



# A new market-based climate change solution achieving 2°C and equity

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Current climate change strategies seem increasingly incapable of averting planetary catastrophe. The United Nations (UN) strategy places responsibility for CO<sub>2</sub> reduction on governments, but governments by nature seek lower burdens. Moreover, arbitrary, ambition-based pledges seriously fail to produce what science tells us is necessary to achieve any identified climate target. In addition, climate financing holds little hope as increasingly dire fiscal circumstances are to persist for decades. The time has come to seek a new effective system before it is too late. Such a system would cap global emissions with a global carbon budget that achieves the adopted target. The most cost-effective plan is to put a global price on carbon, which can be accomplished by creating a global upstream carbon market. In such a market system, a limited amount of allowances would be sold to polluters. It would achieve the target most cost-effectively, raise new revenue from the sales of allowances which would help vulnerable countries in their energy transition and low-carbon sustainable growth. © 2014 The Authors. *WIREs Energy and Environment* published by John Wiley & Sons, Ltd.

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## INTRODUCTION

Any international agreements on climate change must achieve a specific temperature target. They must be goal-oriented instruments. The new agreement the governments are negotiating for 2020 and thereafter should at very least be consistent with the globally held objective of limiting the average global

temperature increase to not more than 2°C above pre-industrial levels. Can the current government-centric strategy do it?

## GAME CHANGE IS NEEDED...

The current emissions reduction system under the United Nations Framework Convention on Climate Change (UNFCCC) is unlikely to achieve this objective because of its government-centric nature. It places responsibility for CO<sub>2</sub> emissions reduction on governments. Why is it unlikely to achieve climate objectives?

The answer is simple: governments by nature and by structure seek lower burdens. In the current national abatement system, increased ambition means increased loss of added values for economies. Therefore, all governments try to lower mitigation costs. Contrary to the intentions of the agreement drafters, the system reduces rather than enhances governments' ambitions. It shoots itself in the foot.

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If it is made less rigid and more flexible, as several countries have recently suggested,<sup>1</sup> it would encourage governments to increase their commitments. Public scrutiny and peer pressure would likewise force them to pledge more ambitiously.

Even with those modifications, though, the system remains disconnected from science. As long as the UNFCCC scheme allows governments to arbitrarily pledge what they deem appropriate and not consistent with what science would identify as indispensable, there is a clear risk of the agreement not achieving temperature targets. An ambition-driven, government-centric, arbitrary pledging system risks continuous disputes and will hardly solve the climate change problem.

Furthermore, most economic actions and transactions are currently handled in the market. A government-centric national abatement system forces governments to manage, regulate, control, and command their economies. It requires a larger bureaucracy. It is less efficient and more costly than letting the market work. In a globalized world, a costly exception is hardly tolerated.

The government-centric national abatement system was introduced by the Kyoto Protocol to reduce GHG emissions by 5% in Annex I countries.<sup>2</sup> Even with such a modest objective, the system is not a success. It never meant to deal with the emerging 'gigaton gap'.<sup>3</sup> If the international community is serious in their struggle against global warming, it must revisit the government-centric system and scrutinize its validity and capacity for overcoming the planetary threat.

A search for more effective and credible solutions should be started. One must begin asking a basic question: why is global warming occurring? It results simply from firms, investors, and consumers excessively polluting the atmosphere by burning more fossil fuels and producing more CO<sub>2</sub> than the planet can sustainably manage.

Today, science is telling the world that there is a limit for global CO<sub>2</sub> emissions if the world adopts targets such as 2°C increase.<sup>4,5</sup> Based on science, a practical solution would be to cap global emissions. The most effective system is to contain global emissions within the established limit and not to allow governments to pledge whatever they can.<sup>6–10</sup>

If we accept this principle, the atmospheric carbon budget becomes a new scarce commodity. Today, all scarce commodities are put into the market to allow all those who wish to use them to pay for and acquire them so as to produce goods. As the price of iron ore is embedded in the price of a car, consumers defray the ultimately passed-on and embedded price of such scarce commodities. We should manage the

carbon budget in the same manner. There is hardly any reason not to do so. All those who wish to burn fossil fuels must pay for their emissions. Consumers must in turn defray the passed-on and embedded price for the emissions.

