

**Report**

**Deep Decarbonization  
Latin America Project  
- Argentina -**

*December 2020*



## Review of proposed mitigation actions

### **Report Activity II-AR.1**

New and existing mitigation actions

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# I. Introduction

## 1. The Project

The project aims to assist in contributing to creating enabling conditions to make finance flows consistent with low-carbon development pathways in the economy of the three Latin American target countries.

Meeting Argentina's vast financial and investment needs requires access to public international finance as well as to private domestic resources, recognizing that national public finance is currently constrained because of the obligation to address external and internal debt services and, consequently, fiscal space to fund climate action is relatively limited. International and national public finance should be able to leverage financial flows to facilitate climate action.

Major specific objectives are:

1. Identify enabling conditions to make feasible the decarbonisation of the country's economy and strengthening resilience. To that end it is convenient to improve and broaden access to international climate finance, as well as creating the conditions for an expanded flow of private resources to fund long-term climate action, in order to complement sparse resources from the public sector.
2. Provide robust information to create awareness and demonstrate that climate action should be a key element in enabling short-term economic recovery, avoiding bad long-term investments and strengthening sustainable development.
3. Contribute to providing elements to enhance the existing climate governance, policy and regulatory framework.
4. Identification of new and innovative financial instruments, including those capable of modifying the risk-return profile of investments.
5. Identify strategic investment opportunities in the selected sectors, under still enduring major budgetary and financial constraints. The aim is to avoid potential carbon lock-in and strengthen mitigation actions while increasing the efficiency of investment decisions.
6. Consolidate a green and sustainable investment portfolio in a prioritized sector, while also assisting to devise demand side policy approaches to reduce emissions.
7. Showcase that a green recovery is feasible, attractive from an investor's perspective, and adding to sustainable development patterns.

According to the workplan, the objective of Activity II AR 1 is to review the proposed mitigation actions with an emphasis on the different National Sectoral and Climate Change Action Plans: energy, transport, AFOLU, industry and infrastructure.

The analysis of the mitigation measures and actions in the NDC, abovementioned Plans and National Inventories for the selected sectors will be performed through a critical review of their scope and implementation possibilities given the current and future national economic context, as well as under the restrictions imposed by the COVID-19 pandemic and its consequences. The latter generated additional uncertainties and challenges regarding the country's socioeconomic and sectoral evolution as well as future commercial international relations and strategic positioning.

The review comprises the assessment of previously identified mitigation measures in the abovementioned sectors, barriers and policies, and measures and instruments that have been previously suggested to overcome them, considering the specificities of the applied theoretical frameworks, as well as the comparative international experiences.

The analysis will result in: i) a summary working document, identifying and the major findings during the review of the key documentation, ii) a working document and a spreadsheet containing an overview of the status and degree of definition of mitigation actions contained in Government's documentation for selected sectors. The purpose of this last document is to define a systematic and standardized approach towards elaborating an inventory of documented mitigation actions from public sources (hereby "government-proposed"), serving as a basis to assess the degree of completeness of the definition of the actions, as well as the definition gaps, their documented and undocumented barriers; and iii) a working document containing an update of previously identified actions and an outline of new mitigation opportunities in selected sectors.

## 2. Activity Objectives

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The purpose of this document is to define a systematic and standardized approach towards elaborating an inventory of documented mitigation actions in the selected sectors, from public sources (hereby "government-proposed"), included in the NDC, sectoral plans and other policy frameworks serving as a basis to assess the degree of completeness of the definition of the actions, as well as the *definition gaps*, their execution status.

Additionally, new mitigation options not included in the plans are detected to identify low carbon investment opportunities. The review, identification and assessment of mitigation options in the selected sectors will enable, in the following phases of the project, the development of an investment portfolio associated to the adoption of deep decarbonization



pathways, plus the identification of further opportunities to inform medium- and long-term strategies and plans by Argentina, and further national contributions.

## II. Methodological approaches

The analysis of the mitigation actions in NDC, NAMAs and Sectoral Plans and National Inventories for the selected sectors will be performed through a critical review of their scope and implementation possibilities given the current and future national economic context, as well as under the restrictions imposed by the COVID-19 pandemic and its consequences. The latter generate additional uncertainties and challenges regarding the country's economic and sectoral evolution as well as future commercial international relations and strategic positioning.

The review comprises the assessment of previously identified mitigation measures in the abovementioned sectors, identified implementation barriers and policies, measures and instruments that have been previously suggested to overcome them, considering the specificities of the applied theoretical frameworks as well as the comparative international experiences.

The analysis will result in: i) a summary working document, identifying the mitigation options and the major findings during the review of the key documentation, ii) a working document and a spreadsheet containing an overview of the status and degree of definition of mitigation actions contained in Government documentation for selected sectors and iii) a working document containing an update of previously identified actions and an outline of new mitigation opportunities in selected sectors. Further mitigation opportunities identification will be based on the review of international and national studies as well as on FTDT's previous studies and research revision and multi-stakeholder dialogues.

### 1. Energy and Transport

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Existing documents and sectorial plans in the Energy, Transport, Industry and Infrastructure activities sectors related to energy uses, are reviewed with the aim of assessing critically their scopes and accomplishment possibilities.

The critical review is comprising the assessment of previously identified mitigation measures in the abovementioned sectors, identified implementation barriers and policies, measures and instruments that have been previously suggested to overcome them, considering the specificities of the applied theoretical frameworks as well as the comparative international experiences.

The previously developed studies that have been assessed have included:

- ▷ Sectorial Climate Change Action Plans aimed at enabling Argentina's NDC implementation (2019 revision), comprising the sectorial mitigation measures considered in the following sectors:
  - *Energy and Climate Change Action Plan*
  - *Transport and Climate Change Action Plan*
- ▷ Argentinean Third Biennial Update Report (BUR) (2019)
- ▷ 2030 Energy Scenarios (2019)
- ▷ Long Term Strategies for the Energy Sector (discussion document within the LTS 2050 development process)
- ▷ Energy Efficiency National Plan (being developed)
- ▷ Third National Communication of Argentina to the UNFCCC (2015): GHG Inventories and Mitigation studies
- ▷ Technology Needs Assessment (TNA) - Argentina (2013)
- ▷ Legal frameworks related to strategies and associated plans
- ▷ Deep Decarbonization Project - FTDT: Electric sector projections and transport sector assessments (2017-2018)

For the purpose of this document, we will refer to definition gap as the missing elements of the current publicly disclosed mitigation actions in contrast to a *well-defined* action or policy. Although *well-defined* might prove to be a biased classification due to the naturally different challenges faced in order to assess mitigation actions among different sectors and sub-sectors, in this analysis the degree of completeness of the definition in public documentation for each mitigation action is characterized through the presence or lack of the following attributes:

- ▷ GHG reduction potential.
- ▷ Timeframe.
- ▷ Technical feasibility.
- ▷ Economic feasibility.
- ▷ Identification of funding sources.
- ▷ Identification of barriers.
- ▷ Implementation status.
- ▷ Identification of Policy measures and instruments to address and remove identified barriers.
- ▷ Proposed MRV scheme.
- ▷ Infrastructure vs. behavioral measures.

Further mitigation opportunities identification will be based on the review of international and national studies as well as on FTDT's previous studies and research revision, as well as mitigation measures mentioned during multi-stakeholder dialogues.

The Annexes to this Report include a synthesis of all the measures analyzed that are part of the National Plans and the revised documents mentioned above, and the results of the surveys carried out with key stakeholders, from the public and private sector

### 2. AFOLU

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Existing documents and sectorial plans in the AFOLU sector are reviewed with the aim of assessing critically their scopes and accomplishment possibilities, including, inter alia, the following sources:

- First Revision of the NDC;
- Climate Change National Adaptation and Mitigation Plan;
- Third National Communication, GoA;
- Third biennial update report, Republic of Argentina;
- Sectoral Action Plans:
  - *Agriculture and Climate Change National Action Plan*
- Technology needs assessment for climate change mitigation and adaptation in Latin America. Final report on Argentina
- Opportunity cost analysis on deforestation related to the implementation of REDD+ in Argentina.
- Other relevant sources

The mitigation potential of the different actions in the AFOLU sector will be reviewed, considering regional differences and their projection to 2050. For this assessment a baseline scenario of emissions in 2050 will be established and the degree of mitigation of each action and as a whole will be compared.

The possibilities and limitations of implementing climate change mitigation actions (reduction of GHG emissions and carbon sequestration) in the AFOLU will be analyzed, depending on the agro-ecological conditions of the different regions. Regional differences will be assessed according to the activity, following appropriate regionalization criteria to delimit forest, livestock and extensive crop farming regions. Regional intensive crops with a low occupation area would be excluded from the study.

For emissions forecasts, a similar methodology used in the Third National Communication will be followed, comparing a projected BAU (Business as Usual) scenario versus a scenario that includes the identified mitigation measures.

In the AFOLU, the "Land Use Change" sub-sector will be analyzed mainly considering changes in use in native forest areas, considering emissions from deforestation and capture by forest regeneration. These emissions and captures will be projected to 2050, considering the legal instruments in force in Argentina and studies related to the potential implementation of the REDD+ initiative in different regions of the country. In the agriculture and livestock sub-sector, mitigation mechanisms will be analyzed, including the potential impact of carbon sequestration on the soil in crops and on grazing land, and in silvo-pastoral systems through forest growth.

The analysis of the mitigation potential of carbon sequestration in agricultural soils and grazing lands will be estimated in a regionalized way using mathematical models. The IPCC Tier 1 models and the recent model included in the IPCC 2019 guide (Steady State Model-Tier 2) will be used and the AMG model will be evaluated (Milesi et al., 2013). These models allow estimates on carbon dynamics considering soil type, climate and management (tillage system and annual biomass production).

## III. Sectoral outcomes

### 1. Energy

#### Introduction

The analysis aims to summarize the proposed actions contained in National Sectoral and Climate Change Action Plans related to energy in terms of:

- Whether actions act mainly on the supply-side (production) or demand-side (consumption) of energy sector;
- Types of requirements, i.e. investment in public infrastructure and buildings or in private assets, promoting the mainstream adoption of certain consumer appliances and goods, or conversely industrial, commercial or consumer best practices, or mixed approaches, denominated hybrid;
- Whether they focus on the electricity production and consumption, liquid or gaseous fuels such as refined products, biofuels or natural gas/biogas, or others;
- The source of funding stated in official documentation for each of the proposed actions, when available (i.e. public funding or private investment, or by multilateral, development or EXIM banks, and whether these funds are already secured, unsecured or not disclosed); and
- The degree of implementation of each action, analyzing if these are in a planning stage, financial closure attainment, under execution, completely executed, cancelled or postponed.

The results summarized in this document describe the current status and contents of National Sectoral and Climate Change Action Plans and serve as a basis for identifying enabling conditions for deep decarbonisation of the country's economy, identifying funding requirements and implementation gaps, as well as finding strategic investment opportunities in the energy sector, and ultimately produce inputs for the consolidation of a green and sustainable investment portfolio in a prioritized sector, while also assisting to devise demand side policy approaches to reduce emissions.

For this purpose, 39 mitigation actions were analysed, contained in National Sectoral and Climate Change Action Plans:

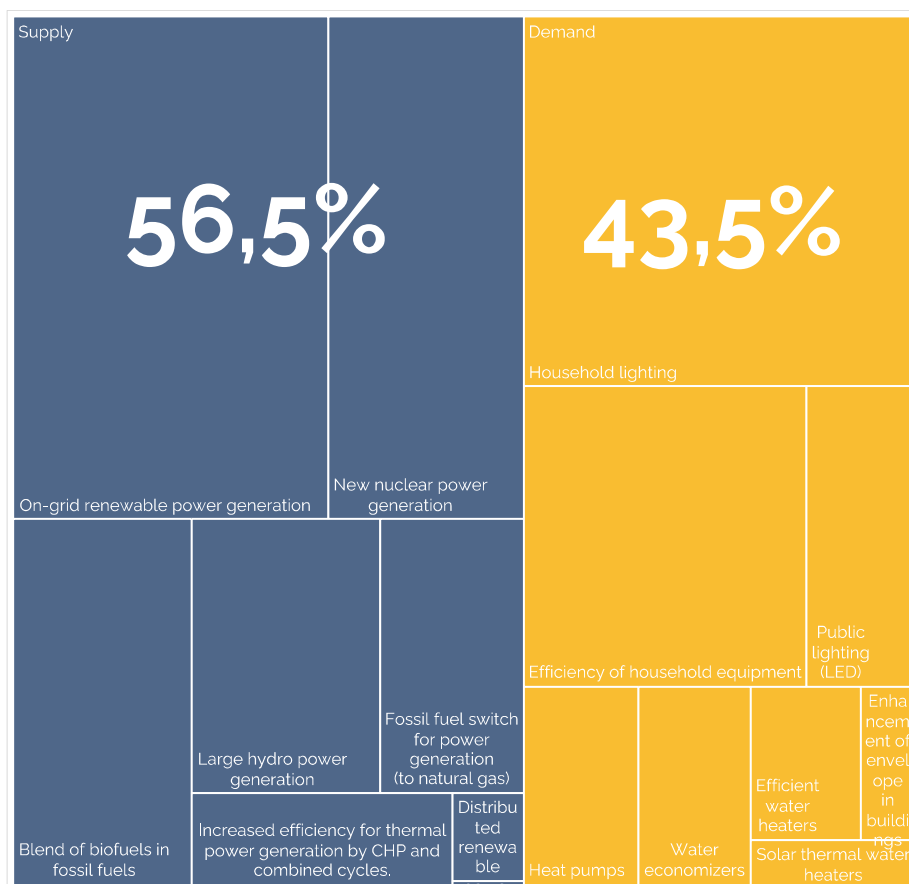
- National Energy and Climate Change Action Plan [2019],
- National Infrastructure and Climate Change Action Plan [2018]

- National Industry and Climate Change Action Plan [2018] — only energy-related actions were evaluated for the Infrastructure and Industry action plans),

accounting for 103.2 MtCO<sub>2</sub>e unconditional emission reductions and 23.02 MtCO<sub>2</sub>e emission reductions conditional to technology, financing and capacity- building, associated to the energy sector, both in supply and demand sides, totalling a maximum potential according to sectoral plans of 126.22 MtCO<sub>2</sub>e. These actions were at a later stage complemented with the discussion of additional new mitigation options, introduced during stakeholder dialogues sessions.

In Figure 1 main measures in the energy sector for the NDC are presented, as well as the emissions saving and the relative share of each one of them. The total of unconditional targets is just below 110 MtCO<sub>2</sub>eq.

**Figure 1: Emissions reduction towards 2030 – Energy sector**



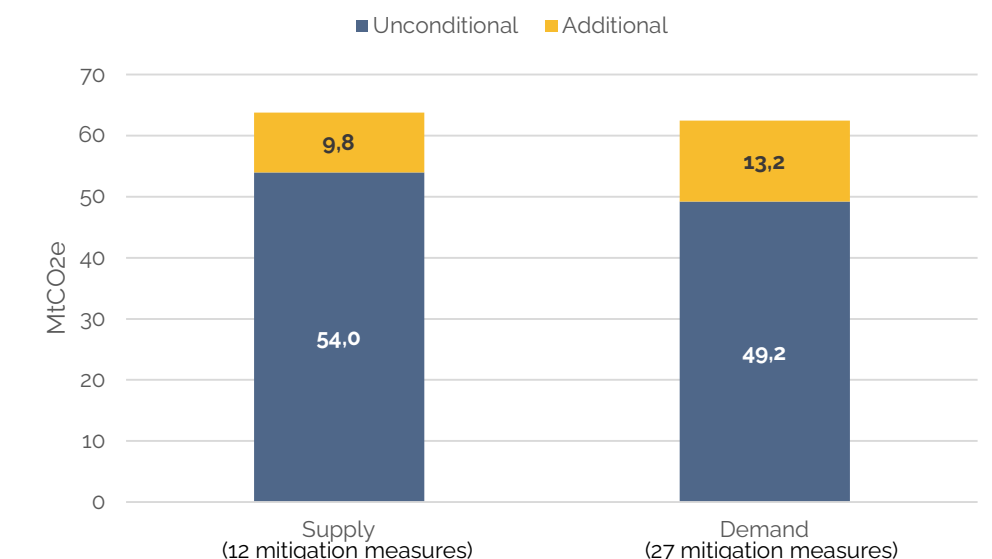
Source: Own elaboration

### Supply or demand side

Out of the 39 analysed actions, 27 are focused on demand-side actions and policies, while the remaining 12 are related to the supply-side. However, due to the larger impact of the latter, slightly more than half of the proposed emission reductions are associated to the supply-side.

Additional reductions, (using the language introduced in Argentina's Plans, and meaning "conditional" reductions) constitute 18% of the total potential expressed in official documentation, and are slightly more relevant on the demand-side, while the supply-side is in relative terms more "concrete" regarding the unconditional character of the proposed reductions.

**Figure 2: Emission reductions unconditional and additional in supply and demand sides**



Source: Own elaboration

The proposed supply-side emission reductions are, however, more concentrated than demand-side actions, given that a few amounts of actions could potentially —according to the analysed documentation— account for more reductions than the demand-side, reducing 63.8 MtCO<sub>2</sub>e in 2030 through the implementation of 12 actions, vs. 62.4 MtCO<sub>2</sub>e achieved through the 27 actions addressed through the demand-side.

The most relevant supply-side actions are the Large-scale penetration of renewable power generation in the national grid (22.16 MtCO<sub>2</sub>e), nuclear power generation (13.79 MtCO<sub>2</sub>e), increasing the blend of biofuels in liquid fossil fuels (9.15 MtCO<sub>2</sub>e), and large-scale hydro power



generation (7.20 MtCO<sub>2</sub>e), explaining together 41.5% of the whole National Energy and Climate Change Action Plan disclosed potential reductions and 82% of the supply-side actions.

Regarding the demand-side, the most relevant actions are the use of more efficient household lighting (20.37 MtCO<sub>2</sub>e), the adoption of efficient home appliances (11.92 MtCO<sub>2</sub>e), the enhancement of households with qualitative deficits through the *Better sustainable household programme* (7.38 MtCO<sub>2</sub>e), the replacement of public lighting with efficient lamps (4.62 MtCO<sub>2</sub>e), and the use of efficient electric motors in Industry (4.23 MtCO<sub>2</sub>e). These 5 actions explain 78% of the potential reductions declared for the demand-side and 38.4% of the complete reductions shown in government sectoral plans.

Notably, most of the demand-side actions (79% in terms of potential reductions) are focused in the residential sector, naturally more atomized than other sectors, while the remaining 21% is focused in the industrial and commercial sectors (14%), and public lighting (7%).

