



CLIMATE AMBITION BEYOND EMISSION NUMBERS

**Taking stock of progress by looking inside
countries and sectors**

**Argentina, Australia, Brazil, Canada, Chile, China, Costa Rica, Europe,
France, Hungary, India, Indonesia, Italy, Japan, Mexico, Nigeria, Peru,
Poland, Russia, Senegal, Slovakia, South Africa, South Korea, Spain,
United Kingdom, United States, AFOLU, Industry, Transport**

**An international report coordinated by
the Deep Decarbonization Pathways (DDP) Initiative**

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Taking stock of progress by looking inside countries and sectors

<i>Introduction</i>	3
<i>Summary for decision-makers</i>	6
A narrative of climate ambition inside selected countries	11
Argentina: E. Maurtua Konstantinidis, J. R. Predassi.....	13
Australia: E. Peterson, A. Malos, M. Argyriou, A. Foerster.....	17
Brazil: E. La Rovere, C. Dubeux, W. Wills, M. Walter, D. Gonçalves; G. Goes, M. D'Agosto, E. Nogueira.....	23
Canada: D. Sawyer.....	29
Chile: R. Palma, C. Benavides, W. Calderón, M. Díaz, M. Montedónico, R. Torres.....	35
China: T. Fei.....	45
Costa Rica: J. Quirós-Tortós, J. Angulo-Paniagua, F. de León.....	51
Europe: P.-V. Nguyen, J.-A. Vinois.....	57
France: N. Berghmans.....	63
Hungary: T. Schaffhauser, F. Nyiro.....	67
India: A. Garg, S. Sudharmma Vishwanathan.....	71
Indonesia: R. Boer, U. Siagian, A. Rossita, L. Anggreni.....	77
Italy: M. Leonardi, L. Bergamaschi.....	83
Japan: K. Tamura.....	89
Mexico: J. M. Valenzuela, D. Buira.....	93
Nigeria: C. Okereke.....	99
Peru: P. Zevallos, R. Aldana.....	107
Poland: M. Bukowski, K. Kobyłka, Z. Wetmańska.....	113
Russia: G. Safonov, V. Potashnikov, A. Dorina, M. Safonov, A. Stetsenko.....	121
Senegal: S. Sarr, S. Fall.....	127
Slovak Republic: R. Filcak.....	135
South Africa: H. Trollip, B. McCall.....	139
South Korea: J. Yun.....	145
Spain: M. Torres Gunfaus, A. Pérez Català.....	151
UK: J. Watson, S. Pye.....	157
US: C. Healy, D. Levai.....	161
A narrative of climate ambition in key hard-to-abate sectors	165
Land use sector: J. Svensson, M. J. Sanz Sánchez, A. Deprez, A. Mosnier.....	167
Industrial decarbonization ambition in the post-Paris context: C. Bataille.....	179
The transition to zero-emission transport: E. Hosek, M. Major, Y. Briand.....	187

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Introduction

CONTEXT

Detailed assessments of the state of progress on GHG emission trends and targets by international institutions can be expected in the lead-up to COP26, including by the secretariat of the UNFCCC and independent assessments by think tanks and research institutions. Some of the headline conclusions of these assessments can already be anticipated today. Firstly, country commitments as reflected in enhanced Nationally Determined Contributions (NDCs) submitted to the UNFCCC by November 2021 will be insufficient to put the world on track to achieve the collective objective of the Paris Agreement to "hold[...] the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels". Secondly, concrete policies and actions adopted by countries on the ground are often not sufficient to achieve these NDC targets. A more positive note may be expected regarding the longer-term perspective, given the adoption of the carbon neutrality goal by an increasing number of countries (and other actors, notably in the private sector). But this positive note will necessarily be tempered by the limited number of Long-Term Low Emission Development Strategies submitted to the UNFCCC (31 to date) and by the lack of a clear sequence of actions towards the carbon neutrality objective or the lack of consistency between short term action and long-term objectives within many of these strategies.

These headline conclusions will be very important to guide the conversations at COP26. They highlight the need to increase ambition and to provide convincing evidence to accelerate action in the immediate and short term to give effect to this ambition. This analysis is essential to deliver robust and accurate information that the climate community and the general public

can mobilize to exert pressure on negotiators to reach a COP26 decision that reflects the imperative of this acceleration.

Yet these assessments are not sufficient to effectively guide the progressive increase of ambition, as organized by the cyclical process of the Paris Agreement.

APPROACH

With this diagnosis in mind, this report adopts a different, complementary, perspective on climate ambition grounded in the framing provided by the IPCC Special Report on Global Warming of 1.5°C around systemic transformations and their enablers.

This report seeks to open the box of emission pathways by considering multiple dimensions of the conditions that will make these pathways possible. These are technical, economic, political, social and governance considerations in need of attention to enable the required far-reaching and systemic transformation towards the long-term goal. Along with a clear picture of the end-goal transformations, a detailed understanding of the role of all these dimensions is key to support governments and other actors to commit to more ambitious and credible emission targets and to guide effective implementation. On the one hand, the revision of emission targets needs to be directed by an assessment of how drivers of emissions should change to trigger transformation rather than an aggregation of marginal mitigation actions in key emitting sectors. On the other hand, converting emissions' targets into pertinent concrete implementation requires well-designed policy packages and investment plans that are informed by a clear and detailed understanding of the starting

point, priorities and interplays between the available levers of transformation.

This report aims at contributing to the process of collective learning in support of the progressive increase of collective ambition, as inserted at the core of the Paris Agreement paradigm. Approaching climate ambition through the lens of underlying transformations calls for deliberating on the heterogeneous nature and the multi-faceted aspects of transitions in different sectors and countries. This forces a move away from a purely global perspective and adopts a more granular approach based on country and individual sector perspectives. Thus, the report explores trends and progress on these transformations, as locally observed over the past years, notably since the Paris Agreement. The underlying rationale is that a good understanding and assessment of the close past and current situation will inform the maturity of climate policy and its strengths and weaknesses. This 'backwards looking' approach can help identify where developments are going in the right direction, where they should be accelerated and where major tensions remain that should be addressed as a priority to avoid undermining the transition. These insights are complementary to those provided by a 'forward-looking' perspective supported by long-term scenario analysis, such as those conducted in the Deep Decarbonization Pathways initiative, which explore in-detail country-level transformations towards global carbon neutrality in the second half of the century.

The analysis conducted in this report assesses progress made in both successes and how these were achieved, as well remaining challenges to align ambition with the Paris Agreement mitigation objectives, across the technical, economic, political, social and governance dimensions previously mentioned. Cross-cutting messages emerging from these country and sector perspectives are distilled to identify the critical enablers emerging from this composite picture. These enablers may be domestic or international, technical, political, institutional or financial. The picture of the state of the ambition discussion, firmly embedded in the country and sectoral realities, can provide means for reflection and action within the international climate community in the lead-up to COP26. This will be particularly important to inform focus areas for advancing the collective ambition agenda.

RELEVANCE TO THE INTERNATIONAL CLIMATE DISCUSSION

The end of the year 2021 marks a critical crossroad for the innovative bottom-up paradigm established by the Paris Agreement. This is the time to both take stock of the progress achieved by the first cycle and to prepare the implementation of the second one. This report aims at contributing to these two intertwined aspects of the discussion in the context of the dynamic nature of the ratchet-up ambition mechanism.

On substance, the report analyses whether there are clear, concrete, and credible signs of progress suggesting that the Paris Agreement process can be effective to achieve its collective goals. It does so by providing a record and analysis of the progress observed at national and sectoral levels during the first cycle and what needs to be done during the second one. This analysis goes beyond targets and symbolic statements by decision-makers to uncover whether climate policy is starting to become integral into the real political economy. It does so by embedding the analysis in sectoral and national realities based on the knowledge on detailed facts that matter to the specific transformations at stake, which represents the adoption of an assessment framework for climate ambition that is in line with the bottom-up paradigm of the Paris Agreement.

On methods, the report is an illustration of an implemented cross-cutting, bottom-up assessment of collective progress and projected ambition, two years before the 2023 Global Stocktake. As such, it provides an example of the type of cross-cutting information that should be considered to jointly assess the adequacy and the credibility of national contributions and their global aggregation. It also prepares the terms of the dialogue on what is needed to unlock or accelerate transformation, in particular, what necessitates more international cooperation.

STRUCTURE OF THE REPORT

The core of the report is made of 26 country chapters and three sectoral chapters, which can be read independently to enrich the appreciation of ambition for these individual countries and sectors.

