Financing Climate Adaptation Measures Using a Credit Trading Mechanism: *Initial Considerations*

By Karl Schultz, Climate Adaptation Works

August 2011

Abstract

Climate mitigation credits have mobilized considerable resources for projects in developing countries, but similar funding to adapt to climate change has yet to emerge. The Cancun Agreements targets up to US$50 billion per year in adaptation funding, but commitments to date have been trivial compared to what is needed. While there are some studies and suggestions, it remains unclear where the money will come from and how it will be disbursed. Beyond this, many development experts believe that the main hurdle in climate adaptation is effective implementation. A framework, based on the polluter pays principle, is presented here regarding the mobilization of resources for adaptation in developing countries using market mechanisms. It is assumed that mitigation and adaptation are at least partly fungible in terms of long-term global societal costs and benefits and that quantifying climate vulnerability reductions is at least sometimes possible. The scheme's benefits include: significant, equitable, and flexible capital flows; and improved and more efficient resource allocation and verification procedures that incentivize sustained project management. Challenges include overcoming political resistance to historical responsibility-based obligations and skepticism of market instruments, and critically, quantifying climate impact costs and verifying investments for vulnerability reduction credits.

Keywords: adaptation finance, adaptation policy, market mechanisms, Climate Investment Funds, financial mechanisms, economic efficiency.

1 Introduction

The explosion in scale of international capital investment in greenhouse gas (GHG) mitigation measures began when the EU Emissions Trading Scheme (EU ETS) incentivized companies with emissions caps to identify low cost emission reduction options. The result has been the development of, and investment in, a variety of projects to generate certified emission reductions (CERs) under the Kyoto Protocol's Clean Development Mechanism (CDM). Approximately 2,500 projects have been registered by the CDM, which by 2012 will result in about 950 million tonnes of carbon dioxide equivalent emissions reductions, worth on the carbon market approximately €11 billion and leveraging much more than that in investment (UNEP Risoe, 2010; Point Carbon, 2011). With the International Energy Agency (IEA) estimating that it will cost an additional US$10 trillion in investment by 2030 to stabilize atmospheric concentrations and avert catastrophic warming, the private sector and indeed most governments accept the essential role of carbon markets in financing climate mitigation (IEA, 2009).

The cost of climate change impacts (CCI), and the investment needed to adapt to climate change, are similarly immense. Studies indicate investment costs could be between $50 billion/year and over $300 billion/year with two-thirds of these costs accruing in developing countries (Parry et. al., 2009). However, an analysis of existing climate funds finds that only about $1.3 billion of international assistance has so far been disbursed or approved for adaptation measures (Climate Funds Update, 2011). While the Copenhagen Accord targets $100 billion/year by 2020 to finance mitigation and adaptation, the known 'new' pledges total only $11.9 billion for the period 2010–2012 and the majority of known funding is for mitigation (Climate Funds Update, 2011; Fast Start Finance, 2011). There is already evidence that some of the pledged funds are reallocations from existing Overseas Development Assistance (ODA) commitments (Adam, 2010).

A debate is raging regarding the sourcing and disbursement mechanisms of the Copenhagen Accord funds (Brown and Kaur, 2009). The Accord notes that funding will come from a 'wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance' and establishes the Copenhagen Green Climate Fund through which a 'significant portion of such funding should flow' (UNFCCC, 2009). A UN High-Level Advisory Group on Climate Change Financing (UN, 2010) has proposed a variety of bold measures, including: taxing carbon transactions, international financial flows, redirecting fossil energy subsidies, and direct government treasury funding. However these suggestions have not yet led to funding decisions and, historically, governmental fiscal transfers for ODA have not met the governments' own commitments (Hamilton and Fay, 2009).

