.0: which players?

The players of climate clubs can theoretically be of three types: States, corporations or individuals. The choice of one or the other of these players or of any combination between themselves is not neutral on the possibilities of success of a coordinated approach on climate issues. We develop further the three ideal types of climate clubs that these types of players suggest.

According to the ideal type of Westphalian club, by bringing together powerful enough countries that represent a considerable amount of global emissions, it would be possible to create an ambitious club, which, by its pulling strength (in terms of commercial sanctions, innovation, military might, etc.), would be capable of bringing with it the other reluctant countries. It is the emblematic approach of William Nordhaus (2015), which rests explicitly on a vision of international relations inherited from the Westphalia Treaties of 1648 to which are generally attributed the fundamental interaction principles between sovereign states.

The Westphalian club does not fit well with the UN process, the latter attaching part of a state's sovereignty through international deals. It is however the UNFCCC process which made possible a great number of important progress in technical fields (REDD measures, CDM, Green Climate Fund, etc.), instigated by essential institutions, whose mere ascent to power and strategic orientation actually default. The Westphalian framework then considers the state as a homogenous unit allowing the establishment of a climatic compromise with other states. Countries undeniably have their own climatic individuality, reflecting preference one could consider as constituent of the economical, social and cultural structure. But one could also form the hypothesis that these specific characteristics regarding climate policies are as much the reflection of the present economical players (consumers, entrepreneurs, dominant economic sectors, among others). The state's preferences in terms of climate policies would then be the reflection of the addition of different economical and social interests.

Therefore, we need to mention the two other ideal types of climate clubs, which we will call Davoisians⁷¹ and Portoalegrians.⁷² Indeed, going from the well-meaning planetary dictator to the well-meaning national dictator (which is implicit in all the proposals of Westphalian clubs) cannot solve any better a problem based essentially on a modification of productive structures, meaning a modification of the organization of work and capital in order to include the climatic constraint. We call the Davoisian clubs those that count corporations as essential pivots of transition, above even the will of States.⁷³ In Portoalegrian clubs, it is individuals, households or social forces that are perceived as the key players of transition.⁷⁴

The attempt at setting-up a carbon tax in France in 2009 shows the extent to which climate policies must account for economic and social players, not to bend to them as it was the case in 2009 with the final abandonment of the project, but to profile and draw potential alliances. It is also permissible to think that this type of alliance of economic and social players has an essential role in international climate negotiations as well (Stewart, Oppenheimer, Rudyk 2013). Considering this, to confer on them an exclusive driving force as Stewart et al.'s proposal does (2013), amounts, inversely, to the Westphalian excess, to neglecting the key role of public power to give credit to any climate agreement and to engage the responsibility of the players involved. The challenge is then to find the right articulation between these three ideal-types: finding the right combination that sources both the credibility of engagement of the Westphalian club, the efficiency in the transformation of productive make-up of the Davoisian club and the creation of a new social fabric as well as the evolution of consumption preferences that characterize the Portoalegrian club. It is the meaning of the proposition presented here.

71. We choose this name in relation to the World Economic Forum organized every year among business leaders in Davos since 1971.

72. We choose this name in relation to the World Social Forum, organized for the first time in Brazil in Porto Alegre in 2001. The WSF has convened civil society organizations every year since then.

73. In this category, we can quote the « Transition through innovation » report for the NGO R-20 Region.

74. Many NGO scan be quoted in this category. Let us just mention Greenpeace et the global scale.

4. Positive carbon pricing as pivot of a climate club

According to the definition put forward by William Nordhaus in his article of 2015, a climate club must fulfill the following four conditions:

The major conditions for a successful club include the following: (i) that there is a public-good-type resource that can be shared (whether the benefits from a military alliance or the enjoyment of a golf course); (ii) that the cooperative arrangement, including the dues, is beneficial for each of the members; (iii) that nonmembers can be excluded or penalized at relatively low cost to members; and (iv) that the membership is stable in the sense that no one wants to leave.

In regards to these conditions, nothing decrees that a club be comprised exclusively of states, as Nordhaus then proposes. Let us go through each of these conditions trying to conciliate them with the necessity to articulate the incentives of the three types of actors, as described in the previous section.

It is of course agreed that **the first point refers to the stability of the climate as a public good** to be preserved.