**Table 1: Unconditional and additional (conditional) reductions proposed by supply-side and demand-side actions**

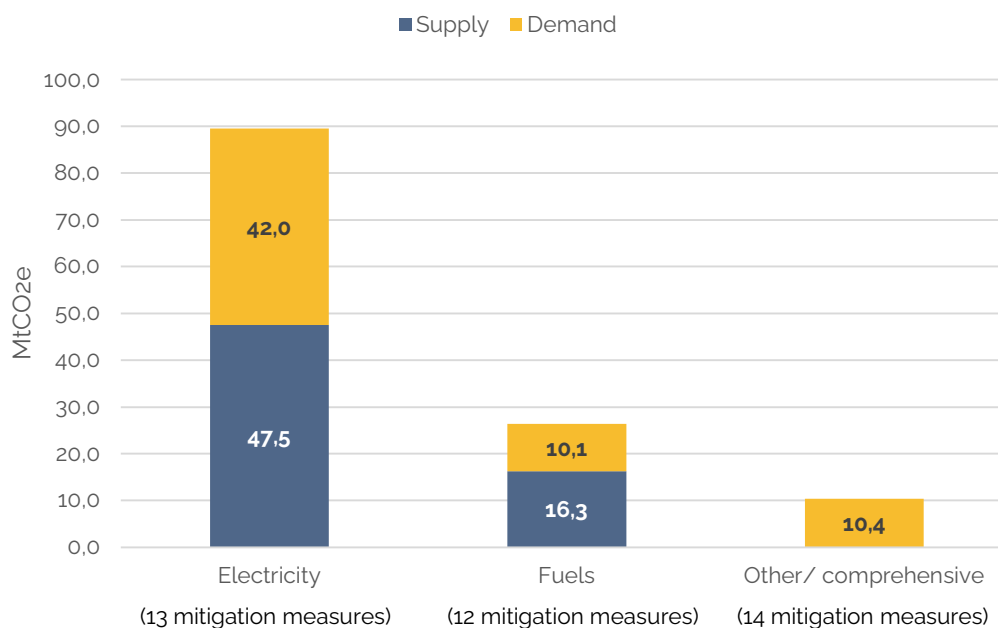
	Unconditional	Additional	Total
<b># of mitigation actions</b>			
Supply	10	6	12
Demand	17	11	27
<b>Total</b>	<b>27</b>	<b>17</b>	<b>39</b>
<b>Mitigation potential MtCO<sub>2</sub>e</b>			
Supply	54.0	9.0	63.8
Demand	49.2	13.2	62.4
<b>Total</b>	<b>103.2</b>	<b>23.0</b>	<b>126.2</b>
Supply	85%	15%	100%
Demand	79%	21%	100%
<b>Total</b>	<b>82%</b>	<b>18%</b>	<b>100%</b>

Source: Own elaboration

#### Energy sources and uses impacted by the proposed actions

Energy-related sectoral plans are clearly biased towards actions focused on electricity-related issues, such as power generation and consumption, representing 71% of the complete emission reductions proposed in the government documentation, while 21% is focused on fuels, and 8% is technology neutral or mixed (most prominently, energy conservation in buildings) and related to resource efficiency/ circular economy in the industry.

Figure 3: Emission reductions aggregated by energy sources in supply and demand sides



Source: Own elaboration

The most relevant single electricity-related actions are prominent on the supply-side:

- renewable power generation in the national grid (22.16 MtCO<sub>2</sub>e),
- nuclear power generation (13.79 MtCO<sub>2</sub>e), and
- large-scale hydro power generation (7.20 MtCO<sub>2</sub>e).

On the demand-side the most relevant electricity-related actions are efficient household lighting (20.37 MtCO<sub>2</sub>e) and increased efficiency in home appliances (11.92 MtCO<sub>2</sub>e), which together explain 72% of the demand-side electricity-related actions.

Regarding fuels, the single most relevant proposed action is increasing the blend of biofuels in liquid fossil fuels (9.15 MtCO<sub>2</sub>e), followed by the fossil fuel switch of liquid fossil fuels for power generation by natural gas (5.52 MtCO<sub>2</sub>e), accounting for more than 90% of the supply-side fuel-related actions. On the demand-side, the most relevant actions —accounting for 85% of the demand-side fuel-related mitigation potential— are the use of heat pumps for household heating purposes replacing balanced draft stoves (3.2 MtCO<sub>2</sub>e), the mainstream adoption of water economizers (3.1 MtCO<sub>2</sub>e), and the use efficient tankless water heaters (2.34 MtCO<sub>2</sub>e) avoiding the use of pilot lights.

Finally, actions related to thermal uses and circular economy, are exclusively focused on the demand side and are mostly related to energy conservation design and practices: Enhancing households with qualitative deficits through the Better sustainable households programme, could report around 7.38 MtCO<sub>2</sub>e worth of emission reductions according to the National Infrastructure and Territory, and Climate Change Action Plan, while enhancing thermal enclosure in buildings could reduce 1.21 MtCO<sub>2</sub>e by 2030, and to the recovery of scrap materials in different industry sectors.

**Table 2: Total emission reductions proposed in energy-related Plans by energy sources in supply and demand sides.**

	Electricity	Fuels	Other/ mixed	Total
<b># of mitigation actions</b>				
Supply	7	5	0	12
Demand	6	7	14	27
<b>Total</b>	<b>13</b>	<b>12</b>	<b>14</b>	<b>39</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>				
Supply	47.5	16.3	0	63.8
Demand	42.0	10.1	10.4	62.4
<b>Total</b>	<b>89.5</b>	<b>26.3</b>	<b>10.4</b>	<b>126.2</b>
Supply	74%	26%	0%	100%
Demand	67%	16%	17%	100%
<b>Total</b>	<b>71%</b>	<b>21%</b>	<b>8%</b>	<b>100%</b>

Source: Own elaboration

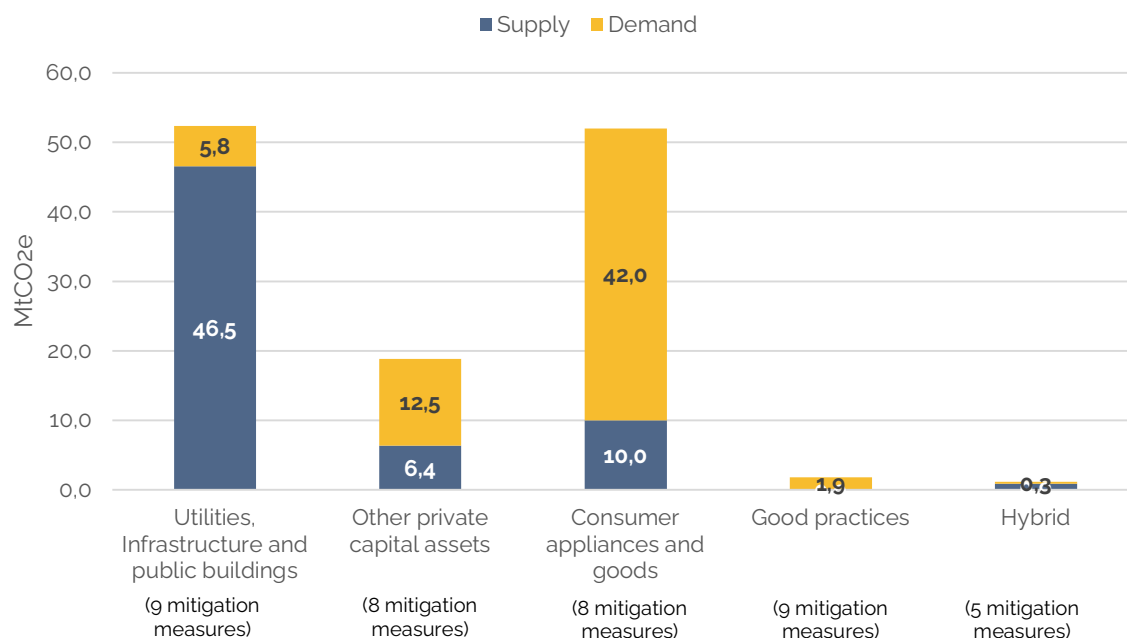
#### Types of efforts required by the proposed actions

Regarding the most relevant types of requirements for the implementation of the three abovementioned Plans are:

- investment in infrastructure and public buildings (41.5% over the total mitigation potential), and
- promoting the mainstream acquisition of efficient consumer appliances and goods (41.2%).

While the former is almost completely focused on supply-side actions (and explains 73% of their potential), such as the investment in utilities (prominently large hydro, other renewables, and nuclear power generation), the latter are mostly focused on the demand-side, except for policies related to biofuels, which although are ultimately bought by private end-users are more intensive in supply-side policy/infrastructure requirements.

Figure 4: Emission reductions aggregated by types of efforts required in supply and demand sides



Source: Own elaboration

In third place, the acquisition of other assets in the private sector represent 15% of the Plans' reductions. The most relevant in the supply-side is the Fossil fuel switch of liquid fossil fuels for power generation by natural gas (5.52 MtCO<sub>2</sub>e), requiring considerable private investment in new natural gas wells and transport. On the demand-side "Enhancing households with qualitative deficits - better sustainable household programme" (7.38 MtCO<sub>2</sub>e) and the use of efficient electric motors in the domestic industry (4.23 MtCO<sub>2</sub>e) explain 93% of the potential demand-side reductions requiring this type of efforts<sup>1</sup>.

Finally, the promotion of good practices, such as resource efficiency actions, as well as hybrid actions, such as the adoption of practices that also require private investment, only account for 2% of the potential reductions and are mostly focused on the demand-side.

<sup>1</sup> The categorization of efforts does not directly imply the source of funding since, for example, the enhancement of households with qualitative deficit requires public, private and/or multilateral expenditure.

**Table 3: Total emission reductions proposed in sectoral plans by type of effort involved in actions**

	Utilities, Infrastructure and public buildings	Other private capital assets	Consumer appliances and goods	Good practices	Hybrid	Total
<b># of mitigation actions</b>						
Supply	5	3	2	0	2	12
Demand	4	5	6	9	3	27
<b>Total</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>9</b>	<b>5</b>	<b>39</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>						
Supply	46.5	6.4	10.0	0.0	0.9	63.8
Demand	5.8	12.5	42.0	1.9	0.3	62.4
<b>Total</b>	<b>52.4</b>	<b>18.8</b>	<b>52.0</b>	<b>1.9</b>	<b>1.2</b>	<b>126.2</b>
Supply	73%	10%	16%	0%	1%	100%
Demand	9%	20%	67%	3%	1%	100%
<b>Total</b>	<b>41%</b>	<b>15%</b>	<b>41%</b>	<b>1%</b>	<b>1%</b>	<b>100%</b>

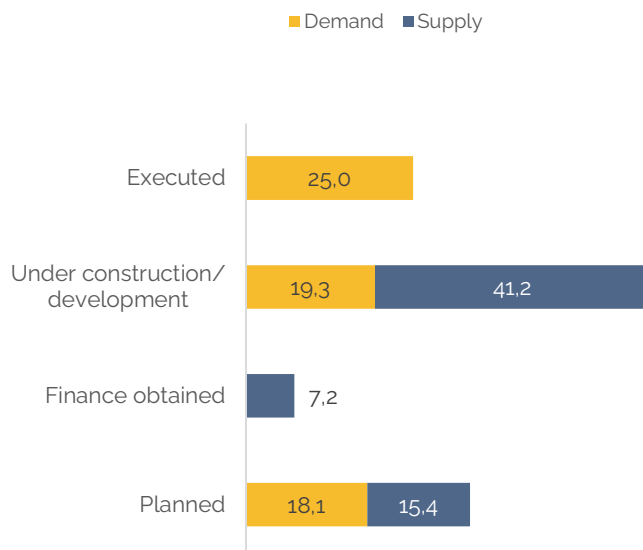
Source: Own elaboration

### Degree of implementation

When it comes to the degree of implementation of the stated policies and actions, their status has been classified into "Planned", "Finance obtained", "Under construction/ development", "Executed", "Delayed/postponed" or "cancelled"<sup>2</sup>.

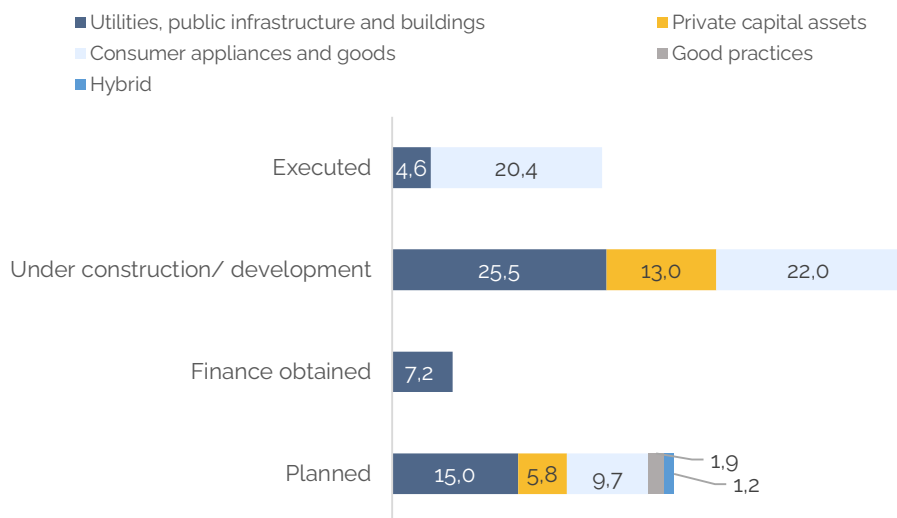
<sup>2</sup> For the purpose of this analysis, please note that the status "under construction or development" does not necessarily imply that the complete ambition of the action will be achieved before 2030: in some cases, due to timeframe/period of execution issues (e.g. large-scale penetration of renewable power generation in the national grid), and in other cases, due to extension issues (e.g. nuclear power generation).

Figure 5: Actions and policies, degree of implementation - in MtCO2e



Source: Own elaboration

Figure 6: Types of efforts required, degree of implementation - in MtCO2e



Source: Own elaboration

In the following table the status of implementation of the different actions by supply and demand sides is detailed:

**Table 4: Total emission reductions proposed in sectoral plans by status of implementation**

	Planned	Finance secured	Under construction/development	Executed	Total
<b># of mitigation actions</b>					
Supply	4	1	7	0	12
Demand	21	0	4	2	27
<b>Total</b>	<b>25</b>	<b>1</b>	<b>11</b>	<b>2</b>	<b>39</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>					
Supply	15.4	7.2	41.2	0.0	63.8
Demand	18.1	0.0	19.3	25.0	62.4
<b>Total</b>	<b>33.5</b>	<b>7.2</b>	<b>60.5</b>	<b>25.0</b>	<b>126.2</b>
Supply	24%	11%	65%	0%	100%
Demand	29%	0%	31%	40%	100%
<b>Total</b>	<b>27%</b>	<b>6%</b>	<b>48%</b>	<b>20%</b>	<b>100%</b>

Source: Own elaboration

Thus, **48% of the stated actions** could be considered as currently being **under construction or development** with different degrees of progress and **20% of the actions are executed**.

On the supply-side, the most relevant under construction/development, are by far large-scale penetration of renewable power generation in the national grid (22.16 MtCO<sub>2</sub>e), the blend of biofuels in liquid fossil fuels (9.15 MtCO<sub>2</sub>e), the fossil fuel switch of liquid fossil fuels for power generation by natural gas (5.52 MtCO<sub>2</sub>e), and increasing efficiency in power generation (3.32 MtCO<sub>2</sub>e). Out of these, it is worth noting that although the insertion of renewable power generation has grown significantly during the last years, this action is still far from the specified objectives, while other ongoing supply-side measures have already advanced degrees of completion.

On the demand-side, the most relevant developing actions are promoting efficiency in home appliances (11.92 MtCO<sub>2</sub>e), and enhancing households with qualitative deficits - Better sustainable household programme (7.38 MtCO<sub>2</sub>e). Although the promotion of efficient household lighting has not yet achieved the goals stated in the National Energy and Climate Change Action Plan, for the purpose of this document it is considered as executed, since initial government efforts have now been surpassed by natural market conditions which should drive further penetration for the planning period.

27% of the potential emission reductions are, according to the three assessed Plans and sector information, still on a planning stage, defined here as the stage where some or most definitions have already been made, but financial requirements have not yet been secured or certain aspects are still needed to be resolved. When it comes to number of actions, this category concentrates 25 out of the 39 analysed in this document, and includes the whole of those identified as good practices or hybrid actions.

The construction of utilities, infrastructure and public buildings, being the most prominent those related to nuclear power generation (13.8 MtCO<sub>2</sub>e). explain most of the supply-side actions still on a planning stage. Other actions, such as efficient electric motors for the industry (private assets, 4.23 MtCO<sub>2</sub>e mitigation potential), previously identified in the Third National Communication but with few advancements, and efficient tankless water heaters (consumer appliances, 2.34 MtCO<sub>2</sub>e mitigation potential) are relevant demand-side actions.

According to the studied National Sectoral and Climate Change Action Plans and sector information, an important share of the required funding for large-scale hydro power generation (with a mitigation potential estimated in 7.2 MtCO<sub>2</sub>e) has already been secured through domestic budget allocations and multilateral/development/EXIM bank funds, while as it was previously mentioned, government actions regarding efficient household lighting is considered as almost executed, as well as most of public lighting initiatives.



**Table 5: Total emission reductions proposed in energy-related Plans - Status of implementation**

	Planned	Finance secured	Under construction/development	Executed	Total
<b># of mitigation actions</b>					
Utilities, infrastructure and public buildings	2	1	5	1	9
Private capital assets	5	0	3	0	8
Consumer appliances and goods	4	0	3	1	8
Good practices	9	0	0	0	9
Hybrid	5	0	0	0	5
<b>Total</b>	<b>25</b>	<b>1</b>	<b>11</b>	<b>2</b>	<b>39</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>					
Utilities, infrastructure and public buildings	15.0	7.2	25.5	4.6	52.4
Private capital assets	5.8	0.0	13.0	0.0	18.8
Consumer appliances and goods	9.7	0.0	22.0	20.4	52.0
Good practices	1.9	0.0	0.0	0.0	1.9
Hybrid	1.2	0.0	0.0	0.0	1.2
<b>Total</b>	<b>33.5</b>	<b>7.2</b>	<b>60.5</b>	<b>25.0</b>	<b>126.2</b>
Utilities, infrastructure and public buildings	29%	14%	49%	9%	100%
Private capital assets	31%	0%	69%	0%	100%
Consumer appliances and goods	19%	0%	42%	39%	100%
Good practices	100%	0%	0%	0%	100%
Hybrid	100%	0%	0%	0%	100%
<b>Total</b>	<b>27%</b>	<b>6%</b>	<b>48%</b>	<b>20%</b>	<b>100%</b>

Source: Own elaboration

### Sources of funding

A short introduction to the common funding sources for the types of mitigation actions contained in official documentation is presented here<sup>3</sup>, based both on disclosed funding sources, as well as on current trends and practices for those cases in which these have not been disclosed.

<sup>3</sup> Although issues related to funding requirements and sources will be addressed in future documents according to the workplan.

Please note that since certain actions require multiple sources of funding, the sum of the rows does not necessarily equal to the total value. For the purpose of this document, this section is focused exclusively on capital expenditures.

According to the National Sectoral and Climate Change Action Plans and current practices, almost 80% of the total emission reductions could be subject to private funding, notably 93% of the potential reductions associated to demand-side actions, and 67% of the reductions associated to supply-side actions, in most cases due to the needs of investment in private assets, as well as in consumer appliances and goods associated to energy efficiency.

Around 40% of the emission reduction potential will also probably be associated to public expenditures, notably with a high share on demand-side actions, materialized in preferential rates for efficiency-oriented credits, while 17% of the potential (33% of the supply-side) is expected to require, inter alia, multilateral and export-import banks funding, being the most relevant, actions the construction of large hydro and nuclear power plants, which have already partially secured funding.

**Table 6: Total emission reductions proposed in sectoral plans by type of funding required<sup>4</sup>**

	Private	Public	Multilateral/ development/ EXIM banks	Total
<b># of mitigation actions</b>				
Supply	9	5	3	12
Demand	24	8	1	27
<b>Total</b>	<b>33</b>	<b>13</b>	<b>4</b>	<b>39</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>				
Supply	42.8	13.0	21.0	63.8
Demand	57.8	36.9	0.0	62.4
<b>Total</b>	<b>100.6</b>	<b>49.9</b>	<b>21.0</b>	<b>126.2</b>
Supply	67%	20%	33%	100%
Demand	93%	59%	0%	100%
<b>Total</b>	<b>80%</b>	<b>40%</b>	<b>17%</b>	<b>100%</b>

Source: Own elaboration

<sup>4</sup> The mitigation potential associated to each source of funding is presented, and not the amount of required funds or investment to achieve the different measures.

### Detailed analysis of mitigation actions

The mitigation actions assumed by Argentina in its National Sectoral and Climate Change Action Plans on which the commitments to reduce CO<sub>2</sub> emissions until 2030 are based are summarized in the following table, classified in supply and demand side.