The country chapters describe the recent evolutions of domestic discourses on climate ambition, national climate policy, national governance and concrete policies and actions with a significant effect on GHG emissions. Each of the chapters highlights a selection of striking and structurally important elements to advance the transformation towards carbon neutrality. The selection of countries reflects a diversity of sizes, geographies, political and governance contexts, stages of socio-economic development and progress on climate-related dimensions, in an attempt to provide a wide variety of relevant situations.

The sectoral chapters cover Transport, Industry and Agriculture, Forest and Other Land-Use (AFOLU) respectively. These sectors are commonly considered as 'hard-to-abate', ie those where techno-economic solutions compatible with carbon neutrality are less clearly identified. These chapters analyse recent trends and reveal the main barriers to overcome in the short term to support rapid and far-reaching transformations.

A "summary for decision-makers" is also included, just after this introductory chapter. It presents 10 cross-cutting messages emerging from the country and sector analysis, as a guide to the selection of priorities for collective action in the post-COP26 period.

Summary

for decision-makers

A- NATIONAL AND SECTORAL PROCESSES

1. A key impact of the Paris Agreement has been the establishment of carbon neutrality as the new reference frame of climate action, triggering the evolution of assessment frameworks, governance processes, and transformational policies in many countries and sectors. Starting today, these structural developments, which are key enablers for Paris Agreement-compatible transitions, need to be continued and strengthened.

The concept of carbon neutrality, which was barely discussed beyond experts before its introduction in Article 4.1 of the Paris Agreement, has become an established reference frame to guide action for a growing number of actors. Structural changes have happened in various countries and sectors over the past few years, progressively turning the carbon neutrality reference into an engine for change: change of perspectives on fossil fuels, emergence of new and innovative solutions, greater attention given to climate national-level governance, institutionalization of action; and even Non-State Actors (NSAs), in particular the business sector and subnational governments, are increasingly acting based on this concept. Even if these changes are not necessarily translated into sufficiently ambitious emission reductions yet, they help progressively build the enabling conditions for deep decarbonization in the coming decades. Achieving the carbon neutrality objective will how-

ever require a strengthening of the current dynamics on assessment frameworks, governance processes, and transformational policies, as a key condition to establish a robust foundation that is able to deliver the necessary transformations at scale.

2. Even if public awareness of climate change is locally and globally rising since the Paris Agreement, comprehensive and open societal debate on how to deeply decarbonize the economy is still lacking

Despite the COVID-19 pandemic, and the resulting economic crisis and social disruption, climate change has remained high on the public and policy agenda, as demonstrated by the rapid proliferation of carbon neutrality pledges across a range of countries, stakeholders and sectors. The important visibility of scientific assessments on climate change, notably the IPCC's, as well as the mobilization of civil society are other signs of the prominent place taken by climate change in the public domain. Opinion polls, where available, have shown a rapidly increasing support of citizens in developed and developing countries for tackling the climate crisis. But, on the other hand, there is still a lack of a structured debate about the rapid, broad, and far-reaching societal transformations implied by carbon neutrality, the possible futures,

concrete options, and choices to be made. This may partly reflect the gap in societies between awareness of climate change and endorsement of carbon neutrality, but also the lack of existing governance processes and technical and facilitative communications resources enabling the conversation to develop in a structured and open manner. The existence of such a structured and open debate is a key condition to guide the decision-making process and to create space for different groups to exert the necessary pressure at all political levels to increase ambition and delivery.

3. Despite progress since the Paris Agreement, narratives, institutions, governance mechanisms, and concrete plans and commitments have not adapted to guide the short-term transition towards carbon neutrality in most countries and sectors. Existing strategies from public and business actors remain largely insufficiently detailed, ambitious and actionable. Notably, they often fail to capture the full set of opportunities and constraints of carbon neutrality for specific actors, and do not convincingly address the interplays with key socio-economic dimensions.

The Paris Agreement relies on the assumption that countries and NSAs will define their own pathways and actions to address climate change. However, precise and actionable plans, with necessary levels of buy-in, and paving the way from where we are

now to long-term goals, are still missing in most countries and sectors. Concrete actions that are commensurate with the size of the challenge are generally lacking too. This may reflect the lack of adequate plans and resources for how actions, costs and benefits should be shared fairly between governments, business, citizens communities and countries. It may also reflect inadequate institutional capacity for leading and coordinating this enormous policy effort. The result is that current strategies and actions by countries and business actors are often not ambitious enough for placing us on a trajectory towards carbon neutrality and are not concretely actionable in specific country contexts. In particular, existing strategies highlight the risk to inaccurately assess what flexibilities exist when translating the global carbon neutrality reference into concrete action for specific actors. These include the risk of overestimating the potential for emissions compensation across sectors (notably of the energy and land use sectors through offsets), across geographies and over time, hence creating the risk of delayed action. Even when plans from public or business actors are in line with the requirements of carbon neutrality from a techno-economic standpoint, their workability often remains limited by the lack of an integrated vision with socio-economic dimensions, the distribution of costs and benefits, and protection of vulnerable communities. In particular, clear plans to integrate decarbonization and a just transition in concrete plans and actions are still missing for most countries and sectors.

B- INTERNATIONAL COOPERATION IN SUPPORT OF NATIONAL AND SECTORAL TRANSFORMATIONS

4. Structured processes, both within and outside of the UNFCCC, dedicated to mutual learning and sharing of best practices between actors from different countries and sectors are a critical enabler for increased ambition.

The assessment of recent practical progress in countries and sectors highlights the existence of a variety

of workable actions and policies, in discussion or already in place. Making this relevant experience available to other decision-makers in a structured manner could increase confidence in the possibility for committing to more ambitious targets and the understanding of the necessary policy actions and structural conditions to meet them. Nonetheless, deriving useful lessons from these specific examples

to support change at scale is challenging, due to the extraordinary diversity of governance and economic conditions, gaps and barriers in countries and sectors. The organization of international processes dedicated to arrange structured exchanges and dialogues on lessons learnt and best practices is a necessary condition to tap the full potential of these knowledge sharing exchanges.

5. The need for international cooperation is widely acknowledged as a key enabler for enhanced ambition, given its potential to catalyze transitions, while supporting economic development and recognizing a diversity of circumstances, responsibilities and capabilities. But existing national and sectoral strategies continue to lack the level of detail required to inform and accelerate the implementation of international cooperative approaches that pre-eminently fit diverse local needs.

The Paris Agreement has marked a shift in the approach to the climate change collective problem, moving away from burden-sharing towards cooperative approaches. Yet, the translation of this paradigm shift into the practical coordination of decisions among a diversity of actors is still limited in scale and scope, despite its potential for unlocking higher climate ambition that delivers development priorities. Enhanced cooperation on technologies, for example, would allow a given country to specialise in specific technologies where it has a comparative advantage rather than trying to cover the development of all the technologies required for decarbonization. Revised trade agreements could also support cooperation along the value chain instead of national competition in intermediate and final goods, maintaining industry competition and economic activity where it is most efficient. For some countries, the importance of local jobs and economic activity may mean that investment in local production of low-carbon technologies is emphasized over pure economic efficiency, but cooperation remains important. The required alignment and coordination of actions across actors would require strengthened processes for the discussion and establishment of international roadmaps emerging as a composite of country and sectoral visions.

6. Aligning financial flows with the differentials in resources and needs of countries and sectors is a critical catalyst for transformative change. Given the scale of the transformation needed, this alignment requires making available substantial additional resources and ensuring coherence with Paris-compatible taxonomies at the same time, adopting innovative finance mechanisms, enabling a scaled-up engagement of the private sector in the net zero transition, and enhanced institutions, processes and legislation in countries and within the financial system.

Achieving mobilization of the \$100bn minimum financial support by developed countries included in the COP21 decision is a key condition to support ambition, both as a tool to implement solidarity and as a lever to attract other public and private funds in the short term. This agreed target has not yet been achieved and many developing countries lack confidence that the funding is forthcoming – a critical barrier to their further action. At the same time, mobilizing the trillions needed for country and sectoral transitions towards carbon neutrality also requires a drastic evolution of the finance sector itself. On the supply side, innovative mechanisms must be put in place to compensate for the risk premium on low-carbon projects in the Global South, for social costs of transitions, and to reduce the incentives for counterproductive investments. On the demand side, countries and sectors must make explicit and visible their investment plans towards carbon neutrality, to motivate financial resources and increase trust of finance actors in the transitions. Significant resources are also required to improve project readiness and therefore fill the current gap in investable programmes in line with carbon neutrality. Projects and programmes need to be clearly identified and contextualized in detailed country and sectoral roadmaps, and there is also a need to put in place transparent and efficient institutions, processes and legislation in countries to guarantee an efficient use of finance flows and increase the absorption capacity where most needed.