There are currently over 20 funds that manage climate programs. While their mandates and funds management vary and provide much needed support, two general criticisms are that they have high administrative costs and that their collective funding is inadequate (Baca, 2010). Funds typically provide resources (e.g. money, consultants) to national ministries and local governments for specific projects or building capacity. Research has shown that in order to be effective, climate adaptation must focus on local-level issues. Indeed, a major barrier in developing countries is their lack of adaptive capacity due to backlogs in protective infrastructure and services, and limitations in governments' resources and skills (Adger et. al., 2003). In addition, many local governments are unwilling to work with the most vulnerable groups (such as slum dwellers), who they perceive to be part of the problem rather than as valued constituents (Moser and Satterthwaite, 2008). So while top-down financing and implementation has a critical role, adaptation measures may work best when the funders and project developers directly identify, work, and forge agreements, with affected communities.

Alternatives to top-down adaptation finance include: employing indices of vulnerability, to serve as benchmarks for insurance protection that farmers could purchase against severe weather events (Hellmuth et al., 2009); micro-finance facilities, which could resource the small-scale adaptation interventions of some of the most vulnerable households (Agrawala and Carraro, 2010); and government loan and equity guarantees, which could stimulate private investment in adaptation (Brown and Kaur, 2009).

Overall, although the funding on the table is necessary and worthwhile, it looks insufficient for what is needed. Indeed, while climate finance is a hot topic, there are only a few interesting alternatives to top-down funding and implementation. Consideration of the top-down funding structures that have so far been proposed, there is a risk that the resources that are allocated will be inefficiently and unfairly disbursed such that many communities will be left vulnerable to climate change.

Given this rather bleak assessment of the existing top-down options, what alternative mechanism could both raise the needed funds and efficiently mobilize these in a flexible, bottom-up and equitable way?

2 A Proposed Structure for Market-Based Adaptation Financing

Before proposing a market-based scheme to finance climate adaptation, it's important to introduce the four main assumptions that motivate the structure. The first is that the wealthier countries have a responsibility to support climate adaptation in developing countries. The higher income countries' development has been due, in part, to abundant use of fossil fuels during industrialization. Major industrialized nations are responsible for 74% of cumulative emissions from 1850-2000, compared with 10% from the largest-emitting developing nations (CAIT, 2010). Now that the science is robust, linking GHGs and climate change and while accepting that all countries eventually will have to limit their emissions, the 'polluter pays principle', as articulated in international law as Principle 16 in the Rio Declaration on Environment and Development, declares that "national authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of Pollution…." (UN, 1992). In other words, industrialized countries have a responsibility to pay for climate adaptation in the developing world.

A second assumption of the proposed structure is that decisions between financing mitigation or adaptation in developing countries are at least somewhat fungible and that to optimize results, they may often be made by a well-regulated market. To accept that only a certain level of warming is tolerable (e.g. 2°C), emissions must unequivocally decline to reach atmospheric GHG concentrations (e.g. 350 ppm) consistent with this level. Beyond this point, however, the theoretical global net social welfare utility can be achieved through the use of either adaptation or mitigation measures. Market players will make the most economically rational decisions to efficiently allocate scarce resources in addressing climate change.

The challenges to creating a market-based scheme include ensuring that it transparently, efficiently, and flexibly provides quantifiable and verifiable incentives, resulting in real and additional greenhouse mitigation and climate vulnerability reduction for poor communities. The third assumption is that quantifying vulnerability reduction is possible, at least in some key areas such as flood defence, the provision of water for human consumption and agriculture, and measures to prevent landslides destroying human settlements and transportation infrastructure. Over time, quantifying vulnerability reduction will improve for a wider variety of interventions.

The final assumption of the proposed structure is that a trade-able credit mechanism can improve the economic efficiency of climate adaptation (Baumol and Oates, 1971). Market-based environmental schemes, such as trade-able environmental permits, have been shown to provide cost savings, over non-market mechanisms, of between 50-90% (Tietenberg, 1985). Other research considering the variety of mechanisms (allowances, offset credits, etc.) have considered the efficiency benefits, but that certain conditions must apply to optimize these efficiency gains (Stavins, 2003). Efficiency gains may not occur if transaction costs are high, if there is insufficient monitoring and enforcement, if there is the possibility for market power, or if there are un-internalized externalities (Tietenberg, 2002). While program design may manage all of these concerns, and non-market regimes may also fall prey to these issues, credit mechanisms in the environmental area have also faced criticism for a variety of political, social and ethical reasons. For example, Bührs (2010) argues that such credit mechanisms are inherently unethical because they neither stigmatize nor punish polluters who harm both people and their environment.