The members of the clubs must include States, corporations and citizens sensitized or interested in actions of mitigation or adaptation. **The benefit of the arrangement between the club's members must reflect the ambition of the most thoroughly implied players while bypassing the numerous possibilities of blockage stemming from existing productive structures.**

According to us, the benefit must come from a certain type of guarantee on the value of the agreed efforts of decarbonization. In order to rationalize this guarantee, we must quantify, and then highlight, the value of the emission reduction induced by each corporate project, and even each change in behavior within the household. This boost of value, which we will call the social value of carbon (SVC), stems from a political compromise between the players of a club. It is therefore not a market price, but rather what one would call a notional price. This social value of carbon serves as an anchor for the financial aid offered to a club's player. This way,

a low-carbon project could be partially financed through certificates of emission reduction, highlighted at the level of this SVC. The financial sector would accept these certificates as loan repayments, insofar as their value would be guaranteed by the national public power.⁷⁵

The non-members are excluded from the benefits of the club insofar as they can in no way receive such certificates of emission reduction. They are therefore indirectly fined: the financial system will modify its choice of optimal portfolio in favor of low-carbon projects commensurate with the value of the chosen SVC. A direct penalty is added in the form of a real price of carbon, as it is slowly put in place today at a sub-optimal level in an increasing number of countries across the world. This real price of carbon, which reveals itself quite insufficient by itself to redirect the productive investments in the way of the low-carbon transition, is greatly useful within the framework of our club proposal.⁷⁶

Belonging to such a club would be stable insofar as it induces an immediate financial advantage. This advantage diminishes with time, but as the penalty of non-affiliation to the club (the real carbon price) increases, the final outcome remains more or less the same. No member of the initial club has any interest in leaving it, while the benefit of joining the club gets more and more pressing as the real price of carbon increases.

75. See: http://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/bat_notes_danalyse_n24_-_anglais_le_12_mars_17_h_45.pdf and <http://www.cepii.fr/CEPII/fr/publications/pb/abstract.asp?NoDoc=7841> for details on the financial aspects of this proposal for the European Union.

76. First of all, the subvention to low-carbon activities could not be entirely reimbursable by the fiscal resources from the expected boost of activity, so that it would draw out additional fiscal resources as the exercise of warranty by financial players wishing to convert their carbon certificates into money. Then, the set-up, parallel to this process, of a classical tax on carbon converging progressively to the level of SVC in the long term would constitute a credible political signal of the temporary nature of the subsidy system allowing to avoid the institutionalization of new income, be it low-carbon. Finally the contingent nature of the emission reduction measure that can be attributed to a concrete individual project makes the articulation of the social value of carbon and a price of carbon indispensable. Indeed, for many low-carbon projects, the full potential of an emission reduction can only be expressed fully in an environment already confronted to a carbon constraint. The thermal isolation of a building contributes better to emission reductions as the households living in it remember to close their windows. They will be furthermore encouraged to do so in the presence of a carbon price, which will overbill their fuel or electricity consumption from a carbon source. This is valid for all sorts of infrastructure implying a behavioral change from the users.

5. From Paris to Marrakech, or the inclusion of a club mechanism in the UN process

It remains to be seen within which diplomatic framework such a club concept could be best integrated; if it requires new collaboration structures or if the existing institutions could suffice. The COP does not hold mandates in financial matters, but it must be noted that COP21 has managed to associate, more than any other, the public and private representatives of the financial system, whether they are ministers of finance who are now part of the negotiation with foreign affair ministers and environment ministers, the financial regulator, or assurance companies, pension funds, banks, and other entities integrated in the COP21 plan through the Lima-Paris agenda.

From there on out—and there are already numerous appeals to go this way⁷⁷—the formal framework of the COP21 would be appropriate to build the foundation of such a club structure, without requiring overly advanced technical details. This would come first and foremost through the announcement of a value attributed to the acts of attenuation and to their mutual benefits in terms of adaptation. Once such a value is announced, States would see their announcement of INDCs not only as an international diplomacy constraint, but also as an opportunity to create value.

A new insert in the last version of the agreement protocol negotiated ahead of the Paris Conference in Bonn on October 23, 2015 invites us to do just that, by asking us to “[r]ecognize the social and economic value of voluntary mitigation actions and their co-benefits to adaptation, health and sustainable development.” One hopes to preserve this gain during the Paris Conference in order to then develop it within an autonomized technical framework before the COP22 in Marrakech. Could positive carbon pricing be the pivot that reconciles the COP and the climate clubs?

77. See for example: <http://www.cepii.fr/BLOG/bi/post.asp?IDcommuniqu=429>.

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“Finance has to play a much bigger role if large-scale and faster de-carbonization is to occur. The scale of climate investments needed is simply too large a transformation that can be achieved by the two tools currently in play: slow, protracted climate negotiations, limited public monies and hesitant carbon pricing. There is no shortage of savings to finance the needed investments, nor a paucity of technologies. Private investors are waiting for the announcement of some bold public policy frameworks to mitigate private risks and uncertainty.” **Dipak Dasgupta**

“Our challenge is to figure out how the drive towards low-carbon economies can be scaled into an unstoppable movement. We need this if we are ever to get onto the under 2 degree pathway, leading to a future carbon-neutral scenario where humanity is able to prevent at least catastrophic levels of climate change and, in doing so, also move the global economy past its current stagnation mode.” **Alfredo Sirkis**

“The low-carbon transition is actually an opportunity to increase the propensity to invest by indicating where savings should go. It shows why reducing the uncertainty attached to low-carbon investments requires targeted financial devices. The paper then suggests that recognizing the social value of mitigation activities can be the cornerstone of a financial intermediation that bridges long-term assets and short-term cash balances.” **Jean Charles Hourcade**