C- SECTORAL PERSPECTIVES FOR NATIONAL AND GLOBAL TRANSFORMATIONS

7. Given the important recent progress on energy technologies, an ambitious energy transition depends on the diffusion at scale of these technologies and the preparation of the related infrastructural conditions. Well-conceived packages of policies, programmes, projects and actions are critical to support diffusion and further development of economic and technological models fitted to local contexts, while properly addressing socio-economic aspects of transitions.

The technologies needed to achieve the transition of the energy sector in the coming decade are already largely available and, in most parts of the world, many are economically competitive in commercial terms. But their deployment at scale raises technical, economic, social and political challenges, given notably the risk of stranded assets, people, communities and regions, the threat it imposes to vested interests, and the challenges of energy access in countries with fast-growing energy demand. Some country experiences show that overcoming these challenges is possible if packages of policies and actions are carefully designed in concert with affected actors and sectors. Longer-term ambitious targets will also require some solutions that are currently at prototype/demonstration phase (such as bioenergy, carbon capture, utilization and storage (CCUS) in hard to abate sectors, hydrogen, energy storage and grid management solutions). Country analyses show that the role of these different options depends on the specificities of country circumstances and the assumptions on their future availability and affordability. Enhanced ambition in the long term therefore requires near-term targeted efforts to demonstrate, scale-up and deploy these solutions to make them affordable. At the same time, a strategic approach is required to minimize detrimental impact on, for example, biodiversity and food security. This will require limiting to a sustainable level some 'solutions' such as BECCS, which if deployed at very large scale would result in highly deleterious land-use pressures on subsistence agriculture and biodiversity hotspots. It is also essential that optimism about these future

solutions does not delay rapid reductions that are possible with existing technologies.

8. Despite the increased focus on the agriculture, forest and other land-use (AFOLU) sector in climate research and policy discussion since the Paris Agreement, the recent observed trends do not feature ambitious emission reductions. These trends reflect limits and challenges of the sector's mitigation potential, notably when accounting for constraints linked to food provision, biodiversity conservation and poverty eradication. They also reflect important political and institutional barriers affecting decision-making and implementation, which need to be overcome to follow Paris-compatible sectoral transformations. Reaching such transformations would in turn require strengthening both domestic actions and international cooperation and enhancing coordination among a diversity of actors.

The global goal of carbon neutrality requires ambitious emission reductions of AFOLU emissions and the maximization of carbon sinks for which the sector is a critical source globally. Implementation of these ambitious transitions consistently with other objectives of the sector (notably food provision, biodiversity conservation and poverty reduction) requires not only technical change but also a combination of economic, political and institutional measures adjusted to the local context. They also call for a more comprehensive and systemic approach to restore socio-ecological systems, in particular at local scales with direct involvement of local communities and farmers. The heterogeneity of carbon sink potential from forest and other land uses across countries, and the necessity to conserve and expand ecosystems holding sinks of global importance for reaching the Paris goals, requires at once local solutions for working with socio-ecological systems, and global cooperation to pool resources and addressing international

drivers of change. The evolution of international trade regimes can also trigger important changes in agriculture land-use change for instance by enabling tracking the GHG content of agricultural commodities, the production of which constitute one of the main international drivers of land-use change.

9. The Paris Agreement has completely transformed the climate policy debate for heavy industry. Recent progress shows that decarbonization for many major industries is technically possible, and would not impose significant costs on the wider economy. But the specific costs for upstream industrial firms require a major shift in national-level and global industrial and trade policies.

Heavy industry poses specific challenges for deep decarbonization, given the level of exposure to international trade and very high GHG intensity. Decarbonization of energy systems, and notably electricity, is a critical necessary component of industrial decarbonization, but carbon neutrality requires addressing number of critical challenges for the sector which have been intensely debated since the Paris Agreement. The demand and supply of zero-carbon technological options, and the policy levers to encourage innovation are key components of industrial transformations towards carbon neutrality. To initiate the process without delay, the Global North needs to take the lead on funding innovation (R&D) and commercializing (lead market with premiums) a suite of key technologies so that by the early 2030s all new industrial production has near zero emissions. Opportunities should also be provided for developing countries to become active players in global technology innovation and adoption, to enable industrialization to meet country needs and utilize local resources to foster development. The Paris Agreement has also triggered intense debates on economic dimensions of the industrial transitions, related notably to capital investment needs, the transfer of mitigation costs to end-users of industrial materials, for whom they are insignificant, and the sensitivity of national economies to the socio-economic implications of industry phase-out.

Finally, the creation and reshaping of supply chains and markets for sustainable materials has emerged as an important approach for zero-carbon industry. This includes removing the most intensive emitting parts of production where low-carbon solutions are cheaper, or the clustering of industry with renewable energy generation and large scale hydrogen production to decarbonise key GHG intense components of industrial emissions, with co-benefits including contribution to grid reliability, reduced thermal water use, and reductions in network and infrastructure costs.

10. Despite progress on low-carbon technologies, technical and structural transformations in the transport sector to date have not been sufficient to get on the right track to meet the Paris Agreement targets. More concerted policies and actions by local and national governments and the private sector are required to achieve the transformations required for carbon neutrality and to maximize the other benefits of a zero-carbon transport system.

The scaling-up of investments in electric mobility and the diffusion of stringent CO₂ standards have triggered technological progress and significant cost reductions of low-carbon vehicles, notably for passenger transport. While technological innovation is an important component of reducing transport emissions, simply improving existing transport systems will not be enough to achieve absolute zero emissions by mid-century. More profound changes in the spatial organisation, notably in cities, supply chains and infrastructure investments will be needed to avoid unnecessary travel demand and shift to lower-carbon modes, across both passenger and freight transport. These transformations will require the engagement and coordination of a much broader group of stakeholders, encompassing the multitude of public and private actors who influence travel demand and behaviour. While progress is being made towards these structural transformations, it must become much more comprehensive and widespread in order to achieve meaningful reductions in global transport emissions.

A narrative of climate ambition inside selected countries

A LOCAL STORY ON CLIMATE AMBITION SINCE THE PARIS AGREEMENT

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DOMESTIC DISCOURSE

Argentina is a country of wonders and contradictions. Since 2015, the country's climate action has been gaining momentum, relevance in the light of the opportunities and incentives that the Paris Agreement created for the sustainable development of the country. Two (very different) administrations have passed since then. And, with ups and downs, climate action has become part of the political agenda in one way or another.

The presidential debate in 2015, the first one in the history of Argentina, covered the issue of climate change and renewable energy for the first time, and both candidates made statements on both issues. It was that year, during COP 21, that Argentina changed administration to President Mauricio Macri. This meant a radical change in the political positioning of the country. The government had now to make good on the promises to raise ambition and start implementing the announcements made during the presidential campaign.

A first signal was to upgrade the Secretary of Environment and Sustainable Development to the rank of Ministry, making a strong statement on the importance the environment would have in the agenda. Three years later, the same government would downgrade the Ministry to a Secretary, allegedly due to spending cuts in the context of a new economic crisis, and in 2019, the current administration, under Alberto Fernández, made the upgrade again, trying to reinforce the fact that the environment was going to be a priority.

Climate took a prominent role in the agenda of the Ministry in 2016 given the fact that the government that same year became the very first country in the world to update its NDC. For that, the Climate Change National Cabinet was created by decree. Dependent on the Chief of Cabinet and coordinated by the Ministry of Environment, giving the mandate to all ministries to cooperate to provide information on sectoral plans for climate action. This was the first step for what years later got reflected in the Climate Change Law that was institutionalized by decree. With the success of the renewable energy programs, President Macri even named 2017 “The year of the Renewable Energy”, again, bringing more attention to their deployment.

In 2018, the push for high profile announcements continued, especially in the light of the G20 summit that Argentina hosted for the first time. Under Argentina's Presidency the issue of climate change was treated independently in the agenda and had to deal with a well established Trump administration that made it difficult to achieve consensus in the working groups and the final communiqué.

