THE CASE FOR INTENSITY-BASED TARGETS TO CURB CLIMATE CHANGE

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The failure to deliver a breakthrough at yet another round of international climate talks in Doha last year was so unsurprising as to be barely disappointing. The disagreements that undermined the Kyoto Protocol, and all the talks that have taken place ever since then, continue to thwart any hopes of significant progress in the negotiations.

While these problems remain unaddressed, the talks go on, focusing on a limited range of sub-issues, with old divisions constantly threatening to flare up and with little realistic hope of a deal that is both achievable and also at sufficient scale to address the problem. Something needs to change.

The tragedy is that the world's population may well be better off if emissions are brought down. On aggregate, so economists of the Stern School say, the benefits of reducing emissions would outweigh the costs. "Prisoner's dilemma" thinking, however, holds the negotiations hostage. There is little incentive for one country to reduce emissions unless everyone else does likewise and there are some players who probably won't benefit in any version of a carbon-constrained future. Add to this the cumulative effect of a century's emissions from the developed countries and the desperate need for the developing world to improve their standards of living, and therein lies the challenge.

To date, Europe has gone the farthest in explicitly recognising the need to meet ambitious long-term emission reduction targets, by implementing concrete legislation such as EU Emission Trading System, the Renewable Energy Directive and the Energy Efficiency Directive. Beyond these, Europe is ostensibly still planning on further decarbonisation targets to 2030 and beyond, guided by its ambition to reduce emissions by 80% by 2050. Europe however only accounts for around 15% of world's carbon emissions.

US emissions are expected to fall by 9% from 2005 to 2020, and then increase again to 4% below 2005 levels by 2030. But these reductions result more from circumstance than from concerted climate policies. The closure of coal-fired power stations under the Clean Air Act will play a role, but it is the shale gas boom that is driving the replacement of closing coal power stations with much lower carbon-emitting gas-fired capacity. In contrast to Europe, there is no formal federal US CO2 reduction target and no formal federal renewable energy target.

Japan had agreed in the run up to the Copenhagen climate talks to cut emissions by 25% by 2020 from 1990 levels – subject to all other major emitters agreeing to ambitious targets. In the wake of the nuclear plant closures following Fukushima, however, it has backtracked. Australia has offered three possible 2020 targets: an unconditional 5% reduction on 2000 levels, or 15% or 25% reductions based on similar targets from other developed and developing countries.

But any action promised by the developed world risks being outweighed by the growth in emissions in the developing world, notably China and India. On the basis of extrapolated trends in energy and carbon intensity, China's emissions will increase from 8.3bn tonnes in 2010 to 11.6bnt by 2020, and 14bnt by 2030. India's will increase from 1.7bnt in 2020 to 2.6bnt in 2020 and 3.6bnt in 2030. Overall, based on current trends, world CO2 emissions from fossil-fuel combustion would increase from 32bnt in 2010 to 38bnt by 2020 and 46bnt by 2030. That's what business as usual looks like. You can arrive at a somewhat lower trajectory if you take into account the recent restructuring of the energy sector in the US in the wake of the shale gas revolution, and the current trend in EU emissions as a result of existing climate policies. For example, BP's 2013 Annual Energy Outlook forecasts world CO2 emissions from fossil fuel use rising from 30bnt in 2010 to 40bnt in 2030.

These trends are set against a backdrop of seemingly worsening news on the state of the climate. The year 2012 witnessed record low summer ice coverage in the Arctic, record high temperatures in Australia, one of the wettest years on record in northern Europe, and was capped off by the devastation of Hurricane Sandy – on all of which can be found some sort of climate-related fingerprints.

WHY THE CURRENT APPROACH TO CLIMATE TALKS NEEDS TO CHANGE

There are clearly many challenges in trying to construct an agreement to limit global carbon emissions that involves hundreds of countries, each with different standards of living, economic structures and emissions profiles. One of the fundamental causes of these difficulties is the continued distinction between developed and developing countries and the difference in obligations that these two groups are being asked to make – the principle of "common but differentiated responsibilities" in UN language. Developed countries (those included in Annex 1 of the Convention) include all countries that were members of the OECD at the time the UNFCCC was drawn up in 1992, as well as countries with economies in transition, including Russia, the Baltic States and several Central and Eastern European States, most of which are now

part of the EU. Within the group of developing countries, 49 are identified as being "least developed countries", due to their limited resources to adapt to climate change.