It is assumed here that other policies will limit future emissions, and that the principal risks to the proposed scheme consist in poor program design. As such, a review is warranted of the tools, players, proposed framework and of how the framework could be tested, followed by a discussion of design challenges.

The tools of this framework include:

- Emission allowances for polluters: a cap and trade scheme (C&T), and,
- Emission reduction credits and Vulnerability Reduction Credits (VRCs): offsets applicable for this compliance regime.

The players include:

- Industrialized nations with obligations based on their cumulative emissions to reduce emissions or reduce climate vulnerability in developing nations,
- Developing nations who will approve and host vulnerability reduction projects,
- Third-party project developers, investors, technology providers who together may provide the exogenous resources to reduce vulnerabilities,
- Communities in developing countries where vulnerability reduction activities are identified, negotiated, and undertaken,
- Third-party validators of projects for registration and verifiers of vulnerability reduction for crediting,
- International body to register projects, issue credits, manage an international credit transaction log, determine CCI costs, and set rules on baseline and monitoring methods.

The proposed framework applies the four assumptions and mobilizes the preceding tools and actors to form a demand and supply for VRCs as follows:

Demand creation:

1. Calculate cumulative emissions for industrialized countries.
2. Estimate and periodically revisit the future 100-year, cumulative costs of climate change impacts (CCI) for developing countries. Periodically redefine 'developing countries'.
3. Based on (1) and (2), calculate the CCI/t of CO_2 equivalent emissions.
4. Wealthy countries need, in the next 100 years, to pay back developing countries for all of their cumulative emissions by further reducing their own emissions, securing international emission reduction credits or emission allowances, or gaining VRCs from adaptation measures in developing countries.
5. VRC credit issuances are calculated, based on periodic assessments of the expected value of the CCI, for the remainder of the 100-year obligation. This incentivizes polluters seeking credits to identify, fund, and manage the most beneficial projects over time.

Supply creation:

1. Countries may finance these measures directly through government treasuries or delegate their obligations to a third party, such as an emitting facility.
2. Developing countries must review and approve all projects, and may create policies on the allocation of VRC funds. Countries may allow third parties (e.g. municipalities, private companies) to sell VRCs directly from the projects they own.
3. An international body runs mitigation and VRC credit registries, accredits third party validation and vulnerability reduction verification auditors, approves project registrations, and issues credits.
4. Adaptation measures are registered, based on reasonable baseline estimates (at project, program, or sector levels), and credits are issued based on activities resulting in additional reductions in vulnerability to climate change.
5. Calculations and issuance of the emission reduction credits may follow existing (e.g. CDM) or new approaches.
6. Issuance of VRCs follows verification by third party, accredited auditors of the estimates of the percentage effectiveness reduction in the vulnerability costs. The number of VRCs issued is based on this percentage and any changes in the residual average costs/t of global CCIs for the remainder of the 100-year obligation noted in the demand creation process.

Table 1 (see at the end of this article) uses a hypothetical case to illustrate the system in practice. Refinements should be made to the demand and supply methodologies based on further research.

This approach to issuing VRCs provides incentives for investors to sustain their projects as credits are only awarded after a project has demonstrated it has, for a defined period, reduced vulnerability to the impacts forecast in the design document. However, the project does not have to risk the possibility that project-level impacts of climate change differ from those expected in the project design document. Rather, third party accredited auditors will review monitoring reports on the ability of the investment to protect against the forecasted changes for the past period (e.g. year) that the project is seeking VRCs, not the actual climatic conditions and impacts.