However, all the big announcements and decisions got stalled that year as the government could not contain the economic crisis that rapidly took over all the agendas, changing all the mindsets and ideas, bringing back the “old recipes” for economic security. The last climate announcement of president Macri was the commitment towards carbon neutrality by 2050. With an economic crisis accelerating, the 2019 elections did not include climate nor renewables in the presidential debate, and the change in administration was imminent.

Simultaneously, the youth climate movement raised with the same strength as around the world, bringing a fresh wave of energy to the Argentinean environmental activism. Youth groups picked up long time pending issues and pushed strongly in Congress, making possible, for example, the approval of the Climate Change Law in 2019, which was sitting in Congress since 2016, if not before. The youth were rapidly seen as key actors in the political class, especially in an election year. And now they continue to be a key actor in many environmental issues.

The Fernández's administration brought strong messages of social inclusion and development aid, and the climate and environmental crises got a more social

narrative, with strong messages of social and environmental justice, just transition, a promise of a new NDC, but fewer concrete actions on the ground, slowing down and discouraging even more the deployment of renewable energy among other things.

Despite both Macri and Fernández were very vocal on climate change - they both spoke with clear commitment and determination, and even translated concrete announcements and promises - the preference for the fossil fuel industry and the large scale agroindustry remains intact. It is thought as a separate issue that has nothing to do with climate change, instead it is considered a matter of energy security, job creation, and economic development.

The public perception on climate change has evolved over the years. Back in 2014, the first national environmental survey¹ concluded that 73% of the population was interested in the environment, and climate was the first choice among different topics. A more recent poll² showed that 73% of the population is more concerned about climate change than the COVID-19 pandemic.

NATIONAL GOVERNANCE

Argentina has always been active in the international climate negotiations. In the past five years, Argentina has been advancing in its international commitments related to climate change. After the submission of its first iNDC in 2015, the country provided a revised version in 2016. Although this was not strictly necessary, it responded to the fact that mid-COP 21 there was a change in the national administration. This update did not represent a significant increase in the ambition of the NDC, but did help strengthen the technical background of the objective. It had two emissions reductions targets by 2030: an unconditional one of 483 MtCO₂e and another of conditional nature of 369 MtCO₂e (subject to the availability of international finance)³.

This NDC was supported by sectoral plans that were updated periodically by each ministry in charge within the period 2016-2019. By the end of 2019, there

1 <https://www.vidasilvestre.org.ar/?9840/Presentacin-de-la-1-Encuesta-Nacional-Ambiental>

2 <https://www.periodistasporelplaneta.com/blog/crisis-climatica-al-73-le-preocupa-mas-que-la-pandemia/>

3 https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Argentina%20First/Traducci%C3%B3n%20NDC_Argentina.pdf

were at least six national sectoral plans with measures established by government dependencies on Forests, Energy, Transport, Industry, and Agriculture, among others. Unfortunately, with the change of the administration these sectoral plans are no longer valid and pending an update.

In addition to the NDC and sectoral plans, the Argentinean government put in place a Climate Change Risk Map System⁴, a tool that portrays layers of risk factors on the country's cartography and that can identify overlaps of different vulnerability indexes across the territory.

Since the Climate Change Law was passed in November 2019, all following work related to climate targets and commitments is communicated in accordance with the provisions of the law. This law was regulated during 2020, and is not yet fully implemented, as not all the structures mandated in it are fully functional. In December 2020, Argentina submitted to the UNFCCC its second NDC. This time, only one economy-wide target was included of 359 MtCO₂e by 2030⁵, which resulted in an increase of ambition with regards its previous commitment. In addition to this, the new NDC included the first Adaptation Communication, and a section on long-term ambition which stated that Argentina was planning to develop its LTS and that it was meant to include an objective to reaching carbon neutrality by 2050.

While the Ministry of Environment and Sustainable Development has made efforts to appropriately communicate and engage with civil society, all the processes for the development of all the NDCs have so far fallen short in the participation dynamics they established.

Other commitments more closely linked to technical work under the UNFCCC are Biennial Update Reports (BURs) and National Inventory Reports (NIRs). In 2015, 2017 and 2019, Argentina submitted its first, second and third BURs, respectively, thus complying with the deadlines stipulated for such documents⁶. This demonstrates an effort to make the national GHG inventory data transparent, to which is added in 2020 the submission of the NIR

(with the BUR3 data). It is important to note that Argentina's Climate Change National Directorate has invested in capacity building to prepare and comply with the reporting requirements provided in the Paris Agreement, bringing the country to a high level of reporting.

ACTIONS AND POLICIES

Several actions and policies established in the last five years contribute directly or indirectly to a path of climate action.

Energy policies:

- The establishment of Energy Scenarios⁷ and Vision 2050 Dialogues for the energy sector highlighted the challenges and opportunities that the energy sector can provide. This used to be an independent civil society exercise that brought together different actors to present scenarios for the development in Argentina. In 2016, the initiative was adopted by the Ministry of Energy and was incorporated in its planning work.
- The Renewable Energy Program (RenovAR) was certainly a game changer and a flagship of climate action during the Macri administration. It started as an innovative policy for attracting international investments and accelerating the deployment of renewable energy for the first time. The first tender of the program was so successful that the government received a nine fold of renewable energy proposals, forcing the program to accelerate subsequent tenders. On the other hand, the program encountered challenges in the delivery of the contracts and the economic risk of Argentina did not contribute to the completion of many contracts.
- The Distributed Generation Law was another success in the pathway to climate action, and many provinces in Argentina are adhering to it. Nevertheless, renewable energy technology is still expensive in the country and the impact of the law is still not significant.
- Energy Efficiency was another program that contributed to the energy developments of Argentina, with the promotion of many policies and a recent law on labeling for cars and homes.

⁴ <https://simarcc.ambiente.gob.ar/>

⁵ https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Argentina%20Second/Argentina_Segunda%20Contribuci%C3%B3n%20Nacional.pdf

⁶ <https://unfccc.int/BURs>

⁷ <https://escenariosenergeticos.org/>

- Hydrogen is clearly raising interests in the energy sector. The current administration has taken many steps towards green hydrogen dialogues, and multi stakeholder consultations with the aim to produce large scale hydrogen for export.

Climate finance:

- Climate finance is a big challenge in Argentina. The recurrent economic crises blur the decision making around this issue due to excess of subsidies and real economic challenges in the population. Fossil fuel subsidies⁸ are a major distortion of the real economy and Argentina directs large amounts of pesos every year to the fossil fuel industry (both production and consumption). Since 2016 the national government has made efforts to reduce that amount, but with difficult consequences; reducing consumption subsidies drastically caused more inflation and generated economic difficulties for the population. The devaluation of the peso caused big impacts in the national budget. As a result, the government has reduced fossil fuel subsidies every year in US dollars, but has raised them in pesos in the same manner.
- The Carbon Tax Law entered into force in 2017, bringing again another signal towards climate action, something which was well received in the international climate community. Nevertheless, it is important to mention that this law did not consider gas, and was a restructuring of many existing liquid fuel taxes, generating a low impact.
- The current administration, in fact the President himself, is very vocal about the proposal to swap international debt with climate action. While this concept is still not well understood nor elaborated, it is another sign that climate is increasingly involved in key development discussions of Argentina.

Other:

- Electric and other low emissions vehicles were promoted from 2019 and continued as of today with import tax exemptions in order to incentivize the market. Nevertheless, the infrastructure requirements are not well established in the country and prices of those technologies are still high for the Argentinean economy.

- In 2020, the Agroecology National Directorate was created within the Ministry of Agriculture, Livestock and Fishery. This represents a milestone towards the deployment of alternative and more sustainable production within the land use sector. It is still to be seen how its work will unfold in a country with a large predominance of industrial agriculture, which accounts for 37% of the national GHG inventory.

In conclusion, there are many new climate-action-related issues that have been incorporated in the last five years, and that are present in the public agenda. Some of them have more weight and traction than others, but in the end they are still a part of the change that is needed towards a low-carbon sustainable future in line with the Paris Agreement. The challenge remains in getting rid of the old negative practices and technologies that have developed a large amount of power in the last 50-100 years.

⁸ <https://farn.org.ar/los-subsidios-a-los-combustibles-fosiles-2019-2020-todo-sigue-igual-de-bien/>

A NARRATIVE OF CLIMATE AMBITION

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INTRODUCTION

Positive action by the states and private sector is driving momentum towards net zero even without national climate leadership.

Australia's per capita carbon dioxide emissions are among the highest in the world, driven by a highly energy-intensive, export-oriented economy¹. This has seen climate action framed as a choice between jobs and the environment, hampering commitment at the national level.

