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Mariana Conte Grand

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GDP-related emission targets weaknesses: the case of Argentina

Mariana Conte Grand (Universidad del CEMA)[*]

GDP linked targets have the potential to favor green growth and avoid "hot air" in uncertain backgrounds, like those of many developing economies. Even if they are not a guarantee of emissions reduction as required by the 2 degree Celsius Copenhagen goal because emissions´ intensity can decrease even when emissions do not. A few countries have submitted at some point of international negotiations a target based on this type of metric. Argentina is one of them, together with Chile, China, India, Singapore, Tunisia, Uruguay and Turkmenistan. As is the case of all target forms, it requires good monitoring and forecast of emissions. But, as the literature has shown, one of the GDP-related target weaknesses is that it relies on a second indicator: the GDP. This article shows concretely how GDP biases influence intensity targets monitoring, using as a base the case of Argentina.

Keywords: climate change, intensity targets, target metrics, developing countries, Latin America, Argentina

1. Introduction

The international community agrees that, in order to avoid massive damages due to climate change, the average increase of global temperature should be kept below 2 degree Celsius with respect to pre-industrial levels (Copenhagen Accord, Point 1). Several research groups have analyzed the gap between the emissions levels needed to honor that goal (e.g., UNEP 2010, den Elzen et al. 2010, Levin and Bradley 2010). Those analysis suggests that the gap is substantial; closing it will require emissions reductions of over 45% to 70% by 2050 compared to 2010 (IPCC, 2014).

Emissions can be reduced using different metrics. Kyoto targets were designed as absolute reduction caps with respect to baselines in the past and limited to developed countries. Then, Copenhagen-Accord pledges (CP) were of four types: fixed reductions with respect to the past; absolute reductions with respect to the (future) business as usual (BAU) emissions; carbon neutrality objectives; and intensity caps with baselines in the past (intensity caps, contrary to fixed caps, do not set a country´s allowable emissions level, but determine their amount as a linear function of Gross Domestic Product). Finally, all Parties of the UNFCCC agreed at the Conference of the Parties in Warsaw (COP 19) to prepare "Intended Nationally Determined Contributions" (INDCs).[1] Submitted INDC´s metrics are mainly the same of CP.

Both the CP and the INDCs include GDP related targets. More precisely, two countries submitted linearly indexed pledges to the Copenhagen Accord: China, to reduce its CO_2 emissions by

[*] The author's viewpoints do not necessarily represent the position of the University.

[1] See in that respect the official site: http://unfccc.int/focus/indc_portal/items/8766.php.

40–45 % per unit of GDP by 2020 compared with 2005; and India, to reduce CO_2 emissions by 20–25 % between 2005 and 2020. And six parties designed dynamic INDCs: Chile, China, India, Singapore, Tunisia and Uruguay.[2]

The discussion of dynamic targets is not new. It began at the end of the 1990s as a mean to foster developing countries´ participation in emissions reduction (Baumert et al. 1999; Frankel 1999). By that time, the Clinton Administration had decided it would not submit the Kyoto Protocol for ratification to the U.S. Senate unless developing countries decided upon their "meaningful participation" in international climate policy. However, the difficulties of fixed GHG targets for countries with not mature economies soon came into view: "economic risk" -if income increases more than expected, abatement would be higher than expected and so would be the corresponding costs of abatement- and "environmental risk" -if a country suffers an unexpected low growth period, abatement can become negative and that country would sell emissions permits "without undertaking real reductions": emissions may be greater than in the absence of such commitments- (Lutter, 2000). Hence, intensity caps appeared as a possible alternative for designing developing countries´ targets.[3]

Way before Chile, China, India or Uruguay announced GDP-linked targets and even before most of the academic literature developed, Argentina designed a dynamic target. In 1999, Argentina, submitted an emission cap and asked for a "new option" of entry into the Kyoto Protocol (Argentine Republic, 1999). Argentina´s target represented a 10% emission reduction with respect to the BAU scenario in 2008–2012 and established committed emissions as the product of a constant (K=151.5) and the square root of its GDP (Barros and Conte Grand, 2002). The argument to use a square root was the fact that the country´s emissions were not linearly related to its macroeconomic performance because its agricultural sector was not as strongly "coupled" to GDP as the energy, industry and waste activities. Argentina´s incentives to adopt an emission cap were its political alignment with the United States at that time and its interest in participating in all the Kyoto flexibility mechanisms. However, Argentina finally removed its proposal from the climate negotiations agenda because its administration changed, and the new government, which had been elected just before the announcement of the target at COP 5 (Bonn, 1999), did not give support to the idea of adopting a GHG target of any form (Bouille and Girardin 2002).

