The price of carbon: ways forward after COP-21

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Because the climate is a common good, economists generally advocate the use of an international carbon price to internalize climate risk, to incorporate as many countries as possible into an agreement and to thwart "free-rider" strategies (Appendix 1). There are two main ways of moving in this direction: allowances markets and taxation. Their implementation entails respecting certain basic economic principles, but also taking into account the lessons provided by twenty-five years of carbon pricing experience around the world.

1. Lessons learned from allowances markets

Over the past twenty years, the instrument of allowances markets has been successfully used in the management of local pollution and fisheries. For CO_2, it has been deployed:

- **In the framework of voluntary initiatives** (Chicago Stock Exchange, Shell and BP). This failed due to insufficient constraint on the cap and for lack of liquidity in the markets.

- **In the context of the Kyoto Protocol by applying it to countries' emissions**. This too proved unsuccessful. When countries had a problem of compliance, they first negotiated, then withdrawn from the system upon the failure of the negotiations (Canada, Australia, Japan following Fukushima, etc.). It would therefore be unrealistic to repeat the experiment by seeking to build a "super-Kyoto" from the contributions submitted by governments in the run-up to the Paris Conference (INDCs – Intended Nationally Determined Contributions).

- **In order to control domestic emissions at least cost**. This has been the most developed experiment to date, with the EU Emissions Trading System, markets in North America, and pilot schemes in China and South Korea. Because of the lack of coordination, however, each public authority is concerned that a too high carbon price affects its competitiveness. This situation leads to systems where the complexity of administrative rules fails to mask the lack of ambition in terms of emissions reduction and the price level. The fragmentation of these markets has a high cost from both the environmental and economic standpoint.

Various initiatives, for example those taken by the World Bank and the International Trading Emissions Association (IETA), are seeking to establish linkage mechanisms between these different markets. Yet if the markets are linked in their current state, there is a risk of downward convergence, with weaker carbon prices and greater complexity. The right approach for a more ambitious goal would be for the five parties concerned (the EU, China, Korea, USA and Canada) to agree to form a "club", aimed at establishing a transcontinental market by 2020 operating with enhanced objectives and strengthened governance. This club of five would account for nearly 60% of global emissions (Appendix 2).

The **project mechanisms** developed under the Kyoto Protocol have enabled more than $100 billion in low carbon investments to be mobilised, mainly in emerging countries. Their impact on emissions is difficult to assess because of the windfall effects for project developers and for the host countries not subject to a carbon

constraint. Their development was interrupted by the fall of the price of credits on the European market. Hence the proposal to revive such mechanisms on the basis of a "notional price" of carbon, guaranteed by governments and refinanced through monetary channels. Complex to implement, this system is liable not to send the right signals to host countries, which may even be encouraged to inflate their emissions to obtain more credits. If introduced, such a mechanism would benefit from integration into the international carbon price & rebate (bonus-malus) system presented below.

2. Lessons learned from taxation experiments

In view of the difficulties encountered in the implementation of allowances markets, a growing number of economists (Nordhaus, Stiglitz, Stoft, Weitzmann) recommend organizing negotiations among countries around the carbon price rather than on emission caps. The idea would be that countries agree to form a "club" pledging to apply a minimum carbon price, for example by introducing domestic carbon taxes at the same rate. This return to favour of taxation among economists is also evident at the IMF and the OECD.

Three lessons have been learned from the introduction of carbon taxes:

- The only taxes introduced have been at a national or sub-national level, the European carbon tax project (1991-1997) having been abandoned because of national resistance (and the unanimity rule required for any tax decisions in Europe);

- In countries where the tax works well, there is predictability of the tax in the medium-term, but exceptions to the principle of price unity (Sweden and other Scandinavian countries, and more recently France and Ireland). With the exception of the Swedish case, these taxes remain at levels below those recommended by economists or calculated by the IPCC to limit warming to 2°C;

- Questions around the domestic redistribution of the tax dominate the debate, since the principle that works best involves using most of the revenues to lower other taxes and to target what economists term the "double dividend".