Australia is yet to set a long term emissions reduction target of net zero and its interim target for 2030 is considered to be inconsistent² with the temperature goal of the Paris Agreement. Australia regularly ranks amongst the world's worst performers for climate action³. Legislation and institutions exist at the federal level that could be used to increase national ambition however the federal Government has not supported an increase to Australia's targets nor committed to a net zero target, despite significant pressure.

In the past five years, public discourse on climate has greatly increased, and calls for national action are coming from the community, the private sector, and internationally. Community sentiment is in

¹ <https://climateanalytics.org/latest/australia-on-track-to-become-one-of-the-worlds-major-climate-polluters/>

² <https://climateactiontracker.org/countries/australia/>

³ <https://dashboards.sdgindex.org/downloads>

large part driven by the lived experience of climate change impacts by Australians, notably the Black Summer bushfires of 2019/2020, coupled with severe droughts and floods.

Australia is due a federal election by mid-2022, and although unlikely this could be before COP 26. This has the potential to be a pivotal election for climate action, with increased ambition expected if either there were a change of party, or if a significantly greater majority for the current Coalition government meant that it could navigate internal divisions on this issue⁴.

DOMESTIC DISCOURSE

Increased private sector accountability and renewed public awareness coupled with international trade pressures are shaping action at the state level, even as federal political division hinders national efforts.

There is distinct polarisation⁵ on climate change issues between the two major political parties at the federal level. Historically, the Coalition of the Liberal and National Parties (centre-right/conservative) demonstrate less action than the Labor Party (centre left) although both parties face pressure to resist climate action from voters in resource-dependent rural communities. The Coalition Government has been in power for the last seven years, and has so far refused to increase Australia's 2030 target or set a long-term net zero target. In fact, efforts from within the government to increase climate action have contributed to leadership change. Since 2015, Labor Party has a commitment to a net zero by 2050 goal and has said they will announce the policies to reach that target before the next election.

The polarisation that exists at the federal and territory level is notably less pronounced at the state level. Even with a wide range of governing political parties or coalitions at the state and territory level, all have set net zero by 2050 targets (or earlier). For example, New South Wales, Tasmania, and South

Australia all have Liberal or Coalition governments and have emission reduction and renewable energy policies that are significantly more ambitious than those at the federal level.

The shifting international context for Australia is another critical factor. At the end of 2020, three of Australia's key trade partners - China, South Korea, and Japan - all set mid-century net zero targets. Together, these countries buy 75% of Australia's exported thermal coal used in power generation and 87% of its liquefied natural gas⁶. While the medium and long term implications of this appear clear for Australia's fossil fuel exports, Australia is yet to actively adjust its economic focus.

The response to the COVID pandemic has heightened discussion about opportunities to pair economic recovery with climate ambition, although economic setbacks have been less severe than in other parts of the world. The Federal Government has focussed on protecting incomes for individuals and businesses while largely ignored the significant potential benefit⁷ of green stimulus. The Government has instead backed a 'gas-fired recovery'⁸, despite recommendations by the International Energy Agency that there can be no new oil and gas fields in a Paris-aligned global pathway. Conversely, at the sub-national level, some spending has been focussed on 'green recovery' and climate action is increasingly being framed in terms of economic growth and job creation. Examples include the recent Victorian Climate Change Strategy⁹ and NSW's Net Zero Industry and Innovation Program¹⁰, which both focus action on investments in emissions reduction that have strong economic and job-creation potential. The Australian corporate sector is also stepping up with net zero targets becoming normalised in the past few years, despite weak national policy. This shift reflects growing expectations around corporate climate risk management from investors and lenders, driven by tightening corporate law and

⁴ The Coalition currently has a majority of one.

⁵ <https://www.cambridge.org/core/journals/transnational-environmental-law/article/abs/australian-energy-transition-as-a-federalism-challenge-uncooperative-energy-federalism/FBB-1D83EA9A4B3730607CFCF6555652C>

⁶ <https://www.industry.gov.au/data-and-publications/resources-and-energy-quarterly>

⁷ <https://www.climateworksaustralia.org/resource/prudent-investments-to-boost-the-economy-and-lower-emissions/>

⁸ <https://www.pm.gov.au/media/gas-fired-recovery>

⁹ <https://www.climatechange.vic.gov.au/victorias-climate-change-strategy>

¹⁰ https://energysaver.nsw.gov.au/sites/default/files/2021-03/NetZero-Industry-Innovation-Program_FINAL_24-March-21_webaccessible.pdf

financial regulation frameworks¹¹ (including the adoption of recommendations by the Task Force for Climate-Related Disclosures) and increased litigation risk. Investor and public scrutiny is shifting to expect short- to medium-term commitments in addition to long-term mid-century net zero targets. A significant portion of Australia's private capital is now shaped by climate targets. Several major Australian pension investment funds recently set net zero by 2050 targets across their entire portfolios. Many investors and lenders, including Australia's biggest four banks, have targets to divest from thermal coal by 2030.

Public opinion is in favour of stronger government action on climate change. Following the 2019/2020 bushfires, a poll¹² found 72% of Australians viewed the fires as a wakeup call on the impacts of climate change and recent polling revealed two thirds of voters think the government should be doing more to address climate change¹³ with many seeing this as the most important issue at the next election. This support is also evidenced by the hundreds of thousands of Australians¹⁴ who attended the 2019 school strike for climate rallies, and a shift in media rhetoric and attention on the issue.

NATIONAL GOVERNANCE

While Australia has some strong institutional capability, federal climate action is insufficient.

Australia is a federation of six states and two self-governing territories, which have their own constitutions, parliaments, governments and laws. At the federal level, there is currently no climate change framework legislation in place. Australia had a comprehensive climate and energy policy between 2012 and 2014,

including a carbon price and a comprehensive suite of measures to distribute funds raised through carbon pricing to those most affected by it. The package was partly repealed in 2014 following a federal election and change in government.

A national framework climate law, similar to those now in place in comparable jurisdictions like the United Kingdom, would serve an important purpose in Australia. Indeed, a private Members bill has been recently proposed¹⁵, although it does not currently have government support.

Of the states and territories, only Victoria and the Australian Capital Territory have enacted climate change framework legislation with targets aligned with the temperature goals of the Paris Agreement. South Australia and Tasmania have climate change legislation but their public commitments are now beyond their legislated ones.

A number of national institutions were established a package of climate and energy legislation in 2011¹⁶, and despite partial repeal, several still play significant roles in the context of Australian climate ambition. The Climate Change Authority¹⁷, originally a key pillar of national climate change action and progress tracking currently has little influence on national policy, although could be reinvigorated. The Clean Energy Finance Corporation (Australia's green bank) facilitates private finance¹⁸ into the clean energy sector by improving bankability of clean energy projects, and is highly regarded internationally. It is relatively insulated from the politically dynamic context, due in large part to the return on investment it continues to achieve¹⁹. The Australian Renewable Energy Agency²⁰ has supported more than 500 projects in early stage project development and technology commercialisation and has recently had its funding extended. The current Federal Government is working to broaden

11 Anita Foerster, Kym Sheehan, Daniel Parris, 'Investing for a Safe Climate?' 44(4) (2021) University of New South Wales Law Journal (forthcoming) and Jacqueline Peel, Brett McDonnell, Hari Osofsky, Anita Foerster, Rebekkah Markey-Towler (2020) Corporate Energy Transition: Legal Tools for Shifting Companies Towards Clean Energy Practices (University of Melbourne).

12 <https://australianinstitute.org.au/wp-content/uploads/2020/12/Polling-January-2020-Climate-change-concern-and-attitude-Web.pdf>

13 <https://www.theage.com.au/environment/climate-change/australia-s-biggest-climate-poll-shows-support-for-action-in-every-seat-20210829-p58mwb.html>

14 <https://www.abc.net.au/news/2019-09-20/school-strike-for-climate-draws-thousands-to-australian-rallies/11531612>

15 https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bld=r6618#:~:text=Introduced%20with%20the%20Climate%20Change,Clean%20Energy%20Regulator%20Act%202011%2C

16 Australian Panel of Experts on Environmental Law, Climate Law (Technical Paper 5, 2017)

17 <https://www.climatechangeauthority.gov.au/>

18 <https://www.cefc.com.au/media/media-release/cefc-welcomes-publication-of-the-independent-statutory-review-of-its-operations/>

19 <https://www.cefc.com.au/media/media-release/cefc-2019-20-investment-update/>

20 <https://arena.gov.au/about/>

the mandate of these organisations to include lower-emissions technologies and allow investment in hydrogen made from gas and CCS.