A proposed pilot project might be the best approach for policymakers to gain empirical evidence and know-how prior to scaling up. Volunteer emitters from industrialized countries could be identified in order to engage with an auditing/engineering company, project developer, or investor to implement a relatively simple project. Based on what works and what does not, improvements to the scheme could form the basis of an international framework.

3 Challenges and Issues in System Design

The two most challenging demand side issues are first, getting developed countries to accept responsibility for the damage their historical emissions have caused to developing countries and second, estimating the CCI cost in them. Establishing an accepted global CCI cost estimate is both an analytical challenge (owing to omissions, double counting, scaling-up from limited empirical data, separating out climate impacts from others, see Argawala and Fankhauser, 2008) and a political challenge. Many studies have focused on adaptation costs rather than impact costs, or combined adaptation with residual impacts. As such, the proposed framework will benefit from improved global climate impact cost assessments. Political decisions need to be made. But to maximize CCI integrity, estimates would perhaps be best undertaken by the Intergovernmental Panel on Climate Change (IPCC).

On the supply side, creating baseline and monitoring methodologies for project level vulnerability reduction is challenging and sometimes impossible. Downscaled climate scenarios are essential, as are sound empirical estimates of the vulnerabilities and costs. Costs may be under counted as some are not easily quantified. However, by encouraging and implementing a pilot program a global regime of baseline methodologies can be formulated, one that may be improved based on project experience. The CDM, for instance, has resulted in the periodic revision of 203 baseline methodologies (UNFCCC, 2011). These methodologies will also provide a wealth of data to aid in improving global CCI cost estimates.

If VRC issuance is too low to justify investment, or there are project and country risks, the VRC trading scheme may not finance certain critical adaptation measures. While it does not matter where climate mitigation takes place to reduce global warming, the benefits of adaptation are mainly local. If there is a risk that a VRC market may ignore certain areas, countries, or project types, then both non-market measures and careful management of the VRC market are warranted. For instance, measures must be taken to ensure that, neither vulnerable communities in the least developed countries nor countries with corrupt or inept governments are ignored and simply because it is easier to work in middle-income countries with good governance regimes. This particular challenge is not unique to market-based adaptation finance and applies, equally, to the use of centralized funds. Thus, it is overcoming these investment disparities may be better achieved through the use of market approaches rather than the top-down funding of governments.

Regulatory certainty is also important and encourages private sector investment. The financing regime should include a commitment that VRCs can be issued for registered projects for the anticipated project lifecycle.

Furthermore, VRCs should only be issued for those projects that directly help the poor and materially vulnerable in developing countries. It would be improper for VRCs to be issued for investment in a port facility that only benefits international shipping conglomerates rather than in a storm drainage system that reduces flooding in a poor urban neighborhood. As such, the VRC market could have positive or negative lists of project types, or provide extra VRC issuances for projects meeting certain project-type, per-capita income or other criteria, to incentivize priorities or provide a more equitable distribution of VRC generating investments. Governments in developing countries need to be incentivized to encourage direct engagement between developers, investors and vulnerable communities. Moreover the registration process must ensure transparency.

In many cases, using conventional public-financing mechanisms or targeted debt and equity guarantees is the only way to fund certain projects or programs. Clearly resources must be mobilized for non-market interventions, in areas such as disaster preparedness, public health initiatives, and civil service capacity building.

One approach to incentivize pro-poor adaptation activities is the quantification of vulnerability reduction, based on average costs for a similar project in an industrialized country. This would overcome the risk that the poorest communities may be ignored due to the lack of exposed economic assets. In addition, it may also help to address the 'development deficit', while maintaining the kind of cost efficiencies that a credit scheme offers (Bührs, 2010). To the extent that CCIs, but also adaptation costs per capita, are lower in least developing countries, and vulnerability reduction potential - per capita, if not based on asset protection, is most significant in poorer communities, this approach would create a greater incentive to support projects for the poor in the poorest countries, overcoming many of the (potentially greater) investment risks and challenges.