After that episode, Argentina did not send a Copenhagen pledge, but has now designed an INDC with a non-GDP related metric. This case study looks back, analyzes what would have happened if the 1999 target had been in place, and if the weaknesses of its design can be claimed to determine the change in the target metric for this particular country. Parties who at some point opted for a dynamic target, maintained it along time (For example, China and India), but that was not the case of Argentina. Our claim is that, as it is stated in the literature, dynamic emission reduction targets depend on GDP measurement, and since Argentina is known to have biased its official GDP statistics, it decided not to take the risk to have its target challenged due to this fact.

This article is organized as follows. Section 2 shows what would have been allowed emissions if Argentina had actually adopted the target it had announced and what reality turned out to be both in

[2] Georgia and Mexico INDCs imply intensity targets, but are based on an absolute reduction with respect to the BAU trajectory. Turkmenistan also states that it will adopt a dynamic target, but it does not specify exactly what it implies.

[3] The advantages and disadvantages of intensity caps are reviewed in Conte Grand (2013) and have been the subject of several papers that include Lutter (2000), Ellerman and Sue Wing 2003, Sue Wing et al. 2009, Jotzo and Pezzey 2007, and Marschinski, and Edenhofer (2010).

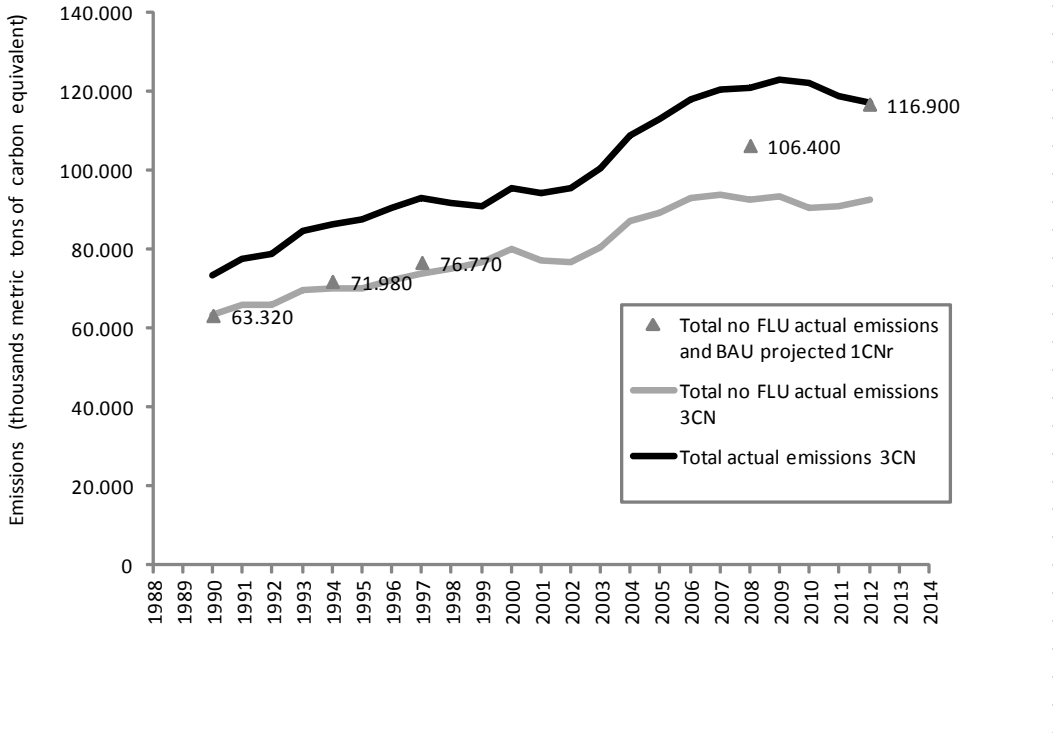
terms of economic and GHG performance. Section 3 discusses the lessons that can be drawn from the design of Argentina´s target with special emphasis on the impact the discrepancy between the official (and alternative measurements of) GDP has in terms of the target. Finally, Section 4 concludes.

