

## Carbon Pricing for a Climate Coalition

Jean TIROLE

TSE and IAST

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*The Rio conference in 1992 took note of a radical paradigm shift, recognizing that the atmosphere's ability to absorb our greenhouse gas emissions had become an important threat to our well-being. For many years, Jean Tirole has argued that international negotiations pay only lip service to the economic dimension- that users of the environmental scarce resource should be forced to internalize the cost they impose on society- , and that the international community procrastinates. More precisely, he emphasizes that carbon policies must embody the basic principle of a single carbon price, and that the choice of instruments and the scope of the agreements condition not only the minimisation of the economic costs of reducing emissions but also the long-term acceptability and therefore credibility of policies. Eight questions to him to assess the current issues and challenges in carbon pricing, for national and global policies.*

### **Why should carbon pricing be the anchor of climate policies, at the national and international levels?**

There is of course uncertainty about political developments, technological progress and climate science, but in the most likely scenario, containing the increase in the world's temperature to 1,5 /2°C will be a really challenging task. The COP 21 agreement embodies laudable ambitions: warming should now stay "well below 2°C" and by 2050 the world should no longer produce net greenhouse gas (GHG) emissions; after 2020, funds for developing countries will exceed the 100 billion dollars level a year that was fixed in Copenhagen in 2009.

Unfortunately, despite the diplomatic success (or because of it<sup>1</sup>), the compromise falls short of the goal. And indeed no head of state returned from Paris saying to his/her fellow citizens that the country had to take costly short-term steps to reduce emissions. The Agreement

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<sup>1</sup> For instance, convincing Saudi Arabia and Venezuela to sign up implied deleting any reference to mandatory carbon pricing.

*“notes with concern that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within least-cost 2 °C scenarios but rather lead to a projected level of 55 gigatonnes in 2030, and also notes that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2 °C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5 °C above pre-industrial levels (...)”.* Yet little tangible has been acted upon, that could put our planet on a better path. And here economics, which was largely set aside at the conference, can shed light on which strategies have the best chance at success.

Climate change is a global commons problem. In the long run, most countries will benefit from a massive reduction in global warming. Unfortunately, there are powerful incentives to leave the burden of reducing greenhouse gas emissions to others. Consider a country that, say, represents 1% of the world population and whose exposure to climate warming is average. That means that when spending 100 € today to obtain environmental benefits tomorrow, it pays 100% of the cost of its virtuous policy and recoups only 1% of its benefits. Imagine a saving vehicle in which when you save 100 €, 99 € would go to third parties' savings accounts, and so you would receive only the return on the remaining 1€. No wonder free riding in global environmental matters prevails.

Things are slightly more complicated than this simple saving analogy suggests. On the more optimistic side, several factors concur to alleviate the free riding incentive. Co-benefits of pollution abatement provide incentives for some action: most notably, the emission of local pollutants (SO<sub>2</sub>, NO<sub>x</sub>...) together with global ones (SO<sub>2</sub>) by coal-fired power plants provides countries with (purely selfish) incentives to curb emissions; and the pressure of domestic and international public opinions provides incentives for further action, even though, to be certain, some window dressing is involved.

On the more pessimistic side, the free riding generated by the lack of collective action is aggravated by concerns about leakages (the fact that environmental benefits are smaller than the level of emission reduction in the country, as activity moves to low-carbon-price countries, through price effects, through relocation or through a shift in industrial market share) and by the desire to receive compensation in future negotiations (as high polluters are usually “rewarded” in international agreements through transfers or a generous allocation of tradable emission rights, so as to get them on board).

Since the emission of a ton of greenhouse gases causes the same environmental damage, wherever, whenever and however it is emitted, a single global price for CO<sub>2</sub> should guide public and private agents in their investment, production and consumption decisions. This encourages polluters to take all available steps to reduce emissions which cost less than that price, guaranteeing that we get the “best bang for the buck”, namely the highest environmental benefit for our collective sacrifices.

### **Could alternative policies be used to achieve pollution abatement?**

Yes, other policies than a price approach are available. But they are likely to be more costly, which should concern us as countries already balk at taking the necessary steps to do what it takes to save our planet. By contrast with the economic approach of confronting economic agents with a price signal, “command-and-control” approaches (source-specific emissions limits, standards and technological requirements<sup>2</sup>, uniform reductions, subsidies/taxes that are not based on actual pollution, vintage-differentiated regulations, industrial policy....) often imply wide discrepancies in the implicit price of carbon put on different emissions. For other pollutants, this has been shown empirically to lead to substantial increases in the cost of environmental policies. To understand why, imagine that agent A emits two tons of CO<sub>2</sub> and faces abatement cost 100 \$/tCO<sub>2</sub>, whereas agent B also emits two tons and faces an abatement cost of 10 \$/tCO<sub>2</sub>. A “fair” policy of proportional pollution reduction to reach a target of reducing pollution by half would cost society 110 \$, while focusing the effort on agent B would cost only 20 \$. This is clearly a misallocation of mitigation efforts (the abatement cost is 550% of what it should be). Similar illustrations could be provided for each of the command-and-control policies cited above.

