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Analysis

Less than 2 °C? An Economic-Environmental Evaluation of the Paris Agreement

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ABSTRACT

The literature dedicated to the analysis of the different climate agreements has usually focused on the effectiveness of the aims for emissions in the light of the advance in climate change. This article quantifies the variation in emissions that the Intended Nationally Determined Contributions (INDCs) will entail and their financial allocation and policies country-by-country and regionally. The objective is evaluating the Paris Agreement feasibility regarding the INDCs and its economic and environmental constraints. The criteria through which the 161 INDCs are analysed are as follows: i/ socio-economic impact of the transition; ii/ focus on energy management; iii/ substitution of non-renewable sources; iv/ the role of technology; v/ equality of the transition; vi/ compliance with emission reductions. The results obtained show that the Paris Agreement excessively relies on external financial support (41.4%). Moreover, its unilateralist approach, the socio-economic and biophysical constraints could be the underlying cause of the ineffectiveness of the 2 °C objective. This way, each country would emit an average of 37.8% more than in the years 2005–2015. When this is weighted, the figure would be a 19.3% increase, due mainly to the increases in China and India. These figures would lead the temperatures up to 3°–4 °C.

1. Introduction

The consequences of climate change induced by human activity are a growing concern for the international community (IPCC, 2014; Melillo et al., 2014). Evident effects such as extreme meteorological phenomena, rising temperatures and rising sea levels show the rapid climatic adaptation of natural ecosystems. The rapid increase in these impacts and the fact that abrupt changes could arise leads to the conclusion that the cost of transferring the responsibility for putting it right to the coming generations becomes ever higher. In this sense, the IPCC (2014) has warned that if, by 2050, we have not managed to reduce the level of emissions with respect to 2010 by between 25% and 72%, then maintaining the rise in world temperatures to below 2 °C with respect to preindustrial levels will be "more improbable than probable". Besides the most visible consequences today, if the temperatures rose by more than 3 °C–4 °C, humanity would face a scenario of massive extinction of species, entailing risks for human health and severe restrictions on access to food and water, so vital for survival (IPCC, 2014). Achieving this goal involves phasing out fossil fuels whereby around 82% of the current reserves of coal, 49% of natural gas reserves and 33% of the oil reserves should remain underground in order to avoid an increase in temperatures of more than 2 °C (McGlade and Ekins, 2015).

Regarding these concerns, in December 2015, the 21st Conference of Parties (COP21) was celebrated, made up of 188 countries, and whose most important result was the Paris Agreement (UN, 2015) and the collection of Intended Nationally Determined Contributions (INDCs) submitted by each of the participating countries. After de burial of the Kyoto Protocol, the current agreement is an unilateral vision in which the players establish their own voluntary objectives (Spash, 2016) through the INDCs. Although the agreement indicates that the main priority is to "hold the increase in the global average temperature *to well below 2*°C above pre-industrial levels", during the COP21, the participants were sufficiently optimistic as to speak openly of 1.5 °C. Not only this, but in spite of the fact that they incorporated such equality criteria as the obligation of Developed Countries (DC) to a greater reduction in emissions and the channelling of financial resources to Least Developed Countries (LDC), the COP21 succeeded in involving some countries with medium incomes in these differentiated efforts (Viola, 2016).

In response to global concerns of these issues, a widening literature on sustainability transitions has emerged in recent years (Markaard et al., 2012). Literature on climate summits mostly evaluates whether

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they comply with emissions limits or not (den Elzen et al., 2011; UNEP, 2010; Höhne, 2012). Considering COP21 and the Paris Agreement (2015), main contributions are related to its impacts in energy technologies evolution (Peters, in press; Lacal Arantegui and Jäger-Waldau, 2017) or evaluate possible transition pathways under its contexts in different regions (Liobikienė and Butkus, 2017; Van de Graaf, 2017; Gao, 2016). Some works, conversely, points out difficulties to accomplish the COP21 objectives according to geopolitical and governance limits from a general perspective of the Paris Agreement (Spash, 2016; Viola, 2016). Moreover, an increasing number of governments, municipalities and NGOs are creating its own low carbon transitions plans according to their own criteria, or those established in the aforementioned climate summits. Thus, on the basis of Wiseman et al. (2013), Nieto and Carpintero (2016) deal with a more in-depth analysis of 19 low-carbon transition plans from government sources and other dependent agencies, NGOs and research centres.

In this article, Paris Agreement is evaluated on the light of biophysical, technological and economic limits, throughout a systematic analysis of each of the 161 INDCs submitted by the 188 countries in COP21.

