Konrad Adenauer Stiftung

NDCs

WHAT IS THERE FOR LATIN AMERICAN BIG CITIES?

NDCs: What is there for Latin American big cities?

A case study and workshop project for four big cities and countries in Latin America.

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Konrad Adenauer Stiftung

IIS International Institute for Sustainability

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Presentation

Freedom, justice and solidarity are the basic principles underlying the work of Konrad Adenauer Foundation - KAS, a political foundation linked to the Christian Democratic Union (CDU), a political party in Germany. With more than 80 offices abroad, and projects in over 120 countries, our goal is to make a unique contribution to the promotion of democracy, the rule of law, and a social market economy.

Alongside to the country-specific programs, there are cross-border regional programs with separate thematic focuses. One of these programs, is the KAS Regional Program "Energy Security and Climate Change in Latin America (EKLA)", which has its headquarters in Lima, Peru. One of our working areas is climate governance at local level. It is undeniable that there is no effective climate solution without the participation of cities. Hence, the KAS supports this study, organized in cooperation with our partner, the Institute for Sustainability (IIS), aiming to provide information for policymakers on the implementation of the Paris Agreement, in selected countries of Latin America. Those goals will not be achieved unless big cities play an active role. Therefore, both, national governments, as well as city governments, need to strengthen a dialogue process to align their Nationally Determined Contributions (NDCs) with existing cities plans, and initiatives on climate change, which may have synergies with each other. We thank ISS for the elaboration of this document, and for the fruitful collaboration with KAS in 2017. We wish you all a pleasant reading!

Dr. Christian Hübner – **Head of EKLA-KAS**


nH
HOTELES
CITY
Gran Victoria

Project motivation: cities and national mitigation efforts

The landmark success of the Paris Agreement must be credited to the (Intended) Nationally Determined Contributions (NDCs) of the countries that are responsible for more than 95% of global emissions. The NDCs were a major effort by National Governments in estimating their expected increases in greenhouse gas (GHG) emissions in the coming decades, and pledging reductions of such emissions in order to limit average global temperature rise to 2°C.

Different countries have proposed different strategies and approaches to reduce emissions. In the overwhelming majority of cases, the NDCs were determined by National Governments 'only'. Some level of consultation existed in many, or most countries, but the engagement of subnational entities was essentially nil. This may be explained by the time pressure under which the NDCs were formulated and also, more relevantly, by the fact that most decisions affecting a country's future carbon emissions are the responsibility of national governments: the energy mix, the percentage of renewables, emission standards, fuel standards, agriculture, land use and forest policies, and many others.

Many other decisions, however, are the responsibility of subnational and local-level governments – including transportation policies, city design, waste management, building efficiency codes, consumer behavior and practices, and many others. Cities, in particular, make a crucial contribution in helping countries to arrive at a climate agreement at a global scale. To begin with, half of the world's population lives in cities, a share that reaches 80 percent in Latin America. Cities house most built assets, generate more than 80 percent of the world's GDP, are responsible for around 70-80 percent of the energy consumed, and generate three quarters of energy related GHG emissions. Such a concentration of people, built assets and economic activity makes cities particularly vulnerable to the impacts of climate change. This same concentration makes it attractive and more cost-effective to focus mitigation (and adaptation) action on cities.

There are other reasons why is it so crucial to engage cities in national efforts to reduce emis-

Thus, it is in the best interest of national governments to focus on how they can better empower and enable local governments and stakeholders to address climate change through everything from day to day decisions to broad urban planning decisions with long-term implications for the future

sions. Cities house most scientists and research bodies; they are major sources of innovation and dissemination of ideas and practices, therefore they may be front-runners in climate action. Many cities worldwide have in fact been ahead of their national counterparts and pushed the climate agenda with greater enthusiasm and vigor, more often as part of their commitment to sustainability and better quality of life.

Despite the obvious case for city engagement in the climate agenda, 'there is a poor understanding of the relationship between city strategies on climate change mitigation and adaptation and the relevant policies at national level. … How and why cities engage in climate policy remains largely unclear and the effect of (binding or non-binding) policies from higher levels of government is hardly understood. Whilst scholars note a supporting effect, the mere existence of international or indeed national climate policies is no guarantee for local plans and action. There is a need to provide cross country empirical evidence on interlinkages of multi-level climate change policy' [14].

From the national perspective, as well, 'there are several broad reasons for national governments to better engage with local governments and stakeholders on the issue of climate change. Local authorities serve as a vehicle for the implementation of nationally driven policies, to ensure that the mandates outlined at national scale are actually carried out and deliver meaningful results at local scale … Urban scale action may be important in its own right and able to provide a means of social and technical innovation that is not possible at broader scale, ultimately providing a vehicle for learning and broader dissemination where successful innovations occur … Local action will also provide essential insights for understanding the political economy of climate change policy – a vehicle to identify how incentives and interests interact at different levels of governance, to observe and understand direct local costs and benefits of action, including local co-benefits, and the local winners and losers of any particular set of policy choices … The evidence or perceptions of who wins and who loses, and the weight of co-benefits associated with any set of climate policies may significantly differ at local scales compared to aggregate nation-wide experience. This can open a range of opportunities for local action that may not exist at broader scales. Thus, it is in the best interest of national governments to focus on

how they can better empower and enable local governments and stakeholders to address climate change through everything from day to day decisions to broad urban planning decisions with long-term implications for the future' [7].

This project aimed at helping both national governments as well as selected city governments in Latin America to strengthen a dialogue process to align the NDC with existing city government plans and initiatives on climate change, which may have synergies with each other.

To achieve this, two sets of activities were carried out: one substantive, which tried to better understand NDC's specific targets and compliance mechanisms, specifically at the city level. At the same time, the project analyzed existing climate action plans of the (selected) cities to assess if and how they fit/complement the NDC targets. The other set of activities was process oriented, and aimed at promoting a dialogue between both levels of government in terms of identifying potential gaps, overlaps, and complementarities of national and city level climate initiatives. This was admittedly a challenging effort but also a very necessary one. This coordination is a goal of national and city governments of all countries in the world, rich and poor, since all levels of government are aware of the enormous challenges involved in fulfilling the Paris Agreement based on their own knowledge and capacity to carry out such a difficult agenda.

The project focused on a selected number of countries and (Mega) cities in Latin America: Brazil and Rio de Janeiro, Mexico and Mexico City, Argentina and Buenos Aires, and Peru and Lima. While São Paulo is larger than Rio, and while Rio is not a federal capital, it was nonetheless selected because its climate agenda is particularly advanced, and there were lessons to be learned and shared with other cities. A field visit including a local workshop was carried out in each city; and a final workshop bringing together representatives from all 4 cities and all 4 national governments took place at the end of the project, in Rio de Janeiro.

Short conceptual framework:

Climate change efforts and government jurisdictions

EVOLVING CONCEPTS AND MODELS

The main objective of this project – to understand the linkages and complementarities between national government efforts to reduce carbon emissions and equivalent efforts by city governments – has been the focus of academic research in the last 10 years or so.

'Cities represent a challenge and an opportunity for climate change policy. As the hubs of economic activity, cities generate the bulk of GHG emissions and are thus important to mitigation strategies. Urban planning will shape future trends. By empowering local governments, national policies could leverage existing local experiments, accelerate policy responses, foster resource mobilization and engage local stakeholders' [7].

The question is how can national and city governments best coordinate their efforts to address the challenges of reducing emissions, fulfilling countries' commitments of the Paris Agreement, minimizing costs, identifying opportunities and ensuring the 'right' institutional framework is in place to incentivize action.

'… There is no archetypical way of planning for climate change, and multiple interests and motivations are inevitable. A multi-scale approach to climate policy in the future is needed, mainly ensuring sufficient capacity and resources to enable local authorities to plan and respond to their specific climate change agenda. … The local level seems to be acting on the basis of the experience gained in implementing environmental policies, as well as broader development policies allied to climate action. ... However, tackling global issues requires more than the planning and action from the most

forward-looking cities. Stronger and coherent national strategies are required. In most of the cases the proactive role of cities in implementing climate strategy depends on their involvement in international associations … A national framework is not always sufficient to trigger climate change action on the ground. … However, the lack of national leadership can lead to a more active membership in climate change networks' [14].

and political fragmentation, … the urban governance of climate change is constituted through a myriad of public and private actors (operating across different scales and through multiple networks) and mediated through sociotechnical infrastructure systems and, in the process, is creating an arena in which what it means to act in response to climate change is being defined and, with it, what it means to have authority to govern' [4].

The lack of national leadership can lead to a more active membership in climate change networks'

Historically, 'the urban response to climate change was mostly characterized by "municipal voluntarism", where a few pioneering municipal governments joined transnational networks and focused on a suite of voluntary actions under their immediate jurisdiction. Such actions were also intended to yield local benefits … By the 2000s, climate change became an issue of strategic urbanism, more central to economic development, urban planning, and infrastructural investment. A number of new municipal networks were formed with active participation from developing country cities. Cities have begun to shape not only the climate change agenda within their own domains, but also within national and international climate arenas' [5].

In an earlier paper, the same author suggests that '… rather than viewing the city as an actor responding to global processes of environmental change

In terms of the UNFCCC (United Nations Framework Convention on Climate Change) process, it seems to be marked by three trends which are gaining momentum: first, there is a growing sense of co-ordination of urban initiatives, which is expressed in a number of initiatives and networks focused primarily on urban policies and approaches to tackling climate change mitigation and adaptation – such as C40, ICLEI, the subsequent launch of the Compact of Mayors at COP20 in Lima, ICLEI United Cities, and Local Governments as well as UN-Habitat. Second, there is the inclusion of the urban dimension in the agendas of the United Nations and the UNFCCC process. And third, there is a growing movement towards standardizing urban responses to climate change, notably monitoring and reporting tools that can account for GHG emissions [5].

VERTICAL COLLABORATION

Different frameworks of climate policy coordination between national and local governments have been proposed. Kern and Alber [19] propose three models under which national and city governments can interact, with increasing degrees of top-down intervention: (i) governing through enabling, (ii) governing by provision, and (iii) governing by authority. A similar but alternative approach has been proposed in [7], 2010 which also include three categories: '… (i) nationally or regionally led enabling frameworks with predominant influence moving through national policy to influence local action; (ii) bottom-up or more autonomous local or regional action that in turn may influence national action; (iii) a hybrid approach showing features of both and sometimes encompassing strong public-private interactions' – see Table 1.

IN GOVERNING BY ENABLING, the national government is primarily limited to the collection of information and the dissemination of knowledge on best-practice cases. The main goal of this approach is to build capacity at local level. This model appears to dominate in federal systems, and the states constitute an additional layer of government that may run more comprehensive programs for local authorities than the federal government. Best-practice dissemination, benchmarking and voluntary certification are particular forms of national governments incentivizing climate change policy at the local level. Competitions and awards can be used to recognize the best-performing local authorities.

IN GOVERNING BY PROVISION, the national government acts as provider. This is often needed because the most urgent problem which most local authorities face when considering climate initiatives is the lack of financial resources. Climate funding schemes have been established mainly in unitary states with relatively strong local authorities, helping to create local capacities. Relatively rich unitary states with a good environmental record tend to become forerunners in this area. Such schemes are most successful when local authorities have a say in the development and setting-up of such programs. Thus, it does not come as a surprise that associations of local authorities are seeking greater inclusion in and influence on national climate change policy and the programs decided at national level.

TABLE 1 / ALTERNATIVE VERTICAL COLLABORATION BETWEEN GOVERNMENT LEVELS

COOPERATION BY INSTRUMENTS: ROLE OF NATIONAL GOVERNMENT	COOPERATION BY RESPONSIBILITIES
• Enabling	• Top-down
• Provisioning	• Bottom-up
• Mandating	• Hybrid

IN GOVERNING BY AUTHORITY, national governments use their state authority to set mandatory requirements for local climate change policy. It may be assumed that in countries in which local authorities are strongly influenced by national regulations, the national government can steer local climate protection action better than in countries in which local authorities enjoy a stronger and relatively independent position [19]. 'National policies establish broad, cross-sectoral price signals to guide investment to climate-friendly outcomes, for example through a tax on carbon or establishment

BOX 1 / NORWEGIAN NATIONAL POLICY ENABLING FRAMEWORK AT URBAN SCALE

In June 1998, the Norwegian parliament passed the Government White Paper on the Kyoto Protocol, introducing local climate policy as an explicit policy area. Using the White Paper as a base, the Minister of the Environment issued a circular in September of the same year requesting municipalities to develop local climate plans aiming at reducing carbon emissions and increasing sequestration through forestry projects. These plans were to be developed in partnership with the country and regional government authorities. A local climate policy program was established in 2000 by the Ministry of the Environment, funding 26 projects in 37 of 435 municipalities and 8 out of 19 counties. In addition to financial help, a web-based information source and emissions calculation tool was put in place by the national government. In the development of climate plans, national financial support appears to have been a key catalyst as only one municipality was reported to have taken action without grant support. However, while plans have been established, it appears that implementation has stalled as funding has not been available to municipalities to support the implementation of the programs.