In most proposals for international carbon pricing through taxation, each participant in the club applying the tax retains the management of its proceeds. If a common customs tariff was introduced by the club, as some suggest, the impact would also be recessive for the least developed countries. The issue of redistribution between countries, the crucial aspect of any climate agreement, is therefore transferred to other instruments. Yet it is desirable to link the two components – carbon pricing and international redistribution – as proposed by the carbon price & rebate approach.

3. Priming global carbon pricing with a carbon price & rebate mechanism

To prime the pump and enhance the credibility of INDCs, we propose examining a carbon price & rebate mechanism, in accordance with the following logic.

- Countries with a higher than average per capita emissions level would have a debt with regard to the global community, calculated on the basis of their excess average per capita emissions multiplied by their population;

- Countries with a per capita emissions level below the world average would have a symmetrically calculated claim. The condition for advancing this claim would

be that they agree to participate in the independent emissions monitoring, verification and reporting (MRV) system under the aegis of the United Nations;

- The initial price level would be dependent on the high emitter countries' willingness to pay. A price of $1/tCO$_2$ would transfer more than $10 billion a year to the least developed countries. A price of $ 7/tCO$_2$ would fund annual transfers of $100 billion. The choice of reference years strongly impacts the type of transfers generated (Appendix 4).

Negotiating a mechanism of this kind would have several advantages.

- It would immediately provide a strong economic incentive to bring the majority of developing countries into the common MRV system, thereby facilitating the consolidation process of INDCs during the five-year review phases.

- It would introduce a single equity criterion, namely the equal rights of the world's citizens to emit greenhouse gases, which would be more operational than the ambiguous formulas used in the negotiations;

- It would give credibility beyond 2020 to the promises of financial transfers to the least developed countries, by setting up a recurring public equity contribution from a new resource, that is clearly additional to existing flows.

- It would encourage, when fully operational, countries to reduce their emissions faster than average so as to reduce penalties or increase their benefits (bonuses), depending on their initial situation. Thus a country that is a beneficiary of the system at the outset would lose its bonus in the event of too rapid an increase in its emissions.

This priming system could change later, for example by lowering the reference threshold initially chosen (average emissions per capita) and by increasing the price applied. With the reduction of the threshold, a growing number of countries would be liable to a penalty and the system could evolve toward a global tax, especially if attempts to consolidate carbon markets made in parallel do not bring the expected results.

4. The role of carbon "reference values"

In view of the difficulty of implementing effective carbon pricing, some advocate agreeing on "reference values" or "notional prices" of carbon. Such notional price trajectories can be reconstructed from economists' work on the "social cost" of carbon (Appendix 5). Their use offers several advantages.

- It provides a metric allowing the comparison of different INDCs and the underlying efforts of each country.

- It sets common reference values for the introduction of effective carbon pricing in the real economy.

- It introduces an indispensable criterion for directing flows of public aid to the development of the low-carbon economy.

- It provides a common benchmark for public and private investment decisions. This would help companies in using voluntary internal carbon prices to help them implement low carbon strategies, while making redundant the idea of "sectoral carbon prices". In the financial sector, applying notional prices to assets will not re-orient global investment flows, but may enhance the credibility of responsible investment approaches.

It seems to us, however, that these notional prices are merely reference values that cannot replace effective carbon pricing. If we really want to limit the risks of warming above 2°C, it is not fictitious prices that must be applied to greenhouse gas emissions, but real prices.

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Appendix 1. The three economic principles of the call launched by the Climate Economics Chair and Toulouse School of Economics

FOR AN AMBITIOUS AND CREDIBLE CLIMATE AGREEMENT IN PARIS

Climate negotiations at the United Nations have not substantively addressed the root cause of climate change from an economic perspective.