If firms, investors and consumers of carbon products are made to pay, they will pollute less and change to low- or non-carbon economic system.<sup>11</sup> Market and price will be more cost-effective than governmental actions in bringing the economic system to low- and non-carbon levels.

## A NEW UPSTREAM GLOBAL CARBON MARKET WOULD DO THE JOB...

A new upstream global carbon market would achieve all the aforementioned objectives (See Box 1). Since the carbon budget is a global asset reserved for all humanity, an assembly of all governments would manage the entire process which goes simply as follows.

### BOX 1

#### KEY ELEMENTS OF THE PROPOSAL

An assembly of all governments of the world would:

- agree to achieve temperature target such as 2°C,
- decide to cap global emissions with the carbon budget of xxxGTCO<sub>2</sub> for 2020–20xx,
- put collective property right on such budget,
- establish a digital upstream global carbon market,
- sell the carbon budget as allowances by auction and by installments,
- force all upstream providers of fossil fuels of all countries to buy allowances before they provide such fuels to downstream combustions,
- earn new revenue from such sales,
- decide how to use such revenue, and
- establish a compliance system to eliminate frauds.

First, the assembly of governments would decide on the temperature target (e.g., 2°C) and the corresponding long-term carbon budget in its declining pathway (e.g., for 2020 through 2050). Then the assembly puts collective property right on the budget and sells them in the form of allowances in the digital global market via auction and by installments. The

assembly enforces upstream providers of fossil fuels, i.e., importers and domestic extractors of those fuels of all countries to buy allowances. Domestic extractors are those who provide fossil fuels to national consumptions. Upstream providers of fossil fuels would, by commercial logic, pass the price on to the downstream economy. Thus the carbon price would be integrated and embedded in the global economy. The assembly obtains revenue from the sale of allowances giving birth to a new form of climate financing.

This is a new international system that achieves adopted temperature target most cost-effectively. The temperature target would be achieved because the assembly of governments would not issue an allowance exceeding the adopted carbon budget. The carbon price in this system is globally uniform and explicit. It is genuine and credible as it comes from global market forces: global supply of the limited carbon budget and global combustion demands of fossil fuels.

The new system disposes of the carbon budget in the global market where firms decide to emit or not to emit depending upon their capacity to produce added values in comparison to the uniform carbon price. As the system would theoretically remain in force for the next 3–4 decades, it provides firms, investors, and consumers with the necessary long-term trend of the carbon price which is bound to rise with the depleting carbon budget. Firms are free to emit CO<sub>2</sub> as long as the carbon price allows them to make profits. They can emit and grow as long as they are sufficiently efficient to produce added values under the prevailing carbon price.

The explicit and rising cost of CO<sub>2</sub> emissions are crucial for the economy to shift to the low- and non-carbon system. The upward trending price would drive firms and investors to invest in energy efficiency and switch to low- or non-carbon production systems. All necessary technology investments would be implemented not because of the manipulative price interventions of governments but because of global market-based carbon pricing.

The carbon pricing system is the key tool most world economists and climate experts have been advocating as indispensable for achieving climate goals.<sup>12–16</sup> A carbon tax can produce similar results.<sup>17,18</sup> The difference between carbon tax and the upstream global carbon market is that the latter is capable of directly limiting emissions within a set of carbon budget for the adopted temperature target.<sup>19</sup>

The carbon market would achieve the most cost-effective use of the carbon budget if it is designed as a global system. The global market would expand

the scope and diversity of low-cost use of the carbon budget, ensuring the maximum value-added production in participating economies. The global market offers a complete level playing field for all firms, investors, and consumers. The uniform carbon price would eliminate competitive distortions and carbon leakage. Furthermore, a global market minimizes price volatility because supply and demand for allowances would be global and less dependent on a short term economic outlook.