SOURCE: Corfee-Morlot [7].

of national cap and trade regulations. Central governments then assist local governments to contextualize national policies (i.e., to understand exactly how best to clarify goals in local contexts and priorities), as well as assist them to develop capacity' [7].

LEARNING FROM THE 'BOTTOM UP': FROM CITIES AND REGIONS TO NATIONAL ACTION. 'In a bottom-up system, local authorities are encouraged or allowed to go beyond national requirements or incentives to independently act to address climate change, either as an active part of national policy or in its absence. Learning and experience acquired through successful local programs diffuses to inform and steer policymaking at regional or national levels. Inevitably both directions of influence – top-down and bottom-up – co-exist to shape action and policy across levels of decision making' [7].

'In the United States, as in Australia, the absence of national leadership on the issue of climate change has also served to create a policy vacuum into which city and state authorities have ventured, suggesting that coordination and support across

vertical layers of government may not always be necessary in promoting urban responses to climate change. Nonetheless, in each case, (state and) municipal authorities were able to draw on federal funding to undertake various initiatives, albeit these were relatively small in scale, and have been able to exercise their autonomy in devising and implementing climate policy' [4].

'There are a number of other examples of note in the US which have a decentralized approach to governance. The State of California is a notable example for its leadership on air pollution control that has provided a foundation of knowledge, experience and political will to support its recent actions to address climate change – action that is far in advance of those taken by the US national government. New York City has also become a leader on the issue of adaptation and mitigation due in part to a strong network of academic and government practitioners, working together to advance understanding and support decision-making' [7].

In an analysis of the governance links between different levels of government in the case of adaptation to climate change, OECD [28] looks at a

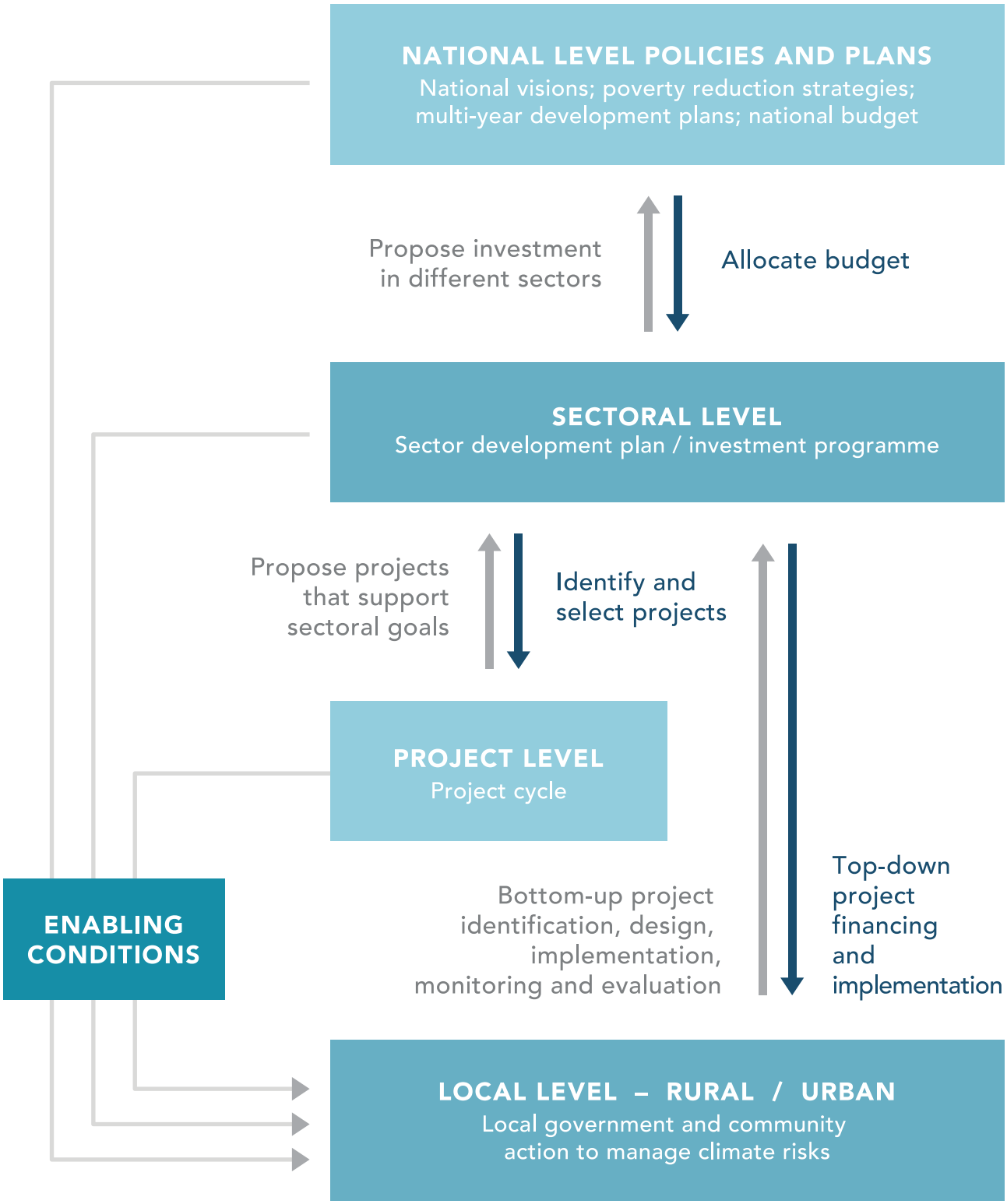
BOX 2 / CLIMATE GOVERNANCE, CITY OF PORTLAND AND THE STATE OF OREGON

Since 1994 Portland aggressively developed a green building sector and innovation that had a direct influence on state-wide policy. The effort was begun by a volunteer citizen group, which was created to inform city council decisions concerning sustainable development and commissioned a planning process to explore the potential for a local green building technical assistance program. It grew into a Green Building program which is a partnership between city government and local organizations, focusing on policy development, demonstration projects, technical assistance, education and financial incentives. It is funded through local residential and commercial solid waste fees, and grants.

The motivation behind the green building programme was to develop and maintain a local/regional competitiveness around a new green pole of economic activity. In 2007, the City of Portland had the highest number of LEED certified buildings in the United States, and was attracting firms and qualified workers from around the country. The Portland experience induced a state-wide effort to regulate building energy performance and move towards green buildings more broadly across the state.

SOURCE: Corfee-Morlot [7].

FIGURE 1 / DECISION LEVELS IN POLICY GUIDANCE



SOURCE: OECD [28].

'whole government' approach, and identifies four specific levels: centralized national ministries and decision processes at the national level; sectoral ministries; project level; and the local level which includes both urban and rural contexts. Figure 1 shows the suggested overall architecture of the policy guidance, as well as the interactions between the various levels.

Latin American specific context. In the more specific case of Latin America, 'although urban areas are not major GHG emitters, they play crucial, yet understudied roles in the climate change arena. They are not only growing sources of greenhouse gases, but (in common with urban settlements in other regions) are also hotspots of vulnerability to floods, heat waves, and other hazards that climate change is expected to aggravate. These roles create unique challenges and opportunities for urban mitigation and adaptation responses, and for mainstreaming them with development goals.

Some urban centers are actively participating in the climate arena and the region's population and organizations have a long experience of responding to climate related hazards. These responses have taken place in a context of processes of democratization, retrenchment of the state, decentralization and increased participation of the private sector and civil society organizations.

Following an international trend, most national governments have given priority to mitigation over adaptation, and to impact or top-down assessments with strong participation of physical scientists over bottom-up or vulnerability assessments. A few cities in the region are developing climate policies often associated with air pollution, water avaiability and other local, development concerns' [13].

An antagonistic perspective. While it is indisputable that national and city governments should coordinate, align and support each other's initiatives on climate change, the reality imposes itself and, as with many other areas of government intervention, such coordination is extremely limited and often non-existent. 'Despite over two decades of policy interventions at the city level to address issues of climate governance, there remains a stubborn gap between rhetoric and action. Explanations for this gap vary from case to case but focus on issues of institutional capacity and factors of political economy' [4].

Many, or most, government responsibilities regarding climate change are well beyond the mandates of cities and local governments. This includes energy policies and pricing, the design of the energy matrix and the sources of energy supplying cities, fiscal and market mechanisms, such as tradable permits and carbon taxes[1]. Even many decisions that take place at the local level are largely influenced by the national government due to their funding – notably urban infrastructures such as transport systems – or due to regulations, such as energy efficiency, standards for buildings and appliances, vehicles. Cities do have more autonomy with regard to land-use planning, education, and voluntary programs.

Whether or not governments have been collaborating in the climate agenda, this project aims to promote and enhance a dialogue – and a first crucial step is an analysis of the existing plans at national and city levels. This is the objective of the next section, which focuses on the four countries and cities case studies.

1. Even though tradable permits and carbon taxes have been successfully implemented at more regional and local levels both in OECD and non-OECD countries, the bulk of such markets and players exist and operate at a national level.

Countries and cities case studies

This section presents and analyzes the basic socioeconomic and climate data and indicators of the four countries and respective four cities. It is the 'hard' section of this brief report and it is based on the findings of the desk review, the field visits to the four countries/cities, and on the results of the final workshop that took place in Rio de Janeiro at the end of the activity.

The section is divided into four subsections, one for each country and city case study. Before jumping into the details of each case, their data and numbers, a few summary socioeconomic and climate statistics are presented comparing the four countries and their four cities. Table 2 shows 6 of these main statistics for the four countries and for the world, and Table 3 the same for the four cities. Table 4 details sectoral emissions and reduction targets for the four cities.

In socioeconomic terms, Argentina and Buenos Aires stand out as the 'rich cousins' relative to the other 3 countries and cities. The better socioeconomic conditions are associated to higher emissions in the case of Argentina, but not in the case of Buenos Aires, that shows similar per capita emissions as the other cities. The lower per capita emissions of Lima may be associated to the fact that the figures apply to the entire Metropolitan Region, while in the other three cities only the main municipality is included. Brazil and Peru have lower emissions relative to their populations. The two countries also have lower per capita energy emissions, in the case of Brazil because of its clean energy mix. Table 5 disaggregates national and city emissions by sector.

TABLE 2 / GENERAL SOCIOECONOMIC AND CARBON EMISSIONS STATISTICS, 4 COUNTRIES, 2016

	POPULATION (MILLIONS)	ENERGY EMISSIONS PER CAPITA (T)	GDP PER CAPITA (2016 US$)	SHARE OF GLOBAL EMISSIONS	SHARE OF GLOBAL POPULATION	HDI (WORLD RANK)*
Peru	31.7	1.99	6,060	0.2%	0.43%	0.74 (87°)
Mexico	127.5	3.87	8,200	1.3%	1.71%	0.76 (77°)
Argentina	43.8	4.75	12,460	0.6%	0.59%	0.83 (45°)
Brasil	207.6	2.59	8,650	15%	2.80%	0.75 (79°)
World	7,442	4.97	10,150	100%	100%	--

SOURCES: [46] and [47].

TABLE 3 / GENERAL SOCIOECONOMIC AND CARBON EMISSIONS STATISTICS, 4 CITIES, 2016

	POPULATION (MILLIONS)	SHARE OF NATIONAL POPULATION	GDP PER CAPITA (2016 US$)	ENERGY EMISSIONS PER CAPITA
Lima MR	10.6	33%	9,085	1.7t
Mexico City	9.6	7.5%	20,127	3.2t
Buenos Aires	3.1	7.2%	35,262	3.4t
Rio de Janeiro	6.2	3.0%	15,283	3.6t

SOURCES: [46], [47] and various statistics from country analyses below.

TABLE 4 / FOUR CITIES' EMISSIONS INVENTORIES AND REDUCTION TARGETS

	INVENTORY	TOTAL EMISSIONS- $MtCO_2eq$ (%)	YEAR REFERENCE	REDUCTION TARGET
Rio de Janeiro	• Energy (50%) • Transport (30%) • Industry (10%) • Solid Waste (10%)	11.2 6.8 2.4 2.3	2012	20% (2020)
Mexico City	• Energy (39%) • Transport (37%) • Solid Waste (14%) • Industry (8%)	12.0 11.5 4.2 2.4	2012	≈30% (2025)
Buenos Aires	• Energy (49%) • Transport (33%) • Solid Waste + Government (10%)	5.6 3.9 1.2	2012	30% (2030)
Lima	• Transport (30%) • Industry (10%) • Buildings + Solid Waste (32%)	5.5 5.0 4.9	2012	30% (2030)

SOURCES: Various country tables below.