The climate is a planetary public good shared by all. Every ton of CO_2eq (CO_2 and other greenhouse gases) released destroys that resource in equal measure. A transition to a low carbon economy requires policies that put a price on carbon, so that economic actors account for the damage to the climate from their emissions. If the Paris summit is to take any convincing action against the consequences of climate change, it has to build a cooperative structure with strong economic incentives, based on three principles:

Principle 1

All nations should ultimately face the same CO_2eq price

Principle 2

Carbon pricing must incentivize universal participation

Principle 3

"Free-rider" behaviour has to be curtailed

The immense challenge of the COP-21 is to build a cooperative framework that is attractive to as many countries as possible. This framework's credibility depends on designing economic incentives that have a global impact. The economists who have signed this call wish to map out feasible solutions by presenting public policy-makers with this shared assessment of the causes behind current obstacles faced by the negotiations.

Source : https://sites.google.com/a/chaireeconomieduclimat.org/tse-cec-joint-initiative/call

Appendix 2. CO_2 emissions (excluding land use) by the top 20 emitter countries (2012)

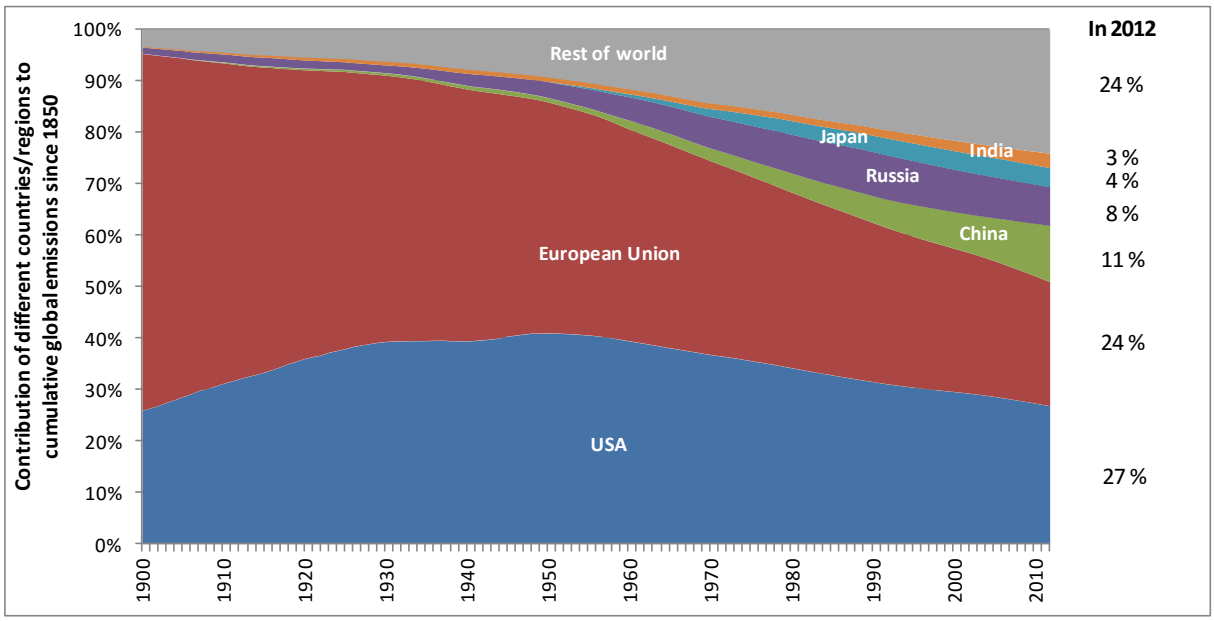
		CO2 emissions in 2012 (MtCO2, excluding land use)	Proportion of global emissions in 2012	Cumulative proportion up to the country considered
1	China	9 313	28%	28%
2	USA	5 123	15%	43%
3	European Union	3 611	11%	53%
4	India	2 075	6%	59%
5	Russia	1 722	5%	65%
6	Japan	1 249	4%	68%
7	South Korea	617	2%	70%
8	Iran	594	2%	72%
9	Canada	543	2%	73%
10	Saudi Arabia	480	1%	75%
11	Brazil	478	1%	76%
12	Mexico	460	1%	78%
13	Indonesia	456	1%	79%
14	Australia	391	1%	80%
15	South Africa	383	1%	81%
16	Turkey	332	1%	82%
17	Ukraine	286	1%	83%
18	Thailand	273	1%	84%
19	Kazakhstan	234	1%	85%
20	Egypt	220	1%	85%

Source: CAIT database, WRI

Note. The inclusion of emissions from land use (deforestation and specific agricultural emissions) significantly changes the rank of the major forest countries, particularly Brazil and Indonesia.