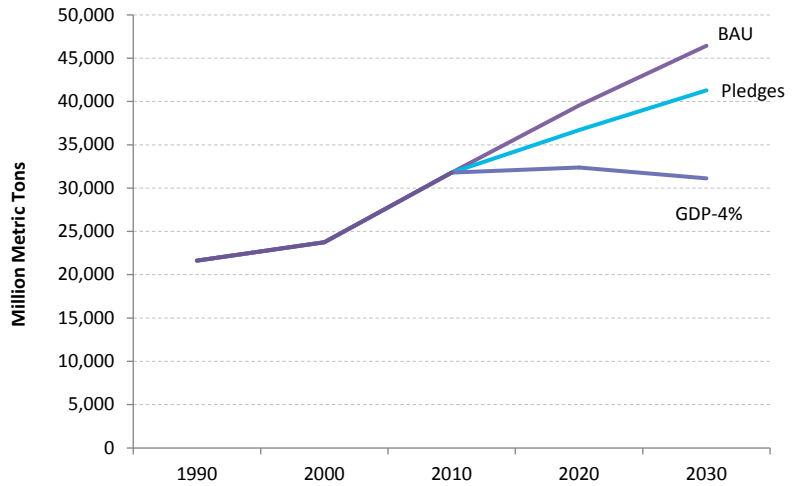
Under the current negotiating process, developed countries are being asked to commit to legally binding absolute emission reductions while developing countries have offered voluntary pledges, mostly in the form of reductions in emissions intensity. China for example will try to reduce emissions per unit GDP by 40-45% between 2005 and 2020, while India will strive for 20-25% below 2005 levels by 2020. Indonesia will aim to bring emissions down by 26% from "business as usual" in 2020. These pledges however carry no sanctions for non-achievement so their effectiveness is certainly questionable.

That the wealthier nations should shoulder the burden for reducing emissions is based on the notion that (a) they have the means to pay for the reductions and (b) invariably they emit more per head than developing countries, and have done so for many years and are therefore responsible for a large part of the cumulative emissions currently in the atmosphere. The counter argument is that large developing countries are now such substantial emitters themselves that unless these emissions are curtailed in some way, the cuts that the developed world can realistically achieve will make little difference. In 2010, for example, China's emissions from burning fossil fuels were nearly 50% more than those in the US, and India's emissions exceeded Russia's for the first time. Put another way, the current commitments for absolute emission reductions (including Europe, Japan, Australia, and somewhat generously the US) only cover a third of world emissions. The remaining two thirds are uncapped.

But for the developed world to point the finger at China's growth in emissions highlights another weakness in the current negotiating process – a significant part of China's emissions are caused by the production of goods that are exported to developed countries. Estimates from the World Watch Institute and the UK's Tyndall Centre for Climate Research indicate that between a quarter and a third of China's emissions are due to its net exports. It is also logical to assume that the more that developed countries impose rules and regulations to control emissions, the more this off-shoring of production and leakage of emissions to countries with no emission controls will increase. To date, evidence of this leakage directly induced by domestic climate policies is scant, but it is a genuine concern both for manufacturers in developed countries and those charged with trying to develop globally-relevant climate policies.

A third difficulty with the current approach is the rigid nature of absolute targets for the developed world and the fact that they take no account of unpredictable economic factors that have material effects on emissions. This can make achievement of targets as much a lottery as a result of concerted policy. No one, for example, was in a position to predict the scale of the debt crisis and ensuing recession in Europe when

Figure 1: World CO2 emissions from fossil fuels under three scenarios



Source: Bloomberg New Energy Finance, BAU is "business as usual"

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emission caps were originally agreed in the EU Emissions Trading Scheme. As a result the EU ETS now has a huge surplus of allowances with carbon prices languishing at record low levels (below EUR 5/tCO2 today compared to highs of EUR 30/tCO2 in 2008), and this in turn has undermined the scheme's credibility. In the other direction, both Spain and Canada suffered from unforeseen periods of rapid economic growth. Spain's obligation under the EU's climate burden-sharing agreement in 1998 saw it take on a target of *increasing* its emissions by 15% between 1990 and the Kyoto Protocol years of 2008-12. By 2007, Spain's emissions had grown by 55% and Spain was facing the heaviest cost burden out of all EU countries.