**Table 7: Mitigation measures**

Mitigation Measures	MTCO <sub>2</sub> eq	%
<b>Supply Side</b>		
Distributed generation;	0.88	0.80%
Biofuels;	9.15	8.33%
Hydroelectric Generation;	7.20	6.55%
Nuclear Generation;	13.79	12.55%
Substitution of fossils for natural gas	5.52	5.03%
Improvement in the efficiency of thermal power plants	3.32	3.02%
Electricity generation from non-conventional renewable sources (NCRE) on the grid	22.16	20.17%
Isolated generation (PERMER);	0.03	0.03%
<b>Total, Supply Side</b>	<b>62.05</b>	<b>56.49%</b>
<b>Demand Side</b>		
Water economizers;	3.10	2.82%
Solar heaters;	1.03	0.94%
Street lighting (LED);	4.62	4.21%
Efficiency in electrical appliances;	11.92	10.85%
Heating pumps;	3.20	2.91%
Thermal envelope in buildings	1.21	1.10%
Efficient water heaters;	2.35	2.14%
Residential lighting	20.37	18.54%
<b>Total Demand Side</b>	<b>47.80</b>	<b>43.51%</b>
<b>Total Conditional + Unconditional avoided emissions</b>	<b>109.85</b>	

Source: Own elaboration based on National Sectoral and Climate Change Action Plans

#### S. Energy supply axis

##### S.1. Electricity generation from non-conventional renewable sources (NCRE) on the grid

The most important mitigation measure is the incorporation of non-conventional renewable sources (NCRE) into the electricity production system. The objective is to achieve 20% of total energy consumption from NCRE by 2025, firstly wind energy and then solar energy,

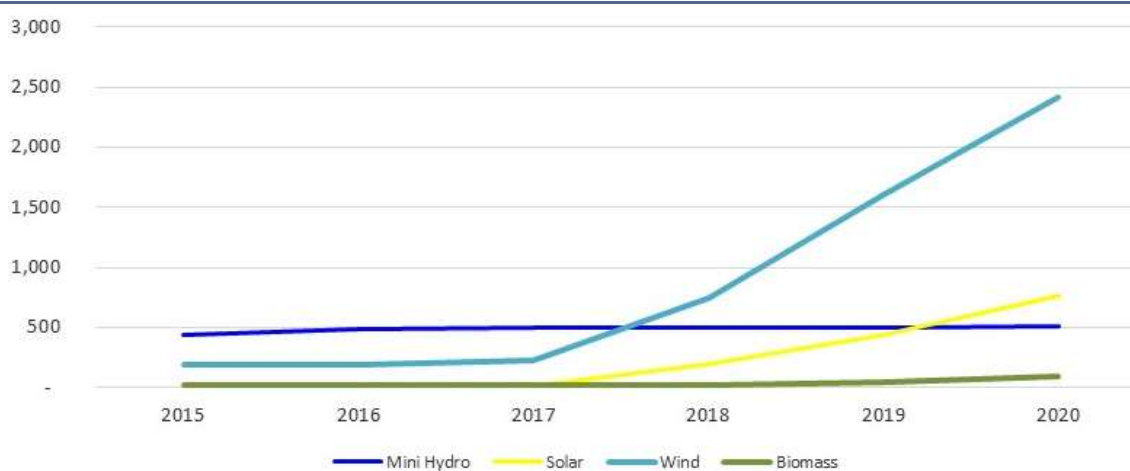
supplementing with a lower proportion of small hydroelectric plants and biomass and biogas production.

This objective is established by Law 27,191 (2015) and determines incentives to produce electricity based on renewable energy sources. The unconditional goal was to reach 8% of electricity consumption in 2018; 12% in 2019; 16% in 2021; 18% in 2023; and 20% in 2025. As an additional objective, proposes to reach 25% in 2030.

The main instrument for the execution of these measures has been a public auction program called RenovAr, and the constitution of a Guarantee Fund (FODER, in Spanish) constituted by a guarantee line from the World Bank and funds from public budget. Four successful rounds of auctions were carried out, complemented by the creation of a Long-Term Market for NCRE, with contractual commitments between private producers and large industrial consumers.

The results achieved between 2016 and October 2020 have been important, verifying that these programs have been successful in physical terms (installed power capacity and share in total generation). Figure 7 displays the evolution of NCRE installed capacity between 2015, practically zero, and October 2020 accomplishing 2,420 MW of wind power; and 760 MW of solar power., which accounts for 9.1% of the total capacity currently installed in the country. In terms of monthly share, electricity consumption from NCRE had its peak in October 2020, reaching almost 12% of the total power generation, although the average for the year was 9.1%.

**Figure 7: Evolution of installed power - NCRE (MW)**



Source: *Compañía Administradora del Mercado Mayorista Eléctrico S.A. CAMMESA - Monthly Report October 2020*

RenovAR was suspended in 2019, and its resumption or its replacement by another program hasn't been presented so far. Although the results have been remarkable, the partial objectives

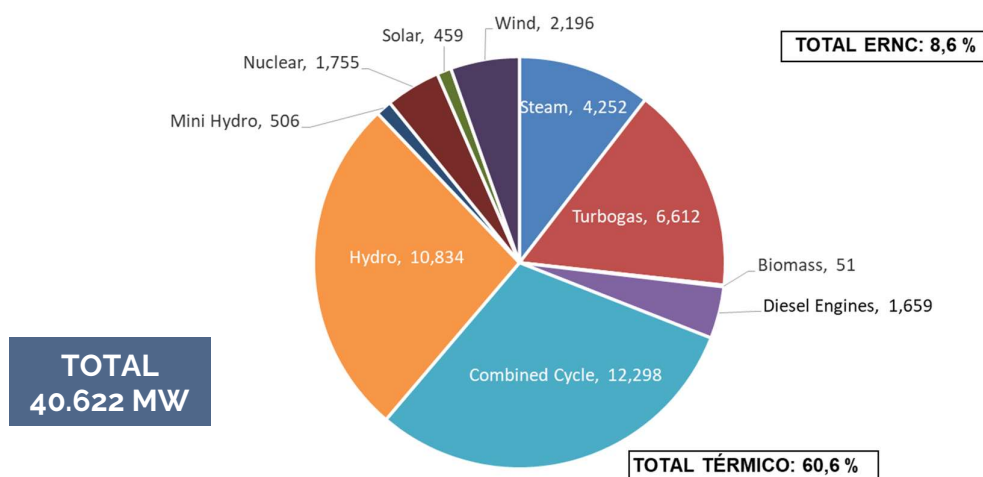
have not yet been reached, with a delay of at least one year and, according to the perception of stakeholders, with little probability of maintaining the current growth rate, and therefore to achieve the objectives set for 2025.

**The probability of complying with the emission reduction, estimated in the NDC, by NCRE on the grid is low.**

**S.2. Nuclear and Hydroelectric Power**

Electricity generated from both nuclear and hydro sources, currently have a 30% share of the total generation (See Figure 8). The execution of projects from these sources would reduce 21 MtCO<sub>2</sub>EQ, or 19% of total reductions estimated for the energy sector.

**Figure 8: Installed capacity - Power plants 2020 in MW<sup>5</sup>**



Source: CAMMESA

The National Energy and Climate Change Action Plan proposes the construction of two new nuclear power plants within the Framework Agreement for Economic and Investment Cooperation between the Government of Argentina and the Government of the People's Republic of China. Until 2030, one of the two 1,200 MW nuclear power plants would be brought into service.

<sup>5</sup> This figure refers to installed capacity (not power generation)

Negotiations for the signing of commercial contracts are locked, and the location of this new power plant is being discussed as well as its technology: Pressurized Water Reactor (PWR) or Pressurized Heavy Water Reactor (PHWR). China is proposing next generation reactors (EPR) and there is no significant progress on this issue. At this point, and considering that the construction of a new nuclear power plant requires no less than seven/eight years, it seems by multi-stakeholders highly unlikely that it will be operating in the Argentine electrical system by 2030.

The National Energy and Climate Change Action Plan also contemplates other projects, including: 1) extension of the operational lifetime of the Embalse Nuclear Power Plant (620 MW) for 30 years; 2) extension of the operational lifetime of the oldest plant (Atucha 1) for 15 years; 3) development of two Small Modular Reactors (SMR) technology: CAREM 27 and CAREM 150. The Embalse Nuclear Power Plata project is already completed and therefore is considered as part of the baseline scenario

The mitigation measure regarding nuclear generation includes installing new nuclear centrals or improving the existing ones (including unconditional and conditional targets), therefore increasing generation capacity up to 27.3 TWh by 2030. This represents 14% of the total emission reductions for the National Energy and Climate Change Action Plan.

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***The probability of fulfillment of the objective set for nuclear power generation is extremely low, due to the long execution periods and the uncertain economic and politic environment for its achievement.***

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In the case of hydroelectric projects, there is a greater probability of achieving the proposed objectives. There are works in progress in the Santa Cruz river (1,310 MW), others that have already been tendered and awarded (Ana Cua and Portezuelo del Viento), and some in advanced development stages (Yacyreta expansion, Chihuido I).

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***The probability that all the hydroelectric projects will be in operation in 2030 is reasonable and therefore it is possible to achieve the objectives set out in the National Energy and Climate Change Action Plan.***

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In the trend scenario of the official national energy scenarios<sup>6</sup>, it is expected that nuclear generation plus hydroelectric power will cover 38% of total electricity production in 2030. That is, maintaining its current share, 71.4 TWh, with a growth rate of demand of 2.6% per year. To

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<sup>6</sup> Escenarios Energéticos 2030, Secretaria de Energía, Republica Argentina

accomplish this, 1,262 MW nuclear and 2,503 MW hydroelectric will have to be built, with an investment of more than 23,000 million USD.

#### **S.3. Biofuels**

In 2016, law 26,093 was passed establishing that 12% of diesel should be mixed with soybean biodiesel, and 10% of gasoline with bioethanol from sugar cane and corn. This program ends in May 2021; however, a bill is currently in the Congress to extend this promotion plan for two more years and then establish a new regime that has not yet been defined.

In the estimates included in the NDC, the existing mix is maintained and the possibility of bringing the gasoline mix to 16% in 2030 with the introduction of flex vehicles in the market is added. The conditional target is a 20% cut for diesel in urban buses (B20) and the incorporation of flex-fuel technology for naphtha-alcohol engines, with the corresponding adaptation of the automotive industry.

Biofuels could avoid the emission of 9.15 MtCO<sub>2</sub>eq conditional and unconditional, that is, 8.3% of the total reduced emissions, estimated for the energy sector.

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***Biofuels have high probability of being achieved, and it would even be possible to improve this mitigation measure.<sup>7</sup>***

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#### **S.4. Other mitigation actions in the supply axis**

There are other mitigation actions that add the possibility of avoiding the emission of 8.8 MCO<sub>2</sub>eq, which is 8% of the total emissions to be reduced by the energy sector. All are associated with the production of electricity, a) substituting fossil fuels for natural gas, b) improving power plants efficiency, and c) isolated generation with photovoltaic solar installations within the PERMER project, financed by the World Bank.

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***Other mitigation actions in the supply axis are already in execution and in an advanced state of progress, so there is no uncertainty that they will be fulfilled.***

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#### **S.5. Synthesis supply axis**

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<sup>7</sup> Will be discussed in greater depth in section 5, Transport

The mitigation actions in the supply axis, include conditional and unconditional targets for reducing 62.05 MtCO<sub>2</sub>eq by 2030, accounting for 56.5% of the emissions avoided by the energy sector. Of the total, it is likely that these objectives will not be fully achieved due to the absence of certain conditions that may enable a robust and sustained progress.

#### **D. Energy demand axis**

On the demand side, main mitigation actions are associated with increasing efficiency in energy consumption in the residential, commercial and industry sectors. Efficiency measures in transport will be seen in the corresponding section.

The emissions reduction estimated for 2030 on the demand side amounts to 47.8 MtCO<sub>2</sub>, that is, 43.5% of the total estimated for the energy sector.

Mitigation measures on the demand side can be classified in: a) energy efficiency; b) energy savings in industry, and c) clean energy in new infrastructure.

#### **D.1. Energy efficiency**

Main energy efficiency mitigation actions proposed in the National Energy and Climate Change Action Plan are related with lighting. The goal is that 100% of lighting in the residential sector will be LED by 2030 and an increase in the use of LED and high-pressure sodium lamps (SAP NT) in the public lighting network is achieved. The objective is to:

- increase the current number of LED luminaires from 1.2 million in 2020 to 4.6 million in 2030.
- go from 900 thousand SAP NT lamps in 2020 to 1.4 million in 2030.

These two actions would avoid almost 25 MtCO<sub>2</sub>eq from being emitted, about 23% of the emissions reduced by the energy sector, and would be the most important mitigation measure on the demand side to meet the energy sector commitments.

However, recent studies carried out (not published yet) by the team of the project "Energy Efficiency in Argentina", financed by the European Union, in the preparation of the End-Use Energy Balance of the country, permit to ascertain:

- Almost 80% of the residential energy consumption is explained by heating, water heating and cooking: 35% thermal uses (room conditioning); 23% sanitary water heating; cooking (8%); and, refrigerators (13%). Moreover, the share of lighting is irrelevant (less than 2%).



- The large reductions in energy consumption due to the replacement of LED luminaires that are proposed in the Sector Plan should be revised and included in the baseline scenario, since there is no other type of lamps available for purchase in the market.

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***In the field of energy efficiency there is still a great opportunity to obtain greater emission reductions.***

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Greater emissions reductions could be achieved by, for example: a) the improvement of the thermal envelope and of the insulation of homes (double or triple glass) and replacement of equipment; b) changes in heating uses could have better results. Most of the use of heaters occurs in cold or temperate places and the equipment is mainly balanced draft with maximum efficiencies of 55%.

Other relevant actions for the NDC regarding energy efficiency can be achieved with the incorporation of appliances. The unconditional measures correspond to the labeling of refrigerators, washing machines and air conditioning equipment and the inclusion of equipment with reductions of stand-by consumption. Additional measures include incentives for the replacement of these electrical appliances plus the TV and temperature set point for air conditioning. The goal by 2030 is that 70% of the equipment reach A3 + and A5 + efficiency<sup>8</sup>.

Other mitigation actions evaluated include the installation of solar water heaters, water economizers and heat pumps in urban and rural residential homes.

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***The probability of meeting the energy efficiency goals is significantly high as many of the actions are already underway and are incorporated by consumers with relative ease. However, according to the opinion of the public and private stakeholders, it is possible to assume that efforts in this field are underestimated and there is an important opportunity to achieve better results.***

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#### **D.2. Energy Savings in Industry**

The National Action Plan for Industry and Climate Change includes measures that are directly related to the energy sector and, in particular, the design of energy efficiency policies in the sector. The coordination of the sectoral plans was ordered by the National Climate Change Cabinet to the ministerial jurisdictions with authority over the sector, therefore, measures with

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<sup>8</sup> The letter A is the highest efficiency rating and indicates that the appliance consumes less than 55% of a standard appliance. Thus, over time, more efficient categories such as A +, A ++, etc. are added.

energy components are included in different National Sectoral and Climate Change Action Plans.

In the industry sector, energy mitigation measures are classified into three categories: a) energy efficiency; b) circular economy and c) renewable energy in industry.

The **energy efficiency** measures are the most important in the action plan, particularly the replacement of old engines for ones with greater efficiency, that would avoid 2.49 MtCO<sub>2</sub> of emissions (unconditional) and additional saving of 1.74 MtCO<sub>2</sub> conditionally to finance, technology and capacity building.

Other measures of energy efficiency of less impact include the replacement of refrigeration and lighting systems and achieving more efficient construction systems for industrial facilities.

The **circular economy** impacts moderately on energy savings and the use of renewable energy, both for thermal uses and for electricity production, but the impact is low in terms of total emissions avoided in the industrial sector.

The unconditional measures included in the National Industry and Climate Change Action Plan, related to **energy consumption**, account for a low emission reduction, estimated at 6.91 MtCO<sub>2</sub> in 2030 and is equivalent to 6% of the emissions avoided by the energy sector.

However, energy efficiency experts from the European Union project have detected that significant energy savings can be achieved in the industrial sector with low and even zero investment, in particular cases.

The aggressive use of management systems (ISO) is a low investment measure that presents great mitigation potential, specifically in Small and Medium Industries. Therefore, with few resources dedicated to management systems, energy savings could be achieved in this sector. For instance, in the country there are no international certifiers of the ISO 50001 standard.

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*Training of human resources specialized in energy savings in the industrial sector would be a high impact measure, consequently reducing emissions.*

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#### **D.3. Clean Energy in New Infrastructure**

As in the previous category of demand side measures, the National Infrastructure and Territory, and Climate Change Action Plan includes energy efficiency measures that were considered in the analysis of energy mitigation measures.

The unconditional commitment associated with these actions amounts to 8.5 MtCO<sub>2</sub><sup>9</sup>, all associated with the Better sustainable household programme, which consists of improving housing from low socio-economic segments with qualitative deficit in order to reduce its energy requirement and associated emissions. The current administration widened the scope of the original Program, and organized it within the framework of the Argentina's Bicentennial Credit Program for Individual Housing (ProCreAr), that includes a new line of credits specifically oriented towards the thermal conditioning of existing homes.

Another mitigation measure included in the aforementioned Plan, is the commitment to connect 83,000 homes to the natural gas network by 2030 to replace carbon-intensive fuels and improve air quality and housing comfort.

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*These opportunities confirm the existence of significant prospects in terms of energy efficiency that would allow to substantially increase energy savings and increase the potential CO<sub>2</sub>e emissions avoided.*

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#### **Stakeholder consultations: mitigation actions and their feasibility**

During the bi-lateral and multi-lateral stakeholder dialogues, the actors' views and perceptions were collected regarding the feasibility of measures and the most prevalent barriers identified by sectoral specialists, both from the private and public sectors.

The following paragraphs summarize the most relevant conclusions obtained during and after these dialogues regarding the feasibility of measures and other stakeholder insights on the energy-related actions, while the information on barriers is presented in the document report "Barrier Analysis to Implementation of NDC mitigation actions - I AR 1".

#### **Likelihood of completion of actions presented in energy-related Plans and their objectives**

According to the methodology presented in the report "Multi-stakeholder dialogues –III AR 2", during bilateral and multi-lateral stakeholder dialogues, participants were asked to answer whether they considered that certain actions –selected according to their sub-sector or expertise– were likely to be completed as planned according to the official documentation.

Regarding the supply-side, as it was mentioned previously, stakeholders have considered that two of the most relevant mitigation actions contained in the assessed Plans, accounting for **23% of the proposed emission reductions** (29.36 MtCO<sub>2</sub>e out of 126.22 MtCO<sub>2</sub>e) **had low**

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<sup>9</sup> Avoided emissions could only be quantified partially according to a general approach utilized.

**completion likelihood**, being nuclear power generation with the lowest probability of achievement (90% of opinions selecting the option of “not likely at all”). Moreover, achieving a share of 30% of renewable energy (excluding large hydro) in the power generation mix by 2030 has been considered “not likely at all” by 77% of respondents.

Large-scale hydro power generation was considered more likely to be completed due to ongoing projects and secured funding, and increasing the blend of biofuels in liquid fossil fuels (9.2 MtCO<sub>2</sub>e) appears as the most likely action due to the maturity of the market and the potential opportunities regarding captive fleets and regional availability.

Regarding the demand-side, actions have received higher likelihood assessments, with relatively fewer negative perceptions. Household lighting, for instance, has been mostly described as the most likely or highly likely to happen (only 4% rating it as “not likely at all”) due to past actions and current market drivers.

The adoption of aggregated household energy efficiency actions is considered likely to/high likely to be completed by almost 90% of respondents, with barely 11% of users considering it “not likely at all”. The full adoption of efficient public lighting, through a combination of high-pressure Sodium lamps and led lamps showed 84% of positive assessments in terms of completion.