TABLE 5 / NATIONAL EMISSIONS ($MtCO_2eq$) AND CITY EMISSIONS (%)

	BRAZIL 2011	RIO % OF BRAZIL	PERU 2012	RM LIMA % OF PERU	MEXICO 2013	MEXICO C. % OF MEXICO	ARGENTINA 2012	B.AIRES % OF ARGENTINA
Energy	196	5.7%	27	11%	127	8.4%	128.8	4.9%
Transport	175	3.8%	18	31%	174	6.6%	54.6	7.1%
Industry	95	2.6%	6	82%	115	1.0%	15.3	NA
Solid Waste	58	4.3%	8	27%	31	13.7%	20.8	5.8%
Agriculture	406	--	26	--	80	0.9%	119.5	--
LULUCF (*)	349	--	87	--	32	--	90.5	--
Resid/Comm.	--	--	--	--	106	9.5%	--	--
TOTAL	1271	1.8%	170	9%	665	4.6%	429.4	2.7%

SOURCES: Various country tables below.

TABLE 6 / COUNTRY AND CITY REDUCTION TARGETS (% AND t/person/yr)

	BRAZIL	RIO DE JANEIRO	PERU	RM LIMA	MEXICO	MEXICO CITY	ARGENTINA	BUENOS AIRES
Target year	2030	2020	2030	--	2030	2025	2030	2030
Base year	2005	2005	2010	--	2013	2012	2012	2008
Not cond. Target	43%	20%	30%	--	22%	28%	15%	30%

SOURCES: From the various country tables below.

As observed in other countries and contexts, the direct contribution of cities to national emissions is rather small relative to their populations. This reflects the fact that their importance in terms of emissions is indirect, via consumption of goods and services, which are produced outside city limits. This is the typical case of energy production – refineries, power plants and industries are typically located outside of cities. Yet, the city of Rio de Janeiro has a large thermal power plant associated to a steel industry on the outskirts of the city, but within its legal boundaries. The same applies to refineries and a few industries in both Mexico City and the Lima Metropolitan Region.

Lastly, in terms of overall comparisons of the 4 cities and 4 countries, Table 6 presents their reduction targets. In general terms, countries aim at a 30% reduction of their emissions relative to a base year

(between 2005 and 2013), except for Brazil and Argentina. Argentina stands out as one of the G40 countries with the lowest reduction targets (15%), although it has a conditioned reduction target of 30%. Brazil, on the contrary, stands out as a country that has one of the highest emission reduction targets among all countries in the world (43%). Its emission reductions are almost entirely associated to reductions in deforestation and land use.

In terms of the cities, the reduction targets are roughly equivalent among the three largest cities (20% by 2020 and/or 30% by 2030). Lima does not have a specific target, even though it has an Adaptation Strategy coupled with mitigation actions which are quite comprehensive, but not quantified in terms of emissions reductions. The next four subsections describe the efforts of countries and cities in greater detail.

1. Brazil NDC and climate mitigation plans of Rio de Janeiro, São Paulo and Belo Horizonte

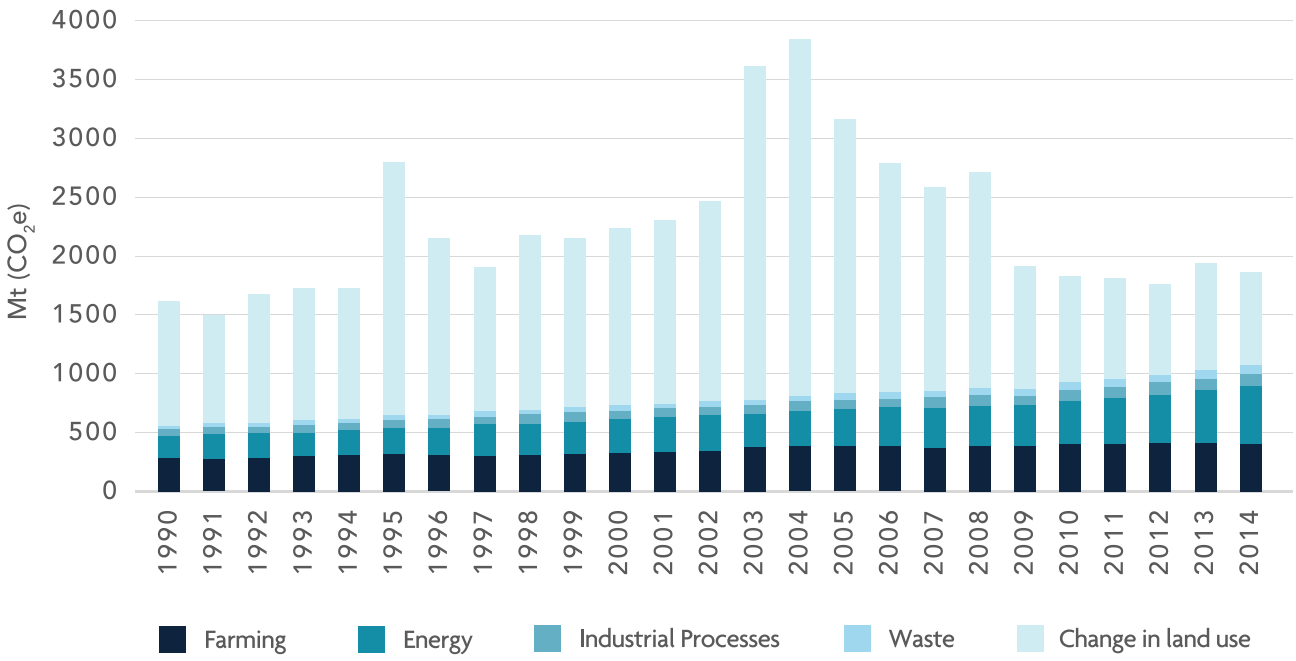
Because Brazil has more than one very large metropolitan region, in addition to Rio de Janeiro, data and statistics have been included for both São Paulo and Belo Horizonte, which are the country's first and third largest cities, Rio being the second. The three cities' emissions are proportional to their size, except for Rio, which has a much higher emission rate due to the presence of a large industrial complex of thermal power and steel mill plants. Emissions from this industrial complex represent some 50% of the entire city's emissions, leading Rio's per capita emission rates to be twice as high as those of São Paulo and Belo Horizonte. The per capita emissions of all cities combined represent between half and one third of the national average, indicating the extremely high level of emissions from agriculture and land use– Table 7.

TABLE 7 / BRAZIL NATIONAL AND CITY EMISSIONS, VARIOUS COMPARABLE STATISTICS

TOTAL EMISSIONS			
BRAZIL	RIO DE JANEIRO	SÃO PAULO	BELO HORIZONTE
2.8% of the world opulation	3% of country's population	5.7% of country's population	1.2% of country's population
2.4% of world GDP	5.3% of national GDP	10.7% of national GDP	1.4% of national GDP
2.3% of world emissions	1.8% of national emissions	1.2% of national emissions	0.3% of national emissions
• Total emissions ≈ 1271.4 $MtCO_2$-eq • Per capita ≈ 6.5t CO_2-eq (2010)	• Total emissions: ≈ 22.6 $MtCO_2$-eq • Per capita ≈ 3.6t CO_2-eq (2012)	• Total emissions: ≈ 15.1 $MtCO_2$-eq • Per capita ≈ 1.4t CO_2-eq (2009)	• Total emissions: ≈ 4.4 $MtCO_2$-eq • Per capita ≈ 1.8t CO_2-eq (2013)
Brazil = 7th largest world GGE emitter	In the three cities, energy and transport represent more than 80% of cities' emissions.		

SOURCES: [15], [17], [21], [29], and [32].

FIGURE 2 / EVOLUTION OF BRAZIL'S GROSS GHG EMISSIONS, 1990-2014 ($MtCO_2eq$)



SOURCE: [27].

The high level of emissions from the green sectors is illustrated in Figure 2 that shows the evolution of Brazil's GHG emissions since 1990. Emissions from deforestation have always accounted for the largest share of Brazil's emissions, which peaked in 2005. Since that year Brazil has placed the control of deforestation in the Amazon Region on top of its political agenda, and the results have been very significant, with emissions from deforestation having decreased drastically.

In parallel to high emissions from deforestation, Brazil has historically enjoyed low levels of emissions from energy generation and consumption. This has been a consequence of the very high level of renewables in the energy mix – around 40%, with 2/3 of electricity originating from (renewable) hydropower plants. In addition to this, Brazil has two very successful biofuels programs – for alcohol replacing gasoline, and biodiesel complementing diesel. The combination of these two factors has been that Brazil has historically had high overall emission levels with low energy sector emissions. With the control of deforestation, overall emissions have decreased significantly, while the participation of energy emissions has been increasing. This later trend is reinforced by the exhaustion of new hydropower options, forcing Brazil to intensify the use of fossil fuels for power generation. This trend contrasts with most countries, even though Brazil remains in a relative comfortable position in terms of its energy sector emissions. Despite this position, through its NDC, the country committed to increase up to 18% the share of biodiesel in the overall diesel market, increase the production of ethanol to 54 billion liters in 2030, promote efficiency gains in industry representing 10% of consumption, and lastly, to have 45% of the overall energy mix comprised of renewable energy by 2030.

With regard to sector emissions – Table 8 – the transport sector is clearly the most relevant, in all three cities. It is the only sector with emissions that have some significance in the aggregate of emissions from the Brazilian economy. Emissions from industry represent process emissions only, and do not include those originating from industries' own energy consumption. This is an IPCC methodology that to some extent diffuses the actual contribution of the industrial sector to overall emissions. As in other countries, emissions from solid waste are a small portion only of a city's emissions. São Paulo, in particular, implemented back in 2004 and 2008 two recycling plants with capacity to produce biogas, with significantly reduced GHG emissions. Rio and Belo Horizonte have yet not implemented such systems, and have higher per capita emissions in this subsector.

TABLE 8 / BRAZIL NATIONAL AND CITY SECTOR EMISSIONS AND RESPECTIVE SHARES ($MtCO_2eq$)

SECTOR	BRAZIL 2010 (1)	RIO DE JANEIRO 2012 (2)	(2) / (1)	SÃO PAULO 2009 (3)	(3) / (1)	BELO HORIZONTE 2010 (4)	(4) / (1)
Energy	196	11.2	5.7%	3.1	1.6%	0.7	0.4%
Transport	175	6.8	3.8%	9.2	5.3%	3.2	1.8%
Industry	95	2.4	2.6%	0.4	0.4%	--	--
Solid Waste	58	2.3	4.3%	2.4	4.4%	0.4	0.7%
Agriculture	406	--	--	--	--	--	--
LULUCF (*)	893	--	--	--	--	--	--
TOTAL	1821	22.7	1.8%	15.1	1.2%	4.4	0.3%

SOURCES: [15], [17], [21], [29], and [32].

In terms of future emissions and mitigation targets, as indicated above, Brazil has pledged a very ambitious NDC and its sizeable emissions reduction effort is concentrated on land use change, with a 53% reduction relative to 2010. It must be noted that, as many other countries, in 2010 Brazil had already reduced 40% of its emissions relative to 2005. As has also been discussed, the energy share in total emission is projected to increase from 10% in 2010 to 57% in 2030, with an 85% increase in emission levels.

Concerning the cities, Rio de Janeiro has an ambitious plan to reduce its emissions in all sectors, with a focus on transport and solid waste. São Paulo does not currently have a more aggressive mitigation plan, even though a draft plan was circulated for input from civil society (Prefeitura de São Paulo 2011, but was never made into a law), which was extremely ambitious and of high technical quality. According to the current Plan, emissions should have been reduced by 30% relative to 2005, an optimistic early projection that did not occur. Belo Horizonte has a target relative to a business as usual (BAU) scenario, with a 20% reduction in the trend by 2030, which means a net increase in the same period. Focus areas of the Belo Horizonte Plan are similar to those of Rio and São Paulo – namely transport and solid waste. In terms of per capita emissions, city targets are well below the national target, which remains nearly constant for the projected period – Table 9.