Appendix 3. The contribution of different areas of the world to the accumulation of CO_2 in the atmosphere

Cumulative CO_2 emissions (excluding land use) since 1850:



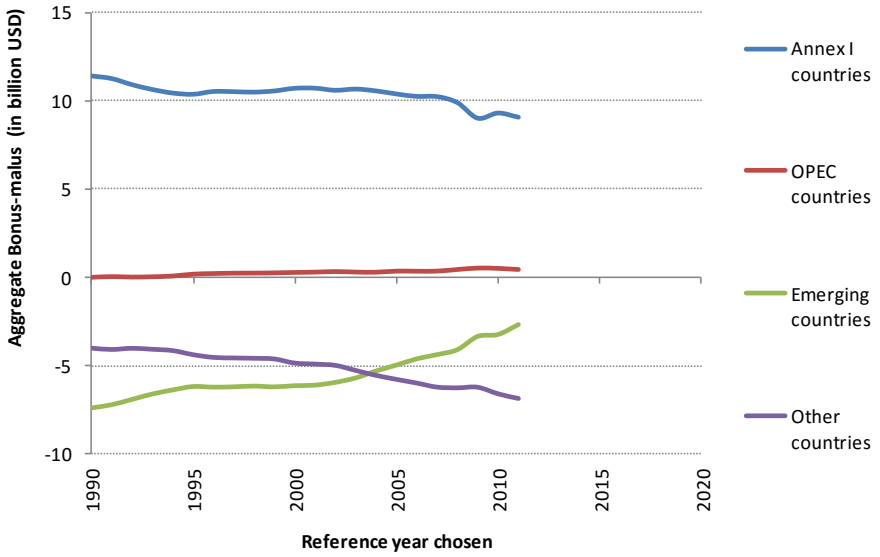
Source: Climate Economics Chair, from CAIT database, WRI

Note. Emissions from international transport by air and boat are not included. Taking them into account would increase the proportion of the "Rest of the world".

Appendix 4: Contributors to and beneficiaries of a carbon bonus-malus at $1/tCO$_2$eq 2011

	Total emissions (MtCO2eq)	Population (Million)	Emissions per capita (tCO2eq/person)	Bonus-Malus at 1$/tCO2eq (Million dollars)
TOP 10 contributors				
USA	6,550	312	21.0	4,590
China	10,553	1,344	7.9	2,099
Russia	2,374	143	16.6	1,475
European Union	4,541	503	9.0	1,377
Japan	1,307	128	10.2	504
Canada	716	34	20.9	500
Australia	563	22	25.2	423
South Korea	688	50	13.8	375
Saudi Arabia	533	28	19.2	358
Iran	716	75	9.5	241
Other contributors	4,495	399	11.3	1,985
Total contributors	*33,036*	*3,038*	*10.9*	*13,927*
WORLD	**43,413**	**6,903**	**6.3**	**0**
Top 10 recipients				
India	2,486	1,221	2.0	-5,194
Bangladesh	129	153	0.8	-833
Pakistan	308	176	1.8	-800
Nigeria	325	164	2.0	-708
Indonesia	835	244	3.4	-699
Philippines	150	95	1.6	-448
Ethiopia	125	89	1.4	-438
Vietnam	274	88	3.1	-278
Congo Dem. Rep.	172	64	2.7	-230
Tanzania	73	46	1.6	-218
Other recipients	5,501	1,524	3.6	-4,081
Total recipients	*10,377*	*3,864*	*2.7*	*-13,927*