2. Results of Argentina´s target

Argentina has elaborated three National communications to the UNFCCC: the first (1CN) was finished in July 1997 (an addendum was added in March 1999: 1CNr), the second (2CN) was presented in March 2008 and the third (3CN) has just been finished last month.

Argentina´s emissions as calculated in the National Communication containing the target (with projections for 2008 and 2012) as well as the last GHG inventory estimations are shown in Figure 1. We use million metric tons of carbon equivalent to maintain the 1999 target´s unit of measurement. Note that Argentina´s first emissions inventory was poor in terms of forestry and land use emissions´ estimations (FLU), but projections took them into account.

Figure 1. Argentina´s emissions



*Note: Change in land use was only partially estimated in the revised first national communication. Emissions are reported in million metric tons of carbon equivalent in the 1CN and Gg of CO2equivalent in 3CN. We convert the latter to the former units dividing by 44*1000/12. The number 1000 stands for the fact that 1 Gg es 1000 metric tons and 44/12 is to convert CO_2 in C.*

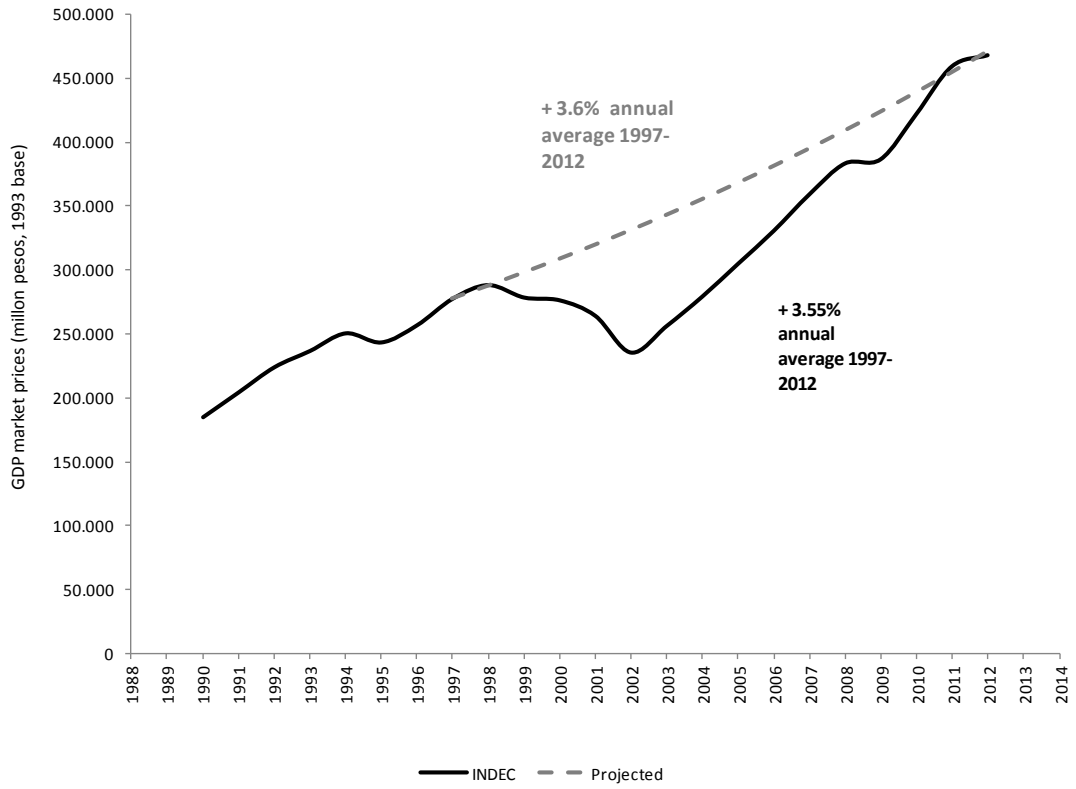
As can be seen in Figure 1, actual and forecasted emissions are almost equal for 2012: 117,119 and 116,900 thousands metric tons of Carbon equivalent respectively.