TABLE 9 / BRAZIL AND ITS CITIES' EMISSIONS PROJECTIONS AND MITIGATION TARGETS

A. EMISSIONS PROJECTIONS

SECTOR	BRAZIL			RIO DE JANEIRO			SÃO PAULO (APROX.)		
	2010	2030	%	2012	2025	%	2009	2040	%
Energy	371.1	688	+85	18.0	13.4	– 25.7	12.3	20.5	+65
Industry	89.9	99	+10	2.4	1.2	– 51.9	0.4	0.4	+2.8
LULUCF (*)	756.2	358	– 53	--	--	--	--	--	--
Solid Waste	54.1	63	+16	2.3	1.4	– 38.4	2.4	2.6	+8.3
TOTAL	1271.4	1208	– – 5	22.7	15.9	– 29.8	15.1	23.5	+55

B. MITIGATION TARGETS

	BRAZIL		RIO DE JANEIRO	SÃO PAULO		BELO HORIZONTE
Target year	2025	2030	2020	2040	2012	2030
Base year	2005	2005	2005	2009	2005	2007
Target (Mt)	– 800	– 900	– 2,3	– 2.1	– 10.7	--
Target (%)	– 37	– 43	– 20	+50	– 30	+ 20
Per capita target (t/person/yr)	6.2	5.4	1.4	--	--	1.1

SOURCES: Part A: [15], [25], [37], [16], [36], [39]; Part B: [13], [14], [21], [24], [25], [26], [29], [30], [31], [32], [34].

Concrete mitigation measures that have been proposed for the energy sector in the city plans include replacing public lighting with LED lamps, solar panels for water heating, re-urbanization of degraded neighborhoods, energy efficiency in buildings, incentives for decentralized generation with renewable sources, and reduction of consumption. In the transport sector, mitigation comes mostly as a co-benefit of transport management and includes measures such as expanding BRT lines, bicycles lanes, metro expansion, traffic management, fleet renovation and scrapping, integration of transport modals, demand management (promotion of public transport), among others.

2. Mexico NDC and Mexico City climate mitigation plan

Mexico is the second largest of the countries analyzed. It is the world's 12th largest economy and also the world's 12th largest emitter of GHG. The country has 1.7% of the world's population and is responsible for 1.3% of global emissions. Mexico was the first developing country to announce its NDC and is the only of the four countries with an implemented carbon pricing mechanism, initially set at a low US$ 3.50/t CO-eq. Mexico is also currently designing a tradable permit system for the largest emitting sectors. Emissions from energy, transport and industry account for the largest share of total emissions (more than 2/3) – Table 10.

TABLE 10 / MEXICO AND MEXICO CITY EMISSIONS, VARIOUS COMPARABLE STATISTICS

MEXICO	MEXICO CITY
• Mexico total emissions in 2013 ≈ 665 $MtCO_2$- eq, ≈ 3.6t CO_2 per capita, 2/3 from the combustion of fossil fuels • 1.7% of the world population, 1.3% of world emissions, 12th largest world emitter of GHG • Main sector emissions: vehicles, power generation and industry ≈ 2/3 of total emissions • 88 $MtCO_2$- eq of emissions from gasoline cars, total emissions from agriculture ≈ 80 $MtCO_2$- eq	• Mexico City: 7.5% of the country population, produces ≈ 18.4% of its GDP • Total emissions ≈ 30.7 $MtCO_2$/ t-eq ≈ 4.6% of national emissions • Energy and transport represent 2/3 of city emissions

SOURCES: : [6], [10], [47].

The Mexico City Metropolitan Region is one of the largest in the world. Mexico City (CDMX) alone holds 7.5% of the country's population, produces 18% of the country's GDP and emits 4.6% of the national GHG emissions. Regarding their emissions, in both the country and the city the vast majority is energy related – energy, transport, industry, oil and gas. As with the other 3 countries, direct city emissions are only a small proportion of total national emissions, and smaller than the population percentage – Table 11.

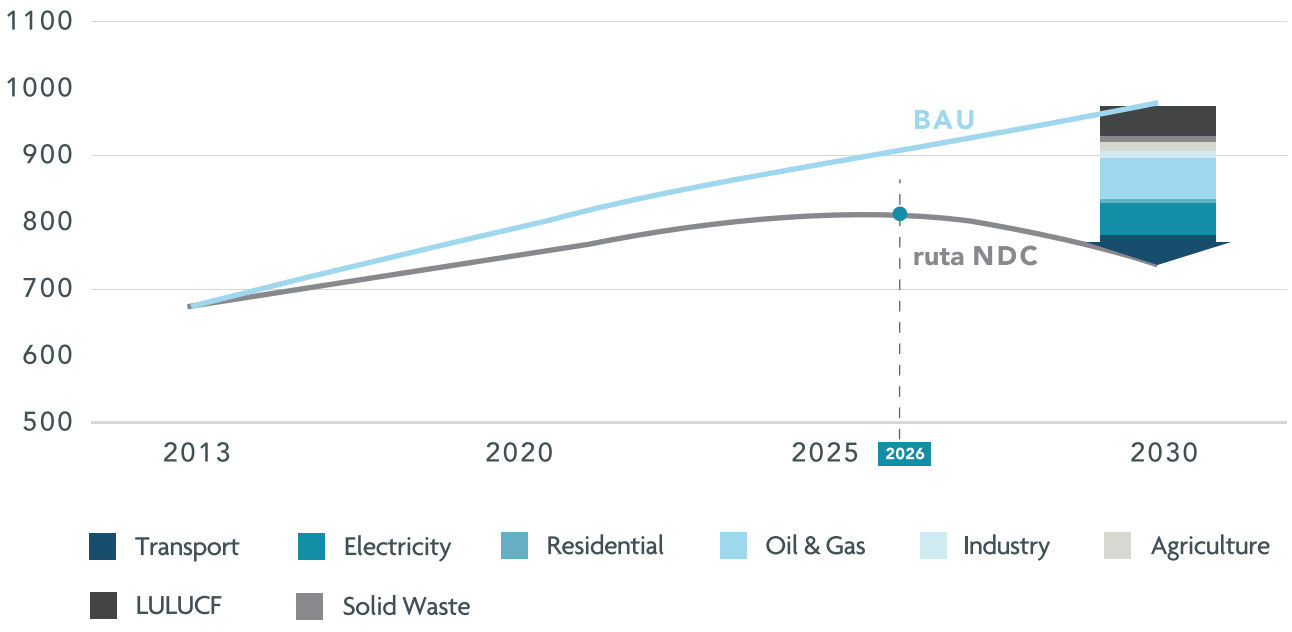
Moving towards emissions projections and their climate mitigation targets, Mexico has an unconditional target of reducing 22% its projected emissions in 2030 relative to the BAU, with a commitment period beginning in 2021. It also proposes a conditional reduction of 36%, depending on the availability of external funding. The projections are based on individual sector projections, a unique feature of the Mexico plan compared to the other 3 countries. Figure 3 shows the country's projected emissions in the 2013-2030 period, with and without the NDC commitments. Table 12 details the reduction targets by sector.

TABLE 11 / MEXICO AND MEXICO CITY SECTOR EMISSIONS AND RESPECTIVE SHARES ($MtCO_2eq$)

SECTOR	MEXICO 2013 (1)	MEXICO CITY 2012 (2)	(2) / (1)
Transport	174	11.5	6.6%
Energy	127	10.7	8.4%
Residential & Commercial	26	2.5	9.5%
Oil and gas	80	--	--
Industry	115	1.2	1.0%
Agriculture	80	0.7	0.9%
Solid waste	31	4.2	13.7%
LULUCF	32	--	--
TOTAL	665	30.7	4.6%

SOURCES: [15], [25], [37], [16], [36], [39]; Part B: [13], [14], [21], [24], [25], [26], [29], [30], [31], [32], [34].

FIGURE 3 / MEXICO EMISSIONS 2013-2030, BAU AND NDC ($MtCO_2eq$)



SOURCES: [12].

TABLE 12 / MEXICO AND MEXICO CITY EMISSIONS PROJECTIONS AND MITIGATION TARGETS

EMISSIONS	MEXICO				MEXICO CITY			
SECTOR	EMISSIONS			REDUC-TION 2030	EMISSIONS			REDUC-TION 2025
	2003	2030 BAU	2030 NDC		2012	2025 BAU	2025 TARGET	
Transport	174	266	218	18%	11.5	12.6	8.3	34%
Industry	115	165	157	4%	2.4	5.1	4.4	14%
LULUCF	32	32	-14	143%	0.7	0.7	0.7	2%
Solid waste	31	49	35	29%	4.2	5.5	4.7	15%
Energy	232	367	280	24%	12.0	12.8	8.3	35%
Power generat.	126	202	139	31%	--	--	--	--
Oil & Gas	80	137	118	14%	--	--	--	--
Resid./comer.	26	28	23	18%	--	--	--	--
Agriculture	80	93	86	7%	--	--	--	--
TOTAL	664	972	762	22%	30.8	36.7	26.4	28%

SOURCES: : [6] and [12].

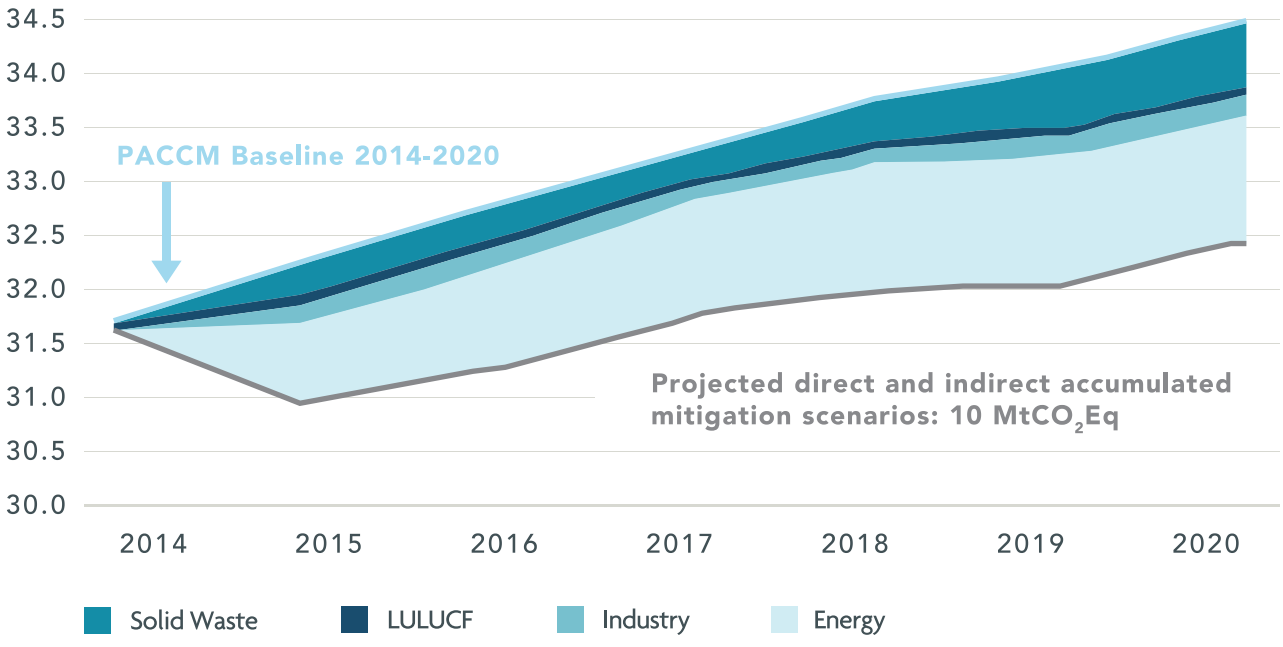
One of the major challenges for the country to attain its reduction targets is to control emissions from energy, industry and transport. In the energy sector, the goal is to have 43% of the energy mix from clean sources by 2030. One of the major obstacles is the persistent energy subsidies that go to households' electricity bill (that can be as high as 50% of their bills, a subsidy of almost US$ 6 billion/year). Only this year Mexico cut its subsidies to gasoline, which have cost around US$ 11 billion per year to the country. In the transport sector, many technology standards remain outdated and Mexico City needs to further improve its integrated management system, despite many initiatives originally aimed at air pollution control. As in other countries, the industry sector remains reluctant on the climate agenda, with (justified?) fears of loss of competitiveness. The NDC does not indicate priority sectors for controlling emissions, although it indicates objectives to substitute fuels. A tradable permit system is currently being analyzed as an alternative mechanism to address industrial emissions.

Mexico City (CDMX) aims to reduce by 28% its emissions relative to the projected BAU in 2025, with a stronger focus on energy and transport. The Mexico City's Climate Action Program (PACCM in Spanish) was prepared in a short period of time with extensive and open consultation to the public, but without major coordination with SEMARNAT (the Ministry of Environment). At the same time, it may be noted that Mexico's NDC does not include cities as vehicles for the implementation of mitigation actions. Mexico City is a member of a few international networks, including C40 and CDP (Carbon Disclosure Project). Figure 4 below shows the sectoral emissions projections until 2020 according to the Mexico City's Climate Action Program.

