



Long-term abatement potential and current policy trajectories in Latin American countries



Leon Clarke^{a,*}, James McFarland^b, Claudia Octaviano^c, Bas van Ruijven^d, Robert Beach^e, Kathryn Daenzer^f, Sara Herreras Martínez^g, André F.P. Lucena^h, Alban Kitousⁱ, Maryse Labriet^j, Ana Maria Loboguerrero Rodriguez^k, Anupriya Mundra^a, Bob van der Zwaan^{l,m,n}

^a Joint Global Change Research Institute, Pacific Northwest National Laboratory, United States

^b United States Environmental Protection Agency, United States

^c Joint Program on the Science and Policy of Global Change, Massachusetts Institute of Technology, United States

^d National Center for Atmospheric Research, United States

^e Research Triangle Institute, United States

^f Pennsylvania State University, United States

^g Netherlands Environmental Assessment Agency, The Netherlands

^h Energy Planning Program, Universidade Federal do Rio de Janeiro, Brazil

ⁱ Joint Research Center, European Commission, Italy

^j Eneris Environment Energy Consultants, Spain

^k CGIAR Research Program on Climate Change, Agriculture and Food Security CCAFS, Colombia

^l Energy Research Centre of the Netherlands (ECN), Policy Studies, Amsterdam, The Netherlands

^m Johns Hopkins University, School of Advanced International Studies, Bologna, Italy

ⁿ University of Amsterdam, Faculty of Science (HIMS), Amsterdam, The Netherlands

ARTICLE INFO

Article history:

Received 29 August 2014

Received in revised form 4 January 2016

Accepted 16 January 2016

Available online 3 February 2016

Jel Classification:

Q40

Q50

Keywords:

Scenarios

Latin America

Climate mitigation

ABSTRACT

This paper provides perspectives on the role of Latin American and Latin American countries in meeting global abatement goals, based on the scenarios developed through the CLIMACAP–LAMP modeling study. Abatement potential in Latin America, among other things, is influenced by its development status, the large contributions of non-CO₂ and land use change CO₂ emissions, and energy endowments. In most scenarios in this study, the economic potential to reduce fossil fuel CO₂ as well as non-CO₂ emissions in Latin America in 2050 is lower than in the rest of the world (in total) when measured against 2010 emissions, due largely to higher emission growth in Latin America than in the rest of the world in the absence of abatement. The potential to reduce land use change CO₂ emissions is complicated by a wide range of factors and is not addressed in this paper (land use emissions are largely addressed in a companion paper). The study confirms the results of previous research that the variation in abatement costs across models may vary by an order of magnitude or more, limiting the value of these assessments and supporting continued calls for research on the degree to which models are effectively representing key local circumstances that influence costs and available abatement options. Finally, a review of policies in place in several Latin American countries at the time of this writing finds that they would be of varying success in meeting the emission levels proposed by the most recent IPCC reports to limit global temperature change to 2 °C.

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1. Introduction

Stabilizing GHG concentrations and limiting associated temperature change will eventually require deep emission reductions from all regions of the world. However, the manner and timing of abatement will differ across countries and regions. Each country's or region's contribution will depend on the nature of its emissions in the absence of abatement (baseline emissions) and the associated potential to

reduce those emissions. An important issue within this context is the nature of possible emission reductions in any country or region consistent with ambitious long-term global climate goals.

This study aims to explore several dimensions of abatement in Latin America. In specific, it explores the following questions. First, what are key characteristics of Latin America that might influence opportunities to reduce emissions, including states of development, emission profiles, and energy mixes. Second, is the economic abatement potential higher or lower in Latin America than in the rest of the world? This question is related to the appropriate Latin American abatement commitments in the context of global climate discussions. Third, how might the

* Corresponding author.

E-mail address: leon.clarke@pnnl.gov (L. Clarke).

Table 1
Development and CO₂ emission indicators.
Source: UNDP, 2013; World Bank, 2014.

	Argentina	Brazil	Chile	Colombia	Mexico	LAM&C	China	India	EU	USA	World
GDP/cap, PPP (2011 \$) ^a	N/A ^e	14,323	21,049	11,637	16,316	14,366	10,756	5050	33,294	50,866	13,609
GDP/cap, MER (curr. US\$) ^a	14,680	11,320	15,245	7763	9818	9773	6093	1503	32,917	51,755	10,351
Urban population (%) ^a	93	85	89	76	78	79	52	32	74	83	53
Access to electricity (%) ^b	97	99	N/A	97	N/A	95	100	75	N/A	N/A	78
Access to improved sanitation (%) ^a	97	81	99	80	85	82	65	36	100	100	64
Gini index ^c	44	55 ^d	52 ^d	56	47	N/A	42 ^d	34	30	49	N/A
HDI ^a	0.811	0.730	0.819	0.719	0.775	0.741	0.699	0.553	N/A	0.937	0.694
IHDI ^a	0.653	0.531	0.664	0.519	0.593	0.550	0.543	0.392	N/A	0.821	0.532
CO ₂ emission (metric ton/cap) ^c	4.47	2.15	4.21	1.63	3.76	2.91	6.19	1.67	7.35	17.56	4.88
CO ₂ intensity of energy (kg/kgoe) ^c	2.31	1.58	2.34	2.35	2.48	2.14	3.29	2.78	2.15	2.45	2.53
CO ₂ intensity (kg/GDP, PPP) ^c	N/A	0.15	0.22	0.15	0.24	0.21	0.67	0.36	0.22	0.36	0.38
Primary Energy (GJ/cap) ^c	77	57	76	29	63	41	76	24	142	300	77
Final Energy (GJ/cap) ^c	56	45	58	20	40	30	47	16	99	203	53

^a Data for 2012.