Similarly, Canada accepted a target of minus 6% under the Kyoto Protocol from 1990 levels, but then found that its emissions had increased by 27% by 2007 as a result of the rapid expansion of its oil and gas industry. Canada subsequently withdrew from the Protocol.

Any hope of a global deal has to somehow reconcile these fundamental issues. One can paper over the cracks with work on the Clean Development Mechanisms or climate finance, but without agreement on the extent to which each country should reduce emissions, how to deal with emissions leakage and the rigidity of the current target-setting process, real progress in moving towards global reductions in emissions will continue to be glacial.

THE WAY FORWARD

The answer to these challenges lies in moving away from the binary distinction of developed and developing countries

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and the imposition of absolute targets for the developed group, and towards a more inclusive system that is based on emissions intensity. Intensity-based targets are expressed as CO2 emissions per unit of activity. Activity can be measured at an aggregate level, for example in terms of GDP or GDP per capita, or at a more detailed level based on measures of underlying efficiency of the economy. By framing targets in this way, governments would be held accountable for emissions they can actually control. This in turn should foster greater commitment to the negotiating process in general.

Intensity-based targets can also be set for every country in the world – irrespective of their developed/ developing status. Under an intensity-based approach, each country would be allowed to grow its economy but its emissions intensity would need to follow a declining rate. Under intensity-based approaches, every country would have a "stretch" target consistent with their level of development.

Intensity-based targets are also optically much more appealing to policy-makers and the public, who have to juggle desire for growth with environmental obligations. If an economy were to grow more quickly than planned a country would see itself as carrying an unfair burden. Emissions would be higher in the intensity-based scheme under this extreme scenario for that particular country – something that would be undesirable from an environmental point of view, but the element of flexibility would be welcome to governments. Besides, the global consequences are likely to be muted by declining emissions from other countries as market shares are rebalanced.

Intensity-based targets are not new. China's current emissions pledge is framed in relation to GDP, as is that of Indonesia, in a roundabout way, by referencing the country's target to some estimate of business as usual. The UK's Climate Change Agreements, which impose energy efficiency targets on key energy-using industries, and the Dutch industrial energy covenants, are both intensity-based schemes.

The principal argument levelled against intensity-based targets is that they do not cap emissions – that they allow emissions to grow as the economy grows, although at a slower rate than they would under business as usual. This argument, however, is based on recent experience where intensity-based targets have been too weak, eg China's target is likely to be closely aligned with its business-as-usual emissions trajectory, resulting in little additional effort. Intensity-based targets can deliver absolute emission reductions. It is simply a matter of how demanding the targets are. If the rate of decline in emissions intensity is greater than the rate of economic growth, emissions will fall in absolute terms.

Intensity-based targets, when defined in relation to GDP, are also sometimes felt to be too blunt because they can be achieved through structural changes in the economy rather than any real improvement in emissions. This in itself, however, is not necessarily a bad thing. If an economy reduces its emissions by growing its less energy-intensive sectors, for example knowledge-based industries, in place of high energy-using industries, then it should be rewarded for doing so. One could even argue that given society's constant desire for higher standards of living, shifting the way we create and appreciate value is the only way in which the emissions will be solved in the long term. But this has its limits. If the dematerialisation of an economy comes from the displacement of energy-intensive manufacturing to other countries, then the GDP intensity target runs into the same problem of emissions leakage as absolute targets.

This issue, however, is not a show-stopper, as intensity-based targets can be adjusted to take into account changes in the shape of the economy. The US Energy Information Administration has done precisely this by developing an energy intensity index based on the underlying changes in energy efficiency of five key economic sectors: residential buildings, commercial buildings, industry, transport and power generation. The activity in each of these sectors is measured in terms of physical units, for example floor area for buildings or ton-miles for transport, and then weighted according to the share of energy used in each sector to derive a single composite index. Clearly, over time if less energy is used in industry because its share of the economy shrinks then the index also comes down, but it is less sensitive to changes in the underlying structure of the economy than an index based on GDP only.