CDMX has begun to issue green climate bonds, a mechanism that allows Mexico City to fund its Mexico City's Climate Action Program actions. The green bonds can only fund activities that have a positive environmental impact in terms of emission reductions

CDMX has begun to issue green climate bonds, a mechanism that allows Mexico City to fund its Mexico City's Climate Action Program actions. The green bonds can only fund activities that have a positive environmental impact in terms of emission reductions, such as renewable energy, street lighting and transit improvements. The first issuance was in the amount of 1 billion Mexican Pesos (around US$ 50 million), and a second issuance is expected soon, in the same amount. The use of funds and technical operations are reported yearly to the Mexican Stock Exchange. The interest paid to investors is around 7%. Box 3 summarizes the history, structure and main aspects of the Mexico City's Climate Action Program. Box 4 shows a cost-effectiveness curve for the various mitigation actions, a unique feature of the Mexico Climate Plan.

FIGURE 4 / MEXICO CITY EMISSIONS 2014-2020, BAU AND PACCM ($MtCO_2eq$)



SOURCE: [12].

BOX 3 / THE MEXICO CITY CLIMATE ACTION PLAN – PACCM

HISTORY AND OBJECTIVES

The Mexico City Climate Change Program (Programa de Acción Climática de la Ciudad de México 2012-2020) is perhaps the most comprehensive and detailed of its kind among Latin American Cities. The Plan is a follow-up to the 2008-2012 Plan, which has already achieved the mitigation of 6 million ton CO_2eq – 4.5% of the business as usual (BAU) scenario. The 2014-2020 Mexico City's Climate Action Program seeks to strengthen the Federal District Government (GDF) climate policy and to build on the achievements of the first phase. The criteria that govern the Mexico City's Climate Action Program are: build consensus among GDF agencies; strive for social equity and gender equality; improve the quality of life of citizens in the framework of sustainable development; communicate between federal and local public programs; include society and decision makers; and maintain flexibility in order to adapt the proposed actions to new technological changes.

It's interesting to see that earlier initiatives were planned and developed before the enactment of the legal framework. The Mitigation and Adaptation for Climate Change and Sustainable Development ('Ley de Mitigación y Adaptación al Cambio Climático y Desarrollo Sostenible del Distrito Federal' was launched in 2011, three years after the first plan). It was developed by the Federal Commission on Climate Change (CCDF), created to ensure the necessary coordination among government institutions and with key stakeholders.

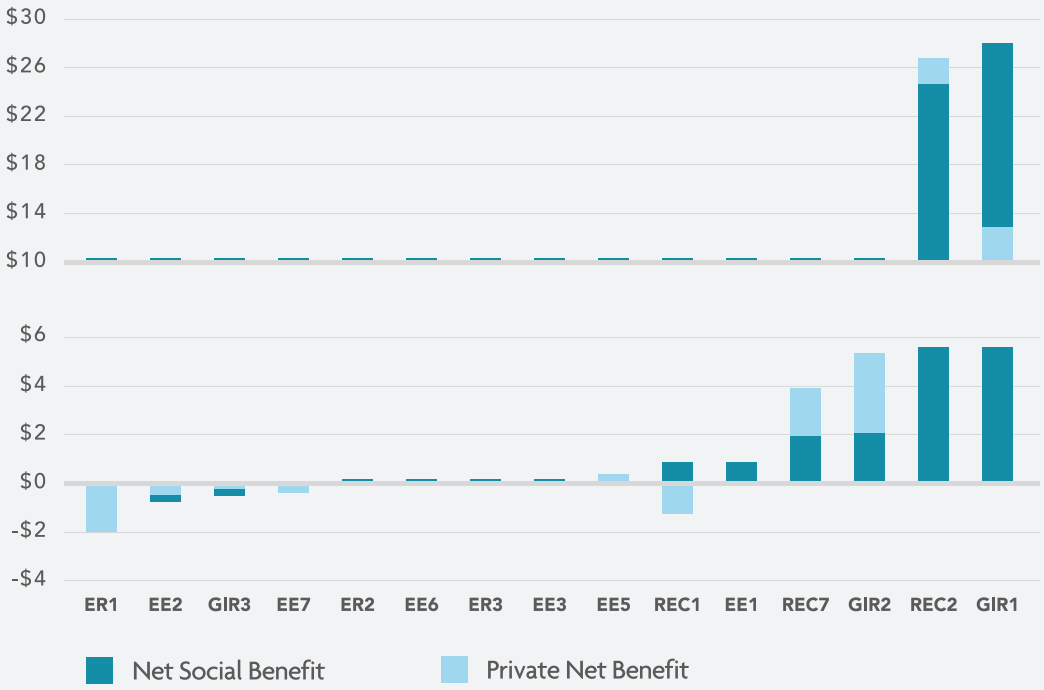
STRUCTURE

The Plan is structured along five main axes – energy transition, urban planning, environmental quality, environmental resources and biodiversity, infrastructure and resilience – with two additional crosscutting axes – education/communication and research and development. The Plan contains a detailed set of activities necessary to achieve each proposed goal. Of all 69 activities planned, 27 came from the first plan, of which 12 were adapted for the new goals. The activities were defined with clear responsibilities combined with a set of measurable impact indicators. Further, all activities were proposed keeping in mind the potential synergies among them, also maximizing the synergies between adaptation and mitigation and their cost-effectiveness. These aspects were included to minimize competition, conflict and overlaps, as well as to attract funding.

ECONOMIC ANALYSES

A unique feature of the Mexico Climate Plan is the use of sound economic analyses to support the prioritization of actions. Incorporating major externalities associated with the various proposed actions, the Plan differentiates their private and social economic costs and benefits and hints on responsibilities of private agents and government. Figure 5 presents the private and social net benefits of different mitigation actions contained the Mexico City Climate Action Plan.

FIGURE 5 / PRIVATE AND SOCIAL NET BENEFITS OF MITIGATION ACTIONS (BILLION PESOS), MEXICO CITY

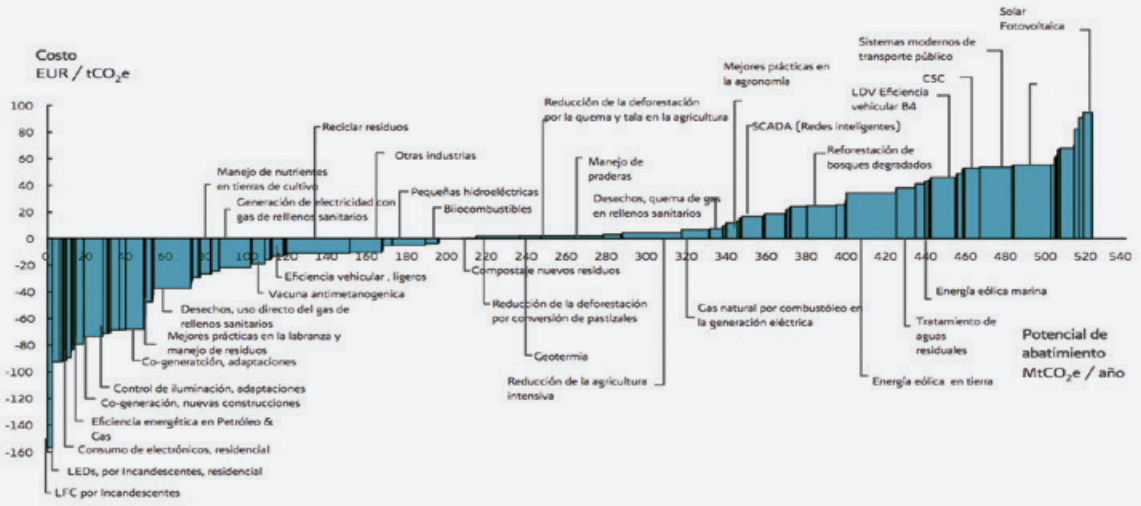


ER1 = Construction codes with sustainability criteria / **ER2 =** Photovoltaic systems on bus stops / **EE6 =** Energy efficiency in trolleybuses / **EE7 =** Improvements in public lightening system / **EE2 =** Scrapping refrigerators / **GIR3 =** Solid waste recycling with new technologies / **REC1 =** Expansion of metro line 12 / **ER3 =** Solar lightening in public parks and educational centers / **EE1 =** Energy efficiency in the public transport system / **EE5 =** Energy efficiency in SACMEX facilities / **EE3 =** Change consumption habits in public buildings / **REC7 =** New metrobus corridors / **REC2 =** Scrapping microbuses + creation of concessioned corridors / **GIR1 =** Sludge stabilization in wastewater treatment plants (WWT) / **GIR2 =** Efficiency of WWT.

SOURCE: Margulis [20] apud [6].

BOX 4 / COST-EFFECTIVENESS OF MITIGATION ACTIONS OF MEXICO'S CLIMATE PLAN

FIGURE 6 / COST X CUMULATIVE MITIGATION (2009-2030) – EUROS/tCO_2eq



SOURCE: [45].

3. Argentina NDC and Buenos Aires climate mitigation plan

Argentina is the richest of the countries analyzed. It has the highest Human Development Index (0.83), which places the country in the 45th position globally, way ahead of Mexico and Brazil, with HDIs of 0,76 and 0,75 (77th and 79th positions, respectively). Argentina, however, has the highest per capita emissions of the four countries, with 0.6% of the world's population, the same 0.6% of world emissions, and nearly the same world GDP. Energy and agriculture account for the largest shares of the country's emissions.

With 3.1 million inhabitants, the City of Buenos Aires has 7.2% of the country's population, although every day another 3 million people commute into Buenos Aires to work, so that the city produces nearly 20% of the country's GDP while being responsible for 'only' 5.3% of national emissions. As with the other countries, more than 50% of the city's emissions come from the energy sector – Table 13.

Relative to their sector emissions, in both the country and the city the vast majority are energy related – energy, transport and industry. As with the other 3 countries, direct city emissions are only a small proportion of total national emissions, and smaller than the population percentage – Table 14.

TABLE 13 / ARGENTINA AND BUENOS AIRES EMISSIONS, VARIOUS COMPARABLE STATISTICS

ARGENTINA	BUENOS AIRES
0.6 % of the world population	7.2% of country population
0.7% of world GDP	20% of the country's GDP
0.6% of world emissions	5.3% of national emissions (not including LULUCF), 2.7% of total emissions
Total emissions ≈ 207.9 $MtCO_2$-eq Per capita ≈ 4.7t CO_2-eq	Total emissions ≈ 11.7 $MtCO_2$-eq Per capita ≈ 3.4t CO_2-eq

SOURCES: Own calculations, [2], [43] and [47].

TABLE 14 / ARGENTINA AND BUENOS AIRES SECTOR EMISSIONS AND RESPECTIVE SHARES ($MtCO_2eq$)

SECTOR	ARGENTINA 2012 (1)	BUENOS AIRES 2012 (2)	(2) / (1)
Transport	54.6	3.9	7.1%
Energy	128.8	6.0	4.9%
Government		0.6	
Solid waste	20.8	1.2	5.8%
Industry	15.3	NA	
Agriculture	119.5	---	
LULUCF	90.5	---	
TOTAL	429.4	11.7	2.7%

SOURCES: [2], [43].

With regard to emissions projections and mitigation targets, Argentina has an unconditional (revised) target of reducing its projected emissions by 18% in 2030 relative to the BAU. It also has a (revised) conditional reduction of an additional 19%, depending on the availability of external funding, technology transfer and capacity building. The lion's share of emissions reductions are to take place in the energy sector, with BAU emissions going from 128,8 in 2012 to 206 $MtCO_2eq$ in 2030, with a conditioned NDC target of 110 $MtCO_2eq$ in 2030 (a 47% reduction) – Figure 7 shows the mitigation actions specific to the energy sector with their conditioned and unconditioned reduction targets.

In relation to the country, Buenos Aires was responsible for ≈ 5% of the emissions from the energy sector in 2012, and the city expects to emit 9 $MtCO_2eq$ until 2030

Concerning Buenos Aires, the city has a reduction target of 10% in 2020 and 30% in 2030, relative to 2008. At the end of the first (2010-2015) implementation period, the city reduced 320.000 tCO_2eq. The emissions reduction projections are aggregate and no specific sector targets have been specified.

In relation to the country, Buenos Aires was responsible for ≈ 5% of the emissions from the energy sector in 2012, and the city expects to emit 9 $MtCO_2eq$ until 2030, around 4.5% of the emissions of the national BAU scenario. Even though the city has many opportunities to reduce its energy emissions, its contribution to the national target remains marginal.