Another central feature of the global market system is the upstream nature of the market.<sup>20</sup> In this plan, the assembly of governments would force upstream providers of fossil fuels in all countries to buy allowances when they introduce fossil fuels into the downstream economy. The upstream providers buy allowances in the global digital carbon market and surrender them to Designated National Offices (DNOs) when they introduce those fuels into the downstream national economy. After the authorization is given by those national offices, the upstream providers would, by commercial logic, pass the carbon price on to the downstream economy.

Thus, carbon price would be integrated in the global economy as all carbon products contain part of the upstream carbon price.<sup>21</sup> With the carbon price embedded in all carbon products, consumers bear a portion of the carbon cost when they buy those products.

The upstream carbon market would relieve governments from obligation to reduce emissions of their firms and consumers. There would be no need for governments to regulate, control, command, and intervene in their carbon economies. As a result, there would be an end to comparability disputes over each government's emission levels. Climate integrity would become highest as the need to resort to off-setting mechanisms would be eliminated. The market operates under the same rule and same numbers globally, eliminating arbitrary measurements and calculations. In this scheme, 1 ton of CO<sub>2</sub> is 1 ton of CO<sub>2</sub> everywhere in the world.

The upstream global market solution is compatible with individual requirements of different national circumstances. Because the solution is price-driven and not volume-driven, it imposes no volume-wise emissions constraints upon governments and firms. The uniform carbon price does not alter existing competitive relationship among different industries and sectors both in national and international contexts, and it encourages all firms that wish to excel in global competition on the basis of their comparative advantages.

The upstream global carbon market solution is a top-down system because it sets the temperature targets globally. But the rest of the system is entirely a bottom-up process where all individual firms, investors, and consumers would make business decisions based upon the carbon price and price signals. Bottom-up only systems devoid of temperature targets cannot achieve any goal. All climate change strategies must have top-down temperature targets for them to be serious.

The application of the carbon budget is imperative in achieving an energy transition in the possible new era of abundantly available fossil fuels because of fracking and the shale gas revolution. Energy transition to a low-carbon economy will probably not be achieved without a numerical cap on the global combustion of fossil fuels. Statements favoring aggressive efforts and drastic measures for energy transition are insufficient unless they are tied with measures and actions that achieve numerical targets.

## NEW SOLUTION FOR CLIMATE FINANCING

Successful climate change strategies must provide solid solutions for climate financing for developing countries and resolve other problems, such as replacing old energy infrastructures, in both developing and developed countries. They must provide sufficient financing for technological innovations. The proposed upstream global market solution provides new major financial resources to meet these requirements.

It can do so because in this proposal the assembly of governments is the owner of the carbon budget. The assembly therefore sells allowances by auction worldwide every year, obtains revenue and channels them to meet those as well as other requirements.

The new climate financing approach is a built-in and annually replenishing system derived from the annual sale of emission allowances. The financing does not rely on treasuries of governments. It comes from polluters' global payments for the limited carbon budget.

It is the assembly of governments that would make all decisions on climate financing. It would negotiate and agree on how to distribute the newly acquired revenue. Governments will have diverse views about how the fund should be distributed. A variety of equity criteria has been developed.<sup>22,23</sup> Yet, in the climate change negotiations, nothing is definitive until governments come to an agreement. There are no pre-ordained *ex ante* criteria.

In view of an indisputable consensus for scaling up the provision of short- and long-term financing

for developing countries, the assembly would in all likelihood decide to distribute the major part of that revenue to those countries. This proposal offers a new solution for equity in the form of a built-in and annually replenishing financing of major magnitude.