SETTING FAIR TARGETS

A first step is to recognise the underlying pattern of energy and emissions intensity seen in virtually every country in the world over the last 20 years – one of a declining intensity, but where the intensity falls at a diminishing rate as economies get wealthier. This is represented in Figure 2 which shows the relationship between emissions intensity (CO2/GDP) and income per head (GDP/capita) for key countries between 1990 and 2010.

There is a clear pattern of higher emissions intensity for less developed countries than for more advanced economies. Through the process of economic growth, countries invariably become less energy – and hence carbon – intensive for each extra unit of output achieved. As economies evolve, energy-intensive industries such as agriculture, primary manufacturing and construction become less important contributors to output, giving way to more knowledge based industries and services.

Our research, based on historical data for economies at different stages of economic development, indicates how

the intensity of economies is likely to evolve, and in the absence of unpredictable technical changes and pre-existing climate policies. The group of developed countries, including Australia, Canada, Japan, the EU, the US, Russia, South Korea and Switzerland that accounts for over half of world GDP, would be expected to improve its aggregate emissions intensity by 1.2% per year between 2010 and 2020, and 1.6% per year between 2020 and 2030. The group of large developing countries (China, India, Indonesia, Turkey, Saudi Arabia, Mexico and Brazil) would be expected to reduce its emissions intensity at an average rate of 2.6% per year and 2.9% respectively over these periods. Over the next 20 years therefore, excluding the effects of US shale gas and existing EU policies, developing countries on the whole will reduce their emissions intensity at roughly twice the rate of developed countries.

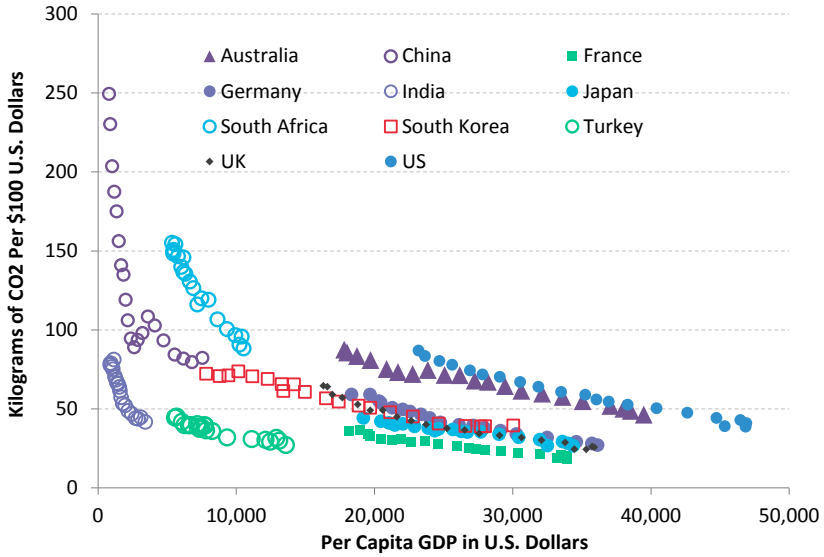
These common and relatively predictable patterns of emissions intensity can then be used to set targets for each country that reflect the current and expected future levels of emissions in relation to that country's national wealth. One option would be to set a single, global target level of emissions intensity at a given level of income per head. Each country would then have a trajectory towards this end-point. For example, the target level could be 30kCO2/$100GDP at $50,000/capita.

One problem with this approach is that less well-off countries with large populations, such as China or India, would have to do relatively little or nothing in terms of per-capita or per-unit GDP emission reductions for decades, while their economies are allowed to grow and reach the levels of wealth of the developed world. In the meantime, these countries' emissions would increase significantly in absolute terms, with the full burden of reductions falling on the more developed economies.

What is needed is a system of emission targets that places more weight on the responsibilities of richer nations, but still requires developing economies to slow down and ultimately restrain the growth in their emissions.

In 2005, Bloomberg New Energy Finance chief executive Michael Liebreich wrote a White Paper entitled

Figure 2: Historical carbon intensity of leading economies



Source: UNFCCC, IMF, UN. CO2 emissions refer to those from the combustion of fossil fuels (i.e. excluding other greenhouse gases and land use change and forestry. GDP measured at current prices and converted to USD at purchasing power parity in each year.