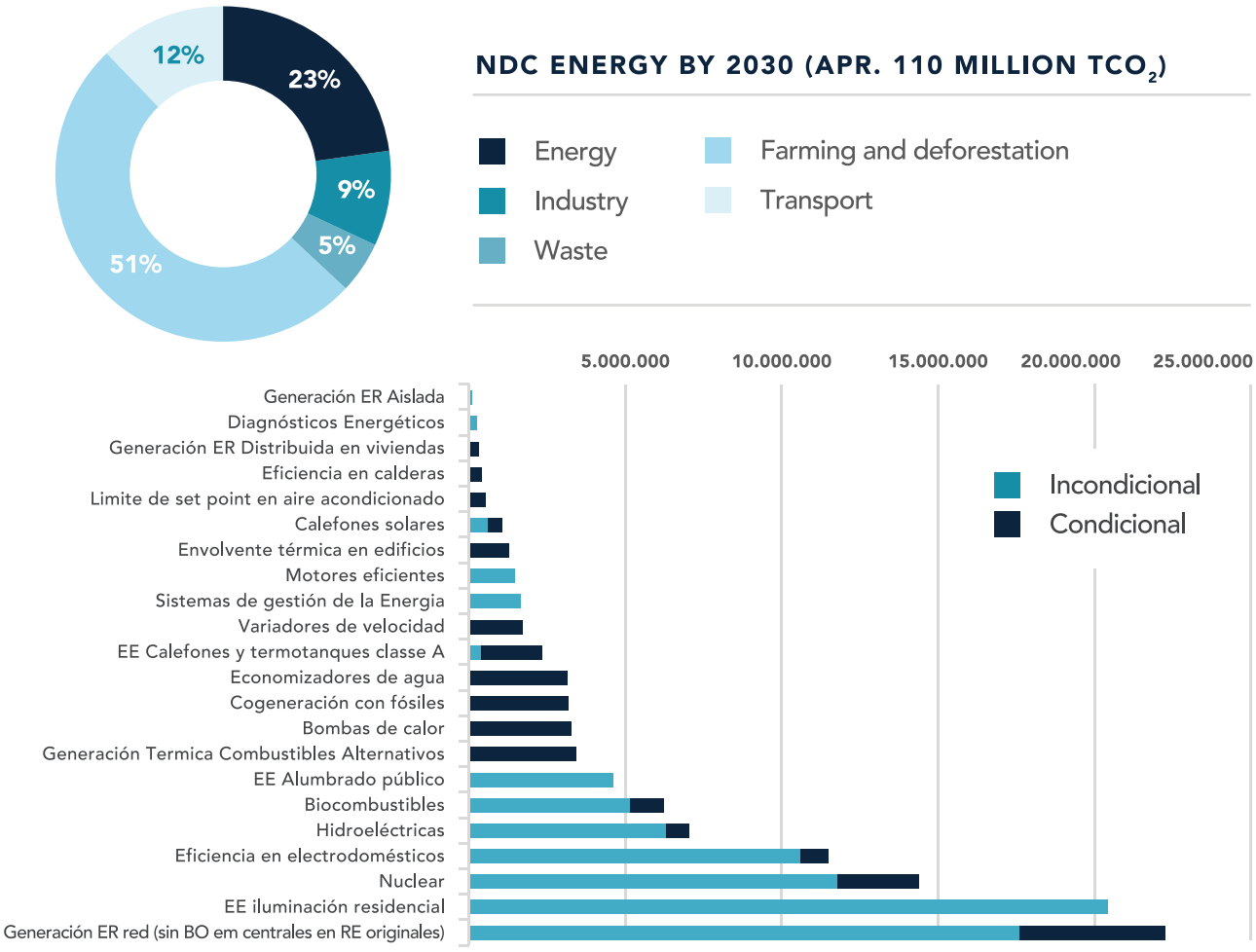
The transport sector was responsible for 13% of national emissions in 2012. The BAU scenario projects an increase of 47% without any mitigation efforts. Buenos Aires was responsible for 7% of the national emissions from the transport sector in 2012 and is expected to increase its contribution slightly to 8% in 2030 in the BAU scenario.

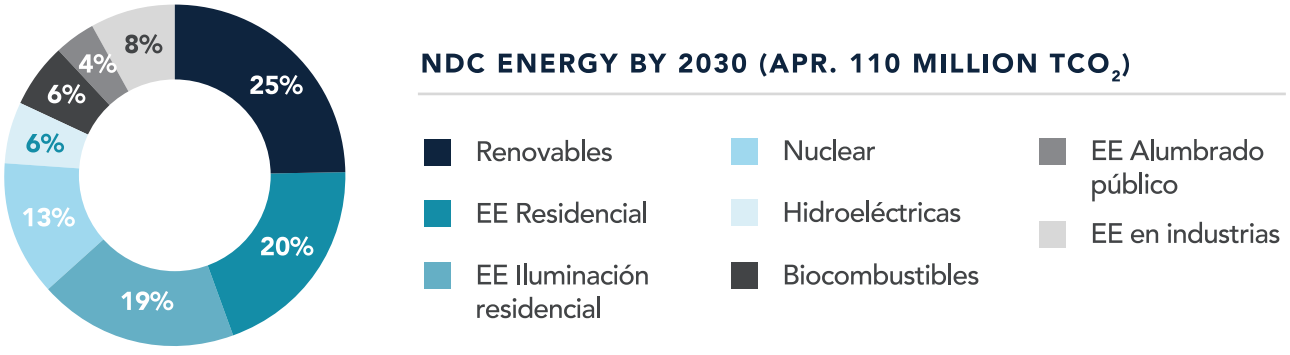
TABLE 15 / ARGENTINA AND BUENOS AIRES EMISSIONS PROJECTIONS AND MITIGATION TARGETS

SECTOR	EMISSIONS 2012	EMISSIONS 2030 BAU	EMISSIONS NDC CONDITIONED	EMISSIONS NDC NOT CONDIT.	EMISSIONS 2012 (A)	EMISSIONS 2030 BAU (B)	EMISSIONS 2030 W/ ACTION PLAN
Energy	128.8	206.8	110	-47%	5.6	9.0	
Transport	54.6	80.2	57	-29%	3.9	6.2	
Solid Waste	20.8	57.1	24	-58%	1.2	1.2	
Industry	15.3	28.9	43	49%			
LULUCF (*)	90.5	51.7	68	32%			
Agriculture	119.5	167.3	176	5%			
TOTAL	429.5	592	483	-18%	11.7	17.3	12.1

SOURCES: Own calculations, [42], [43], [2].

FIGURE 7 / ARGENTINA MITIGATION MEASURES IN THE ENERGY SECTOR





SOURCE: [22].

FEW OBSERVATIONS ABOUT ARGENTINA NDCS

The project team conducted short interviews with colleagues in the Ministry of Environment in Buenos Aires, a procedure which was adopted in all four countries and all four cities. The team had some difficulties understanding the final numbers presented in the Third National Communication (to the UNFCCC), the NDCs, the revised NDCs, and some numbers and calculations contained in background studies prepared for the Third National Communication. The main difficulty concerned the expected sectoral emissions and emissions reductions by 2030. The Ministry indicated that such projections were not made public, so that some of the numbers appeared to be inconsistent. The Ministry is setting up user-friendly platforms to be launched soon in order to divulge the numbers.

Also, as part of the NDC implementation process, sectoral contributions are becoming more specific. The Ministry has created six thematic/sectoral groups – (i) energy, (ii) transport, (iii) agriculture and forestry, infrastructure and land use, (iv) risk management, (v) climate finance, (vi) education, culture and communication, and (vii) production. In addition to the sectoral perspective, special attention is being given to partnerships with Provinces and municipalities. The Ministry is helping to build capacity and supporting Provinces and municipalities in the preparation of their emissions inventories followed by their mitigation (and adaptation) plans.

4. Peru NDC and Lima climate mitigation plan

Peru is the smallest of the countries analyzed, both in terms of land area as well as population. Peru is also the poorest of the four countries, with a GDP per capita slightly above US$ 6,000, although its HDI is almost the same as the ones of Brazil and Mexico. With 0.43% of the world's population, Peru produces 0.25% of the world's GDP and accounts for only 0.2% of global GHG emissions. Unlike Mexico and Argentina, and more similar to Brazil, emissions from agriculture and deforestation account for 50% of total emissions from Peru – Table 15.

Lima was the only one among the four analyzed cities that has prepared a climate plan for the entire Metropolitan Region. This is particularly relevant and serves as an example of best practice in our understanding. The nature of economic activity, the way municipalities in a Metropolitan Region are physically and economically connected, and thus their consequent emissions, make it crucial to work the climate agenda at the level of Metropolitan Regions, and not at the individual city level. The Lima Metropolitan Region has nearly 1/3 of the national population, produces 50% of the country's GDP and is responsible for 9% of national emissions – Table 16.

Regarding their sector emissions, there are differences between Peru and the Lima Metropolitan Region. This is mainly because of the indicated high percentage of emissions from deforestation at the national level. Industry, energy and transport, which account for 86% of emissions from Lima MR, account for only 30% of national emissions. This means that the mitigation efforts must have different focuses in Lima and in Peru – Table 17.

TABLE 16 / PERU AND LIMA EMISSIONS, VARIOUS COMPARABLE STATISTICS

PERU	LIMA
0.4 % of the world population	1/3 of country population (Metropolitan Lima)
0.25% of world GDP	50% of the country's GDP
0.2% of world emissions	9% of national emissions
Total emissions ≈ 63.2 $MtCO_2$- eq Per capita ≈ 2.0 t CO_2- eq	Total emissions ≈ 18.4 $MtCO_2$- eq Per capita ≈ 1.9 t CO_2- eq

SOURCE: [9], [26] and [47].

TABLE 17 / PERU AND LIMA SECTOR EMISSIONS AND RESPECTIVE SHARES ($MtCO_2eq$)

SECTOR	PERU		LIMA	
	2012	% OF NATIONAL	2012	% OF NATIONAL
Industry	6.1	4%	5.0	82%
Transport	17.8	10%	5.5	31%
Energy	26.8	16%		
Solid waste	7.8	5%	2.1	27%
Residential / Commercial			2.8	
LULUCF	86.7	50%		
Agriculture	26.0	15%		
TOTAL	171.2	100%	15.4	9.0%

SOURCES: [2], [43].

Concerning emissions projections and mitigation targets, the lion's share (68%) of emissions reductions relative to the projected BAU is in the land use change and deforestation sector – which, as mentioned, accounts for the largest share of total emissions. Attention needs to be paid to the fact that the BAU scenario projects Peru nearly doubling its emissions from deforestation and changes in land use, which is disturbing for reasons beyond climate change. As with Argentina and Mexico, Peru has an unconditional reduction target of 20% in 2030 relative to the BAU scenario, and a conditional reduction

target of 30%. The Peru Climate Action Plan contains a list of 75 main mitigation measures in each of the six sectors considered, with an indication of the mitigation potential of each. This is interesting in the context of the other countries, suggesting that the NDC was mostly established on a bottom-up basis.

No cost-effectiveness curves, however, have been presented for such actions. The Ministry of Environment has now created a multi-sectoral workgroup consisting of 13 ministries to determine the costs, co-benefits and general conditions for the government to achieve its 20% reduction target – Table 18.

TABLE 18 / PERU EMISSIONS PROJECTIONS AND MITIGATION TARGETS ($MtCO_2eq$)*

SECTOR	2010	2030 BAU	2030 WITH NDC	% OF TOTAL REDUCTIONS IN 2030	REDUCTION/ BAU EMISSIONS
Energy	27	42	32	12%	26%
Transport	18	31	28	3%	10%
Industry	6	15	10	6%	34%
Solid Waste	8	15	12	4%	25%
LULUCF (*)	87	159	98	68%	38%
Agriculture	26	35	31	5%	13%
TOTAL	170	298	209	100%	30%

SOURCE: [9].

* - No projections of sector reductions for Lima, except aggregate 30%.

The Lima Climate Action Plan does not specify how its reduction targets will be achieved, but it aims at promoting new, low-carbon urbanization, dividing the city according to eco-zones. The Plan makes reference to a study by the University of Leeds that indicates a series of investment opportunities with high economic returns and emissions reductions. In the transport sector, Lima MR is responsible for nearly 30% of national sector emissions, and mitigation actions include bus fleet renovation, clean fuels, rationalization of bus lines, traffic management and BRT systems. With solid waste, emissions correspond to about 5% of national emissions, with Lima MR accounting for 27% of the national sector emissions. The main focus of mitigation actions in solid waste by the city are in line with national actions, focusing mostly on regulations and regularization of the sector´s activities.