The assembly of governments could additionally decide to utilize international financial institutions, such as the World Bank, JEF, Green Climate Fund (GCF), AfDB, IDB, and ADB, as custodians of those funds so that they make sure the funds must be used most properly and efficiently in the developing countries.<sup>24</sup>

The new built-in financing mechanism would help developing governments so that their consumers and industrial sectors could cope with the rising carbon price. Governments of developing countries could assist their firms and investors in purchasing most modern technologies for their quick energy transition. They would invest in adaptation and provide basic energy services to their local communities. They would also invest in building capacities of their people and institutions to address global warming.

Furthermore, the new financing mechanism could help all countries to replace outdated energy infrastructures. It would also enhance investments in innovative technologies such as carbon capture and storage (CCS).

Overall, the new financing mechanism would be a major, credible, and constant source of grant money that would enable all countries, developing as well as developed, to achieve sustainable clean growth. By providing a new major climate funding to developing countries, the proposed upstream global carbon market solution would create strong new demands for renewable energies, pull down their prices, and quicken global energy transition.

This climate financing represents no explicit bilateral transfer of resources from one country to another. All those who burn fossil fuels, use a part of the carbon budget and draw benefits from their emissions must bear the cost of their polluting actions regardless of nationality. Their payments carry no sovereign identity, especially as globalized international trade involves consumers of one country buying products made using CO<sub>2</sub> emissions of other countries and vice-versa.

Today, climate financing holds little hope in the UN system. It will become even less probable as nations experience interminable fiscal difficulties. Apparently innovative funding must be sought. In this era of fiscal difficulties, a large sum of new money cannot be raised unless we force all those who pollute and profit from their emissions to defray the costs of

their polluting actions. The upstream global carbon market solution achieves this objective.

## EASY VERIFICATION AND SMALL OPERATION COSTS

The management and operation of the upstream global carbon market, including verification of fraudulent emissions, are straightforward. It requires no cumbersome global structures, let alone a 'world government'. It needs only the assembly of governments making basic decisions and a small and efficient bureaucracy monitoring the digital market that operates as follows.

The assembly of governments, on the basis of their agreement, would issue a limited amount of allowances with coded serial numbers. The assembly would agree to force all upstream providers of fossil fuels of all countries to buy allowances and surrender them to the DNOs of each country when they provide fossil fuels into their downstream economies. The DNOs authorize upstream provision of fossil fuels only when surrendered allowances match their carbon contents. Upon authorization, DNOs would notify the assembly and all DNOs of all other countries that allowances with coded serial number xx-xxx-xxx were duly surrendered. All transactions would be done instantaneously via the Internet.

This verification system would have to be further developed to ensure that the fossil fuels introduced into downstream utilization are within the carbon budget issued by the assembly of governments. Furthermore, the assembly would have to establish a most elaborate fraud-prevention mechanism as well as

sufficiently severe penalty system to deter fraudulent sale and utilization.

This plan is neither unwieldy nor a global machine that challenges any nation's sovereignty. It is a lean, effective, and integrated system with far lower operation costs than the current strategy. For a climate change system to endure for the next several decades, it must be a consistent system that eliminates disputes among governments.

## CONCLUSION

The proposed system intends to reduce costs of mitigation for all countries by turning the burden sharing game to revenue sharing one.<sup>25,26</sup> A climate solution should not restrain any nation's growth perspective, be it developing or developed. Burdening some countries more severely than others is a self-inflicted and mutually ruinous strategy in the present and coming era of increased interdependency.

An old institution that took its basic concept from the spirit and dynamics of the 1960s should not govern the system of 2050 and beyond. A far better and more enlightened strategy would be able to change our system, do away with the classic division of obligations between categories of nations, allow firms to emit within the carbon budget, force all polluters to pay for the use of the scarce budget, permit sale revenue to save vulnerable countries from energy poverty so that those countries emit less and produce more. This system would be a way to achieve a thriving worldwide low- or non-carbon economy and achieve equity. Future generations will suffer if we fail to stop global warming by not emancipating ourselves from old ideas.

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