The Clean Energy Regulator manages the Emissions Reduction Fund, Renewable Energy Target (achieved in 2020, and not expanded) and the National Greenhouse and Energy Reporting scheme. Through these, Australia has sound data on emissions and energy use by entities across a substantial proportion of the Australian economy potentially providing a strong foundation for good policy if the political direction were to change.

Australia's economy is currently dominated by energy and emissions-intensive exports. While the federal government is supportive of diversification into clean energy, there is no drive to transition from other energy export markets.

The export of carbon-intensive resources is a substantial part of the Australian economy²¹. Australia's exported fossil fuel CO₂ potential is more than double Australia's total domestic emissions²². In contrast, Australia has some of the best renewable energy resources in the world, which could position Australia as a significant net exporter of clean energy - either converted into green hydrogen for export or perhaps directly to countries via undersea transmission cables.

Similarly, Australia has abundant reserves of minerals critical to low-carbon technologies such as lithium, cobalt and rare earth elements offering a key export growth opportunity for Australia over coming decades.

Through these resources, Australia could keep its global role in exporting energy resources - but be a force for decarbonization rather than the current position of supplying the fossil fuels that create emissions.

However, without complementary Australian energy and industrial decarbonization policies, expanding hydrogen and mineral sectors won't necessarily reduce emissions in Australia, and may even increase them. Fortunately, policies focussed on encouraging low-emissions technologies tend to have bipartisan political support.

ACTIONS AND POLICIES

Australian climate change policy and action needs significant strengthening, particularly at the federal level to align with Paris temperature goals.

Australia is a signatory to the Paris Agreement and the Federal Government has committed to an emissions reduction target of 26-28% on 2005 levels by 2030. Australia is not yet on track²³ to meet this target although government projections suggest that existing climate policy - including the Emissions Reduction Fund and the Technology Investment Roadmap may right this course. The Federal Government has signalled its intent to reverse its previous negotiating position that it would use Kyoto 'carry-over credits' to meet any shortfall. The use of these credits is strongly opposed by most UNFCCC parties and may not be accepted within the Paris Agreement.

There is no federal commitment as yet to a net zero emissions timeline, with the government position strongly in favour of 'technology, not taxes'. The key national policies include: Australia's Technology Investment Roadmap²⁴; the Emissions Reduction Fund (a voluntary reverse auction process where businesses can earn Australian Carbon Credit Units that can either be sold to the Australian Government or in the secondary carbon market); and the Safeguard Mechanism (explained in more detail later). The Federal Government has indicated they will release Australia's long-term emissions reduction strategy before COP26, which is likely to be focussed on support for technologies.

Continuing the distinction between Australia's federal and state governments, not only have the Australian States and Territories set goals of net zero emissions by 2050 or earlier, most also have 2030 targets stronger than the national one. However, no jurisdiction has systematically or comprehensively addressed how all government decision-making should achieve their targets.

There have been recent gains in other cross-economy policy areas, as well as room for further action. The

²¹ <https://climateanalytics.org/latest/australia-on-track-to-become-one-of-the-worlds-major-climate-polluters/> -

²² <https://www.aph.gov.au/DocumentStore.ashx?id=b1bb0f89-fd83-4848-9680-8dbc9469f5a4&subId=680320>

²³ <https://www.industry.gov.au/news/projecting-australias-emissions-2020-report>

²⁴ <https://www.industry.gov.au/data-and-publications/technology-investment-roadmap-first-low-emissions-technology-statement-2020>

advances include state government spending policies considering integration of net zero in government finance and investment and several recent state budgets highlight climate change as a focus. Infrastructure policy is showing some progress and several states are considering how to align procurement policies with climate change objectives. However so far, no jurisdiction has effectively incorporated the transition to a global net zero economy into their export policies and programs.

Analysis of climate policies at the sectoral level continues to highlight the differences between federal action and stronger state ambition, although increased commitment is needed at all levels.

Energy

The divide between federal and state policies can be clearly seen in the energy sector - most states and territories have strong targets and policies in renewable energy. However, the efficiency of meeting these is compromised by the lack of supportive federal policy. Australia has the highest global uptake of solar PV, almost eight times the worldwide average, and one in four homes have solar panels on their roof²⁵.

There is no federal plan to phase out coal, nor are there any state targets for early retirement of fossil fuel generation from the grid. Likewise, there are no federal or state plans to prevent further expansion of coal mining (in fact there is active support for the establishment of new mines) and states with gas resources are approving new extraction projects.

In recent years, there have been numerous processes to ensure the grid-connected electricity systems and markets respond to the rapid expansion of renewable energy - supported by large-scale investment in transmission and storage projects at the federal²⁶ and state level. The Finkel review into the Future Security of the National Electricity Market²⁷, the Australian Energy Market Operator's

Integrated System Plans²⁸, as well as market design reviews, are focussed on security and reliability of electricity. However, the last proposed policy to include a joint focus on lowering emissions (the National Energy Guarantee, proposed by the Finkel review in 2017) was not taken forward by the Coalition government.

Energy Efficiency and Productivity

Australia lags behind much of the developed world in terms of energy efficiency²⁹ even though this policy area has reasonably solid bipartisan support. The Coalition Government introduced the National Energy Productivity Plan³⁰, in 2015, which aims to improve energy productivity by 40 per cent between 2015 and 2030 although implementation of the plan has been slow. The Emissions Reduction Fund includes opportunities for projects with a number of energy efficiency outcomes to earn Australia Carbon Credit Units. The National Construction Code, implemented by all states and territories, plays an important role in building energy efficiency, and is guided by a trajectory towards 'zero energy (and carbon) ready buildings'³¹. ClimateWorks Australia research³² suggests that this outcome requires a substantial reduction in use of natural gas in buildings, although few states and territories have any policies to incentivise electrification or a pathway to transition away from gas.

In several states, retailer energy efficiency schemes require large energy retailers to help households and businesses save energy and reduce emissions (some via white certificates). These schemes are not yet unlocking the full range of energy efficiency opportunities.

25 <https://www.csiro.au/en/news/news-releases/2021/australia-installs-record-breaking-number-of-rooftop-solar-panels>

26 <https://www.energy.gov.au/government-priorities/energy-supply/delivering-priority-transmission-projects>

27 <https://www.energy.gov.au/government-priorities/energy-markets/independent-review-future-security-national-electricity-market>

28 <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp>

29 <https://www.eec.org.au/news/eec-news/article/australia-ranks-worst-for-energy-efficiency-in-developed-world#:~:text=Australia%20ranks%20worst%20for%20energy%20efficiency%20in%20developed%20world%2027%20June%202018&text=The%20American%20Council%20for%20an,position%20in%20the%202016%20ranking>

30 <https://www.energy.gov.au/government-priorities/energy-productivity-and-energy-efficiency/national-energy-productivity-plan>

31 https://consultation.abcb.gov.au/engagement/energy-efficiency-scoping-study-2019/supporting_documents/Trajectory%20for%20Low%20Energy%20Buildings.pdf

32 <https://www.climateworksaustralia.org/wp-content/uploads/2020/04/Decarbonization-Futures-March-2020-full-report-.pdf>

Transport sector

Transport is one of the greatest challenges for Australia, with emissions currently increasing. Individual vehicles are seen as the preferred way to travel and most states and territories have overwhelmingly allocated funds to expanding road networks, rather than mode shifting and public transport.

Up until early 2021, there were no national transport-specific emissions reduction policies³³ and Australia is the only OECD economy without vehicle CO₂ emissions standards³⁴. Electric vehicle policy is thin on the ground with the federal Future Fuels Strategy³⁵ discussion paper notably silent on policies to make electric vehicles (EVs) more affordable or a phase-out date for the sale of new fossil fuel cars. States and territories have rolled out charging infrastructure, and some have set electric vehicle uptake targets, although only recently accompanied by incentives.

Industry

Increases in industrial emissions have been dominated by the mining, oil and gas sector. Emissions have increased rapidly in recent years as a result of the swift expansion in liquefied natural gas (LNG) production for export. The primary federal policy for managing industry emissions is the Safeguard Mechanism which is not designed to reduce emissions or cap them in absolute terms and has failed to incentivise the meaningful industrial emissions reductions needed to align to net zero by 2050.