The Lima Climate Plan has been prepared with little consultation with its numerous municipalities. The Metropolitan Region consists of 43 municipalities, governed by 43 mayors. This obviously introduces a significant coordination challenge, which is nonetheless common to all metropolitan regions worldwide. An additional challenge is that the political decentralization is not matched by an equivalent economic decentralization. Given the dispersion

There are still major win-win opportunities in terms of mitigation actions, and these are, and should be, the focus of government efforts.

of government authorities, capacity is also rather limited in most municipalities, even in the richer municipalities such as San Isidro and Miraflores, so that there is need for central government support and/or from the Metropolitan government. Yet, the Paris Agreement incentivized Miraflores to launch 3 major Decrees (Ordenanzas), formalizing the local environmental commission responsible for designing the district's environmental strategy and how to align it with national goals and directives. Miraflores has also prepared its emissions inventory and is slowly developing its mitigation plan.

Lastly, environmental management is relatively new in Peru and in Lima; the legal management system needs consolidation, and both Lima and Peru still face enormous local environmental challenges. For example, twenty-five percent of the solid waste collected in the Lima MR is dumped in open landfills without processing, and less than 50 percent of the wastewater receives any kind of treatment. These and other similar problems remain as challenges for a country that is still in the lower end of income among developing countries, so that the entire sustainability agenda will have to keep pace with the general development agenda. There are still major win-win opportunities in terms of mitigation actions, and these are, and should be, the focus of government efforts.

Lessons, reflections and recommendations

The project team is very thankful to the governments of all 4 countries and 4 cities for their good receptivity and openness to the initiative. This exercise has proven to be a rich learning and exchange experience to all parties involved.

The broader context

1. THE NEED FOR NATIONAL AND LOCAL GOVERNMENTS TO COORDINATE

'The engagement of all levels of government – local, sub-national and national – is crucial to tackle effectively climate change. Policies and plans, as well as actions, at national and subnational level are interlinked and dependent, and coherence among them is necessary to successfully achieve climate targets. … While the Paris Agreement provides a clear reference to the role of cities and regions as non-party stakeholders, local governments need favorable framework conditions, both at the national and international level, able to allow them to unfold fully in regards to climate protection' [28]. A lack of coordination between levels of government facilitates resistance by private agents that are eventually reluctant to engage and/or to comply with regulations, typically being afraid of loss of competitiveness. Coordinated efforts between government levels greatly facilitate regulation and pricing.

'Advancing governance of climate change across all levels of government and relevant stakeholders is crucial to avoid policy gaps between local action plans and national policy frameworks (vertical integration) and to encourage cross-scale learning between relevant departments or institutions in local and regional governments (horizontal dimension). Vertical and horizontal integration allows two-way benefits: locally-led or bottom-up where local initiatives influence national action and

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nationally-led or top-down where enabling frameworks empower local players. The most promising frameworks combine the two into hybrid models of policy dialogue where the lessons learnt are used to modify and fine-tune enabling frameworks and disseminated horizontally, achieving more efficient local implementation of climate strategies' [7].

Unfortunately, our case studies revealed that in almost every case comprehensive debates, consultations and negotiation processes among the different policy levels did not take place. Neither did cities identify how their efforts will contribute to national level goals, nor did the national level governments indicate specific ways to share responsibilities with regional and local level authorities. We are very sure that this lack of coordination and cooperation entails a significant number of missed opportunities. This lack of more extensive consultation and mutual engagement does not mean that some initiatives and efforts did not take place, as discussed below.

2. PROACTIVE CITIES AND OPPORTUNITIES

The 4 cities analyzed took a proactive role in developing local level climate action plans, committing to climate goals even before the national governments. In principle, these commitments ignored funding from national governments and competition within country and across cities. One wonders why this was the case. Bulkeley [4] suggests that '…The emergence of the urban governance of climate change is one of a growing number of governance experiments that are emerging as a result of dissatisfaction with progress at the international level and the fragmentation of political authority'. Cities clearly see more opportunities of embracing the climate agenda early, in contrast to a position in which they might lose competitiveness by committing to low-carbon targets. A good example is the annual emission of green bonds by Mexico City for mitigation actions, which has been well accepted in the market and is generating around US$ 50 million per year. This is a rather encouraging experience.

3. SUPPORT FROM NATIONAL GOVERNMENTS

Climate governance is unique in the sense that it addresses a global common problem, but coordination difficulties are not unique to the climate. The national government needs to conceive a system to engage lower levels of government. However, not

only in the 4 case studies at hand, but worldwide, the experience has been that federal governments 'have only provided limited and largely inconsistent support, and it is currently unclear as to whether they will support future municipal action. … With highly variable degrees of vertical autonomy, with respect to regional and national governments, institutional fragmentation, scarce finances, and local conflicts between environmental and development goals, the extent to which municipalities have been able to put into place policies that constrain emissions of GHGs or insist that future vulnerabilities are taken into account has been limited' [4].

4. HOW TO COORDINATE

The need for the national government to support municipalities in the climate agenda is very clear. 'A review of current practices suggests the need for national governments to help create a sound institutional foundation and knowledge base to support decision making and action at local levels. This includes developing harmonized GHG inventory methods for local government use, boundary organizations to generate regional science-policy or economic-policy information, and developing strong urban climate policy networks. Making such tools available will help local governments to design, implement and refine policies to find cost-effective climate policy solutions and drive economic development in green sectors. It will also help national governments to deliver on ambitious climate policy goals in the coming decades' [6]. Again, Mexico provides a good example of such initiatives: The National Institute of Ecology (INE) is planning on designing a platform for States and Municipalities to prepare their emissions inventories. Another platform will focus on designing sustainable cities more broadly. This is aimed specifically at small and medium size cities. Heidrich [14] provides a slightly different but not opposite perspective: 'Cities can provide and deliver strategies without the wider support and guidance but they need to have the capacity, resource and political will to do so. Where such wider support is limited, only larger or capital cities have achieved this. This creates a considerable gap between smaller cities and larger cities, which should be addressed by providing support and clear climate change strategies for cities of any size. … clear guidance in which case collaboration across city boundary is needed. Cities look for national guidance and if this is not available align themselves to international guidance and networks' [14].

5. IMPLEMENTATION

While cities have defined emission reduction targets, often converted into Law, the refined plans on how to reach the stated goals (mitigation measures) may need detailing. Planning is easier than implementation. 'To date, much of the urban response to climate change focuses on universal targets … without considering how such targets should be distributed across the urban arena or the procedures by which diverse urban publics might engage in debate about what constitutes a fair and equitable response to climate change' [5]. Yet, all countries and cities analyzed are now actively engaged in designing implementation plans – notably Argentina, Brazil and Peru. Especially for cities, such efforts cannot ignore the fact that they '… need to have access to the necessary resources to achieve their stated goals. Local initiatives cannot be effectively implemented without recognition in the form of a mandate and medium to long-term support and funding. Adequate legal frameworks need to be in place to foster local action. These frameworks should enable and facilitate the roll-out of action from bottom-up' [28].

6. INCENTIVES TO COORDINATE

Cities have a crucial role on both mitigation and on adaptation, but surely more on the adaptation agenda. In adaptation, support from the national government will be dictated by the level of vulnerability of a city. With mitigation, this support will depend on the significance of emissions by individual cities and regions, thus the criterion for providing support will be mostly a function of their size and level of economic activity. In either case, however, the fundamental drive to promote coordination between different levels of government seems to be political: whether the two governments are run by the same political party, the level of political and economic decentralization of the country, and the degree of autonomy of cities and municipalities.

7. CITIES AUTONOMY AND NETWORKS

Cities have a fundamental role in influencing demand. This means changing consumer habits and the culture towards sustainability, which includes lower energy and lower carbon activities, which will ultimately influence a city's and a country's level of emissions. This requires cities to have a good degree of independence from national governments. An important mechanism that facilitates such autonomy is their participation in international networks. 'Participating in networks gives municipalities access to flows of opportunities, and allows the municipality itself to be a part of the flow. Cooperation also opens a possibility to create a positive image of a municipality as forerunners spearheading innovative ideas align with ecological modernization, i.e., combining local economic development with reduction of GHG emissions. Thus, networks may strengthen their participants' ability to attract investments from the private sector and from public funding to bring about sustainable development' [3]. But cities also have a stake beyond participating in networks: as suggested by the same author in a later paper, '… the real potential for cities lies then not in complying with the existing frameworks and modes of operating within the international architectures of international climate policy, but in illuminating how other pathways are possible' [5].

Specific lessons from country and city case studies

8. THE IMPORTANT ROLE OF CITIES

Brazil and Peru have significant emissions from the agriculture and land use change sectors. Even in these two countries, the city- induced demand and energy consumption make them central players in national mitigation efforts. 'It's clear that cities hold substantial power opportunity to transform the energy profile of a Country' [28]. This means that there is great scope for addressing energy consumption at the city level, with its major emitting sectors, which are transport, industries and commercial and residential buildings. Emissions from solid waste are also largely the responsibility of cities.

9. WORK AT THE LEVEL OF METROPOLITAN REGIONS

It makes eminent good sense to work at the level of Metropolitan Regions, as opposed to individual city or municipality levels. Of the four case studies,

only Lima has taken this approach. This necessary coordination is not unique to the climate agenda – it applies equally to transport, sanitation, solid waste, and other services where economies of scale call for integrated action. If the government of Rio, for example, wants to reduce emissions from the transport sector by modernizing its bus fleet, it would be rational and economic for neighboring municipalities to adopt a similar approach. The municipalities of a Metropolitan Region can work together to develop a joint vision, use synergies, and identify local/regional goals, for example, carbon neutrality. Sustainable development goals can and should be tailored to the level of regions and greater metropolitan areas [41].

10. THE BROADER SUSTAINABILITY OBJECTIVE

The case studies made it clear that city climate actions take place in the context of broader sustainability. Climate plans must be aligned with the broader dimension of other environmental, social and economic objectives. Most actions that aim at reducing GHG emissions are also beneficial to other environmental (for example, air pollution), social (health), and economic (energy efficiency) goals. These are the co-benefits, and they generate not only higher social and economic returns, but also make their political acceptance much easier.

11. NEED FOR SOUND TECHNICAL ANALYSES

Cities emission reduction targets were mostly political – and established at around 30% until 2030. Country NDCs tended to be based on (more) technical analyses. We say they were political because they were not established based on bottom-up analyses of the potential emission reductions by individual economic sectors. The question remains whether the proposed targets were too ambitious or too moderate? This is difficult to assess in the absence of transparent calculations and projections. Mexico City is partly outside of this pattern due to the high technical quality of its Mexico City's Climate Action Program.

References

[1] **Banco de Desarrollo de América Latina, CAF 2014.** *"Programa de Adaptación al Cambio Climático"*. Lima, Peru.