Evolution of transfers following the reference year

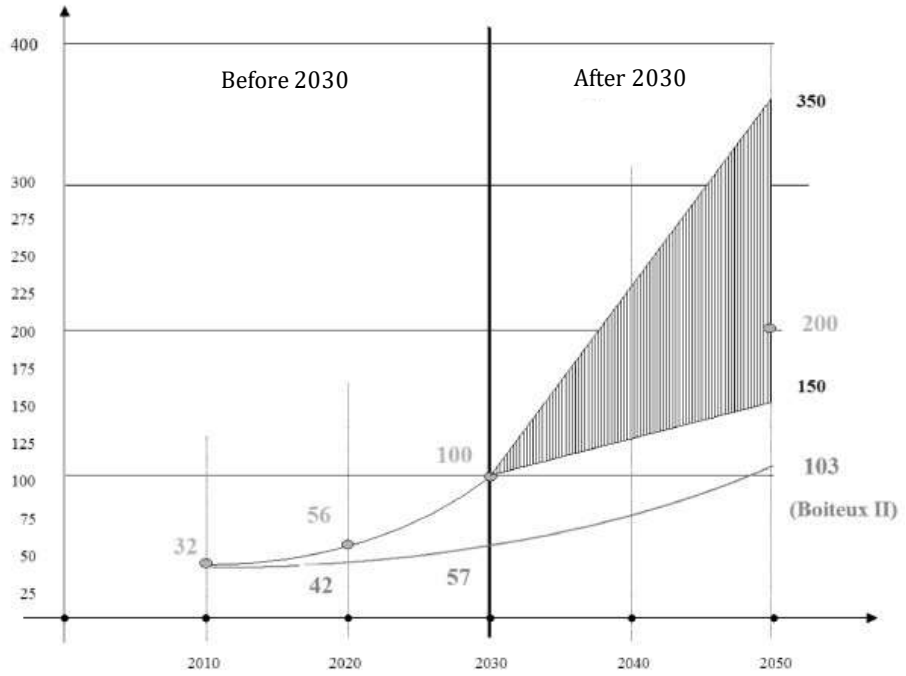


Source: Climate Economics Chair, from WRI data

Appendix 5. Estimations of the social cost of carbon

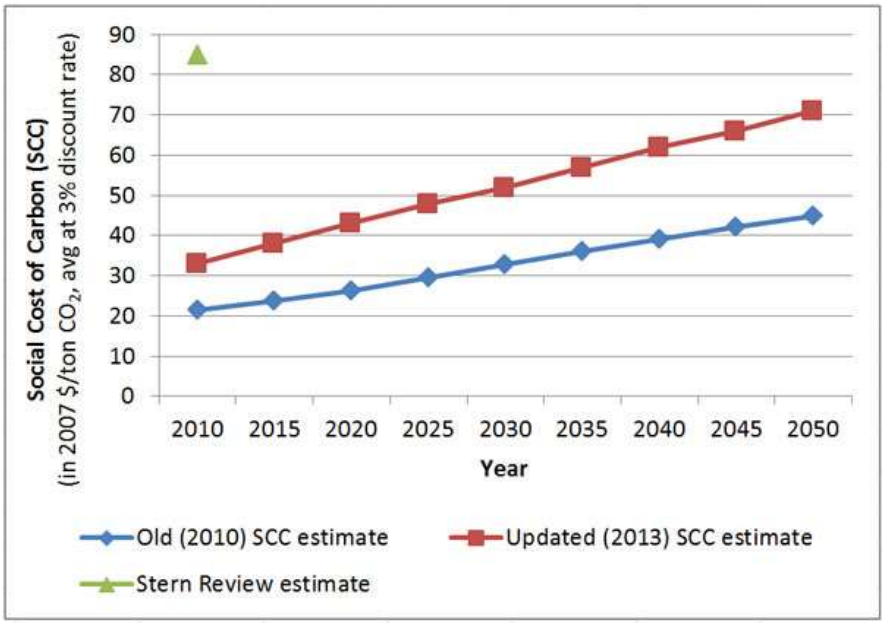
A/ French estimated carbon price associated with the "Factor 4" goal in 2050

Price per tonne of CO_2 in euros



Source : Quinet Report

B/ Estimated social cost of carbon in the United States from the "cost/benefit" method



Source: Interagency WG on Social Cost of Carbon, US Government, 2013