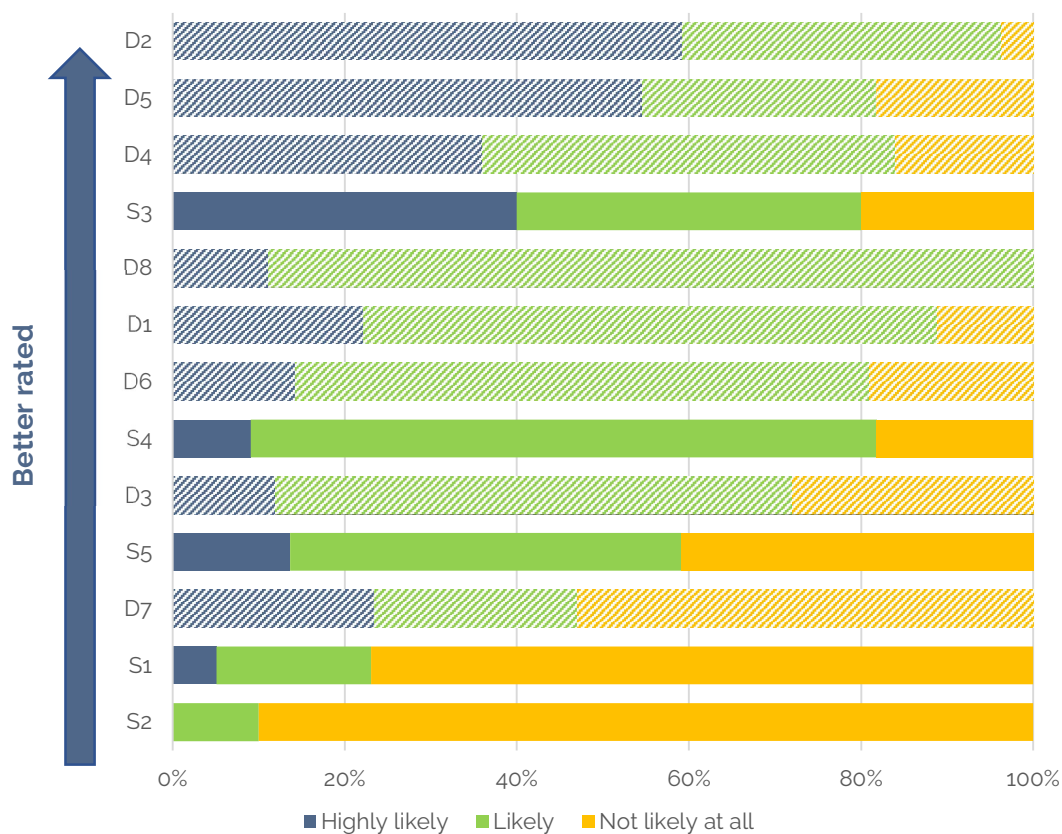
Conclusions for the most relevant actions are presented in the next table and figure.

Table 8: Relevant energy-related actions rated by potential of Implementation

	Action/ package	Stated reductions MtCO <sub>2</sub> e	Not likely at all (A)	Likely (B)	Highly likely (C)	Total	C+B/2
	<b>Supply-side</b>						
<b>S1</b>	Large-scale penetration of renewable power generation in the national grid	22.16	77%	18%	5%	100%	14%
<b>S2</b>	Nuclear power generation	13.79	90%	10%	0%	100%	5%
<b>S3</b>	Increasing the blend of biofuels in liquid fossil fuels	9.2	20%	40%	40%	100%	60%
<b>S4</b>	Large scale hydro power generation	7.2	18%	73%	9%	100%	45%
<b>S5</b>	Solar PV and wind power in industry	0.12	41%	45%	14%	100%	36%
	<b>Demand-side</b>						
<b>D1</b>	Demand-side energy efficiency – general – households and public [package]	47.79	11%	67%	22%	100%	56%
<b>D2</b>	Household lighting	20.37	4%	37%	59%	100%	78%
<b>D3</b>	Enhancing households with qualitative deficits - better sustainable households programme	7.38	28%	60%	12%	100%	42%
<b>D4</b>	Public lighting	4.62	16%	48%	36%	100%	60%
<b>D5</b>	Efficient electric motors	4.23	18%	27%	55%	100%	68%
<b>D6</b>	Circular economy and resource efficiency actions	2.58	19%	67%	14%	100%	48%
<b>D7</b>	Minimum quality standards for social-interest households	N/A	53%	24%	24%	100%	35%
<b>D8</b>	Access to natural gas in households	N/A	0%	89%	11%	100%	56%

N/A: mitigation potential not assessed in government documentation

Figure 9: Relevant energy-related actions rated by potential of Implementation



Note: Pattern fill refer to supply side measures and solid fill refer to demand side measures

Source: Own elaboration

## 2. Transport

### Introduction

This analysis aims to summarize the proposed actions contained in national transport and climate change sectoral plan in terms of:

- ▷ Whether actions act mainly on freight or passenger transport and fuels consumption;
- ▷ Type of efforts required for implementing the actions, such as the investment in public infrastructure or in private assets, promoting the mainstream adoption of

certain vehicles/modes of transport, or conversely consumer best practices, or mixed approaches, denominated here as hybrid;

- The source of funding stated in official documentation for each of the proposed actions, when available (i.e. if it is funded by public or private investment, or by multilateral, development or EXIM banks, and whether these funds are secured, unsecured or not disclosed); and
- The degree of implementation of each action, determining if are in a planning stage, have secured financial funding, or under execution or completely executed (or cancelled/postponed).

The results summarized in this document will not only be relevant to describe the current status and contents of national sectoral plans, but will as well serve as a basis for proposals enabling the decarbonisation of the country's economy, identifying funding requirements and implementation gaps, as well as identifying strategic investment opportunities in the transport sector, and ultimately produce inputs for the consolidation of a green and sustainable investment portfolio in a prioritized sector, while also assisting to devise demand side policy approaches to reduce emissions.

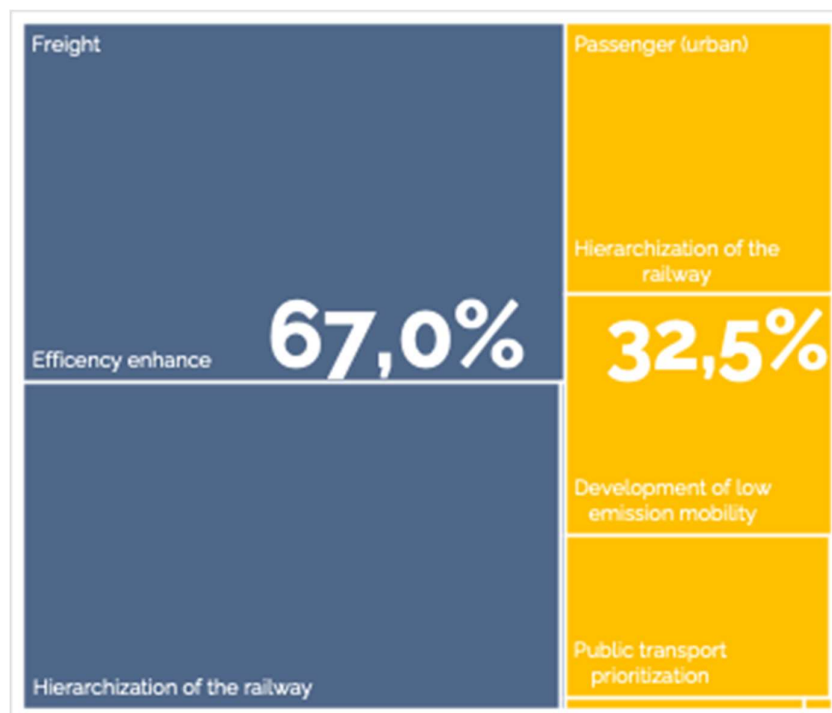
For this purpose, mitigation actions, contained in the National Transport and Climate Change sectoral plan (2017), were analyzed. These actions contained in national sectoral plan were at a later stage complemented with the discussion of additional options, introduced during stakeholder dialogue sessions.

According to the National Transport and Climate Change sectoral plan "By 2030, Argentina will have implemented policies, measures and actions in transportation to provide better conditions for people's mobility and goods, reduce time and prioritize safety, comfort and sustainability, in order to substantially reduce greenhouse gas emissions and promote adaptation mechanisms to climate change that reduce the vulnerability of the sector facing the impacts of this events".

The Plan aims to achieve, through 17 particular actions, a reduction by 2030 of 5.9 MtCO<sub>2e</sub>, concentrated mainly in the freight transport sector (59.6%), followed by transport urban passenger transport (39.6%), with a lower participation in interurban transport passengers (0.8%).

From a first analysis of the distribution of the estimated mitigation potential by the Ministry of Transport, it appears that more than 90% of the potential is comprised by of 6 measures, as can be seen in the following figure.

Figure 10: Mitigation measures in the Transport Sector



Source: Own elaboration

### Freight or passenger transport actions

Out of the 17 analysed actions, 10 actions are focused on passenger transport, while the remaining 7 actions are related to freight transport. However, due to the larger scale of the latter, slightly 67% of the proposed emission reductions are associated to freight transport, while 33% correspond to passenger transport.

Table 9: Emission reductions proposed freight and passenger transport actions

	# of mitigation actions	Mitigation potential (Emission reductions)	
		MtCO <sub>2</sub> e	%
Freight	7	3.96	67%
Passenger	10	1.95	33%
<b>Total</b>	<b>17</b>	<b>5.91</b>	<b>100%</b>

Source: Own elaboration



The most relevant freight transport action, "Hierarchization of the railway (freight) — Rail Freight Investment Plan", states truck-to-rail cargo switch (1.87 MtCO<sub>2</sub>e) and represents nearly half (47%) of the mitigation potential presented in the national plan for freight transport, and almost one third (32%) of the emission reductions estimated for the whole national plan.

The truck driver training measure (1.04 MtCO<sub>2</sub>e) accounts for 26% of the freight transport mitigation potential according to the plan, and 18% of the potential estimated for the whole plan. The following actions, in terms of mitigation potential, are smart transport programme (0.693 MtCO<sub>2</sub>e), the renewal of truck fleets with scrapping (0.336 MtCO<sub>2</sub>e) and the construction of *Paseo del Bajo* (0.015 MtCO<sub>2</sub>e). The National Road Plan to 2025, a relevant set of actions involves considerable expenditures in infrastructure but has not disclosed yet the mitigation potential by the government, and the implementation of trucks' speed-limiting devices is presented without an estimation of its emission reductions potential.

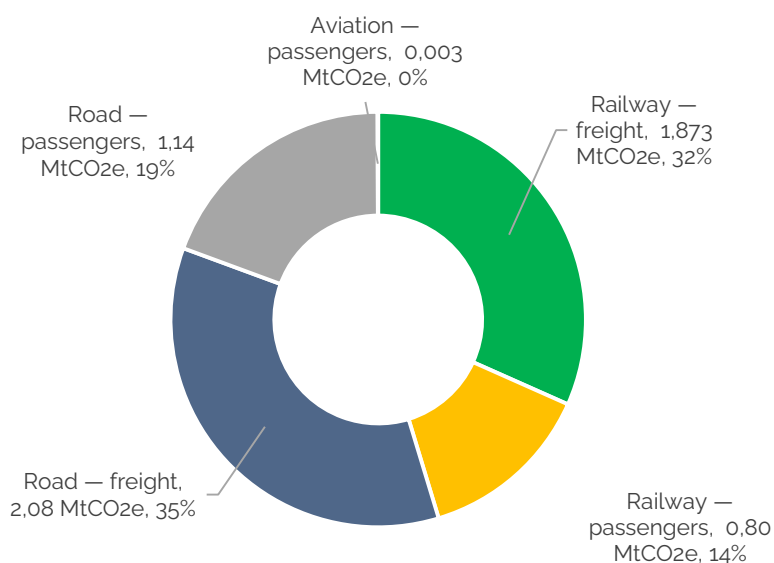
Regarding passenger transport actions, the most important ones are:

- Development of Regional Express Railways (RER) (0.733 MtCO<sub>2</sub>e) constitutes the most important action, accounting for 38% of the potential stated for passenger transport, and for 12% of the whole plan,
- promotion of low emission light vehicles (0.465 MtCO<sub>2</sub>e), mostly focused on light electric vehicles, and representing 24% of the passenger transport emission reductions and 8% of the plan's emission reductions, and
- implementation of metrobuses (0.457 MtCO<sub>2</sub>e), accounting for 23% of passengers' and 8% of the complete plan.

These are followed by lower-impact actions when it comes to emission reductions, such as the promotion of alternative energy buses (mostly focused also on EVs, 0.154 MtCO<sub>2</sub>e), the renewal of bus fleets, from Euro III to Euro V standard (0.065 MtCO<sub>2</sub>e), the construction of non-level crossings for rails (0.041 MtCO<sub>2</sub>e), the re-establishment of inter-urban passenger rail services (0.030 MtCO<sub>2</sub>e), the modernization of commercial aviation (0.003 MtCO<sub>2</sub>e) and the development of bicycle paths (0.003 MtCO<sub>2</sub>e).

It is also worth noting that 45.3% of the actions included in the plan are related to an increased use of rail transport, both for freight and passengers, while 54.6% correspond to road transport and 0.1% are related to the modernization of inter-urban commercial aviation.

Figure 11: Mitigation actions per type and mode of transport

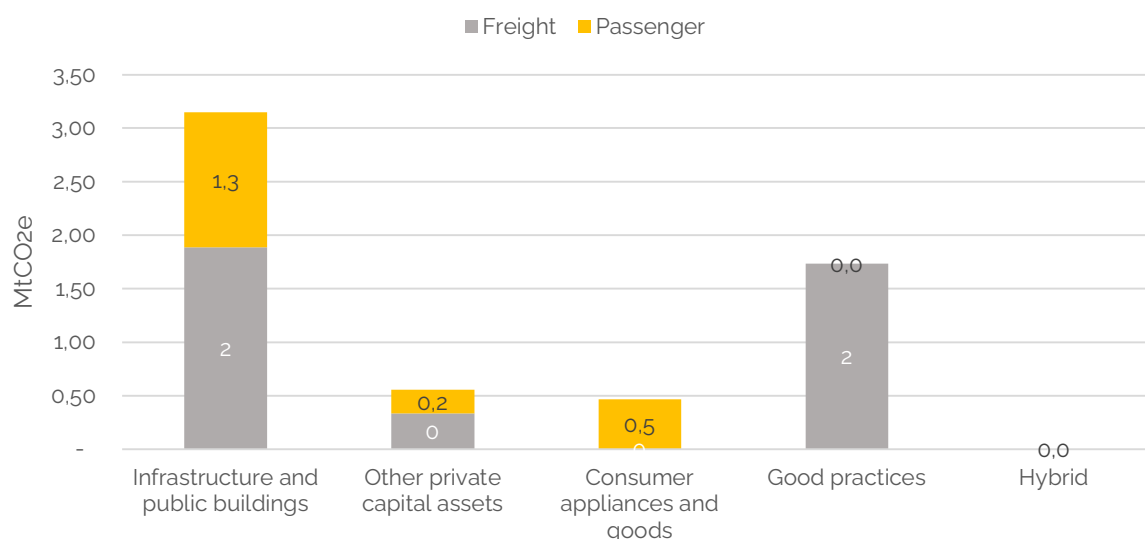


Source: Own elaboration

### Types of efforts required by the proposed actions

Regarding the types of efforts required for the implementation of the action plan, the most relevant requirements are focused on investment in infrastructure (53% over the total mitigation potential), and the implementation of good practices (29%), followed by the acquisition of assets by the private sector (9%) and particular vehicles (8%).

Figure 12: Total emission reductions by type of effort involved in actions proposed in sectoral plans



Source: Own elaboration

More than two thirds of the potential related to the investment in infrastructure (60%) is mostly focused on freight transport and represents 48% of the potential of the actions related to moving goods. Similarly, actions associated to the implementation of good practices are almost completely focused on freight (smart transport and drivers training) and represent 44% of the subsector's potential.

The acquisition of assets by the transport sector is comprised by the renewal of truck fleets with scrapping (0.336 MtCO<sub>2</sub>e), the adoption of alternative energy buses (0.154 MtCO<sub>2</sub>e), the renewal of bus fleets, from Euro III to Euro V standard (0.065 MtCO<sub>2</sub>e), and the implementation of speed limiting devices, with undisclosed reductions.

Regarding consumer vehicles, these actions are related to the adoption of light electric vehicles (0.465 MtCO<sub>2</sub>e), while the action categorized as "hybrid" is the development of development of bicycle paths (0.003 MtCO<sub>2</sub>e), requiring both the investment in infrastructure and promoting the mainstream adoption of bicycles.

**Table 10: Total emission reductions proposed in sectoral plans by type of effort involved in actions**

	Infrastructure and public buildings	Other private assets	Consumer appliances and goods	Good practices	Hybrid	Total
<b># of mitigation actions</b>						
<b>Freight</b>	3	2	0	2	0	7
<b>Passenger</b>	4	2	1	2	1	10
<b>Total</b>	7	4	1	4	1	17
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>						
<b>Freight</b>	1.89	0.34	-	1.73	-	3.96
<b>Passenger</b>	1.26	0.22	0.47	0.00	0.00	1.95
<b>Total</b>	<b>3.15</b>	<b>0.56</b>	<b>0.47</b>	<b>1.74</b>	<b>0.00</b>	<b>5.91</b>
<b>Freight</b>	48%	8%	0%	44%	0%	100%
<b>Passenger</b>	65%	11%	24%	0%	0%	100%
<b>Total</b>	<b>53%</b>	<b>9%</b>	<b>8%</b>	<b>29%</b>	<b>0%</b>	<b>100%</b>

Source: Own elaboration

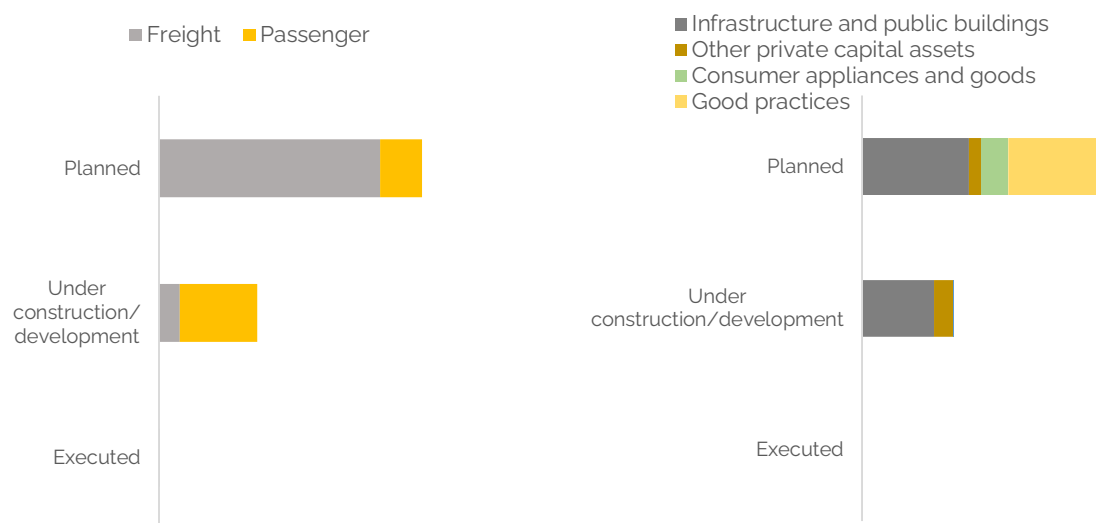
### Degree of implementation

In terms of degree of implementation of the stated policies and actions, the status has been classified into "Planned", "Finance obtained", "Under construction/ development", "Executed", "delayed/postponed" or "cancelled".

For the purpose of this analysis, the status "under construction or development" does not necessarily imply that the complete ambition of the action will be achieved before 2030<sup>10</sup>.

<sup>10</sup> To some extent some of the actions might be described as not likely to be completely executed by the horizon of planning (2030)

**Figure 13: Total emission reductions proposed in sectoral plans by status of implementation**



Source: Own elaboration

The following tables show the status of implementation of the different actions for freight and passengers transport and the degree of implementation related to the types of efforts required by each action.