Some of the palpable benefits of the scheme thus include the potential for project-based VRCs to overcome or avoid some institutional barriers (e.g. the hostility of local government to supporting adaptation investments in informal settlements) the creation of incentives that provide direct benefit to the community involved, and the very involvement if the community itself. Companies (especially when they have caps on their emissions in industrialized countries), and third-party developers and investors will be highly motivated to identify and engage with communities where there is significant, and relatively low cost, vulnerability reduction potential. A rigorous VRC issuance regime will force them to maintain a keen eye on their projects if they wish to reap benefit; the result will be accountability and sustainability. As the finance does not need to be funneled through any particular organization, such as a local government that is hostile to vulnerable communities, funds can go where they are needed and, relatively speaking, where they should be well spent.

There is a risk that a disproportionate share of the investment is allocated for mitigation rather than adaptation. This should be avoided as there is a morally compelling need and obligation stemming from the polluter pays principle to finance adaptation in developing countries. The proposed credit mechanism offers an opportunity to effectively meet much of this need so system design should strive to incentivize adaptation.

A potential 'supply release mechanism' could be incorporated into the scheme to ensure that a minimum level of finance is allocated to adaptation, using conventional financing mechanisms (e.g. grants to government programs). Such a mechanism could be triggered for a given period, if the share of mitigation reduction credits exceeded a certain level such as 65% of all credits. At this point the capped entity could be required to pay, at the estimated adaptation cost/t, into a fund that could then allocate resources towards adaptation measures using grants, loans, or other means. Alternatively, as noted above, market regulations could be imposed creating greater issuance of VRCs per verified expected vulnerability reduction value. This latter measure could be undertaken in a flexible manner to target specific countries or project types, or be adjusted for the market as a whole.

4 Conclusions

As with the case of climate mitigation, the use of market mechanisms alone to reduce vulnerabilities to climate change is insufficient. Even with the most cleverly designed schemes, funds cannot be allocated to protect all vulnerable communities or all natural systems. However, this is a problem for all financing alternatives. Requiring that polluters pay to reduce vulnerabilities is probably the fairest or most equitable approach. In addition, the proposed scheme promises to be flexible and efficient. It is also perhaps the best way to raise funds and does not risk the so-called 'donor fatigue' that plagues overseas development assistance.

To the author's knowledge, this is the first published paper on the design of a market-based vulnerability reduction crediting mechanism and it therefore constitutes a first step of an essential process of multidisciplinary research and debate on the economics, policy framework, and technical alternatives for baseline and crediting methodologies. Future key areas of work include: applying the lessons of project-based mitigation credit schemes; considering criteria for imposing cumulative emissions obligations; better understanding the extent to which supply and demand for adaptation investment is stimulated through the international framework and national policies; identifying the most appropriate project types; creating appropriate baselines and methodologies for measuring vulnerability reduction values; improving understanding of climate change impact costs and risks; modeling and performing scenario analyses against the alternative design options; and, coming up with governance and implementation frameworks at international, national, and community levels. A pilot scheme could address all of these issues.

The Higher Ground Foundation
- stand up to climate change

References:

Adam, D., 2010, 'Climate fund 'recycled' from existing aid budget, UK government admits. Move appears to contradict repeated government pledges that climate aid would be additional to existing aid programmes,' *The Guardian*, 25 January [available at http://www.guardian.co.uk/environment/2010/jan/25/climate-aid-uk-funding].

Adger, N., Huq, S., Brown, K., Conway, D., Hulme, M., 2003, 'Adaptation to climate change in the developing world', *Progress in Development Studies* 4(3), 179-195.

Agrawala, S., Crick, F., Jetté-Nantel, S., Tepes, A., 2008, 'Empirical Estimates of Adaptation Costs and Benefits: A Critical Assessment', in: S. Agrawala, S. Fankhauser (eds), *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments*, Organisation for Economic Co-operation and Development, Paris, 29-84.