In 2017 CSIRO (Australia's national science agency) released the Low Emissions Technology Roadmap³⁶ which outlined energy and industrial options that if taken would be of benefit to Australia in the transition to low emissions energy. In addition to funding that supports action under the Roadmap domestically, the federal government recently announced partnerships

with other countries to co-fund research and demonstration projects, as well as facilitating deployment and export of Australian low-emissions technologies and energy³⁷.

Land and Agriculture

The Emission Reduction Fund is currently the primary federal policy incentive for emissions reduction in land and agriculture. This fund provides Australian Carbon Credit Units to projects that undertake activities to reduce emissions or enhance carbon storage and government purchasing of the credit units is being used to help meet Australia's 2030 target. Land clearance remains a substantial issue in many states and territories and actions to reduce agriculture emissions are at very early stages.

³⁷ <https://www.industry.gov.au/news/international-partnerships-to-accelerate-low-emissions-technology>

³³ <https://www.climatechangeauthority.gov.au/sites/default/files/2020-09/Prospering%20in%20a%20low-emissions%20world.pdf>

³⁴ <https://jetcharge.com.au/blog/fuel-efficiency-emissions-standards-australia#:~:text=Despite%20our%20national%20commitment%20to,country%20without%20fuel%20efficiency%20standards.&text=On%20a%20grams%20of%20CO2,50%25%20more%20than%20Japanese%20equivalents.>

³⁵ <https://consult.industry.gov.au/climate-change/future-fuels-strategy/>

³⁶ <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/low-emissions-technology-roadmap>

STATE OF PROGRESS ON CLIMATE AMBITION

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INTRODUCTION

Brazil has played a relevant role in international climate change negotiations since its beginning in 1992, as host country of UNCED. While resisting to the establishment of a UN convention on forests, Brazil has favoured the creation of UNFCCC. It was the only non-Annex I country to make a proposal to the design of the Kyoto Protocol in 1997, based upon the historical contribution of each country to global warming. The country was also a driving force leading the establishment of CDM (unfolding from the Brazilian proposal to Kyoto of a Clean Development Fund) and of its rulebook established through the Marrakesh Accords in 2001. It has eventually become one of the three developing countries with larger number of CDM projects hosted.

Domestically, after the creation of an Inter-ministerial Climate Change Commission to approve CDM projects, the first National Climate Change Plan was approved in 2008, setting an institutional framework to internalize climate change into governmental planning implementation and follow-up routines (Brasil, 2008).

Brazil was also one of the first major developing countries to present a voluntary commitment to limit its GHG emissions at the UNFCCC COP 15 in 2009. It aimed to an economy-wide GHG emissions reduction between 36.1% and 38.9% by 2020 compared to a projected business-as-usual scenario, which translated into a reduction of the absolute level recorded in 2005, an unseen target from a non-Annex I country.

Eventually, Brazil was very active in the negotiations leading to the signature of the Paris Agreement of the UNFCCC, at COP21 in Paris, 2015.

This paper focuses on an update of the analysis of climate ambition in Brazil, presenting the state of the progress achieved since 2015.

NATIONAL GOVERNANCE

In September 2015, Brazil submitted its intended Nationally Determined Contribution (iNDC) to the UNFCCC Paris Agreement, confirmed as the first NDC, in 2016. The economy-wide commitment is to reduce GHG emissions by 37% in 2025 and has an indicative target of reducing 43% by 2030, compared to the 2005 value. It also presented the means of implementation in its annex.

In December 2020, the Brazilian government presented its "new first NDC" to the UNFCCC, confirming the 2030 target and updating the base-year value. The 2005 value of 2.1 GtCO₂e presented in 2015 had come from the Second National Inventory, and the updated value of 2.8G tCO₂e presented in 2020 came from the Third National Inventory, implying a substantial change in the commitment. **The absolute economy-wide GHG emissions cap increased from 1.3 to 1.8 GtCO₂e in 2025 and from 1.2 to 1.6 GtCO₂e in 2030.** On the other hand, the new first NDC also included an indicative target of reaching climate neutrality by 2060 (Brazil, 2020).

In April 2021, the Brazilian president announced the country's commitment to achieving climate neutrality by 2050 at the Summit of Climate Leaders organized by the US President.

ACTIONS AND POLICIES

This analysis focuses on the AFOLU, Transport and Energy Supply sectors, which are key to improve climate ambition in Brazil.

AFOLU

The positive record of environmental governance in 2005-2012 has demonstrated the country's capacity and the viability of achieving simultaneously the goals of economic development,

conservation of natural resources and reduction of GHG emissions in the AFOLU sector. The main requirement to resuming this pathway is to restore the political will to promote this new paradigm, that protecting and restoring forests is a mean and not an obstacle to achieve economic development.

After UNFCCC COP15 (2009), the National Policy on Climate Change - PNMC (Law 12,187 / 2009) was created, regulated by Decree 7,390 / 2010 and later by Decree 9,578 / 2018. One of the instruments of the PNMC is the Sectorial Plan for the Consolidation of a Low Carbon Economy in Agriculture (ABC Plan), created to encourage the adoption of sustainable low-carbon production technologies in agriculture. In 2021, Decree 10.606 instituted a new 2021/2030 modern and integrated structure of ABC Plan.

Thanks to the ABC Plan, rural properties using low carbon and carbon capture techniques have reached 40.4 Mha already in 2018, more than the 2020 target of 35.5 Mha. The animal waste treatment target of 4.4 million m³ was reached in 2019 already (Agroicone&Input, 2020). In line with crop-livestock-forest integration systems, the government launched the Carbon Neutral Beef label in 2015. Through specific protocols, the program certifies beef from cattle raised in areas with planted trees for offsetting emissions and providing thermal comfort to the animals. The first line of certified products entered the market in 2020.

Historical data from INPE show that the annual deforested area in the Amazon in the early 2000s averaged 2 Mha / year. In 2004, it reached a peak at 2.7 Mha before a sharp decrease between 2005 and 2012, when it was down to 457 thousand ha (84% reduction). This success in reducing emissions from deforestation was the result of both economic policies and command-and-control measures. Credit for agricultural activities (soft loans by public financial agencies) were conditioned to proof of compliance with environmental laws and regulations. New government plans were launched, and the incentive for creation and management of Conservation Units, as well as the demarcation of Indigenous Lands, also protected areas of native forests against deforestation. However, the approval of a New Forest Code by the

Congress in 2012 has granted an amnesty to producers who illegally deforested until July 2008, sending a signal of impunity for illegal land clearing and encouraging future deforestation. On the other hand, it created important instruments such as the Rural Environmental Registry (CAR) and the Environmental Recovery Program (PRA). The problem is that the enforcement of reforestation of native vegetation in private rural properties aimed by these regulations has been delayed by several extensions of the initial deadline for compliance.

In 2017, the federal government also created the National Policy for Recovery of Native Vegetation - Proveg (Decree 8.972 / 2017), which has the National Plan for the Recovery of Native Vegetation (Planaveg) as an instrument. Proveg aims to articulate, integrate and promote policies and programs to recover forests and other forms of native vegetation in at least 12 Mha up to 2030. Nonetheless, there is a lack of technical and financial incentives to encourage a large-scale reforestation with native species in Brazil. The use of mechanisms such as Payment for Environmental Services, REDD +, and Quotas for Environmental Reserves, foreseen in the National Policy of Payments for Environmental Services (Law 14.119 / 2021), may enable the fulfillment of this goal.

Therefore, between 2013 and 2018, the annual deforestation rate in the Amazon was on average of 658 thousand ha/year (MCTIC,2020). More recently, in 2019, it reached 1 Mha (34% higher than in 2018), and in 2020, 1.1 Mha (INPE, 2021), as a result of the change in environmental governance promoted by the current federal government since 2019. The recent restructuring of environmental agencies such as IBAMA and ICMBIO led to the reduction of command-and-control measures, such as inspection, area embargoes, and the application of fines. Moreover, constant attempts to approve bills that make the regularization of illegal occupation of public lands more flexible tend to encourage economic exploitation and deforestation (MP 910/2019; PL 2633/2020 and PL 510/2021).

Land clearing for the expansion of agricultural activities of soy, beef, and native wood production chains, are the main drivers of defor-

estation in Brazil. Failures in the traceability of these chains (for example, tracking primary and secondary suppliers of slaughterhouses is particularly challenging in the Amazon region), insufficient engagement of environmental agencies, and little requirement for proof of origin for agricultural and forestry products by consumers and importers are the main barriers to reduce deforestation.