**Table 11: Total emission reductions proposed in sectoral plans by status of implementation**

	Planned	Under construction/development	Executed	Total
<b># of mitigation actions</b>				
Freight	4	2	1	7
Passenger	3	7	0	10
<b>Total</b>	<b>7</b>	<b>9</b>	<b>1</b>	<b>17</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>				
Freight	3.61	0.34	0.02	3.96
Passenger	0.68	1.27	-	1.95
<b>Total</b>	<b>4.29</b>	<b>1.60</b>	<b>0.02</b>	<b>5.91</b>
Freight	91.1%	8.5%	0.4%	100%
Passenger	35.1%	64.9%	0.0%	100%
<b>Total</b>	<b>72.6%</b>	<b>27.1%</b>	<b>0.3%</b>	<b>100%</b>

Source: Own elaboration

As shown in the previous table, 73% of the potential stated for actions shown in the national plan are considered to be still in the planning stage or at very early implementation steps, corresponding mostly to freight transport actions (84%).

For freight transport, the most relevant actions are the Rail Freight Investment Plan (1.873 MtCO<sub>2</sub>e), the drivers training (1.040 MtCO<sub>2</sub>e) and the smart transport programme (0.693 MtCO<sub>2</sub>e). Regarding passenger transport, the most relevant action is the promotion of light electric vehicles (0.465 MtCO<sub>2</sub>e), still facing drawbacks mostly related to the cost of acquisition, followed by the adoption of alternative energy buses (0.154 MtCO<sub>2</sub>e), which face a similar challenge, and by the renewal of internal combustion buses, from Euro III to Euro V (0.065 MtCO<sub>2</sub>e) which faces the lack of Euro V compliant fuels domestically and the delays of mandatory new standards in local refineries.

Additionally, 27% of the stated potential in actions could be considered as currently being under construction or development with different degrees of progress, and correspond 79% to passenger transport actions' potential and 21% to freight transport.

Regarding passenger transport, the most relevant actions are the development of regional express railways —RER (0.73 MtCO<sub>2</sub>e), followed by the implementation of metrobuses (0.46MtCO<sub>2</sub>e), and while the former shows a modest degree of advance, the latter has already shown notable results (although not big impacts on emissions), but mostly focused on the city of Buenos Aires. Regarding freight, the only action considered as in incipient execution is the renewal of truck fleets with scrapping (0.336 MtCO<sub>2</sub>e).

By now, only the construction of *Paseo del Bajo* has already been executed (2019), accounting for reductions of 0.015 MtCO<sub>2</sub>e by 2030.

Most of the potential associated to actions related to the mainstream adoption of light vehicles (100%) and the adoption of good practices (99.8%) are still in early stages of development or planning, as well as the construction of new infrastructure (59%). However, both the acquisition of assets by the private sector (60.5%) and the hybrid actions (100%) have already entered into a more advanced execution phase, together with 40% of the actions associated with the construction of infrastructure.

**Table 12: Total emission reductions proposed in sectoral plans by status of implementation and type of effort involved**

	Planned	Under construction/ development	Executed	Total
<b># of mitigation actions</b>				
Infrastructure and public buildings	1	5	1	7
Private capital assets	3	1	-	4
Consumer appliances and goods	1	-	-	1
Good practices	2	2	-	4
Hybrid	-	1	-	1
<b>Total</b>	<b>7</b>	<b>9</b>	<b>1</b>	<b>17</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>				
Infrastructure and public buildings	1.87	1.26	0.02	3.15
Private capital assets	0.22	0.34	-	0.56
Consumer appliances and goods	0.47	-	-	0.47
Good practices	1.73	0.00	-	1.74
Hybrid	-	0.00	-	0.00
<b>Total</b>	<b>4.29</b>	<b>1.60</b>	<b>0.02</b>	<b>5.91</b>
Infrastructure and public buildings	59.5%	40.0%	0.5%	100%
Private assets	39.5%	60.5%	0.0%	100%
Consumer appliances and goods	100.0%	0.0%	0.0%	100%
Good practices	99.8%	0.2%	0.0%	100%
Hybrid	0.0%	100.0%	0.0%	100%
<b>Total</b>	<b>72.6%</b>	<b>27.1%</b>	<b>0.3%</b>	<b>100%</b>

Source: Own elaboration

### Sources of funding

Although issues related to funding requirements and sources will be addressed in future analysis, a short introduction to the common funding sources for the mitigation actions contained in official documentation is presented here, based both on disclosed funding sources, as well as on current trends and practices for those cases in which these have not been disclosed<sup>11</sup>.

<sup>11</sup> For the purpose of this document, the analysis is focused exclusively on capital expenditures, while OPEX will be addressed in the future.

According to the national sectoral plans and current practices, almost 83% of the total emission reductions could be subject to public funding, 92% of the potential reductions associated to freight transport, and 65% of the reductions associated to passenger transport, since a relevant share (more than half) of the national plan comprises the construction of infrastructure or state-run capacity building.

Private investment, expected to contribute to materializing 17% of the reductions proposed by the national plan, is mostly associated to the acquisition of consumer electric vehicles (46%), as well as capital goods for the passenger transport (21%) resulting for the acquisition of electric buses and the renewal of existing diesel fleets with Euro V compliant models, and the renewal of truck fleets with scrapping (33%).

**Table 13: Total emission reductions proposed in sectoral plans by type of funding required<sup>12</sup>**

	Private	Public	Multilateral/ development/ EMIN banks	Total
<b># of mitigation actions</b>				
<b>Freight</b>	2	5	3	7
<b>Passenger</b>	4	6	2	10
<b>Total</b>	<b>6</b>	<b>11</b>	<b>5</b>	<b>17</b>
<b>Mitigation potential (MtCO<sub>2</sub>e)</b>				
<b>Freight</b>	0.34	3.62	1.89	3.96
<b>Passenger</b>	0.68	1.27	0.77	1.95
<b>Total</b>	<b>1.02</b>	<b>4.89</b>	<b>2.66</b>	<b>5.91</b>
<b>Freight</b>	8%	92%	48%	100%
<b>Passenger</b>	35%	65%	40%	100%
<b>Total</b>	<b>17%</b>	<b>83%</b>	<b>45%</b>	<b>100%</b>

<sup>12</sup> Please note that since certain actions require multiple sources of funding, the sum of the rows does not necessarily equal to the total value, and that in this section only the mitigation potential associated to each source of funding is presented, and not the amount of required funds.



### Detailed analysis of mitigation actions

**Table 14: Mitigation measures**

Mitigation Measures	MTCO <sub>2</sub> eq	%
<b>Supply Side</b>		
Distributed generation;	0.88	0.80%
Biofuels;	9.15	8.33%
Hydroelectric Generation;	7.20	6.55%
Nuclear Generation;	13.79	12.55%
Substitution of fossils for natural gas	5.52	5.03%
Improvement in the efficiency of thermal power plants	3.32	3.02%
Electricity generation from non-conventional renewable sources (NRCE) on the grid	22.16	20.17%
Isolated generation (PERMER);	0.03	0.03%
<b>Total, Supply Side</b>	<b>62.05</b>	<b>56.49%</b>
<b>Demand Side</b>		
Water economizers;	3.10	2.82%
Solar heaters;	1.03	0.94%
Street lighting (LED);	4.62	4.21%
Efficiency in electrical appliances;	11.92	10.85%

Source: Own elaboration

The mitigation actions assumed by Argentina in its National Transport and Climate Change Action Plan on which the commitments to reduce CO<sub>2</sub> emissions until 2030 are based are summarized in the following table, classified in three areas of intervention:

- Urban Passenger Transport.
- Interurban Passenger Transport.
- Freight Transport

Global GHG emissions in Argentina were estimated at 368 MtCO<sub>2</sub>e in 2014, with the Transport sector contributing with 14,7%. Estimates for 2030, in a "business as usual" (BAU) scenario, reach 592 MtCO<sub>2</sub>e, with the Transport sector reducing its participation to 13,1%. Proposed NDC considers global emissions would be reduced in 2030 to 483 MtCO<sub>2</sub>e, but the participation of the Transport sector would increase to 14,9%. While NDC scenario would represent a 18,4% reduction in the country's global emissions, the reduction in transport related emissions would only reach 7,6% (in both cases NDC vs BAU).

The following table presents the proposed actions sorted according to their respective contributions to reducing GHG emissions in 2030:

**Table 15: Proposed actions in the transport sector**

ACTION	SUBSECTOR	Reduction GHG 2030 (MtCO <sub>2</sub> eq)
<b>Railway hierarchy</b>	Freight	1,873
<b>Drivers training</b>	Freight	1,040
<b>RER Development - Regional Express Network</b>	Urban passengers	0,733
<b>Smart Transportation Program</b>	Freight	0,693
<b>Promotion of light and low-emission vehicles</b>	Urban passengers	0,465
<b>Implementation of Metrobuses</b>	Urban passengers	0,457
<b>Truck fleet renewal (scrapping)</b>	Freight	0,336
<b>Alternative energy buses</b>	Urban passengers	0,154
<b>Urban bus fleet renewal</b>	Urban passengers	0,065
<b>Construction of over/underpasses (non-level crossings)</b>	Urban passengers	0,041
<b>Re-establishment of interurban rail services</b>	Interurban passengers	0,030
<b>Paseo del Bajo (new highway link in central Buenos Aires)</b>	Freight	0,015
<b>Air navigation improvements</b>	Interurban passengers	0,003
<b>Bicycle path development</b>	Urban passengers	0,003
<b>Vehicle energy efficiency labeling</b>	Urban passengers	Not rated
<b>National Road Plan to 2025</b>	Freight	Not rated
<b>Maximum speed limitation on trucks</b>	Freight	Not rated
	<b>TOTAL</b>	<b>5,909</b>

Source: Own elaboration

The objectives seem very unambitious, considering that the transport sector represents almost 30% of final energy consumption, and the expected energy related reductions barely represent 5% of the estimated reductions for the energy sector, and in the National Energy and Climate Change Action Plan there are very few measures linked to the transport sector.

The government is working on reformulation revised version of the National Transport and Climate Change Action Plan, which is expected to be completed by September 2021.

#### **U. Urban Passenger Transport**

Proposed measures are classified in the following manner:

#### **U.1. Development of a regional express network (RER, in Spanish)**

The Railway Plan for the Metropolitan Area of Buenos Aires (AMBA, in Spanish) is divided into three large sub-measures: 1) high-speed network (RER) development program, which will promote passenger modal shift; 2) electrification of the RER branches; and 3) the development of over/underpasses, which will improve the speed of train and automotive circulation.

The RER development program foresees the extension of the route of the following trainlines: Roca, Sarmiento, Belgrano Sur, Belgrano Norte, San Martín and Mitre. The system will link the railways from different areas of AMBA (north, west and south) generating a large regional connectivity node.

The project involves an estimated investment of 14,000 million dollars until 2023 and was included in the national budgets as of 2016. Although some components of the project have been developed (or are under development)<sup>13</sup> there is some uncertainty of significant fulfillment in the short term.

In order to construct and enter into operation this project, some conditions need to be met: a secure supply of electricity, from clean and renewable sources; the elimination of 120 level crossings out of a total of 828; improving the vehicular traffic flow and allowing the train formations to develop speeds compatible with the quality of service required. In addition, more transfer centers are needed: apart from the renovation of stations, it is essential to consider the generation of a greater offer of comfortable and safe transfer areas for passengers. Finally, it is vital to ensure the complementation of the public passenger car transport network with that of the railroad: this issue affects both the lines of national jurisdiction and the provincial and municipal lines.

#### **U.2. Low emission mobility development**

This action consists of extending the "energy efficiency label" system. In a first stage, the measure is aimed at labeling light vehicles, with the possibility of being extended to trucks and heavy equipment. The goal is to establish a comparative labeling, which comes from an approved and standardized measurement, which allows the consumer to know the parameters of fuel consumption and its impacts on the environment.

The progressive inclusion of electric vehicles is also sought with the aim of reducing emissions. The measure consists of incorporating Ultra Low Emission Vehicles (ULEV) with emission level of up to 50% lower compared to the average of new vehicles built in the same year. Given that

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<sup>13</sup> Elevation of the Tigre branch (Mitre Railroad) between Dorrego and Núñez and of the San Martín Railroad between Palermo and La Paternal, and connection of the South Belgrano Railroad between Buenos Aires Station and Constitución

in Argentina there is still no standardized classification, in general reference is made to low emission, "clean" technologies or to vehicles with ultra-low emission levels, replicating standards adopted by other countries.

The main components of the projected action are the incorporation of clean technologies in light utility vehicles, government fleets, car-sharing systems and private cars: it aims to significantly increase the proportion of electric vehicles among annual sales in the coming years. Although the range varies according to different scenarios, the objective contemplates that about 1.5% per year of the AMBA's vehicles based on low-emission technologies will be incorporated until 2030.

The Incorporation of clean technologies (electric vehicles) in the taxi fleet is twofold. On the one hand, it has a direct impact by reducing emissions and on the other hand, there is an indirect effect, by disseminating the use electric vehicles. The City of Buenos Aires has actions aimed at the incorporation of electric taxis with the objective of reaching 35% of the City's taxis to be based on clean technologies by 2035.

Decree 331/2017 established a significant tariff reduction for the import of 6,000 electric vehicles. The tariff is eradicated for companies that import unarmed vehicles and that have terminals in the country.

Another action that aims to increase the efficiency of urban passenger transport and therefore reduce GHG emissions, is the promotion of buses with alternative energies, electric or hybrid motorization. Providing that there is a fleet of 9,982 buses under national jurisdiction in the AMBA, the proposed action set a target of at least 30% of the total fleet to be electric units in 2030. Negotiations for the establishment of electric bus manufacturing companies are currently advanced. The first stage to implement this action consists of incorporating buses within a pilot test. Some initiatives under study include transferring the subsidy for diesel fuels to the new electric buses and to eliminate tariffs as there is no local production of electric buses.

The government is trying to promote electric mobility, but this process has been long and slow. A virtual electrification of the entire fleet would be achieved in no less than 20-30 years, as the electrical system for higher demand levels needs to be deployed.

In Argentina there is a very incipient demand for electric vehicles, currently there are only about 120 patented electric vehicles. In the long term, the objective is to shift to electric vehicles production. Substituting combustion cars to electric vehicles is an entire paradigm shift, involving Transport and Energy. Therefore, total disruption in the automotive and energy value chain.

#### **I. Interurban Passenger Transport**

The interurban passenger transport is composed by:

##### **I.1. Commercial aviation modernization**

The country seeks to double the number of people traveling by plane and boost air transport by the end of 2019. The mitigation actions planned to achieve this spike in efficiency include the incorporation of aircraft with higher efficiency standards, improvements in fuel consumption efficiency, improvements in air traffic and modernization of the airport infrastructure.

##### **I.2. Railway rehabilitation**

This action requires railway investments in both infrastructure and rolling stock and management systems to improve and increase interurban passenger transport by rail, in the areas with highest passenger flows: Buenos Aires-Mar del Plata and Buenos Aires-Rosario. In order to achieve it, it will be necessary to re-functionalize the existing railway line and offer a service with standards comparable or superior to those of the automobile or bus.

#### **F. Freight Transport**

Main actions are:

##### **F.1. Rail Freight Investment Plan (PIF) - Derivation of cargo from truck to rail**

This action seeks to shift the load transport from trucks to railway, as a consequence of the rehabilitation, modernization and incorporation of railway lines, wagons and locomotives, particularly for the movement of solid bulks and general cargo in containers, reinforcing the connections with ports and facilitating the cargo transfer.

The incidence of the railway mode in the modal matrix should triple compared to the current situation, reaching an incidence close to 12% ton/km in local loads in 2030. There is great uncertainty in the short term since the current concessions are very close to conclusion. The operation of the freight rail system is governed by Law 27,132 of 2015 (not yet regulated) and establishes state responsibility for the administration of the railway infrastructure and the free provision of transport services within the framework of "open access". The required investments are estimated at near 15,000 million dollars until 2035, although part of the budget is already under execution with public funds.

It should be noted that in 2018 and 2019 there were significant investments in the network of the former Belgrano Railway that links the province of Salta with the ports of the Gran Rosario area, in which there has been a significant increase in cargo traffic.

The state-owned company Trenes Argentinos Cargas currently operates all the narrow- and medium-gauge networks and a fraction of the wide gauge networks (formerly the San Martín Railway), while the rest of the system's operation is administered by three private enterprises (Nuevo Central Argentino, Ferrosur Roca and Ferropreso Pampeano). The concessionaires covered approximately 50% of the network and the rolling stock in operation in 2017, but their participation was 70% in terms of traffic (measured in ton/km).

The three concessions expire in the short term (between October 2021 and March 2023) and various alternatives are being evaluated: end due to term expiration or extensions with readjustment of the object to adapt the contracts to the spirit of Law 27,132.

#### ***F.2. Improved efficiency in road freight transport***

It is part of the Intelligent Transportation Program that seeks to promote energy efficiency in relation to the automotive cargo and passengers transport operations. The lack of knowledge about the program, the high initial investment and competition between companies reveal challenges towards its execution, depending on public financing.

#### ***F.3. Driver training and Smart Driving Program***

It refers to the implementation of driver training plans, in accordance with the intelligent transportation program, which recognizes incentives for automotive transportation companies to voluntarily implement actions aimed at obtaining improvements in truck occupancy rates, aerodynamic improvements, use of more efficient covers, improvements in logistics operations, etc., all of them leading to lower fuel consumption (and therefore lower emissions) per unit of transport.

The automotive freight transport sector is composed by numerous providers of very different scales, for many of which the investment could be difficult to address. If a company transferred the cost of its "efficient actions" to the cost of the transport services it provides, it would run the risk of losing competitiveness.

The National Transport and Climate Change Action Plan contemplates for this measure that emissions will begin to be reduced in 2017, accumulating by the end of 2020 2.1% of the total reductions planned for the period 2017-2030 and by the end of 2025, 29.3% of that total.

Rational driving, also called efficient driving, consists of a series of techniques, such as those mentioned below:

Know all the characteristics of the vehicle, accelerate and brake smoothly, and maintain uniform speed, make gear changes when the engine revolutions are in the maximum torque or torque zone, take advantage of the vehicle's inertia, turn off the engine in stops longer than two minutes. The content consists of the implementation of a training program with different thematic modules. It is a measure of extremely low investment and very high benefits in terms of efficiency and, consequently, reducing emissions.

Private transport and logistics chambers are working with the "Green Range" Program, which is more ambitious than the Intelligent Transportation Program of the Ministry of Transportation. The pillars of the Green Range program are as follows: a) optimization of infrastructure; b) vehicle technology; c) stock of correct box differentials, reducing fuel consumption by up to 35% (permanent advice is needed from the automotive companies to the transporters on the optimal use of their vehicles), and d) training: they have their own simulators.

#### ***F.4. Fleet renewal with truck scrapping***

According to the Financing Program for the Expansion and Renewal of the Cargo Fleet (Truck Exchange Plan), of the Ministry of Transportation, there are still 20,000 trucks of more than 40 years old in the country, which contributes to a 16-year average age of the cargo fleet, that is extremely high compared to developed countries. The program contemplates the destruction, in a first stage, of models prior to 1982, and the financing required for the renovation of the cargo fleet through subsidies. The main challenge is that there is no funding yet to implement this measure.

#### ***F.5. National Road Plan to 2025***

The National Road Plan to 2025 consists of the development of road works and the use of specific asphalts that improve the flow and physical conditions of traffic, resulting in greater efficiency in mobilization and lower energy consumption. The Plan involves the construction of 2,800 km of new highways, 2,500 km of safe routes, 13,000 km of rehabilitated routes and 2,000 km of new pavements.

The investments required for its implementation are estimated at 37,000 million dollars by 2025. The plan has been in execution since 2016. The allocation of funds is made according to the planned source of financing, which includes the national Treasury and financing of multilateral credit banks.