"Towards a Workable Post Kyoto Framework for Emissions Reductions", in which he proposed that countries should commit to reduce emissions at an annual rate equivalent to their rate of real GDP growth less a certain percentage. In other words, each country should achieve the same reduction in carbon intensity (emissions/GDP). He chose "GDP less 4%" as a realistically achievable target that would see global emissions fall in absolute terms if all countries participated and future growth is similar to previous trends. Global real GDP growth averaged around 3.5% a year between 1990 and 2010, so in theory actual emissions would decline in absolute terms if these patterns continue. Currently, global CO2 emissions are increasing at 3% a year (2000-2011 average).

China's real GDP growth rate has averaged around 10% over the last 20 years, so if it continued to grow at the same rate, China's absolute emissions target would be an increase of no more than 6% per year. India's economy has grown at 6.5% a year, so its emissions target would be an increase of 2.5% per year. In contrast, the US, EU, Japanese and Australian economies grew at annual average rates of 2.4%, 1.8%, 1.1% and 3.2% respectively between 1990 and 2011. Assuming a 4% reduction factor, annual emission reduction targets for these countries would therefore be -1.6%, -2.2%, -2.9% and -0.8%, if future economic growth is similar to previous trends.

At first sight, the use of a flat percentage reduction for every country may seem indiscriminate and to disadvantage developing countries that aim to achieve higher rates of economic growth. In practice the opposite is the case: as noted above, it is easier for less developed economies to reduce emissions per unit of GDP growth than more developed economies, so a given percentage reduction target is less costly to achieve.

FAIRNESS=AFFORDABILITY

Another way of expressing the implications of a 4% target applied uniformly across all countries is to look at the additional cost per head. Cost per head is the difference between BAU emissions and the GDP-4% target, divided by expected future population and multiplied by an assumed cost per tCO2 reduced. In this example we use a notional $40/tCO2 price in 2020 and 2030 – other unit costs could be used but the intention is to show the pattern between income per head and cost burden, rather than absolute costs.

Under the assumption of a $40/tCO2 global carbon price, the simple concept of a GDP-4% emissions target would see the US and Canada with annual per capita costs of around $200 in 2020. Under the same regime, India, Mexico and Indonesia would have per-capita costs of $15, $45 and $57 respectively. By 2030, the difference between the per-capita costs of developed and developing countries increases further.

WHAT WOULD THIS MEAN FOR WORLD EMISSIONS?

According to the analysis, a GDP-4% target would see world emissions drop significantly compared to business as usual falling from just over 45bnt in 2030 to 32bnt. In absolute terms, emissions would decline by 2% from 2010 levels by 2030. In contrast the current pledges of the developed world including the US, Japan, EU27 and Australia would only reduce emissions to 41bnt. Under the GDP-4% target, roughly half of the emission reductions by 2030 would come from the group of eight developed countries and blocs (the US, the EU-27, Japan, Australia, Canada, Korea, Russia and Switzerland), with approximately 23% coming from the key developing countries (China, India, Indonesia, Turkey, Saudi Arabia, Mexico and Brazil) and 29% from the rest of the world. Proportionately, the group of developed countries would reduce emissions by 40% from BAU projections in 2030, whereas the group of developing countries would only be required to reduce emissions by 15% from business-as-usual.

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A GDP-4% target is clearly just one way in which intensity based targets could be constructed to include developing and developed countries. Many other variants are possible. For example the 4% factor could be flexed over time to give countries time to prepare policies, and more variability between developed and developing countries could be introduced. To do so risks re-opening the horse trading that has stymied talks so far, although at least when considering intensity-based targets the strength of the disagreement should be more muted. Adjustments could also be made to modify the intensity metric to an energy intensity index rather than GDP to offset the effects of trade and emissions leakage, as proposed by the US EIA. Again, building in this consideration should help modify concerns of unfairness all round.

Whatever variants are developed it should be possible to construct more equitable targets for reducing emissions using an intensity-based approach than the current polarising structure of absolute targets for some and no constraints for others.