[2] **Buenos Aires Ciudad, 2014.** *"Buenos Aires Frente al Cambio Climático"*. Tercera Edición, Buenos Aires, 54p. http://www.buenosaires.gob.ar/sites/gcaba/files/bs_as_cc_2014_corregido.pdf

[3] **Buenos Aires Ciudad, 2015.** *"Plan de Acción Frente al Cambio Climático 2020"*. Buenos Aires, 122p., http://cdn2.buenosaires.gob.ar/espaciopublico/apra/pacc_2020.pdf

[4] **Bulkeley, H., 2010.** *"Cities and the Governing of Climate Change"*. Annual Review of Environment and Resources, Vol. 35:229-253 (Volume publication date November 2010). https://doi.org/10.1146/annurev-environ-072809-101747

[5] **Bulkeley, H. 2015.** *"Can cities realise their climate potential? Reflections on COP21 Paris and beyond"*. Local Environment, 20:11, 1405-1409, Routledge, 6p. http://dx.doi.org/10.1080/13549839.2015.1108715

[6] **Ciudad de México & Centro Mario Molina 2014.** *"Programa de Acción Climática de la Ciudad de México 2014-2020"*. Ciudad de México, México. https://www.gob.mx/cms/uploads/attachment/file/164914/PACCM-2014-2020completo.pdf

[7] **Corfee-Morlot, J., Kamal-Chaoui, L., Donovan, M.G., Cochran, I., Robert, A., Teasdale, P-J, 2010.** *"Cities, Climate Change and Multilevel Governance"*. OECD Environment Working Papers No. 14, 124p, OECD Publishing, Paris. http://dx.doi.org/10.1787/220062444715

[8] **Gobierno de la Ciudad de Buenos Aires 2015.** *"Cambio Climático: Plan de Acción Buenos Aires 2030"*. Buenos Aires, 169p. http://www.iclei.org.br/polics/CD/P2_3_Pol%C3%ADticas%20de%20Constru%C3%A7%C3%B5es%20Sustent%C3%A1veis/11_Politicas%20de%20Cambio%20Clim%C3%A1tico/PDF90_Buenos_Aires_Cambio_Climatico_PlanAccion.PDF

[9] **Gobierno del Perú, 2015.** *"Informe Final Comisión Multisectorial, Resolución Suprema No. 129-2015-PCM"*, 162p. http://www.minam.gob.pe/wp-content/uploads/2015/12/Informe-T%C3%A9cnico-Final-CM-_-RS-129-2015-PCM_Secretar%C3%ADaT%C3%A9cnica-18-09-2015-vf.pdf

[10] **Gobierno de la República de México, 2014.** *"Programa Especial de Cambio Climático 2014-2018 (PECC)"*. 151p http://www.semarnat.gob.mx/sites/default/files/documentos/transparencia/programa_especial_de_cambio_climatico_2014-2018.pdf

[11] **Gobierno de la República de México, 2015.** *"Intended Nationally Determined Contribution"*. Submission to the UNFCCC, 8p. http://www4.unfccc.int/submissions/INDC/Published%20Documents/Mexico/1/MEXICO%20INDC%2003.30.2015.pdf

[12] **Gobierno de la República de México, 2015b.** *"Compromisos de mitigación y adaptación ante el cambio climático para el período 2020 - 2030"*. Ciudad de México, DF, 20p. http://www.inecc.gob.mx/descargas/adaptacion/2015_indc_esp.pdf

[13] **Hardoy, J. and Lankao, P.R., 2011.** *"Latin American cities and climate change: challenges and options to mitigation and adaptation responses"*. Current Opinion in Environmental Sustainability 2011, 3:158–163.

[14] **Heidrich, O., Reckien, D., Olazabal, M., Foley, A., Salvia, M., Hurtado, S.de G., Orru, H., Flacke, J., Geneletti, D., Pietrapertosa, F., Hamann, J.J-P., Tiwary, A., Feliu, E., Dawson, R.J., 2016.** *"National climate policies across Europe and their impacts on cities strategies"*. Journal of Environmental Management 168 (2016) 36-45.

[15] **IBGE – Instituto Brasileiro de Geografia e Estatística, Diretoria de Pesquisas. Gerência de Estudos e Análises da Dinâmica Demográfica, 2013.** *"Projeção da população das unidades da federação por sexo e idade para o período 2000/2030"*. Rio de Janeiro, 22p. ftp://ftp.ibge.gov.br/Projecao_da_Populacao/Projecao_da_Populacao_2013/nota_metodologica_2013.pdf

[16] **Instituto Ekos Brasil, Geoklock Consultoria e Engenharia Ambiental, 2013.** *"Cenários de Emissão de Gases de Efeito Estufa do Município de São Paulo"*. São Paulo, 53p. http://www.prefeitura.sp.gov.br/cidade/secretarias/upload/meio_ambiente/INVEMI_P11B.pdf

[17] **Instituto Ekos Brasil, Geoklock Consultoria e Engenharia Ambiental, 2013.** *"Inventário de emissões e remoções antrópicas de gases de efeito estufa do Município de São Paulo de 2003 a 2009 com atualização para 2010 e 2011 nos setores Energia e Resíduos"*. São Paulo, 147p. http://www.prefeitura.sp.gov.br/cidade/secretarias/meio_ambiente/menu/index.php?p=167735

[18] **Instituto Nacional de Ecología y Cambio Climático (2013).** *"Inventario de Gases y Compuestos de Efecto Invernadero"*.

[19] **Kern, K., Alber, G., 2009.** *"Governing climate change in cities: modes of urban climate governance in multi-level systems"*. Research Gate, 26p. https://www.researchgate.net/publication/41182705_Governing_Climate_Change_in_Cities_Modes_of_Urban_Climate_Governance_in_Multi-Level_Systems

[20] **Margulis, S., 2016.** *"Vulnerability and Adaptation of Latin America Cities to Climate Change: Review of the Literature"*. Economic Commission for Latin America and the Caribbean (ECLAC), Santiago de Chile, 2016. LC/TS.2017/12, 80p. http://www.cepal.org/es/publicaciones/41041-vulnerabilidad-adaptacion-ciudades-america-latina-al-cambio-climatico

[21] **Ministério da Ciência, Tecnologia e Inovação, 2016.** *"Terceira comunicação Nacional do Brasil à Convenção-Quadro das Nações Unidas sobre Mudança do Clima" – Diversos volumes + Sumário Executivo"*. Brasília, 336p. http://sirene.mcti.gov.br/documents/1686653/1706739/Volume+3.pdf/355d4a1e-9f3c-474a-982e-b4a63312813b

[22] **Ministerio de Energía y Minería (2016).** *"Energía y Cambio Climático"*. Presentation at the Universidad Nacional de la Plata. Argentina. https://www.unlp.edu.ar/frontend/media/30/5430/213de664d6045c-357618b151081a3815.pdf

[23] **Ministerio del Ambiente Perú (2015).** *"La Contribución Nacional del Perú - iNDC: agenda para un desarrollo climáticamente responsable"*. Lima, 22p.

[24] **Ministerio del Ambiente Perú (2015).** *"Construyendo participativamente la contribución nacional: Propuesta del Perú (INDC) para consulta pública"*. Lima, 54p.

[25] **Ministério do Meio Ambiente.** *"Fundamentos para a elaboração da Pretendida Contribuição Nacionalmente Determinada (iNDC) do Brasil no contexto do Acordo de Paris sob a UNFCCC"*. Brasília, 13p. ttp://www.mma.gov.br/informma/item/10710

[26] **Municipalidad Metropolitana de Lima, 2015.** *"Estrategia de Adaptación y Acciones de Mitigación de la Provincia de Lima al Cambio Climático"*. Lima, 144p.

[27] **Observatório do Clima, 2016.** *"Análise das Emissões de GEE Brasil (1970-2014) e suas Implicações Para Políticas Públicas e a Contribuição Brasileira Para o Acordo de Paris"*. 84p. http://seeg.eco.br/wp-content/uploads/2016/09/WIP-16-09-02-Relatorios-SEEG-Sintese.pdf

[28] **OECD (Organisation for Economic Cooperation and Development), 2009.** *"Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance"*. Paris, 195 pp. www.sourceoecd.org/development/9789264054769

[29] **Prefeitura da Cidade do Rio de Janeiro, Centro Clima/COPPE/UFRJ, 2013.** *"Inventário das emissões de gases de efeito estufa da cidade do Rio de Janeiro em 2012 e atualização do plano de ação municipal para redução das emissões – Resumo Técnico"*. Rio de Janeiro, 62p. http://www.rio.rj.gov.br/documents/91265/0/CRJ_InventarioGEE-2012_resumo_tecnico+-+PORTUGUES+-+FINAL.pdf

[30] **Prefeitura de Belo Horizonte, 2011.** *"Política Municipal de Mitigação dos Efeitos da Mudança Climática – Lei nº 10.175"*. Belo Horizonte. http://portal6.pbh.gov.br/dom/iniciaEdicao.do?method=DetalheArtigo&pk=1057490

[31] **Prefeitura de Belo Horizonte, Way Carbon 2013.** *"Plano de Redução de Emissões de Gases de Efeito Estufa – PREGEE – Relatório Técnico Final"*. Belo Horizonte, 88p. http://portalpbh.pbh.gov.br/pbh/ecp/contents.do?evento=conteudo&idConteudo=34969&chPlc=34969&&pIdPlc=&app=salanoticia

[32] **Prefeitura de Belo Horizonte, 2015.** *"Terceiro inventário de emissão de gases de efeito estufa. Segunda atualização 2011/2012/2013. Período de Referência: 2000 a 2013 – Relatório Técnico Final"*. Belo Horizonte, 44p. http://portalpbh.pbh.gov.br/pbh/ecp/contents.do?evento=conteudo&idConteudo=34969&chPlc=34969&&pIdPlc=&app=salanoticias

[33] **Prefeitura de São Paulo 2009.** *"Lei Municipal do Clima - Lei Nº 14.933, de 5 de junho de 2009"*, institui a Política de Mudança do Clima no Município de São Paulo.

[34] **Prefeitura de São Paulo, 2009.** *"Política de Mudança do Clima no Município de São Paulo – Lei nº 14.933"*. São Paulo. http://www3.prefeitura.sp.gov.br/cadlem/secretarias/negocios_juridicos/cadlem/integra.asp?alt=06062009L%20149330000%20%20%20%20%20%20%20%20%20%20%20%20%20%20&secr=30&depto=0&descr_tipo=LEI

[35] **Prefeitura de São Paulo, 2011.** *"Diretrizes para o plano de ação da cidade de São Paulo para mitigação e adaptação às mudanças climáticas"*. São Paulo, 86p. http://www.prefeitura.sp.gov.br/cidade/secretarias/upload/chamadas/diretrizes_para_o_plano_de_acao_1302029294.pdf

[36] **Prefeitura do Rio de Janeiro, 2011.** *"Política Municipal sobre Mudança do Clima e Desenvolvimento Sustentável – Lei nº 5.248"*. Rio de Janeiro, 13p. http://www.rio.rj.gov.br/dlstatic/10112/148105/DLFE-260353.pdf/LEIMUN5.2.4.8.2.0.1.1.GEE.pdf

[37] **Prefeitura do Rio de Janeiro, CENTRO CLIMA/COPPE/UFRJ, 2011.** *"Plano de ação para redução de emissões de gases de efeito estufa da Cidade do Rio de Janeiro"*. Rio de Janeiro, 49p. http://portalgeo.rio.rj.gov.br/estudos-cariocas/download/3060_Plano%20de%20a%C3%A7%C3%A3o%20para%20redu%C3%A7%C3%A3o%20de%20emiss%C3%B5es%20de%20gases%20de%20efeito%20estufa%20_mar_2011.pdf

[38] **Prefeitura do Rio de Janeiro 2014.** *"Rio Resiliente: Diagnóstico e Áreas de Foco"*. Rio de Janeiro, 55p. http://www.rio.rj.gov.br/dlstatic/10112/126674/4134832/Resiliencia.pdf

[39] **Prefeitura do Rio de Janeiro.** *"Plano estratégico da prefeitura do Rio de Janeiro 2009-2012: Pós 2016 – O Rio mais integrado e competitivo"*. Rio de Janeiro, 194p. http://www.riocomovamos.org.br/arq/planejamento_estrategico.pdf

[40] **Prefeitura do Rio de Janeiro.** *"Plano estratégico da prefeitura do Rio de Janeiro 2013-2016: Pós 2016 – O Rio mais integrado e competitivo"*. Rio de Janeiro, 244p. http://www.rio.rj.gov.br/dlstatic/10112/2116763/4104304/planejamento_estrategico_1316.pdf

[41] **Rambelli, G., Donat, L., Ahamer, G., Radunsky, K. 2017.** *"An overview of regions and cities with-in the global climate change process - a perspective for the future"*. European Committee of the Regions, European Union, 2017.

[42] **República Argentina, 2016.** *"Primera Revisión de su Contribución Determinada a Nivel Nacional"*. Submitted to the UNFCCC. http://www4.unfccc.int/ndcregistry/PublishedDocuments/Argentina%20First/Traducci%C3%B3n%20NDC_Argentina.pdf

[43] **Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Argentina), 2015.** *"Tercera Comunicación Nacional de la Republica Argentina a la Convención Marco de las Naciones Unidas Sobre el Cambio Climático"* (and all its Annexes). Buenos Aires, 282p. http://unfccc.int/resource/docs/natc/argnc3s.pdf

[44] **Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) 2013.** *"Estrategia Nacional de Cambio Climático. Visión 10-20-40"*. Ciudad de México, 64p. http://www.inecc.gob.mx/descargas/cclimatico/2012_est_nal_cc.pdf

[45] **Secretaría de Medio Ambiente y Recursos e Instituto Nacional de Ecologia 2010.** *"Potencial de Mitigación de Gases de Efecto Invernadero en México al 2020 en el Contexto de la Cooperación Internacional"*. Ciudad de México, 137p. http://www2.inecc.gob.mx/descargas/cclimatico/Potencial_mitigacion_GEI_Mexico_2020_COP.pdf

[46] **UNDP (United Nations Development Program) 2016.** *"United Nations Human Development Report 2016"*. New York, 274p. http://hdr.undp.org/en/countries

[47] **The World Bank 2017.** *"The World Bank Climate Change Database"*. https://data.worldbank.org/country

http://www.kas.de/energie-klima-lateinamerika/