^b Data for 2011.

^c Data for 2010.

^d Data for 2009.

^e GDP in PPP data for Argentina is not available from the World Bank.

economic abatement potential vary across countries within Latin America? Fourth, how much would it cost to implement substantial emission reductions in Latin America through 2050? Finally, how consistent were plans in Latin American countries at the time of this writing with longer-term climate or abatement goals? To explore these issues, this study makes use of recently developed scenarios from the CLIMACAP–LAMP modeling study¹ (van der Zwaan, et al., in this volume).

The remainder of this paper proceeds as follows. Section 2 first provides background on development and energy patterns in Latin America, both of which will influence opportunities for abatement in Latin American countries. Section 3 discusses the specification of scenarios used in this study and describes the models participating in the study. Section 4 then discusses economic abatement potential in Latin American countries and the possible reductions in the region as a whole consistent with the goal of limiting the increase in global surface temperature to less than 2 °C at the lowest global economic cost. Section 5 discusses carbon prices and the costs of abatement. Section 6 then explores the degree to which planned activities in Latin American countries (at the time of this writing) were consistent with a 2 °C goal. Section 7 provides final perspectives and identifies several future research needs.

2. Key issues for understanding policy in Latin America

The opportunities for abatement vary across countries for several reasons. One of these, the level of development, is particularly important for understanding global climate discussions and in drafting policies that are adequate to national circumstances. The level of development influences the capacity of countries to take action on abatement, gives some indication of the potential for economic growth and associated emission growth, and raises important issues surrounding the linkage between abatement and sustainable development.² The level of development in the different Latin American countries influences climate policy choices, as countries try to balance costs and benefits of abatement while allowing for human development (see Section 6).

¹ The Integrated Climate Modeling And CAPacity building in Latin America (CLIMACAP) and Latin American Modeling Project (LAMP) were conducted jointly to explore issues associated with abatement in Latin America. Data used for this paper can be found at <https://tntcat.iiasa.ac.at/CLIMACAP-LAMPDB/>.

² An analysis of the relationship between climate policy and development in Latin America can be found in Samaniego (2009), including concerns about the high vulnerability of the region to climate impacts and issues surrounding costs and opportunities of regional and international abatement policy.

According to the UNDP, the state of human development in Latin America³ is second among the developing world, and above the global average, as measured by the inequality-adjusted human development index⁴ (IHDI) (see Table 1). On average, the region enjoys higher living standards than China and India, but it remains behind developed countries such as the U.S. and those in Europe (Table 1). Latin America's income per capita is 2.9 times that of India, but only 27% of that of the U.S., and it lags behind in important indicators such as access to electricity and improved sanitation. Urbanization is high in the region, with a 79% of the population living in cities, as compared to, for example, 31% of the Indian urban population.

Although countries in Latin America have made progress in reducing income inequality, Latin America still has the highest disparities in wealth distribution in the world. Brazil and Mexico, for example, are characterized by very high Gini coefficients measuring income inequality (Table 1) and all of the Latin American countries in this study have substantially lower IHDI than unadjusted human development indices (HDIs). In 2010, 37 million people lived in extreme poverty in the region (with less than \$1.25 per day) (UNDP, 2013). Thus, climate policy for Latin America needs to carefully consider distributional issues, both at the international and national levels (Chakravarty et al., 2009; Markandya, 2011).

Associated with the level of economic development, final energy and primary energy consumption per capita in Latin America are well below that of Europe and the U.S., and generally below the world average (Table 1). Chile, Argentina and Brazil have the highest final energy consumption per capita in Latin America, but these values are still at about half of that of the EU and around 25% of that in the U.S. Similar patterns hold with respect to primary energy consumption.

Emissions per capita are strongly linked to economic output, and to the level of development more broadly, but there is variation in this correlation (Fig. 1). For example, the Latin American and Caribbean region (LAM&C) has a similar IHDI as China but lower emissions per capita. These variations in emission intensity of the different Latin American economies reflect different structures of the energy system, but also differences in policies and resource endowments.

An important consideration in understanding the potential for climate abatement is the structure of the energy system. The future

³ In this circumstance, Latin America refers to Latin America and the Caribbean.

⁴ The human development index measures development along three dimensions: life expectancy, educational attainment and command over the resources needed for a decent living. The IHDI is the HDI adjusted for inequalities in each of the three dimensions of the HDI (health, education and income). The IHDI will be equal to the HDI value when there is no inequality, but falls below the HDI value as inequality rises. See UNDP (2013). Because inequality is high in most Latin American countries, we use the IHDI in this paper.

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