A number of countries have attempted to reduce GHG emissions through direct subsidies to green technologies: generous feed-in electricity tariffs for solar and wind energy, bonus-malus policies favoring low-emission cars, subsidies to the biofuel industry, etc. For each green policy one can estimate its implicit carbon price, i.e., the social cost of the policy per ton of CO<sub>2</sub> saved. OECD studies have shown that these implicit prices vary widely across countries, and also across sectors within each country. In the electricity sector, OECD estimates range from less than 0 to 800 € In the road transportation sector, the implicit carbon price can be as large as 1,000 € in particular for biofuels.

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<sup>2</sup> Standards and technological requirements can be effective policies, provided that the implicit price of carbon be calculated and be roughly in line with that involved for other policies.

The high heterogeneity of observed implicit carbon prices is a clear demonstration of the inefficiency of this command-and-control approach. Similarly, any global agreement that would not include all world regions in the climate coalition will exhibit the same inefficiency by setting a zero carbon price in non-participating countries, even leaving aside leakage issues. Yet, carbon pricing, recommended by the vast majority of economists and many policymakers, has been light-heartedly discarded by the negotiators despite initiatives in this area by different actors urging countries and companies to put a price on carbon emissions.

Proposals for a differentiation of the carbon price among countries, sectors or economic agents ultimately increase the cost of abatement and reduce consumers' purchasing power. Such discriminations, 'motivated' for example by the absence of replacement technologies or the short-term inelasticity of demand, confuse the objective of compensation with that of efficiency. Furthermore, sectoral negotiations complexify the problem in many ways: they require reaching international agreements in N different sectors; they intensify lobbying activities as each sector mobilizes to obtain a favourable treatment; and they are bound to deliver a wide variety of carbon prices driven mainly by the political power of sectoral lobbies.

A carbon pricing system that differentiates among countries similarly would open up a Pandora's box (who pays what?). But above all it would be environmentally unfriendly. Future increases in emissions will come primarily from emerging and poor countries; underpricing carbon in these countries will prevent the achievement of the climate goal, all the more that setting a high carbon price in developed countries will push GHG emitting productions to relocate to countries with a low carbon price, thus obliterating the efforts of rich countries.

### **Where do we stand after the Paris Agreement?**

The carbon pricing approach, though solid in theory and validated in practice for other pollutants has not been embraced by the world's governments (it was embodied in the Kyoto protocol, but with a number of design flaws that led to the complete demise of the protocol). Rather, the "pledge-and-review" mechanism has been confirmed in Paris, with countries only registering their voluntary determined, intended climate actions. In my view this approach is doomed to prolong the waiting game.

First, the pledge-and-review strategy lacks the efficiency of a coherent carbon price. Second, the absence of any binding commitment limits its credibility and makes it very tempting for countries to renege on their pledges. Third, even if pledges are credible, they suffer from the free-rider problem. Thus, the agreement pushes back the concrete commitment deadline for countries to reduce their emissions.

The pledge and review strategy - *Intended Nationally Determined Contributions (INDC)* – has won through. The promises are incomparable, they are insufficient, they would be costly if implemented, and it's a safe bet that, given they are unbinding, they will never be implemented fully anyway. The summit's negotiations on transparency itself are also a failure; it's hard to fathom why southern hemisphere countries are not to be subject to the same monitoring, reporting and verification than others. The rich countries must be generous, not bury their head in the sand. Lastly, the idea that we will adopt a more virtuous path by revising individual goals every five years ignores what economists call the ratchet effect: are we so sure that a country will put itself in a better negotiating position in the future by blithely respecting its promises rather than "dragging its feet"?

Ambitious green fund commitments from developed countries must go hand in hand with a mechanism capable of achieving climate goals. Conversely, we cannot ask Southern countries to make the necessary efforts without appropriate and credible compensation. It takes two to tango.

### **Is there a best way to implement a carbon price policy?**

There is no perfect political-economy solution to climate change, which wraps economic efficiency in a politically convenient package. But the world could do much better than the current policies.