In order to determine the emissions allowed under the target, the key factor is Gross Domestic Product. GDP growth rates had been forecasted at the moment the target was designed. Three

renowned Argentine institutions were responsible for the macroeconomic projections: Facultad Latinoamericana de Ciencias Sociales (FLACSO), Fundación de Investigaciones Económicas Latinoamericanas (FIEL) and Universidad del CEMA (UCEMA). Estimates for average rates of GDP growth for the period 1997-2012 were practically the same: 3.7% for UCEMA, 3.6% for FIEL and 3.5% for FLACSO.

Figure 2 describes the actual evolution of GDP as well as the projected GDP. The figure uses the same unit of measurement determined by the target, even if Argentina has changed the base year from 1993 to 2004. Figure 2 shows that Argentina´s GDP in pesos of 1993 increased from 277,441 million in 1997 to 468,301 million in 2012, when it was estimated to be 471,593 million. We can then conclude that economic growth rate was accurately forecasted *on an annual average basis*, since even when Argentina had a major crisis in 2001/2002 it was followed by a very good economic performance (altered somehow by the 2008/2009 world financial crisis) that compensated that downturn of the economy.

Figure 2. Actual and Projected GDP



Note: INDEC is the Instituto Nacional de Estadísticas y Censos of the Republic of Argentina. Projected GDP comes from the Revised 1st National Communication.

The revision of the First National Communication contains the target presented at COP5. The exact wording is:

> "The Republic of Argentina…voluntarily commits itself to ensure that its net anthropogenic greenhouse gas emissions shall not exceed an amount that is termed *emission target*. The compliance period for the said target shall be the period 2008-2012, and it shall be applicable to the annual emission average for that period. The target shall

be equal to the product of an index multiplied by the square root of the five-year average Gross Domestic Product corresponding to the commitment period. The index is established at 151.5. This value implies an effective reduction in Argentina´s greenhouse gas emissions relative to the emissions estimated for the most likely scenarios, resulting from projections that do not contemplate intervention measures, and that are estimated at between 2% and 10%. The calculation of the Gross Domestic Product shall be based on market prices and expressed in 1993 pesos, according to the Republic of Argentina statistical records of national accounts. Greenhouse gases emissions shall be considered as aggregate emissions and expressed in metric tons of carbon equivalent, … Emissions shall be those originated in the sectors and source categories described in Annex A of the above-mentioned Protocol, plus the net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human-induced land use change and forestry activities…The emission and sequestration gases shall be calculated in accordance with the methodologies adopted by the UNFCCC." (page 58, in Argentine Republic 1999).

As depicted in Table 1, at the moment of the cap´s design, projected BAU emissions for the five year-range Kyoto commitment were 111,650 thousand metric tons of Carbon equivalent. Since the yearly projected GDP for that period was 439,938 million pesos (base year 1993), expected allowed emissions were 100.485 thousand metric tons of Carbon equivalent ((= $151.5 \cdot \sqrt{439{,}938}$)). Hence, the projection was to reduce emissions by 10% (= (111,650-100.485)/111,650).

Table 1. Calculations behind the evaluation of Argentina´s target

	1997		2012		*Average 2008-2012.*	
	Actual	3CN	Projected	Actual	Projected	Actual
GDP (million pesos of 1993)	277.441	277.441	471.593	468.301	439.938	424.030
Emissions (thousands metric tons of C equivalent)						
without FLU	76.770	74.071		92.433		91.995
Total	63.960	92.921	116.900	117.119	111.650	120.414
Allowed emissions (thousands metric tons of C equivalent)					100.485	98.652
% Emissions reduction: (Emissions-Allowed emissions)/Emissions					10%	18%
Emissions intensity: Emissions without FLU/GDP	0,28	0,27		0,20		0,22
Emissions intensity: Emissions/GDP	0,23	0,33	0,25	0,25	0,25	0,28

Note: For 1997, 3CN are the revised figures for that year, when Actual were the calculations in the 1CNr.