#### ***F.6. Trucks limited top speed***

This measure already exists for buses in Argentina since 2008 and, although it is essentially aimed at improving safety on the routes, it should be noted that speed is also a decisive factor in fuel consumption. Therefore, the application of speed limiters in trucks is proposed.

#### **F.7. Alternative fuels for trucks**

Chambers of private cargo transport companies are working on, even though this potential mitigation action is not considered in the National Transport and Climate Change Action Plan:

- Biofuels: potential project that could finance trucks operating with biodiesel (conversations held with GCF). They have a program underway to test trucks of different ages that use biodiesel and diesel in Santa Fe province, connected with telemetry, and measuring combustion emissions. They seek to develop a methodology that can be internationally recognized to measure effectively emissions per type of fuel. The National Agricultural Technology Institute (INTA, in Spanish) would certify biofuel emissions. A pilot test will be carried out with 3000 trucks, that admit a cut with up to 20% biodiesel; or 100%.
- CNG and LNG (Compressed Natural Gas and Liquefied Natural Gas): Establish more CNG loading points along the transport routes and small LNG liquefaction plants in freight plants. They are in conversations with ENARGAS<sup>14</sup> to define 4 corridors and CNG fast charging stations (5'). The CNG is not highly associated with trucks because it adds weight (cylinders) and is not convenient in terms of profitability. This situation changes with road train and modular systems, since there is no impact by adding a 3<sup>rd</sup> axle that allows to transport extra weight, and could migrate to CNG.

#### **Stakeholder consultations: mitigation actions and their feasibility**

During the bi-lateral and multi-lateral stakeholder dialogues for the transport sector, the actors' views and perceptions were collected regarding the feasibility of measures and the most prevalent barriers identified by sectoral specialists, both from the private and public sectors.

The following paragraphs summarize the most relevant conclusions obtained during and after these dialogues regarding the feasibility of measures and other stakeholder insights on the transport-related actions, while the information on barriers is presented in the document report "Barrier Analysis to Implementation of NDC mitigation actions - I AR 1".

As governments intend to differentiate their plans versus the previously stated actions, the commitment from the private sector is challenged by the uncertainty of how long policies or

<sup>14</sup> National agency that regulates natural gas sector



initiatives/programmes are *valid*. Moreover, the removal of previously stated policies needs to be compensated with new actions in order to maintain or raise the mitigation ambition. In this context, it is vital to maintain sectoral experts in the ranks of the transport, energy and climate change government areas as well as proper documentation in order to preserve the technical heritage and promote state policies, in contrast to government policies.

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***A key issue for the private sector is the lack of policies continuity stated by alternating governments.***

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The pressure from sectoral lobbies often results in technology-biased programmes and regulations attempting against a systemic transport policy coordinated among the different incumbent sectoral authorities. This collides with the recurring request by sectoral technology-specific stakeholders for focalized promotion laws.

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***Technology-neutral approaches are required in order to achieve sustainable long-term results.***

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The government is currently revising the existing National Transport and Climate Change Action Plan and expects to have an *enhanced* version by the third or fourth quarter of 2021. In this direction, several coordination instances are being organized with the Secretary of Energy, the Secretary of Agriculture and the private sector.

An internal revision to the plan was performed in 2019 but remains unpublished. Certain actions, such as shipping channels and new configurations for trucks (in accordance to Decree 32/2018) were included in that revision and are expected to be incorporated in the next published version.

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***Coordination between the transport and energy sector is key for a successful design of the National Energy and Climate Change Action Plan and the National Transport and Climate Change Action Plan, since many actions and measures require proper arrangements.***

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The new plan is expected to abandon or modify certain actions due to substantial investment requirements and funding strains, as well as due to political constraints.

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***High costs (infrastructure-based actions) and political constraints (modal change actions) reduce feasibility of the stated sectoral plan.***

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The European Union's Energy Efficiency project, including the Useful Energy Balance (BEU), to be completed by Q3 2021, will provide data and inputs highly useful for the design of the updated sectoral plan, including previously omitted "quick wins" or actions that imply low investment with rapid implementation pathways, including, for example, those related to capacity building.

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***The low availability of timely and quality transport statistics –in contrast to energy statistics– should be addressed during the design phase of the new version of the sectoral plan.***

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Government plans could take advantage from existing private sector initiatives –in certain cases featuring components not included in government plans and based on international standards– with common elements promoting dual-certification pathways.

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***There is an opportunity to articulate existing sectoral private initiatives and government plans.***

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Five sectoral chambers represent 80% of the freight transport sector. Nonetheless, an important challenge for the design and implementation of transport actions is related to the small freight business owners (i.e. one to two trucks), with different capabilities and particular needs. These issues particularly affect the renewal of truck fleets with scrapping.

The sectoral plan does not mention biofuels and the use of natural gas as mitigation actions for the transport sector. However, these were included in the Energy Secretariat *Energy Scenarios 2030* (2019 edition) and are being contemplated in the new NDC (2020). Several public and private sector stakeholders –apart from the specific biofuels and natural gas incumbents– have mentioned these as short-term and cost-effective means for mitigation both for freight and passenger transport.

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***Biofuels and the use of natural gas as mitigation actions for the transport sector are considered short-term and cost-effective means for mitigation.***

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The adjustment of the current carbon tax level (currently 5,5 USD/tCO<sub>2</sub>) and sectoral subsidies (currently mostly focused on diesel oil) is vital to catalyze fuel switch decisions. In this context, there is still need for transparent carbon footprint audits and certifications in order to guarantee that emission reductions are achieved.

Massive electrification of domestic transport could take between 20 and 30 years. This timeframe is long enough for the adjustment of the transmission and distribution infrastructure, the power generation mix—which needs to be low-carbon or carbon neutral in order to grasp the full intended mitigation effort—and the vehicle factories with their supply chains.

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***Nonetheless, there is a need for adequate planning and tracing consistent pathways in order to mitigate or avoid the risk of stranding assets during the transition period to full decarbonization.***

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***Despite several regional and domestic emerging initiatives, hydrogen is still not being contemplated in sectoral plans and in stakeholders' outlooks, and most initiatives are currently focused on the production for export purposes.***

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In this context, there is an opportunity to explore long-term penetration scenarios particularly for the transport sector in order to assess its technical and economic potential, as well as how this vector articulates with current and future mitigation actions.

### 3. AFOLU

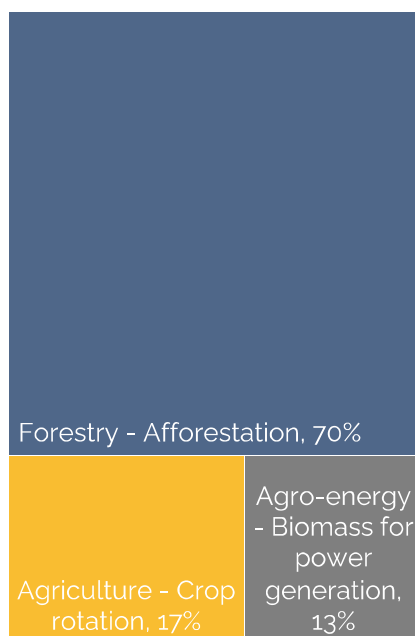
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#### **Introduction**

The results summarized in this document describe the current status and contents of Agriculture and National Climate Change Action Plan and Third National Communication and serve as a basis for identifying enabling conditions for deep decarbonisation of the country's economy, identifying funding requirements and implementation gaps, as well as finding strategic investment opportunities in the AFOLU sector, and ultimately produce inputs for the consolidation of a green and sustainable investment portfolio in a prioritized sector.

Figure 1 summarizes measures in the AFOLU sector identified in the Agricultural and National Climate Change Action Plan and the relative share of each one of them.

**Figure 14: Mitigation measures in the AFOLU sector**



Source: Own elaboration

Additionally, measures in the Third National Communication and new measures identified throughout the assessment are included with preliminary findings in the following sections.

### Agricultural crops

The National Climate Action Plan (2019) mainly covers cereal rotations and their indirect effect on the conservation or recovery of organic carbon in the soil. Secondly, mentions good practices in the use of fertilizers and the use of cover crops.

In the current assessment, the AFOLU sector measures for agricultural crops consider three main effects:

- 1- Reduction of N<sub>2</sub>O emissions from the use of nitrogenous fertilizers
- 2- Reduction or capture of CO<sub>2</sub> emissions in soil carbon stock.
- 3- Reduction of emission intensity per tonne of grain produced

To this end, the mitigation measures assessed for the agricultural crops sector were:

- PGPR technologies (growth promoters and nitrogen free fixers)

- Urea volatilization inhibitors
- Soil carbon content (crop rotation)
- Soil carbon content (biochar)

The estimation of their mitigation potential is still in process and the results presented are preliminary.

Along with the assessment of these measures, dialogues were held with experts in PGPR technologies, fertilization and fertilizer commercialization, and specialists from the private and academic sectors (INTA and Conicet) on the dynamics of C in soil and Biochar. The use of Biochar is entirely new as a mitigation action in Argentina.

#### 1. PGPR technologies (growth promoters and nitrogen free fixers)

This mitigation action impacts on "emissions intensity", as it involves improvements in yields, without increasing the use of nitrogen fertilizers. Currently, their use is not widespread, however, they have gained increasing interest in extensive crops.

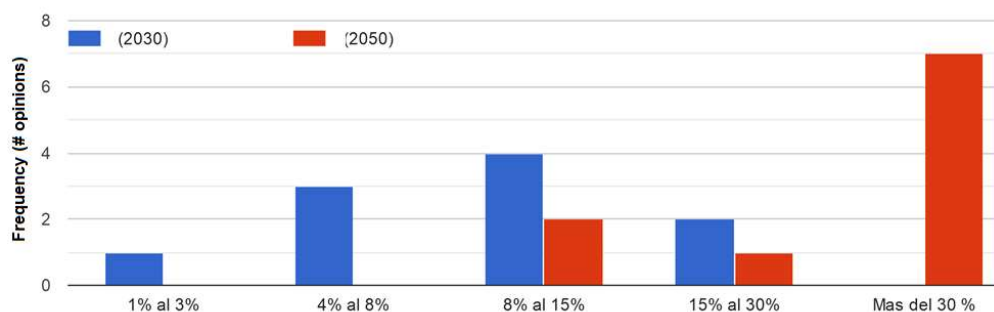
Tests and available literature indicate increases of about 7% in wheat and maize, with some variability between them. In the 3<sup>rd</sup> National Communication, mitigation potential was estimated by the "unused urea" to obtain 7% higher yields.

Alternatively, impacts quantification could be done by estimating the intensity of emissions per yield increase with PGPR, at equal doses of urea. In dialogues with experts from the private sector (production and commercialization), they estimate a growing adoption of these technologies, reaching 30% of the cultivated area by 2050 (Figure 15).

The projection of this mitigation action to 2030 and 2050 will be carried out considering

- a) The projection of the cultivated area in 2050
- b) the increasing level of adoption of PGPR with a 7% increase in performance and a 30% adoption level by 2050.

Figure 15: Dialogues results - Estimation of the increase of planted area with PGPR



Source: Own elaboration

## 2. Urea volatilization inhibitors

This action mainly involves reducing N<sub>2</sub>O emissions by atmospheric deposition, generated from particles volatilized in urea applications. The use of urea "treated" with volatilization inhibitors allows the volatilization of this nitrogenous fertilizer to be reduced to minor values of 1 to 3%.

Total (Direct and Indirect) GHG emissions from the use of urea in Argentina represent around 4.4% of the Agriculture sector and 1.7% nationwide. However, indirect "urea volatilization" GHG emissions in Argentina represent about 1.1% of the Agriculture sector and 0.4% of the country's total. Although it is a minor category, the expansion of the adoption of this technology would be a quantifiable and somehow verifiable action.

Regarding the future adoption of this type of technology in 2030 and 2050, key players in the fertilizer sector were consulted. Although just over 10% of this type of urea is currently marketed, the demand has grown a lot over the last 3 years and it is estimated that it will be increasingly adopted reaching 30% by 2030 and 50% to 70% by 2050.

The projection of this mitigation action to 2030 and 2050 will be carried out considering

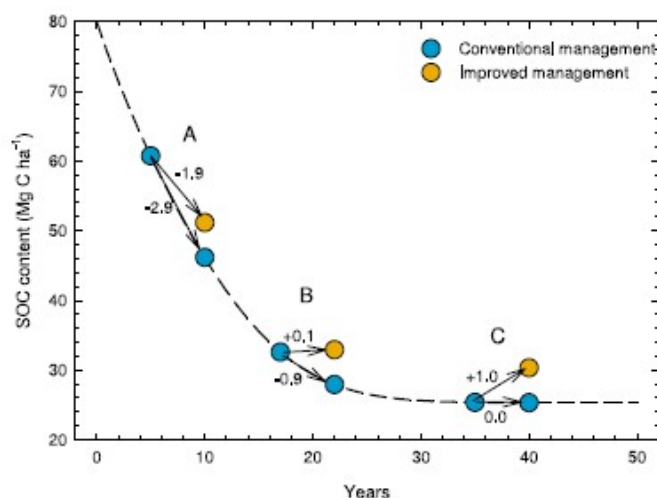
- ▷ a) the projection of the cultivated area and the use of nitrogenous fertilizers in 2050
- ▷ b) the increasing level of adoption of this technology to reach 60% of urea with inhibitors by 2050.

### 3. Soil carbon content (crop rotation)

Mitigation action defined as "reducing emissions from changes in soil carbon stocks" encompasses a range of practices including Rotations, Tillage Systems and Crop Intensification. Undoubtedly, rotation with grasses, either as a crop or a cover crop, has a fundamental role in the conservation and recovery of soil carbon.

This mitigation action requires a conceptual understanding of the dynamics of C in the soil and its recovery. Figure 16 shows the organic carbon dynamics (Sanderman and Baldock, 2010<sup>15</sup>). From an initial state, land use change triggers a loss of organic carbon until it reaches a state of equilibrium, which in temperate zones oscillates over 20 years. This initial drop can be attenuated or later reversed, depending on the management systems implemented (tillage system, rotations, among others). The authors explain the effect, in a conceptual way, comparing the results of a "hypothetical" trial of conventional and improved management practices. The effect of the implementation of "improved" practices ("Improved management") depends on the sector of the curve in which a soil is located. It may result in reduced carbon loss (point A or B) or in carbon recovery (point C);

**Figure 16: Organic carbon dynamics**



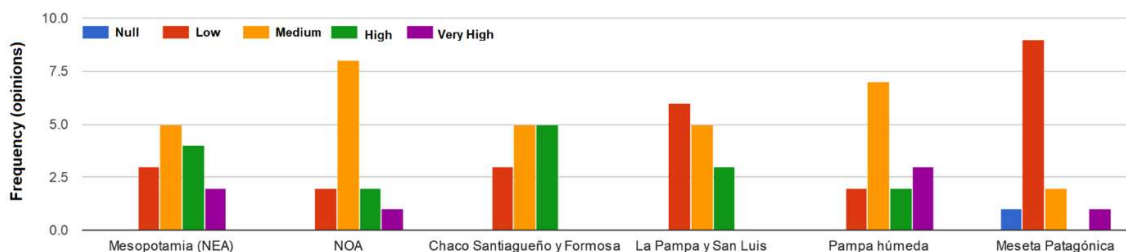
Source: Sanderman and Baldock 2010

<sup>15</sup> Sanderman J. and J. A. Baldock, 2010. Accounting for soil carbon sequestration in national inventories: a soil scientist's perspective. Environ. Res. Lett. 5 034003

With regard to C sequestration in grasslands, conceptually the annual rate of C sequestration in the soil depends on the level of degradation, the type of soil, the climatic condition and the level of carbon saturation.

However, in the dialogues with specialists, important regional differences in the capacity to sequester in livestock systems were noted. Figure 17 below shows the number of opinions regarding sequestration capacity according to regions. In general terms, the Patagonian plateau was identified as the region with the least potential for sequestration, followed by La Pampa and San Luis (Pampa Arenosa) with low to medium capacity for C sequestration in grazing lands. The humid Pampa and NOA regions were considered to have a medium potential for C sequestration, while the warmer regions, such as Mesopotamia, Chaco Santiagueño and Formosa, were assigned a medium to high capacity for C sequestration in grazing lands.

**Figure 17: Dialogues results - Potential for carbon sequestration in soil**



Source: Own elaboration

Therefore, soil carbon balances are a very promising mitigation measure. According to the bibliographic data review, the potential for mitigation in livestock soils could be very promising, and could have a high impact on national inventories<sup>16</sup>. The potential that could be achieved has not been elaborated yet. If the potential is confirmed, the likelihood is very high as the sector has high expectations of being able to make progress on this issue.

For the estimation of C emissions and captures in soil there are quantification models. At present, Argentina reports this category using the Tier 1 methodology, which does not allow for estimating the impact of management scenarios on C soil. This method uses global factors that do not allow quantifying differences at more detailed scales. For these reasons, it is desirable to use models (Tier 3 calculation method) which incorporate annual biomass as an

<sup>16</sup> According to the reporting methodology, it is reported in the soil section

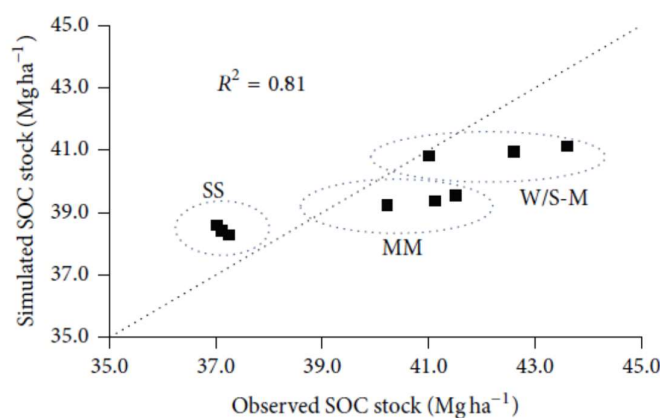


input variable into the carbon balance and simulate change processes which integrate climate and management conditions, in order to identify mitigation scenarios according to soil types and climates.

For croplands, the Steady State Method (Tier 2, IPCC, 2019) is a good alternative for Argentina, as is the AMG model (Milesi delyae et al., 2013), which has been developed and validated nationally. For grasslands, the RothC model could also be used. However, the complexity of estimating "carbon in soil" lies in the availability of territorially disaggregated activity data for both climate and soil variables, and for the production of biomass for livestock and agricultural uses.

By way of example, Figure 18 shows the relationship between values observed and estimated by AMG for 3 different rotations (Milesi Delaye et al., 2013). As annual biomass increases, soil organic carbon increases. The SS rotation corresponds to Continuous Soybean, MM to Continuous Corn and W/S-M to a Wheat/Second Corn rotation.

**Figure 18: Validation of the AMG model of soil organic carbon under different cultivation sequences**



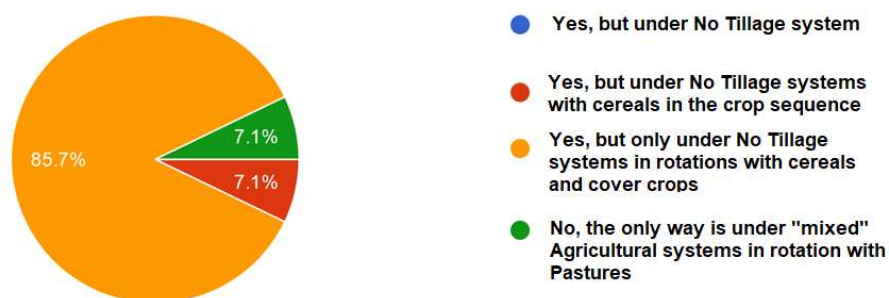
Source: Milesi Delaye et al., 2013

The C sequestration in agricultural soils and grazing lands is feasible but under management practices, validated in stakeholder dialogues (Figure 17Figure 19). There is also agreement that more information and studies are needed to identify the optimal management scenarios in pasture lands and to continue refining management in crop lands in the different regions of the country to achieve net C capture.