There is a debate among economists as to the proper way of implementing carbon pricing. The problem is complex and economists can reasonably disagree on the specifics. And so the jury is still out. But this division among economists is really second order as any of the proposed implementation definitely dominates the current approach.

A carbon tax, collected by individual countries, looks a far more effective tool than voluntary pledges. Countries could be required to impose the common price as long as all others do too, and domestic revenues from the tax could be recycled internally. Transfers to developing or

reluctant countries, such as through the Green Climate Fund, would address concerns about fairness.

Unfortunately, the enforcement of a carbon tax agreement may be problematic, because governments have strong incentives to turn a blind eye toward domestic polluters (remember that they could already impose such a tax now, and they by and large do not): they can underestimate their pollution, or to compensate them by other means such as coal subsidies or tax cuts on fuel. We know from other experiences that foreigners cannot easily impose stringent tax collection when a country is reluctant to strengthen it.

By contrast, the enforcement of an international mechanism based on the *quantity* of national emissions is relatively straightforward. In a cap-and-trade carbon scheme, the international agreement sets a number of tradable permits in conformity with the 1,5 /2°C objective (the “remaining carbon budget”) and allocates these permits to participating countries. The cap-and-trade approach combines the efficiency of the carbon tax with easier enforcement. All one must do is monitor a country’s CO<sub>2</sub> emissions.<sup>3</sup> It is also consistent with subsidiarity<sup>4</sup>. A market for these permits would ensure that a single carbon price emerges from mutually beneficial trades. A country would purchase additional permits when its national emissions exceed its allowance, and any surplus permits could be sold.

Of course, cap-and-trade schemes must be properly designed, as the experience with the European Union's phase-I emissions trading system for example demonstrates. A well-designed trading mechanism must be based on a simple principle: sending the right signals to players. To achieve this, its horizon must correspond to that of companies in their investment choices, in their research programme, or that of households in their decisions regarding housing and transportation; a necessarily long horizon. Unlike the European Union ETS system, it should be possible to trade quotas in futures markets with a horizon of up to thirty years. There are many other features of proper cap-and-trade systems that must be attended to.

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<sup>3</sup> Cf. « Negotiating Effective Institutions against Climate Change », with Christian Gollier, *Economics of Energy and Environmental Policy* (2015).

<sup>4</sup> Another scheme that allows subsidiarity is the carbon price mechanism described by Peter Cramton, Axel Ockenfels, and Steven Stoft in “An International Carbon-Price Commitment Promotes Cooperation” *Economics of Energy and Environmental Policy* (2015).

## **What can we do now for the extension of carbon pricing? What should be the next steps?**

The bleak picture painted above should not shadow the reasons to be optimistic. Firstly, public awareness of climate issues has increased in recent years. Secondly, all countries at COP 21 recognized the extent of the problem and presented trajectories of their pollution, a symbolic progress on Kyoto in 1997. Second, more than 40 countries, and not insignificant ones (USA, China, Europe ...) today run cap and trade systems, albeit with too generous ceilings and therefore very low carbon prices, but nonetheless demonstrating a willingness to use a rational policy against global warming. These carbon exchanges could one day be connected together to form a more coherent and efficient global market, although the "exchange rate" question will be touchy. We need to build on this momentum.

While it is important to maintain a dialogue at the global level, the UN process has shown its limits. Negotiation among 195 nations is incredibly complex. We need to establish a "Climate Coalition", including from the offset current and future major polluters. I don't know whether this should be the G20 or a smaller group (for example, the five biggest polluters, Europe, the US, China, Russia and India, representing 65% of global emissions).

Finally, negotiations should be simplified by separating simple measures (which should be adopted) from the real crux of the negotiation. The fight against global warming is not so much an economic problem (oversimplifying, we know what to do: price carbon), than a geopolitical one. The difficult, but unavoidable, questions relate to the enforcement of the agreement and to the financial transfers among countries. Let's stop beating around the bush.

## **What are the solutions to improve commitments' credibility?**

Sovereign borrowing raises concerns about countries' commitment to repay creditors because sanctions for defaulting are limited. Similarly, even if a good agreement is reached on climate change, it must still be enforced. Naming and shaming should be encouraged but has limited effects as we have seen with the Kyoto Protocol "commitments". Countries can always find "excuses".

There is no bulletproof solution to the problem of enforcement, but at least two instruments should be used against countries which break – or do not want to join- climate agreements. First, the WTO should treat low carbon prices as a form of dumping, leading to sanctions.