Agrawala, S., Carraro, M., 2010, 'Assessing the role of microfinance in fostering adaptation to climate change', Environment Working Paper No. 15, Organisation for Economic Co-operation and Development, Paris.

Baca, M., 2010, 'Call for a Pilot Program for Market-based Adaptation Funding', *International Law and Politics* 42, 1337-1381.

Baumol, W.J., Oates, W.E., 1971, 'The Use of Standards and Prices for Protection of the Environment', *Swedish Journal of Economics* 73, 42-54.

Brown, J., Kaur, N., 2009, 'Financing adaptation: matching form with function', Background Note, Overseas Development Institute, London.

Bührs, T., 2010, 'Sharing the atmosphere: A proposal for an equitable and sustainable global trading scheme for greenhouse gas emissions', Center for the Study of Globalisation and Regionalisation Working Paper 264/10, Department of Politics and international Studies, University of Warwick, Warwick.

CAIT (Climate Analysis Indicators Tool)), 2010, Version 3.0, World Resources Institute, Washington, DC

Climate Funds Update, 2011, 'Overall distribution of funds: December 2010', Climate Funds Update [available at: www.climatefundsupdate.org].

Fast Start Finance, 2011, *Contributing countries*, Fast Start Finance, The Netherlands [available at: www.faststartfinance.org/content/contributing-countries].

Hamilton, K., Fay, M., 2009, 'A Changing Climate for Development', *Finance & Development* 46(4), 10-12.

Hellmuth, M.E., Osgood, D.E., Hess, U., Moorhead, A., Bhojwani, H. (eds), 2009, *ANNEX Index insurance and climate risk: Prospects for development and disaster management*, IRI Technical Report 10-10, Climate and Society No. 2. International Research Institute for Climate and Society (IRI), Columbia University, New York, USA.

IEA (International Energy Agency), 2009, *World Energy Outlook – 2009*, Organisation for Economic Co-operation and Development/International Energy Agency, Paris.

Moser, C., Satterthwaite, D., 2008, *Towards pro-poor adaptation to climate change in the urban centres of low- and middle-income countries*, Climate Change and Cities Discussion Paper 3, iied Human Settlements Discussion Paper Series, International Institute for Environment and Development, London.

Parry, M., Arnell, N., Berry, P., Dodman, D., Fankhauser, S., Hope, C., Kovats, S., Nicholls, R., Satterthwaite, D., Tiffin, R., Wheeler, T., 2009, *Assessing the Costs of Adaptation to Climate Change: A Review of the UNFCCC and Other Recent Estimates*, International Institute for Environment and Development and Grantham Institute for Climate Change, London.

Point Carbon, 2011, *Point Carbon's OTC Price Assessments*, Point Carbon, Oslo, Norway [available at www.pointcarbon.com].

Stavins, R., 2003, 'Chapter 9 Experience with market-based environmental policy instruments', *Handbook of Environmental Economics, Volume 1*. 2003, 355-435.

Tietenberg, T., 2002, 'The Tradable Permits Approach to Protecting the Commons: What Have We Learned?', Working Paper No. 36. 2002, Fondazione Eni Enrico Mattei (FEEM), Venice, Italy.

UN (United Nations), 1992, *Report of the United Nations Conference on Environment and Development (Rio de Janeiro, 3-14 June 1992), Annex I: Rio Declaration on Environment and Development*, United Nations, New York [available at http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm].

UN (United Nations), 2010, *Report of the Secretary-General's High-Level Advisory Group on Climate Change Financing*, United Nations, New York [available at www.un.org/climatechange/agf].

UNEP Risoe, 2010, *CDM/JI Pipeline Analysis and Database*, United Nations Environment Programme Risoe Centre on Energy Climate and Sustainable

Development, Roskilde, Denmark [available at www.cdmpipeline.org].

UNFCCC (United Nations Framework Convention on Climate Change), 2009, *The Conference of the Parties Takes note of the Copenhagen Accord of 18 December* 2009, Decision 2/CP.15 Copenhagen Accord, UNFCCC secretariat, Bonn, Germany [available at http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=4].