The experts agreed on the potential for carbon capture in soils as a mitigation action. On agricultural land (under continuous agriculture) they considered an improvement in C soil

levels feasible on agricultural land, under direct seeding and in rotations with cereals and/or cover crops (Figure 19).

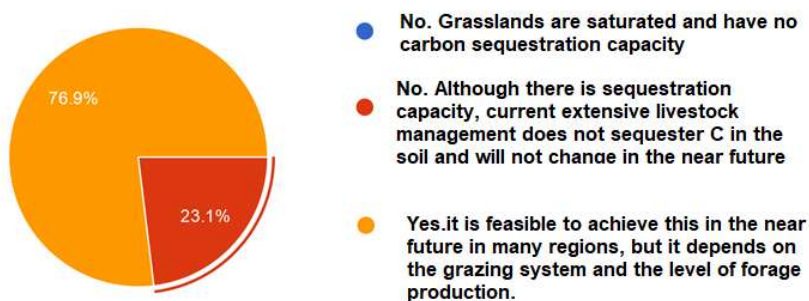
**Figure 19: Dialogues results – Feasibility for national soils under "Continuous Agriculture" to have "neutral" or "positive" Soil Carbon balances (sequestration)**



Source: Own elaboration

There was also a majority agreement that grazing lands in the country would also have the capacity to sequester carbon in soil, but depending on improvements in the management of the livestock system (Figure 20).

**Figure 20: Feasibility of increasing the Carbon stock in soil in pastoral livestock systems, in the next few years in Argentina**



Source: Own elaboration

Estimation of changes in soil C stock will be made by comparing rotation and tillage system scenarios in contrasting areas of the country to estimate the mitigation potential of this

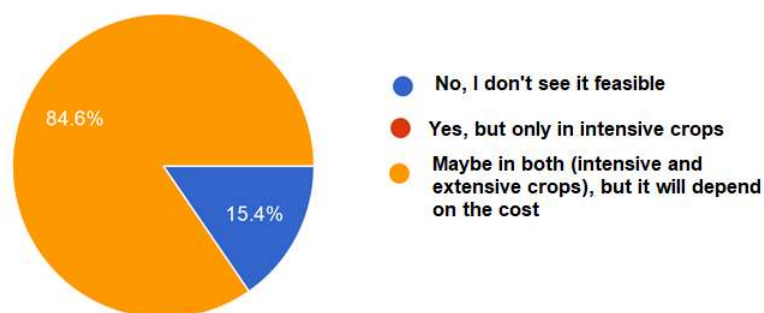
category in croplands. For the Grasslands category, the information is scarcer, hampering long term estimations.

#### 4. Soil carbon content (biochar)

This mitigation action was not explored before in the country, and has been recently incorporated by the IPCC in its 2019 methodological report, thus, it now can be reported in GHG inventories.

According to the dialogues with experts and the literature review, the use of this technology is feasible in Argentina, but is more feasible in intensive crops, mainly fruit trees (where it is already being used) than in extensive crops, due to its costs. In the expert consultation, 85% of the opinions qualified its use in agriculture as possible, but depending on the cost (Figure 21).

**Figure 21: Dialogues results - Biochar adoption in agricultural crops**



Source: Own elaboration

Production of Biochar requires the availability of biomass "close" to the processing site. Its cost per tonne is relatively low for recovering degraded soils or soils with serious limitations for production.

In Brazil, Biochar is used as an amendment due to the large area of leached soils, with low organic matter content and pH close to 4. The latter generates difficulties in the availability of phosphorus for crops, which precipitates in acidic pH. Biochar allows to increase the organic carbon content of soil, water retention capacity and fundamentally pH. The increase in pH allows the applied phosphorus to be available for the crop. According to specialists, it is necessary to apply no less than 10 tn/ha to achieve some direct positive effect on the soil and indirect effect on its productivity.

In Argentina, in agriculture, Biochar would have as main destination, the application in degraded soils by high number of tillages as is the case of intensive horticultural crops. Secondly, it can also be used in non-degraded soils of intensive fruit crops. And finally, its use could be extended to large areas of degraded soils under extensive agricultural or livestock use. Its use in the latter could be more restricted by the cost benefit ratio.

There is no clear information on the direct effect of Biochar use on crops yield. The main effect of this amendment is on some physical properties of soil and its overall productivity, being therefore very efficient in the recovery of degraded soils. Although its uses and benefits are very broad, there is very little experience and studies in Argentina (Milesi Delaye et al., 2020; Dominchin et al., 2019).

The application of Biochar in Europe and other countries is being carried out in mixtures of 10%, with 85% of pelleted compost and 5% of mineral fertilizers (urea, ammonium nitrate, etc.), called "organo-mineral fertilizers". However, there can be numerous mixtures depending on user needs. Both forms (pure and in mixtures) can potentially be used in Argentina, mainly for intensive crops (vegetables and fruit trees).

Biochar production is made from biomass and is an exothermic process. The energy released can be partially used in the processing plant or in nearby facilities. This production feature makes it attractive for installation in industrial zones where energy exploitation is expected.

The Biomass/Biochar ratio is approximately 4 to 1 and the C content of Biochar ranges between 60 and 80%, depending on the process used and the quality required. The highest quality Biochar used in the pharmaceutical and cosmetic industry or in the manufacture of activated carbon filters reaches 80%. Biochar produced for agricultural purposes has a C content of between 60 and 65%.

The process releases energy that can be exploited by 30%. The production of one tonne of Biochar, from 4 tonnes of dry base biomass, allows 5 Megawatts of energy to be used.

Another characteristic of Biochar production is that it can be produced in plants of different scales and the location of production plants must be adjusted to the availability of waste and its nearby demand. This has the advantage of generating employment and use of biomass in different regions of the country, in small or medium sized plants that do not require a large amount of electrical energy for its operation.

For the estimation of mitigation scenarios adopting Biochar, application is exclusively intended to fruit trees, already applied in the country. According to Argentina's BUR 3 (SAyDS, 2019), the area of fruit crops covers 543,411 ha.

Based on this area, two scenarios for the application of Biochar in fruit crops were elaborated:

- Scenario with application of 25% of the fruit-growing area
- Scenario with application of 60% of the fruit-growing area.

In turn, assuming a dose of 5 tn/ha of organo-mineral fertilizer, the application of formulations with two Biochar contents were considered: 10% and 50% content. In these scenarios, the necessary biomass, annual C capture and the installed capacity required for biochar and compost production were estimated.

Although organo-mineral fertilizer is mostly composed of carbon (from compost and biochar), only a fraction of the carbon contained in biochar is considered as "sequestration". The fraction considered as sequestration is defined by the IPCC (2019) in equation 4A.1 and depends on two factors: the C content of the Biochar ( $F_{Cp}$ ) and the fraction of Biochar that remains in the soil after 100 years ( $F_{perm_p}$ ). Therefore, the increase in soil carbon by Biochar application results from multiplying the incorporated mass of Biochar by the C content and the permanence factor. The latter depends on the temperature at which the Biochar was produced. The lowest temperature of the pyrolysis process is 350 to 450 degrees centigrade and would correspond to the lowest quality Biochar, whose permanence fraction is 0.65 (Table 4Ap.2, IPCC, 2019). In our case, the  $F_{Cp}$  and  $F_{perm_p}$  values would be 0.7 and 0.65, respectively.

**Figure 22: IPCC – Annual change in biochar carbon stock in mineral soils**

**EQUATION 4A.1**  
**ANNUAL CHANGE IN BIOCHAR CARBON STOCK IN MINERAL SOILS RECEIVING BIOCHAR ADDITIONS**

$$\Delta BC_{Mineral} = \sum_{p=1}^n \left( BC_{TOT_p} \cdot F_{C_p} \cdot F_{perm_p} \right)$$

Where

- $\Delta BC_{Mineral}$  = the total change in carbon stocks of mineral soils associated with biochar amendment, tonnes sequestered C yr<sup>-1</sup>
- $BC_{TOT_p}$  = the mass of biochar incorporated into mineral soil during the inventory year for each biochar production type  $p$ , tonnes biochar dry matter yr<sup>-1</sup>
- $F_{C_p}$  = the organic carbon content of biochar for each production type  $p$ , tonnes C tonne<sup>-1</sup> biochar dry matter, Table 4Ap.1
- $F_{perm_p}$  = fraction of biochar carbon for each production type  $p$  remaining (unmineralised) after 100 years, tonnes sequestered C tonne<sup>-1</sup> biochar C, Table 4Ap.2
- $n$  = the number of different production types of biochar

Source: Own elaboration

## Cattle and livestock systems

### 1. Reduction of "Emission Intensity" by increasing the national herd extraction rate (slaughter weight and weaning rate)

In the beef cattle activity and applying the IPCC 2006 reporting methodology, emissions are quantified in absolute values (Gg CO<sub>2</sub>eq). Argentina is a developing country and livestock growth estimations are promising in the medium term and long term. Since emissions are directly proportional to the livestock stock, and assuming that this will grow, emissions will also grow.

Developing countries are promoting the validation of the emission intensity indicator (t CO<sub>2</sub>eq/kg Rch) with international organizations. This indicator relates the absolute emission of GHG due to activity (Gg CO<sub>2</sub>eq) per unit of meat produced (teqRch). It accounts for the efficiency of the production process in relation to the amount of total emissions produced by beef production to obtain the unit of product:

$$\text{Emissions intensity}_i = \frac{\text{Emissions}_i(\text{t CO}_2\text{eq})}{\text{Production}_i(\text{t eqRch})}$$

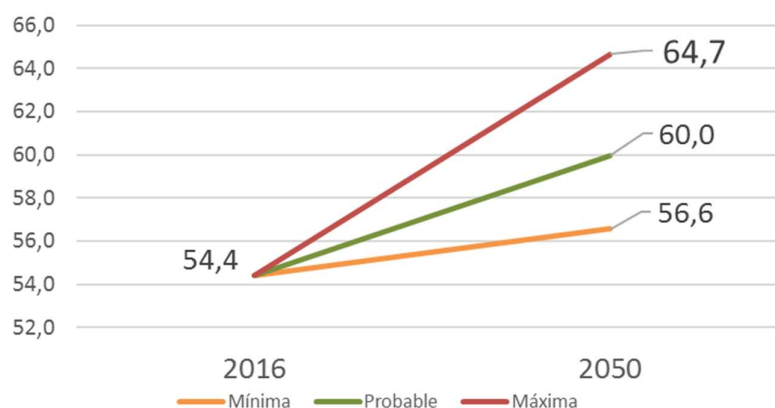
Where:

*Emissions i* : total emissions generated by beef cattle stock for year *i* expressed in t CO<sub>2</sub>eq

*Production i*: meat production for year *i*.

For the information system that is available from livestock statistics and previous INVGEI reports in Argentina, progress can be made in terms of livestock projections and regionalized mitigation measures.

From the surveys to referents, producers and technical advisors, the expectations in terms of livestock business in the medium and long term were obtained. Three scenarios were confirmed: a minimum, a more probable and a maximum.

**Figure 23: Livestock stock projections to 2050 - Millions of heads**

Source: Own elaboration

As far as emissions are concerned, in the base year (2016) 62.3 Mt CO<sub>2</sub>eq are produced by livestock farming. According to stock projections, emissions would be increasing by 14.8% (minimum), 16.4% (likely) and 25% (maximum).

Likewise, the projections of an increase in the amount of product obtained are +12.7% (minimum), +24.0% (probable) and +42.8% (maximum) with respect to the base year. There is a positive impact on the productive efficiency indicator, expressed in terms of the intensity of livestock emissions. For the base year the emission intensity is 23.4 (kg CO<sub>2</sub>eq/kg R<sub>CH</sub>), with projections showing no change in the minimum scenario, a reduction of 6.1% in the probable scenario and 12.5% reduction in the maximum scenario<sup>17</sup>.

According to the proposed scenarios, the most likely one even presents great challenges in terms of implementation. The chances of a maximum scenario being fulfilled are low, and if the barriers studied are not addressed the minimum scenario would be the most similar to a business as usual trend.

## 2. Other Livestock and Intensive Bovine Systems

GHG emission from management and handling of cattle manure is reported according to the IPCC together with livestock. Therefore, it follows the same guidelines of reporting the absolute values, by requirement, and optionally the emission intensity.

<sup>17</sup> It is important to mention that these values are preliminary data that are not yet confirmed and will be worked on in the next steps of the current project.

On the other hand, energy generation from the use of cattle manure would change the category in the reports and would be included in the energy sector. This would imply a reduction on the estimates for the livestock sub-sector.

The mitigation potential that could be achieved has not been elaborated.

Even without knowing the mitigation potential, the barriers to this measure are very strong. They require major structural changes, so it would not be very feasible to achieve the measure.

#### **3. Rolling or other mechanical work to replace burning grassland and savannah**

Records of pasture burning are highly inaccurate and often do not reflect reality. It is also a practice that, although the cause is the livestock producer, is reported in the burning section according to the reporting methodology.

The potential that could be achieved has not been elaborated yet. Nevertheless, a priori it could be inferred that the potential is low compared to other measures.

This measure registers a very low likelihood of occurrence, requiring deep cultural changes in the sector.

#### **4. Silvo-pastoral Systems**

It is a practice that the livestock producer adopts, but by reporting methodology is included in the forestry section.

In the livestock sub-sector, it has no potential impact. However, it is recognized that it is the livestock sector that could promote afforestation for its ecosystem services, thus helping to promote afforestation activity.

By using a reporting methodology closer to a carbon footprint, the livestock producer could be able to assume mitigation ownership, implying medium mitigation potential.

If there were no change in the barriers, the minimum scenario would be a business as usual case. The livestock sector could promote a minimum afforestation, without reaching industrialization.

### **Planted forests**

#### **1. Forested surface increase**



In the forest subsector (implanted forests), previously estimated scenarios of forests implanted area in Argentina were reviewed. These scenarios were defined to 2030 and 2050, and adjusted, after collecting opinions from experts in the forestry sector.

Based on data from the BUR3, the growth of the forested area was estimated to 2050, considering fixed annual increases of the forested area in the same proportion for Eucalyptus, conifers, salicaceae and other minor implanted species.

The estimated areas ranged from 10,000 to 60,000 hectares per year, distributing this increase in area by species and province, according to the distribution in 2016 reported in the BUR3. The forested area was 1,128,000 hectares in 2016 (according to the BUR3).

Considering the scenarios proposed, a conservative scenario where the increase in surface area is 10,000 ha/year would mean an additional total surface area of 300,000 ha by 2050, which, added to the 1,128,411 ha, would project a total surface area of 1,428,000 ha of forest. This projected scenario is the one expected by most of the experts consulted.

Only a small fraction expects a scenario where the annual increase is around 40,000 ha per year. This would imply a total area of 2,328,000 ha by 2050. The scenario with the greatest annual increase in planted forests (60,000 ha/year) is not predicted by any of the experts consulted, and in this scenario of maximum area in 2050 would be 2,928,000 ha.

For the projection of captures and emissions, the growth rates and cutting shifts of the different forest regions were considered, using the same values of the BUR3 of the Argentine Republic

The annual growth of the forested area was calculated using the growth rates and density values used in the BUR3, for conifers, eucalyptus and salicaceae, according to provinces.

**Table 16: Density and growth rate per species**

	Density (tn dm/m <sup>3</sup> )	Yield (m <sup>3</sup> /ha/year)	Annual growth (tn dm/ha year)
<b>Conifers</b>	0.4	20	8
<b>Eucalyptus trees</b>	0.65	40	26
<b>Salicaceae</b>	0.35	23	8.05
<b>Others</b>	0.45	18-20	8.1-9

Source: BUR3

The extracted biomass was calculated for each group of species considering differences in cutting shifts for conifers and other species among provinces.

**Table 17: cutting shifts according to species**

	Cutting shift (years)
<b>Conifers</b>	18 a 40
<b>Eucalyptus trees</b>	12
<b>Salicaceae</b>	11
<b>Others</b>	15 a 35

Source: BUR3

The balance or net carbon capture was calculated as the difference between the captures by annual growth and the emissions by annual extraction. The fixing data corresponds to the initial area (2018) fixing carbon at the corresponding growth rate for each species/region to which the annual increase is added (cumulative until 2050).

The annual emission data correspond to the initial implanted area (2018) divided by the cutting shift, to which the area implanted from 2018 onwards is added from the shift. With a 10-year shift, the total area of the species/region considered emits one tenth of the biomass (Ktdm-kilo tonnes of dry matter), which is the area that can be exploited. Once the years corresponding to the initial shift have been exceeded, the entire area of the implanted plant that arrives in the year will begin to be emitted.

**Table 18- Fixation and annual emission in kilotonnes of dry matter (Ktdm) forested area scenarios**

Annual increase of forested area	Fixation			
	2018	2020	2030	2050
10000	13,782	14,025	15,235	17,657
15000	13,843	14,206	16,022	19,654
20000	13,904	14,388	16,809	21,652
25000	13,964	14,569	17,596	23,649
30000	14,025	14,751	18,383	25,647
35000	14,085	14,933	19,170	27,645
40000	14,146	15,114	19,957	29,642
45000	14,206	15,296	20,744	31,640
50000	14,267	15,477	21,531	33,638
55000	14,327	15,659	22,318	35,635
60000	14,388	15,841	23,105	37,633

Annual increase of forested area	Emission			
	2018	2020	2030	2050
10000	13,661	13,661	13,668	15,725
15000	13,661	13,661	13,672	16,751
20000	13,661	13,661	13,675	17,777
25000	13,661	13,661	13,679	18,803
30000	13,661	13,661	13,682	19,829
35000	13,661	13,661	13,686	20,855
40000	13,661	13,661	13,689	21,881
45000	13,661	13,661	13,693	22,907
50000	13,661	13,661	13,696	23,933
55000	13,661	13,661	13,700	24,959
60000	13,661	13,661	13,703	25,985

Annual increase of forested area	Balance (ktdm)			
	2018	2020	2030	2050
10000	121	363	1,567	1,932
15000	182	545	2,350	2,904
20000	242	726	3,134	3,875
25000	303	908	3,917	4,847
30000	363	1,090	4,701	5,818
35000	424	1,271	5,484	6,790
40000	484	1,453	6,268	7,761
45000	545	1,634	7,051	8,733
50000	605	1,816	7,834	9,704
55000	666	1,998	8,618	10,676
60000	726	2,179	9,401	11,647

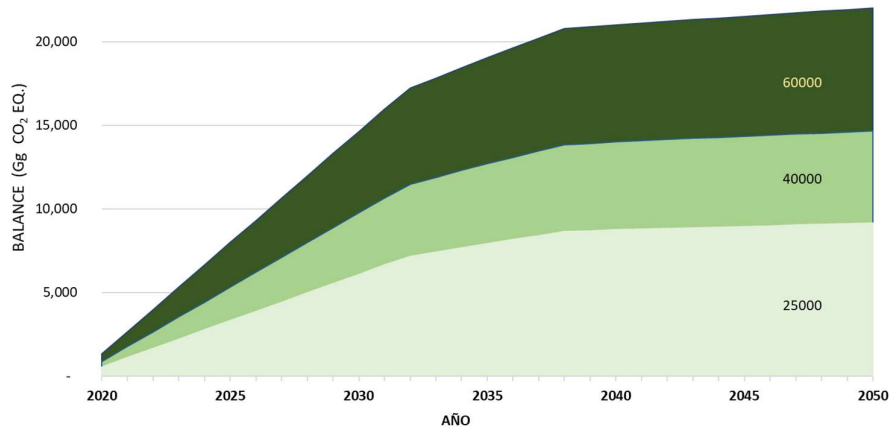
Source: Own elaboration

The following graph corresponds to the CO<sub>2</sub> fixation for the three proposed scenarios if increases in forested area until 2050:

- Conservative scenario, forested area increases: 10,000 ha/year
- Intermediate scenario, forested area increases: 40,000 ha/year
- Maximum scenario, forested area increases: 60,000 ha/year

According to the hypothesis abovementioned, CO<sub>2</sub> balance was performed and does not include emissions from intermediate treatments (pruning and thinning), nor does it consider emissions/absorption of products originating in the forests.