Non-participating countries should be punished with border taxes administered by the World Trade Organization. Besides designing an effective policy, the “coalition members” would try to convince the WTO to introduce an environmental-dumping-based border tax on countries refusing to impose a high carbon price. To be certain, this would be an extra strain added on the WTO, but the shortage of instruments unfortunately leaves little choice.

Second, non-compliance should commit future administrations and should be treated like sovereign debt. In a cap-and-trade system for instance, a shortfall of permits at the end of the year would add to the public debt of the offending country. The conversion rate would be the current market price.

### **How can we overcome redistributive or equity obstacles?**

Wealth inequalities at the domestic and international levels are often invoked to dismiss uniform carbon pricing. The problems raised by wealth inequalities around the world are indeed ubiquitous. On the one hand, if poor people emit proportionally more CO<sub>2</sub>, carbon pricing will worsen inequality starting today. On the other hand, poor people may also be more vulnerable to climate change, so that reducing emissions will reduce inequality in the future.

International wealth inequalities raise the question of the allocation of the burden of the global climate policy. For example, the principle of common but differentiated responsibility is meant to be redistributive to the extent that wealthier countries are also typically those which contributed more to the accumulation of GHG in the atmosphere. This is certainly an important issue, but its solution should not be found in a Kyoto-Protocol-like manipulation of the law of a single carbon price. The non-Annex I parties of the Kyoto Treaty had no binding obligation and their citizens faced no carbon price. This derailed the ratification of the protocol by the U.S. Senate and of course led to a sharp increase in the non-Annex I countries' emissions.

However, using price distortions to reduce inequality is an unsatisfactory second-best solution. At the national level, one should instead use the income tax system to redistribute income in a transparent way when this is possible. At the international level, one could use the revenues generated by carbon pricing to subsidize low-income countries.



**You have also studied price-floor mechanisms. What role should be assigned to such instruments?**

A credible floor price path would also contribute to the credibility of the price signal. Investments in equipments with a low carbon content and research efforts in carbon-free technologies will be achieved only if economic agents anticipate substantial carbon prices in the future. That said, there needs to be some flexibility in the setting of this floor price. For example, radical discoveries leading to a significant reduction in emissions would result in a natural decline in prices that could fall below the floor price. But again these technical considerations, however important, are second-order at this stage of policymaking.

Whether one opts for a carbon tax or for cap-and-trade, one should be concerned by the possibility that, conditional on the accruing news about the climate change process, technology or demand, the ex-post adjustment be too lax (too low a carbon tax, too high a number of tradable permits). To understand why, note that the carbon tax or tradable rights path is designed so as to incentivize long-term investments: in carbon-light housing, transportation infrastructures or power plants and in green R&D. Ex post the price incentive has served its purpose but still imposes sacrifices; put differently, optimal environmental policies are not time-consistent. There is a temptation to announce high prices in the future so as to incentivize green choices and not to deliver on this announcement once the investments have been sunk. Furthermore, the possibility of administration turnover or news about other aspects (say, public deficit or indebtedness, economic opportunities) may transform climate policy into an adjustment variable, adding to the overall time inconsistency.

Twenty years ago, Jean-Jacques Laffont and I studied this time inconsistency by looking at the optimal mechanism which could be designed by a centralized authority (the world's nations here) when news that will accrue may vindicate a change of course of action. The optimal mechanism must trade off commitment and flexibility. The optimal policy consists in providing authorities with flexibility, provided that the latter commit to compensate permit owners (in cash or Treasury securities).

A relatively simple solution to the 'time-inconsistency' problem associated with flexibility: contingent debt, which I explain here in the context of tradable emission rights. To avoid being too tempted to issue new permits over time, States would issue 'put options' with varying strike prices. These put options would repay the owners of tradable emission rights

the difference between the exercise price and the realised price if this difference is positive. For these States, this amounts to issuing 'contingent government bonds'. Correspondingly, they can undertake to repurchase a price-dependent number of permits if their price falls below the announced threshold.

More precisely, authorities must issue a menu of permits with different redeeming values that limit the authority's ability to expropriate their owners by flooding the market with pollution permits. For example, if news led the authority to lower the price of permits (or the carbon tax) from \$50 to \$40, some \$50 and \$45- strike price put options on the Treasuries (with agreed upon country keys) would become in the money; at \$35, some other options (with a \$ 40 strike price) would also be in the money, and so forth. This approach creates flexibility but constrains it by forcing the authority to partly compensate permit owners. It obviously requires a governance mechanism, whose existence is inescapable anyway in any international agreement.