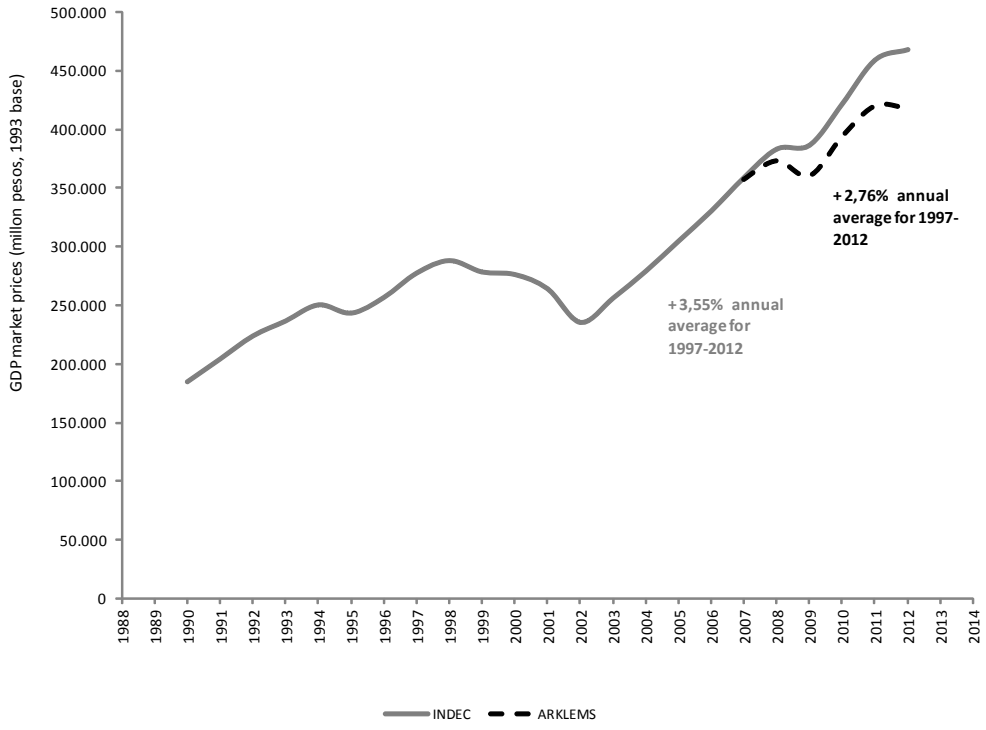
The reality was that, on one side, the actual average GDP per year for the commitment period (2008-2012) was 424,030 millions 1993 pesos. Hence, allowed emissions according to the committed cap would be 98,652 thousand metric tons of Carbon equivalent per year (= $151.5 \cdot \sqrt{424{,}030}$). On the other side, yearly emissions for this same period according to the Third National Communication are 120,414 thousand metric tons of Carbon equivalent, more than the projected BAU scenario even if actual GDP was less than its projection. If Argentina had a binding target, it should have had 18% less emissions average per year than it actually had in the commitment period. Part of that gap may be simply explained by the fact that, since the target was not binding, the country undertook less mitigation actions that it would have if it was.

The advantages and disadvantages of fixed and dynamic targets have been widely studied in the environmental economics literature. Intensity targets allegedly have the virtue of favoring green growth and avoiding "hot air" in uncertain backgrounds, like those of many developing economies. Intensity caps, contrary to fixed caps, do not set a country´s allowable emissions level, but determine it as a linear function of GDP. "Pure" or "linear" intensity targets imply determining emissions intensity, while fixed targets imply capping emissions.

3. Discussion

However, it has been shown that uncertainty about the degree of abatement effort under intensity caps can be higher or lower than that for fixed targets, depending on the relationship between the stringency of the target, the emissions-GDP link, and the forecast errors of GDP and emissions levels. If uncertainty about future GDP is much higher than uncertainty about future emissions levels, then a coupling of the target to the GDP introduces more uncertainty instead of less. Similarly, if the correlation between emissions levels and GDP is low, then there is not much advantage to coupling allowed emissions levels to GDP. Hence, intensity targets do not work in economies where parts of emissions levels are independent of GDP (i.e., non-CO2 GHG emissions and emissions from land use change). Hence, the superiority of intensity caps over fixed targets turned out to be less advantageous than expected. As a result, several alternatives to pure intensity targets were envisaged: for example, growth-indexed emissions limits (Ellerman and Sue Wing 2003; Sue Wing et al. 2009) or generalized intensity caps (Höhne and Harnish 2002; Jotzo and Pezzey 2007), as that of Argentina.