Figure 24: CO2 balance resulting from increases in forested area



Source: Own elaboration

**2. Growth rate increase (genetic intervention) – Species and regions**

To be developed in next phases of current project.

**3. Impact of capture in paper manufacturing, construction, furniture and other harvested wood products**

To be developed in next phases of current project.

## IV. Policy menu

Complementary to the comprehensive list of mitigation measures examined in the above sections of this report, a mapping of the measures has been carried out, based on the good practice policy menu of the Climate Policy Database (CPD)<sup>18</sup> (Höhne *et al.*, 2015). This approach helps to identify the current coverage of relevant climate policies areas within Argentina's mitigation measures. The CPD developed by NewClimate Institute served as a basis, as it defines the most important policy areas that require action and collects information on implemented policies related to climate change mitigation across different sectors. The database entails policies that have been implemented in the 30 major emitting economies, including Argentina, covering 82% of global GHG emissions in 2012 (EU JRC and PBL, 2014).

*Good practice policies* are defined as follows:

***“Good practice policies are climate and energy policies that have been -or are being - implemented in various countries, have proven their feasibility and generally agreed in the literature to contribute directly or indirectly to significant deviation from business-as-usual GHG emissions development in specific (sub-)sectors, while possibly generating co-benefits that contribute to meeting (other) national development goals” (Höhne et al., 2015).***

In a first step the mitigation measures (and corresponding policies) examined in the Barrier Analysis for Argentina were categorized on the basis of the policy menu of the CPD. The CPD policy menu provides for a subdivision of mitigation measures by sector and area (Table 19).

**Table 19: Sectors and areas covered under the CPD policy menu (Höhne et al., 2015)**

Sector	Area
General (cross-cutting)	Changing activity
Electricity and heat	Energy efficiency
Industry	Renewables
Buildings	Nuclear or CCS or fuel switch
Transport	Non-energy
Agriculture and forestry	

Source: Höhne *et al.*, 2015

The mapping exercise enables a distinction between mitigation measures that are carried out in Argentina (Category I) and those that are part of the international good practice policy menu but that are currently neither being implemented in Argentina nor included in the Barrier

<sup>18</sup> An online database was developed and used to collect the data ([www.climatepolicydatabase.org/](http://www.climatepolicydatabase.org/)).

Analysis (Category II). The information provided by the CPD and in the Barrier Analysis has been complemented by further research to ensure that all climate mitigation related policies currently being implemented in Argentina are covered.

Mitigation measures that are being implemented in Argentina (Category I) are thus further divided into the following sub-categories:

- ▷ Mitigation measures included in the Barrier Analysis which are covered in the good practice policy menu (green)
- ▷ Mitigation measures included in the Barrier Analysis which are not covered in the good practice policy menu (light green)
- ▷ Mitigation measures that are being implemented in Argentina which are not covered in the Barrier Analysis (yellow)

Table 20 summarizes the categorization described above and shows the color-coding scheme that was applied in order to visualize which good practice policies were included in the Barrier Analysis.

**Table 20: Categorization and scope of mitigation measures**

Category	Scope of mitigation measures
Category I: Implemented in Argentina	Included in Barrier Analysis (and analysed mitigation measures) <i>Unmentioned policies/developments in Barrier Analysis</i> <b>Importance of financial instruments</b> Examples of financial instruments
	Included in the Barrier Analysis (and analysed mitigation measures), not covered in the good policy menu
	Implemented in Argentina, not included in Barrier Analysis (and corresponding measures analysed).
Category II: Not implemented in Argentina	International good practice examples that are neither implemented in Argentina nor included in Barrier Analysis.

It should be noted that the here applied approach does not provide insights into the level of ambition of the examined mitigation measures.

Since the focus of our project is on the financing of mitigation measures, a first assessment was made in this analysis, which shall provide information about the importance of financial instruments in the implementation of the individual mitigation measures (highlighted in red). In addition, those policies included in the barrier analysis were further examined in order to identify typically used financial instruments, such as grants, loans, or tax incentives.

This analysis shows that most of the mitigation measures identified as good practice policies by the CPD are being implemented in Argentina and are covered in the Barrier Analysis but also highlights some gaps. It also becomes evident that financial instruments play an important role for most of the analyzed mitigation measures in an interplay with other policies. On the one hand, this underlines the importance of financial support programs for the implementation of mitigation measures and, on the other hand, offers an initial approach to link the Barrier Analysis with the upcoming project activities, such as the proposals for financial instruments and regulatory changes or the development of sectoral investment plans.

The table below presents an overview of Argentina's mitigation measures (as analyzed in the barrier analysis) and relates the measures to good practice climate policies. Additionally, it highlights the importance of financial instruments for implementing good practice climate policies.

**Table 21: Mitigation measures in Argentina – Coverage of good practice policies**

<p>Included in barrier analysis (and analysed mitigation measures)  <i>Unmentioned policies/developments in barrier analysis</i>  <b>Importance of financial instruments</b>  <i>Examples of financial instruments</i></p>
<p>Included in the barrier analysis (and analysed mitigation measures), not covered in the good policy menu</p>
<p>Implemented in Argentina, not included in barrier analysis (and corresponding measures analysed).</p>
<p>International good practice examples that are neither implemented in Argentina nor included in barrier analysis.</p>

**Table 22: General**

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
<b>Climate Strategy (Climate Change Law, 2019)</b>				
<b>GHG reduction target (NDC)</b>				
<b>Coordinating body for climate strategy</b>				
<b>Support for low-emission RD&amp;D</b>				
<b>National energy efficiency target</b>		<b>Renewable energy target (see below)</b>		



Table 23: Electricity and heat

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
	<b>Support for highly efficient power plants:</b> •Energy efficiency incentives for thermal power plants (2017)	<b>Renewable energy target for electricity sector:</b> •Renewable Energy Law (2015), target not met for 2017	<b>CCS support scheme:</b> •Carbon capture and storage (mitigation measure) •Instruments: tax credit, grants/subsidies	
	<b>Reduction obligation scheme</b>	<b>Support Scheme for renewables:</b> •Law on ren. Energy •PPAs available for renewables •Long-term renewable energy market (MATER) •Net-metering for distributed generation •Renewable Energies in rural markets (PERMER) •PROBIOMASA project •RenovAr Programme rounds 1.2 and 3 •Instruments: grants/subsidies, tax credit, loans, FITs or premiums, tender schemes	Nuclear power generation (mitigation measure)	
		<b>Grid infrastructure development:</b> •Grid expansion tenders (2019)		
		<b>Sustainability standards for biomass use</b>		
<b>Overarching carbon pricing scheme or emissions limit (carbon tax)</b>				
<b>Energy and other taxes:</b> •"Carbon tax" (2017); natural gas is excluded				
<b>No fossil fuel subsidies</b> •Tax Law, 2017: reintroduced taxes on liquid fossil fuels, carbon emissions •COVID-19 response: fixed domestic oil to a price higher than international prices				

Table 24: Industry

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
Strategy for material efficiency	<p><b>Support for energy efficiency in industrial production:</b></p> <ul style="list-style-type: none"> <li>•National programme for rational and efficient use of Energy (2007)</li> <li>•Energy efficiency bill</li> <li>•Potential investment plans of energy efficiency in SMEs (Argentinian Fund for Energy Efficiency, has ended)</li> <li>•Instruments: grants/subsidies, loans</li> </ul>	<p><b>Support schemes for renewables:</b></p> <ul style="list-style-type: none"> <li>•Renewable Energy Law (2015)</li> <li>•PPAs available for ren. (2016)</li> <li>•Long-term ren. energy market resolution (2017)</li> <li>•Distributed generation through ren. sources (2018)</li> <li>•Instruments: grants/subsidies, tax credit, loans, FITs or premiums, tender schemes</li> </ul>	<p><b>CCS support scheme</b> (see above)</p>	Landfill methane reduction
	<p><b>Energy reporting audits:</b></p> <ul style="list-style-type: none"> <li>•Argentinian Fund for Energy Efficiency (has ended)</li> <li>•Provision 3/2018 (implementation of ISO 50001)</li> <li>•Instruments: grants &amp; subsidies, loans</li> </ul>	Sustainability for biomass use		Incentives to reduce CH <sub>4</sub> from oil and gas production
	Using waste heat (reduce primary energy consumption)	Biomass generation/co-generation in industrial plants		<p><b>Incentives to reduce N<sub>2</sub>O from industrial processes:</b></p> <ul style="list-style-type: none"> <li>•Catalytic N<sub>2</sub>O destruction (as of 02/2019)</li> </ul>
	<p><b>Minimum energy performance and equipment standards for appliances</b></p> <ul style="list-style-type: none"> <li>• Implementation of an energy management system in argentinian industrial companies (e.g. via ISO 50001)</li> <li>• Instruments: grants/subsidies, loans</li> </ul>			
Overarching carbon pricing scheme or emissions limit (carbon tax)				
Energy and other taxes (carbon tax)				
No fossil fuel subsidies				

Table 25: Buildings

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
Urban planning strategies	<p><b>Building codes and standards and fiscal/financial incentives for low-emissions choices in heating, cooling, hot water, and cooking:</b></p> <ul style="list-style-type: none"> <li>•Mandatory Energy Efficiency Label to Build New Social Housing (2018)</li> <li>•Energy Efficiency in Public Buildings</li> <li>•Retrofitting - social housing</li> <li>•Instruments: direct investment, grants</li> </ul>	<p><b>Support scheme for heating and cooling:</b></p> <ul style="list-style-type: none"> <li>•Distributed generation from ren. sources</li> <li>•Regulation of solar thermal heaters (2018)</li> <li>•Use of solar thermal energy in social housing (bill)</li> <li>•Gradual replacement of conventional boilers with electronic ignition</li> <li>•Instruments: grants, direct investment</li> </ul>	Access to natural gas in private housing (reduction of carbon intensity)	
	<p><b>Minimum energy performance and equipment standards for appliances</b></p> <ul style="list-style-type: none"> <li>•Law 26.473 prohibiting commercialization of incandescent light bulbs (2010)</li> <li>•Promotion of thermal insulation (public/private buildings) (Buenos Aires)</li> <li>•Thermal air-conditioning regulations in construction of buildings (Buenos Aires)</li> <li>•Efficient Public Lighting Plan (2017), according to barrier analysis not active anymore</li> <li>•Efficiency of household appliances</li> <li>•Instruments: grants/subsidies</li> </ul>	<p><b>Support scheme for hot water and cooking:</b></p> <ul style="list-style-type: none"> <li>•Use of solar thermal energy in social housing (bill)</li> <li>•(Hot) Water saving systems</li> <li>•Instruments: grants, direct investment</li> </ul>		
		Sustainability standards for biomass use		
Energy and other taxes (carbon tax)				
No fossil fuel subsidies				

Table 26: Transport

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
<p><b>Urban planning and infrastructure investment to minimize transport needs:</b></p> <ul style="list-style-type: none"> <li>• Law 27.132 on expanding and improving the railway system (2015)</li> <li>• Instruments: direct investment, multi-/bilateral loans/grants</li> </ul>	<p><b>Minimum energy/emissions performance standards or support for energy efficiency for light duty vehicles:</b></p> <ul style="list-style-type: none"> <li>• Fuel performance and CO2 emissions labelling for light-duty vehicles (2017)</li> <li>• Motor efficiency</li> <li>• Energy efficiency labelling of vehicles (potentially expand to heavy duty vehicles)</li> <li>• Instruments: grants/subsidies, retirement premium</li> </ul>	<p><b>Biofuel target:</b></p> <p>Law on biofuels (2006), amended in 2016, expires in 2021</p>	<p><b>Support for modal share switch:</b></p> <ul style="list-style-type: none"> <li>• Nat. Mitigation Plan in Transport sector (2017)</li> <li>• Dev. of train freight</li> <li>• Bus Rapid transit systems (Metrobus)</li> <li>• Integrated plan of works for Network of Metropolitan trains (2016) (AMBA/intercity)</li> <li>• Instruments: grants/subsidies, loans, tax relief, direct (infrastructure) investment</li> </ul>	
	<p><b>Minimum energy/emissions performance standards or support for energy efficiency for heavy duty vehicles:</b></p> <ul style="list-style-type: none"> <li>• Incentives to renew truck fleet (2012)</li> <li>• Smart Transportation Programme (2018)</li> <li>• Programme to renew bus fleet</li> <li>• Instruments: loans, tax incentives, direct investment</li> </ul>	<p><b>Support schemes for biofuels:</b></p> <ul style="list-style-type: none"> <li>• National Programme for Biofuels (2004)</li> </ul>	<p><b>E-mobility programme:</b></p> <ul style="list-style-type: none"> <li>• Reduced import tariffs for EVs (2017, 2018)</li> <li>• Inclusion of EV in the regulation (2018)</li> <li>• Promotion of electric buses</li> <li>• Instruments: tax relief, subsidies, retirement premium</li> </ul>	
		<p><b>Sustainability standards for biomass use</b></p>		
<b>Tax on fuel and/or emissions (carbon tax)</b>				
<p><b>No fossil fuel subsidies:</b></p> <ul style="list-style-type: none"> <li>• Tax exemption for GNC and PG vor vehicle use (2017)</li> </ul>				

Table 27: Agriculture and Forestry

Changing Activity	Energy efficiency	Renewables	Nuclear or CCS or fuel switch	Non-energy
<b>Standards and support for sustainable agricultural practices and use of agricultural products</b>				
<ul style="list-style-type: none"> <li>▪National Programme for Good Agriculture Practices in Fruit and Vegetable Products (2018)</li> <li>▪National Programme on Smart Agriculture (2011)</li> <li>▪Good Practices Network (Red de Buenas Prácticas Agrícolas)</li> <li>▪National plan for avoidance of food losses and waste</li> <li>▪PROBIOMASA: Project for the promotion of bioenergy (2013) (only addressed under "energy")</li> </ul>				
<b>Incentives to reduce CO<sub>2</sub> emissions from agriculture</b>				
<ul style="list-style-type: none"> <li>▪Law for minimum environmental protection budgets to control (agr.) burning activities (2009) (under examination)</li> </ul>				
<b>Incentives to reduce CH<sub>4</sub> emissions from agriculture</b>				
<b>Incentives to reduce N<sub>2</sub>O emissions from agriculture:</b>				
<ul style="list-style-type: none"> <li>▪Practices that enable better efficiency of nitrogen (through nitrification inhibitors)</li> <li>▪Application of variable rate fertilization (reduce N<sub>2</sub>O emissions)               <ul style="list-style-type: none"> <li>▪Biological nitrogen fixation</li> <li>▪Instruments: e.g. tax incentives</li> </ul> </li> </ul>				
<b>Incentives to reduce deforestation and support for afforestation/reforestation</b>				
<ul style="list-style-type: none"> <li>▪Minimum Budgets for Environmental Protection of Native Forests (2007) Ley de Bosque Nativo               <ul style="list-style-type: none"> <li>▪Promotion of forestry activities and reforestation</li> <li>▪Sustainable forestry strategy for 2030 (2018, revised in 2019)</li> </ul> </li> </ul>				

## V. Synthesis of key preliminary findings

- ▷ **The likelihood of reaching the emissions avoided by the measures analyzed on the energy sector (supply side) are extremely low** due to large-scale investment and capital-intensive facilities are included and face challenges to find financing and long terms for their execution
  - Large-scale investments in heavy infrastructure, such as large nuclear power plants, or capital-intensive facilities, such as non-conventional renewable energy power plants, face challenges to find financing at international level.
  - The auction programs for the purchase of solar, wind and other renewable energy have been suspended in 2020 due to COVID-19 and will be replaced by another contracting mechanism that has not yet been defined.
  - The incorporation of new nuclear power plants in 2030. There are general agreements with the People's Republic of China but the commercial contracts have not been signed. Considering the long periods of preparation and construction of nuclear facilities, and in the current state of uncertainty, it is very difficult to ensure that these commitments are fully met.
- ▷ **On the contrary, there are high prospects and a wide margin of improvement in the reduction of emissions from the demand side, which seems underestimated in the plans studied.**
  - In the field of energy efficiency there is still a great space to obtain greater emission reductions: a) the improvement of the thermal envelope of residential buildings and of the insulation of homes (double or triple glass) and replacement of equipment; and b) changes in heating uses.
  - Many of the actions are already underway and are accepted by consumers with relative ease, having overcome the barriers. However, according to the opinion of public and private stakeholders interviewed, efforts in this field are underestimated and there is an important space to achieve better results.
- ▷ The National Action Plan for Industry and Climate Change includes measures that directly affect the energy sector and in particular the design of energy efficiency policies in the industrial sector. **The low coordination between the Ministries in charge of drafting the different sectoral plans may be the cause of the unambitious objectives reflected in some of them, such as the industrial or the transport sector.**
- ▷ **Significant energy savings can be achieved in the industrial sector with low and sometimes even zero investment.** The aggressive use of management systems (ISO) is a low investment measure that presents great potential, especially in Small and Medium Industries. The training of human resources specialized in energy saving

in the industrial sector would be a high impact measure, with consequences in reducing emissions.

- ▷ A similar situation is observed in efforts to reduce emissions in new infrastructure, such as new residential buildings, and in access to natural gas for existing ones, replacing oil products, or including renewable energies such as solar, biomass and others.
- ▷ In the **Transport sector**, the objectives **seem very unambitious**, considering that the sector represents almost 30% of final energy consumption, but the expected reductions barely represent 5% of the estimated reductions for the energy sector, and in the energy plan there are very few measures linked to the transport sector.
- ▷ The alternative fuels are not part of the National Transport and CC Plan, but there are opportunities to reduce emissions:
  - Biofuels
  - NGC and LNG
- ▷ The urban passenger transport concentrates on two major areas:
  - Greater rail responsibility: Although some components of the project have been developed (or are under development) there is doubt of a significant realization in the short term as a secure supply of electricity, from clean and renewable sources, is necessary.
  - Low emission mobility development: highly concentrated in electric vehicles
- ▷ Finally, the freight transport seeks as the most important measure the Rail Freight Investment Plan, based on the derivation cargo from truck to rail.
- ▷ **Afforestation** is a core technological option in Argentina with large mitigation potential and the capacity to widely enhance absorption by sinks in different areas of the country. Emission reductions resulting from large scale initiatives devoted to afforestation and reforestation can offset emissions from livestock production and contribute to progressively higher ambition in Argentina's NDC and facilitate its implementation.
- ▷ Enhancing carbon in soils in beef cattle production, through an increase in soil carbon content in cattle grazing lands and pastures, is considered, a priori, a mitigation measure with significant potential. No quantitative estimation of emission reductions has been completed yet in this stage of the project; however, work is ongoing to estimate potential emission reductions. The technical feasibility of this mitigation measure is high and producer's expectations, gathered through surveys and dialogues, are equally high.
- ▷ Increase in the beef cattle extraction rates (relatively low in Argentina), would allow reduce the GHG emissions intensity in livestock production, increasing productive efficiency and diminishing relative emissions per ton.
- ▷ Livestock production under silvicultural-pastoral systems. These combined systems may promote afforestation or reforestation, increase production and allow for

enhancement of sinks. The potential for GHG emission reductions has not been estimated yet, in this first stage of the project activities, while in stakeholders' dialogues producers have shown interest in the opportunities provided by this option.

- ▷ Intensive cattle production, in particular in feed-lots, can take advantage of the potential for bioenergy generation on the basis of manure management. Emissions from manure storage and processing represent about 10% of total emissions by livestock. Even if GHG emissions are reported in the livestock sector according to the IPCC methodology (IPCC, 2006), energy generation from this source of biomass would imply a reduction of emissions in the sectoral inventory, while supplying a new source of renewable energy.
- ▷ **As a conclusion, the imperative need to achieve integrated planning among all jurisdictions and sectors that allows to increase ambition and reduce emissions.**
- ▷ **The absence of systematic and long-term statistical information, particularly in some sectors, hampers to plan and evaluate the fulfillment of the proposed objectives, thus, building a reliable information system is vital**



## VI. References

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