Thus, the aim of this article is to put these INDCs under the same microscope that analysed some previous plans (Nieto and Carpintero, 2016), situating the focus on the socio-economic impacts, international equality, technology, energy and emissions. This analysis will allow us to evaluate the feasibility of the Paris Agreement policies in complying with its own objectives through the national commitments (INDCs). In the same way, we will evaluate the main limitations of the imposed governance and finance framework. In order to achieve these aims, a systematic analysis of the policies, the emission reduction commitments and the funding needs for implanting INDCs has been carried out.

The article is structured as follows: Section 2 describes the methodological process used to give homogeneity to the data offered by the INDCs. Section 3 sets out the main results of the exhaustive analysis of these INDCs. Section 4 confronts the results extracted from INDCs with the biophysical restrictions and the literature. Finally, Section 5 summarizes the article's main conclusions.

2. Methodology

The flexibility of the Paris Agreement has led to a lack of systematic presentation of the INDCs. Therefore, this paper proposes a methodology to homogenize data and categorize the information (for more detailed information, consult Annex A, as well as the repository of INDCs).[1] We have examined a total of 161 INDCs representing 188 countries that account for 97.8% of the world's emissions.

In order to achieve the aims of this article, we have paid special attention to the policies of mitigation as opposed to those of adaptation because of their economic (Buchner et al., 2015) and environmental importance. We have noted (as far as possible) the data concerning the objectives for reducing sectoral and global emissions, the policies for achieving the said objectives and their funding, with the greatest possible breakdown. We have also studied the proposed financial mechanisms and the nature of the agents who would lead the transition. We have grouped the different countries with respect to their level of income in accordance with the World Bank's (WB) classification, establishing a distinct group for the 12 most contaminating countries on the planet (Top 12) in 2014 (72.2% of the total emissions) because of their relevance for climate policies.

With reference to emissions, the INDCs have both unconditional and conditional objectives. The former would be carried out exclusively with domestic resources, while the latter would be conditional on receiving outside assistance. In general, the INDCs presented some problems that made the analysis more difficult; such as the discrepancies between the year of reference and that of the time horizon. To resolve this issue, we have discarded those INDCs that do not have the year 2030 as their time horizon or the reference year outside the range 2005–2015. This reference year has been chosen because of two reasons. Firstly, EU used 2005 as one of the reference years (along with 1990 and 2030) in its Communication titled *A roadmap for moving to a competitive low carbon economy in 2050*. Secondly, most of the INDCs are within this time range, so it was reasonable to use it. Besides, a differential analysis has been carried out of the 12 most contaminating countries (Top12), for which we were able to establish a common reference year of 2005.

On the other hand, the reduction objectives are presented in different ways:

i/ As a partial and/or sectoral objective: for instance, a proportion of renewable sources in the energy mix or objectives that are merely relative to one sector of the economy. These have not been considered in the calculation of emissions reductions.

ii/ In GHG emissions intensity (CO2eq/GDP). To calculate the net variation in emissions, we proceed as set out in the Methodological Annex.

iii/ As emissions reductions with respect to a base year. The only countries obliged to do so are those in Annex I[2] and, with some exceptions, the only ones who do so in this way. No additional calculation is needed beyond establishing the base range and/or horizon year.

iv/ As emissions reductions with respect to a trend scenario (business as usual). This is the most common scenario used by all the countries not in Annex 1, except Brazil.[3] To calculate the variation in absolute terms with respect to the base range, we proceed as detailed in the Methodological Annex.

Taking a conservative stance, we have considered that the trend and the real variation in emissions are the same for the Annex I countries, assuming that they will carry out all the promised policies and that they will, indeed, reach the appointed goals. In addition, we have calculated the weighted emissions with respect to each country's contribution to global emissions in 2013, the last year for which reliable, homogeneous data exist through the Emission Database for Global Atmospheric Research (EDGAR) of the European Commission.

On the other hand, the necessary funding for each plan has been broken down into mitigation, adaptation and other expenses. The INDCs provide figures in dollars (without specifying any basis) to be expended from 2020 to 2030. Financial effort is measured as the share of financial funding allocated by the INDC over GDP (2010 constant dollars at market prices). External funding and its proportion over total funding have been evaluated as well. Similarly, we have obtained the amount of funding required per unit percent of emissions reduction. This information has been obtained directly from the data facilitated by the INDCs. When not provided, it has been made the assumption that the share of external funding equals the proportion of conditional emissions reduction over total emissions reduction.

Finally, it has been summarized the main policies with respect to the different sectors of each country, as well as a summary table of the main policies to which each country is committed. The policies are broken down according to the Directives of the IPCC for the national inventories of greenhouse gases (IPCC, 1996. However, the breakdown of the energy sector has been used due to its strategic nature for some INDCs.

[1] http://www4.unfccc.int/submissions/INDC/Submission%20Pages/submissions.aspx.

[2] Industrialized countries members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

[3] Unless explicitly mentioned alternatively, when a particular country is mentioned, the reference is its INDC, which can be consulted in the UNFCC repository, as explained in footnote 1.