Figure 3. Official and estimated GDP



Note: INDEC is the official GDP and the estimated one is from ARKLEMS. AR stands for Argentina and KLEMS stands for Capital, Labor, Energy, Material and Service Inputs. ARKLEMS is lead by Ariel Coremberg in Argentina. It mirrors the WORLDKLEMS Project lead by Dale Jorgenson from Harvard jointly with.Marcel Timmer and Bart Van Ark at University of Groningen.

On the other hand, another argument in the literature against dynamic targets is complexity (Dudek and Golub 2003; Müller and Müller-Fürstenberger 2003). There is no doubt that for intensity targets another variable has to be monitored in addition to emissions. There too, reliability of data matters greatly (Pizer 2005; Zhang 2011). But, as it has been documented (Maddison and Wu 2008 for China, Sturgess 2010 for Greece and Coremberg 2014 for Argentina), some developing countries have

problems with official national account statistics. Hence, GDP may not be an entirely reliable indicator, and so may compromise the follow-up monitoring.

This point is quite clear for Argentina. Indeed, as documented in Coremberg (2014), the official GDP is overestimated if the pre-2007 methodology is replicated. Argentina´s statistics office (INDEC) was the object of a political intervention in January 2007 with the goal of altering the inflation index, and beginning there, several other statistics were altered. This had an impact on the measurement of the GDP, as can be seen in Figure 3.

As a consequence of the GDP´s distortion, allowed emissions under the target given by the corrected GDP would have been even lower: 94.980 thousand metric tons of Carbon equivalent per year ($151.5 \cdot \sqrt{393.058}$) instead of 98,652. Hence, emissions should have been 21% (and not only 18%) lower than what they were in the 2008-2012 period.

4. Conclusions

GDP linked targets have the potential to favor green growth and avoid "hot air" in uncertain backgrounds, like those of many developing economies. But, as has been shown by the literature, those characteristics of intensity targets do not work in economies where parts of emissions levels are independent of GDP (i.e., non-CO2 GHG emissions and emissions from land use change).

Even if they worked to smooth uncertainty of the effort each country has to make, they are not a guarantee of emission reduction. Emissions´ intensity can decrease even when emissions increase, so that indicator reduction is not enough to close the gap in order to reach the 2 degree Celsius Copenhagen goal.

But its main weakness may be the fact that this type of target not only requires a good assessment of emissions, but relies on a second indicator: the GDP. Even if several documents suggest the need to submit GDP in base year and the methodology to measure GDP and GDP growth for countries who choose this type of metric,[4] it may not be enough when sovereign governments decide for some reason an intervention of their statistics offices.

Several countries in the Latin American region belong to the group of those who chose an intensity target for their INDCs (this is the case of Chile and Uruguay). Argentina had experience with this type of metric, it could have done the same, but instead, it chose a -15-30% deviation from a Business-as-Usual trajectory for its INDC. It is possible that at least part of that decision was influenced by the fear that if a GDP-linked target was chosen, the international community would question the way GDP is measured and that would go against the Argentina INDC.[5]

References

[4] See for example, documents suggested for the preparation of INDCs in UNFCCC portal: http://unfccc.int/focus/indc_portal/items/8766.php

[5] Argentina´s INDC as it was presented has already being ranked as "inadequate" in Climate Tracker because "Argentina's unconditional target is to reduce GHG emissions incl. LULUCF by 15% below its BAU scenario by 2030. This target is equivalent to a 60% increase above 2010 levels or 128% above 1990 levels excl. LULUCF." (see http://climateactiontracker.org/indcs.html for more details).

Argentine Republic (1999), Revision of the First National Communication. Available at http://unfccc.int/resource/docs/natc/argnc1e.pdf. Last access: May 12, 2013.

Barros V. and M. Conte Grand (2002), "Implications of a Dynamic Target of GHG emissions reduction: the case of Argentina", *Environment and Development Economics* 7: 547-569.

Baumert, K., R. Bhandari and N. Kete. (1999). What Might A Developing Country Climate Commitment Look Like? Washington, DC: World Resources Institute. May.