UNFCCC (United Nations Framework Convention on Climate Change), 2011, *Approved Methodologies by Scope*, UNFCCC secretariat, Bonn, Germany [available at http://cdm.unfccc.int/Statistics/Methodologies/ApprovedMethPieChart.html].

Illustration:

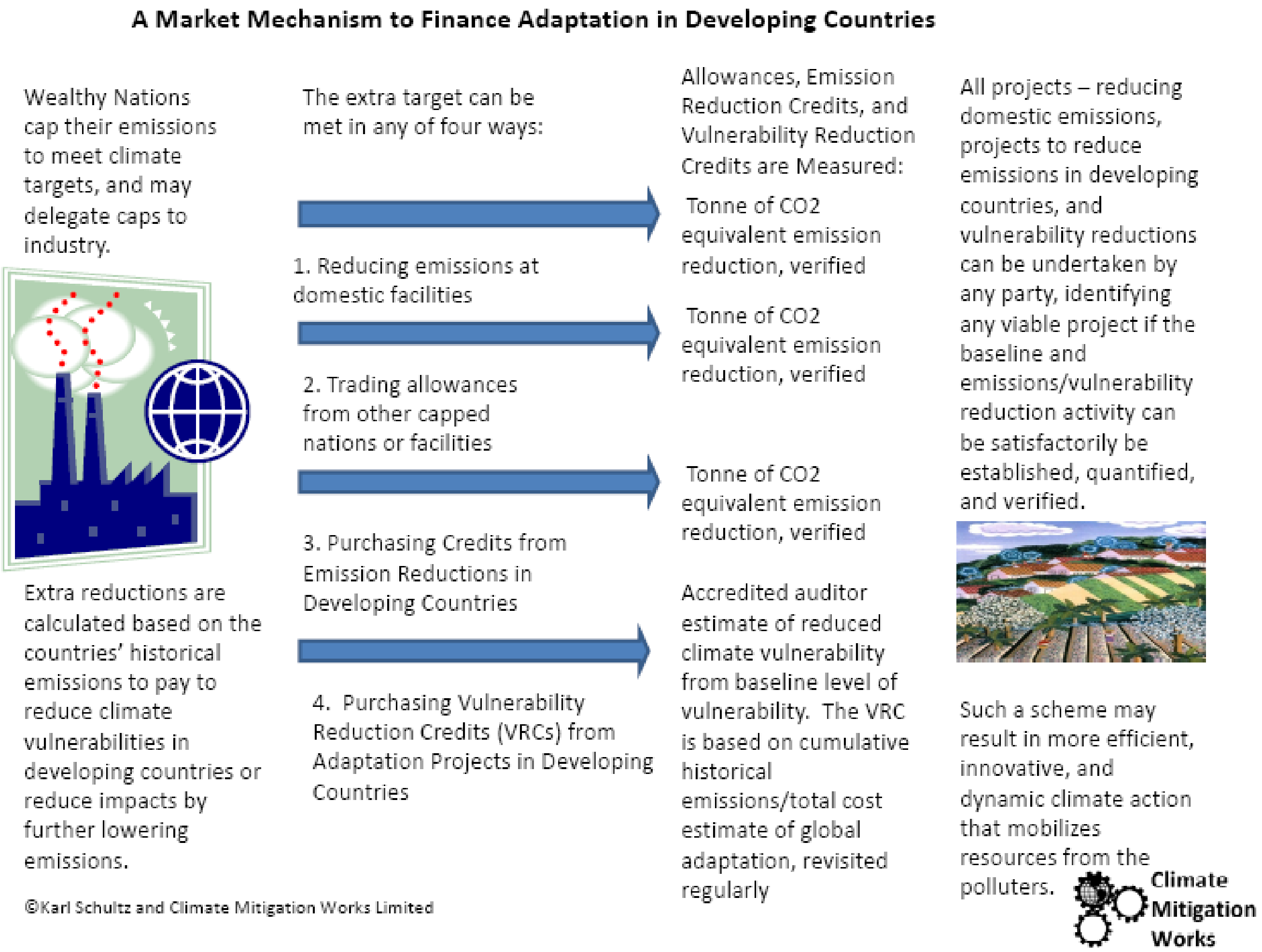

Table 1:

Table 1. Hypothetical Case of Vulnerability Reduction Credit (VRC) Project		
	Quantity	**Calculation**
Demand Drivers		
Global cumulative emissions, 1850 – 2000	1 trillion t CO_2e	
Wealthy Countries	750 billion t CO_2e	
Developing Countries	250 billion t CO_2e	
UN official estimate of developing country climate change impacts (CCI) costs	$200 billion/year	Average costs (that in practice would probably be broken down into periods). By year two this declines by 1% to $198 billion/year
100 year CCI costs	$20 trillion	100 years x $200 billion/year
Developing Country costs/t CO_2 equivalent caused by wealthy country emissions	$26.67/t CO_2e	$20 trillion/750 billion t CO_2e
Example of Wealthy Nation Liability and System: The "United European Principate" (UEP):		
Cumulative emissions 1850 -2000	60 billion t CO_2e	
UEP may for each year: • reduce its emissions by these 60 billion t/100 years (=600 million t), • secure allowances from other wealthy countries, • reduce emissions in developing countries, • secure VRCs reduce the expected value costs of climate vulnerability by 600 million t x $26.67/t = $16 billion, or, • a combination of the above. UEP chooses to reduce allowances by 600 million/year by facilities covered under an existing emissions trading scheme and have industry figure out how it will comply.		
Example of Company Covered by UEP's Compliance Scheme: CoalWindEnergy (CWE), an electric utility		
CWE baseline emissions	1.1 million t CO_2e	
CWE allocations under existing emissions trading scheme	1.0 million t CO_2e	
Further reduction under historical emissions retribution regime	0.1 million t CO_2e	
CWE total allocations	0.9 million t CO_2e	1.0 million t CO_2e – 0.1 million t CO_2e
Total emission "deficit"	200,000 t CO_2e	Of which 0.1 million t CO_2e must be met through existing ETS allowances or mitigation credits
CWE actions for the year:		
Reduce own emissions:	50,000 t CO_2e	Reduces coal burn by efficiency improvements and introduction of biomass
Purchase of allowances and emission credits	75,100 EUAs and CERs	
Purchase of VRCs:	74,900	From storm-drainage project in large city in a developing country

The VRC Producing Project: Storm drains Project is for an informal settlement in a large secondary city. The settlement already suffers flooding and contamination of ground- water leading to health problems; both problems will increase with sea-level rise and more severe weather caused by climate change.		
Design document estimate of vulnerability reduction costs caused by project:	$1 billion over 50 year project life	This is reviewed an formally validated by a UN accredited vulnerability reduction auditor
Year one: UN accredited verification of % vulnerability protection from estimate in design document	94%	Verification showed that portions of drainage system not properly constructed and results in some storm-water exiting into community
VCRs issued for year one:	74,900 VCRs	1 year/50 year project life x 94% expected vulnerability reduction/$26.67 Climate Change Impact cost (CCI)
Year two % vulnerability protection:	104%	The above faults were fixed and extra maintenance resulted in protection exceeding design document's estimate
99 year future average Climate Change Impact costs (CCI) estimate, calculated in year two:	$198 billion/year average	A surge of adaptation investments and improvements in impact modelling result in a 1% drop in estimated impact costs/year. 99 years because first year of 100 years retribution "paid" by wealthy countries
Year two CCI/t:	$26.4/t	99 years x $198 billion/year/(750 billion t CO_2e – 1/100 years/750 billion t CO_2e)
Year two VRC issuance:	79,572	$2,000,000 x 104%/26.14/t
To consider project economics:		
Opportunity cost:	Allowance price = $50 Credit price = $45	
Life cycle cost of storm drainage project:	$15/VRC	