Bouille D. and O. Girardín (2002), "Learning from the Argentine Voluntary Commitment", in Baumert, Kevin A. (ed), Options for Protecting the Climate, World Resource Institute, Washington D.C.

Conte Grand M. (2013), "Is there a future for intensity targets in the Durban Platform climate negotiations?", Discussion Paper 2013-59, Harvard Project on International Climate Agreements, Belfer Center for Science and International Affairs, Harvard Kennedy School, August.

Coremberg A. (2014). "Measuring Argentina's GDP Growth: Myths and facts", World Economics 15 (1): 1-31.

den Elzen M. and N. Höhne (2008), Reductions of greenhous gas emissions in Annex I and non-Annex I countries for meeting concentration stabilisation targets Clim. Change 91 249–74

den Elzen M. G. J., A. Hof, M A Mendoza Beltran, M Roelfsema, B van Ruijven, J van Vliet, D P van Vuuren, N Hoehne and S Moltmann (2010) Evaluation of the Copenhagen Accord: Chances and Risks for the 2C Climate Goal (Biltoven: Netherlands Environmental Assessment Agency).

Dudek, D., and A. Golub (2003), "Intensity" targets: Pathway or roadblock to preventing climate change while enhancing economic growth? Climate Policy 3S2:S21–S28.

Ellerman, A.D. and I. Sue Wing (2003). Absolute v. Intensity-Based Emission Caps, Climate Policy 3 (Supplement 2): S7-S20.

Frankel, J. (1999), "Greenhouse Gas Emissions," Policy Brief no. 52, The Brookings Institution, Washington, DC, June.

Höhne, N. and J. Harnisch (2002). Greenhouse gas intensity targets vs. absolute emission targets; Proceedings of the 6th International Conference on Greenhouse Gas Control Technologies (GHGT-6) Kyoto (Japan), October 2002, Eds. J. Gale and Y. Kasa, Pergamon Press, Vol. II, pp. 1145-1150.

Jotzo, F. and Pezzey, J. (2007), 'Optimal intensity targets for greenhouse emissions trading under uncertainty', Environmental and Resource Economics, vol. 38, no. 2, pp. 259–284.

Keohane, N. O., R.L. Revesz, and R.Stavins (1998). "The Choice of Regulatory Instrumetns in Environmental Policy." Harvard Environmental Law Review, 22(2):313-67.

Levin, K. and R.Bradley (2010). "Comparability of Annex I Emission Reduction Pledges," WRI Working Paper. World Resources Institute, Washington DC. February.

Lutter, R. (2000). "Developing Countries' Greenhouse Emissions: Uncertainty and Implications for Participation in the Kyoto Agreement". Energy Journal. October 2000. Vol. 21, No. 4: 93- 120.

Maddison, A. and Wu, H. (2008) Measuring China's economic performance. World Economics 9(2):.

Marschinski, R. and O. Edenhofer (2010). Revisiting the Case for Intensity Targets: Better Incentives and Less Uncertainty for Developing Countries? Energy Policy 38 (9), p.5048-5058.

Müller B and G. Müller-Fürstenberger (2003) Price-related sensitivities of greenhouse gas intensity targets. Climate Policy 3 (Suppl 2): S59–S74.

Pizer W. A. (2005). "The Case for Intensity Targets". Climate Policy 5.4: 455-462.

Sturgess, B. (2010) Greek economic statistics: a decade of deceit. So how come the rating agencies missed it again? World Economics 11 (2):.

Sue Wing, I., A.D. Ellerman and J.M. Song (2009). Absolute vs. Intensity Limits for CO2 Emission Control: Performance Under Uncertainty, in H. Tulkens and R. Guesnerie (eds.), The Design of Climate Policy, MIT Press, 221-252.

UNEP (2010), “How Close are We to the Two Degree Limit?”, United Nations Environmental Program. http://www.unep.org/PDF/PressReleases/temperature-briefing-21-02-10-final-e.pdf. Last access: April 4, 2013.

Zhang, ZhongXiang (2011). "Assessing China’s carbon intensity pledge for 2020: stringency and credibility issues and their implications," Environmental Economics and Policy Studies vol. 13(3): 219-235, September.