Transport

Despite the successful record on biofuels, the transport sector still faces important political and economic barriers to follow a pathway compatible with the Paris Agreement. Efforts to overcome these obstacles must consider electromobility, practically non-existent in Brazil.

Between 2005 and 2015, there were significant advances in the research, production, and distribution of biofuels. Progressive increases in mandated blends with fossil fuels, such as gasoline, and diesel oil allowed to reach the blending rates of 27% anhydrous ethanol in gasoline (E27) and 13% biodiesel in diesel oil (B13) used in motor vehicles in 2021. Besides, most light vehicles in Brazil are now equipped with "flex-fuel" engines using either gasoline or ethanol according to the consumer's choice based on the prices at the pump. The market share of ethanol is now around 25%, after a decrease in 2010-2017 when gasoline prices were heavily subsidized.

In 2018, the government launched the RenovaBio Program (2018) to further expand the participation of biofuels in the national energy balance. The initiative consists of a cap-and-trade system for fuel distribution companies, with 10-year goals, carbon footprint certification schemes, and the supply of decarbonization credits to producers and importers of biofuels. These cumulative efforts have increased the share of biofuels in final energy consumption to reach 24% in 2020. This performance has already gone far beyond the goal of 18% set by the first NDC for 2030.

In 2018, the government launched the Rota 2030 Program (2018), replacing the Inovar-Auto Program (2012-2017) with respect to energy efficiency of ve-

hicles. Both policy instruments provided tax incentives for research and innovation in the automotive industry. Lastly, efforts to expand the transport infrastructure were made through the Public-Private Investment Partnerships – PPI (2016) and Advance (2017) programs. These programs have promoted public and private investments in strategic infrastructure projects, encouraging credit and financing.

The lack of a national electric vehicle industry, the strong economic recession since 2015 and the national currency devaluation since 2020 are obstacles to local investments in charging infrastructure and vehicles. Action of policymakers is also lacking in the establishment of policy instruments that could accelerate electromobility, such as financial incentives and basic infrastructure.

Public transport has the potential to be the main vector for the penetration of electromobility in Brazil. However, it has been continuously losing passengers to individual motorized transport. Among other factors, this is due to the low quality of concession contracts, insufficient government subsidies, and historical incentives to the automotive industry, for example, by reducing the Tax on Industrialized Products (IPI) on automobiles. Rota 2030 could be another important driver of change, but automakers are not meeting their targets, and the program is limited to light vehicles. Although buses and trucks represent less than 5% of the total vehicle stock, they are responsible for 59% of GHG emissions from road transport.

Alternative biofuels, such as biokerosene and bio-oil, face high costs in research and development, production, distribution, and storage. Even considering the strong ethanol and biodiesel markets, recent controversial decisions by the federal government have reduced their attractiveness. **In 2020, the government exempted anhydrous ethanol from import duties during negotiations with the United States. This measure not only stimulated gasoline consumption but also reduced the competitiveness of the domestic biofuel industry. In 2021, the government reduced the federal tax burden on diesel oil and persuaded state governments to reduce their tax on this fuel. Recently, for the first time, the government approved a reduction in the content of biodiesel in diesel blends (from 13% to 10% in 2021), intending to reduce the price to the consumer.**

Energy Supply

In order to get to carbon neutrality by 2050, the main challenges are to continue the expansion of renewable energy and to solve the problems caused by the growing share of intermittent power generation in the grid without further dispatch and building of natural gas - fired thermopower plants.

Brazil makes great use of renewable energy sources of power generation. As of 2019, hydropower (64%), wind power (8%), and biomass (7%, both from sugar cane and wood) ensure the supply of clean energy electricity, while solar power (1%) is gaining momentum. Political and financial measures have encouraged hydropower since the sixties and other renewables after the oil shocks in the seventies. There are incentives for renewables like discounts on tariffs, reduction of import taxes, and subsidies for wind, small hydro, solar, and biomass. However, given its growing competitiveness, a new bill under discussion at the Congress aims to reduce the economic incentives for decentralized power generation by consumers, which can slow down the growth of solar power generation. Natural gas supplies the main back-up to renewables in periods when they are not available, accounting for 9% of power generation in 2019, so the carbon footprint of the national grid is very low (75 g CO₂/kWh) and GHG emissions from power generation are barely 3% of the total country emissions. However, it is increasingly difficult to build new large hydropower plants as most of the potential to be tapped is located in environmentally sensitive areas in the Amazon region. Anyway, Brazil seems well on track to meet the first NDC goal of 23% of renewables other than hydro in the power generation mix by 2030. The availability of batteries and other energy storage options at reasonably low costs will be key to reach zero emissions from the power sector by 2050.

Fossil fuels subsidies are still high in Brazil. The higher amount goes to the consumption of gasoline and diesel oil. From 2010 to 2017 domestic prices of these transport fuels were kept artificially low, due to concerns about increasing inflation rates and the political pressure of truck drivers' strikes. Since then, pricing policy is more aligned with international prices, but still subject to stop and go decisions caused by political and economic difficulties during the pan-

demics. Another substantial amount of long duration subsidies was granted to oil and gas production, in order to attract investments of foreign companies in the development of the huge pre-salt offshore discoveries. Fugitive emissions have been reduced over the years in oil and gas exploration and production, thanks to the adoption of ANP Resolution n. 249/2000 (replaced by resolution n° 806/2020), which requires authorization to burn associated natural gas above 3% of the total produced per field. Its reinjection in pre-salt fields is still high, but the government has recently approved a new bill (Decree n° 9,616 / 2018), aiming to establish a more open, diversified, competitive, and efficient natural gas market to promote investments in infrastructure for increasing its use. Its use for replacing fuel oil as a heat source and in new industrial processes (e.g. steel manufacturing) can help to reduce GHG emissions from industry, but mitigation policies must avoid the carbon lock-in risk of its use for power generation to meet base load demand.

DOMESTIC DISCOURSE

As the public opinion has repeatedly shown its support to environmental protection, the key issue to align domestic ambition with the Paris Agreement objective remains the political attitude of the federal government.

The structural obstacles to a transition of Brazil towards climate neutrality are well known, including the **financial constraints to fund the high capital costs of low-carbon investments, and the political difficulties to sharply reduce subsidies to oil and gas and to introduce carbon pricing schemes within a reform of the tax system** (La Rovere et al, 2018; La Rovere, 2019). These obstacles and the previously highlighted specific sectorial barriers were aggravated by the economic crisis since 2009, and by the new federal government on duty since 2019.

Although the country's administration has recently shown a negative bias in regard to national climate ambition, some governmental programs such as *RenovaBio* and the recently approved regulations on the Payment for Environmental Services have provided a framework to a future improvement of climate ambition.

Brazil's Central Bank moves toward incorporating sustainability criteria in its decision-making process, promoting adequate management of climate, social and environmental risks in the banking sector, and sustainable finance. In 2020, it announced creating a "Green Bureau," to be associated with the rural credit information system containing information on farmers' sustainable practices and the intention to boost incentives to move rural credit in a green direction. In 2021, it released for public consultation stricter regulations on the transparency of the business sector about its exposure to climate risks.

Some advancements of the discourse on climate change since the Paris Agreement were recorded in the business sector.

Part of the agribusiness has understood the key role of good environmental practices to keep and increase its international market share. They have taken into account some recent menaces of protectionist measures from developed countries' governments and consumers to boycott Brazilian exports of beef, soy products, wood and even all products made in Brazil. Part of industry is also keen to accept a regulated carbon market, in the form of an Emissions Trading System, as a mean to allow greater attractiveness and subsequent acceleration of the entry of financial resources into the country.

In several occasions during the last two years, former ministers of Economy and of Environment, state governors and mayors, scientists and a significant number of large companies have made public statements, sent letters and met the Presidency to demand a more environmentally friendly governmental policy, sticking to the country commitment to the Paris Agreement. Finally, civil society is increasingly mobilized through environmental NGOs. This has included a pioneer climate litigation process started in Brazil by a process to request that the Court rules the government to present a really more ambitious NDC to the UNFCCC, as the "new" first NDC presented in December, 2020 would not meet the criterion of increased ambition as requested by the Paris Agreement. In parallel, NGOs are mobilizing a wide spectrum of stakeholders to prepare a proposal of a more ambitious NDC.

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CLIMATE AMBITION

Dave Sawyer, EnviroEconomics

DOMESTIC DISCOURSE

Opinion research has shown for over a decade that Canadians are willing to move on climate policy, with historical opinion surveys consistently showing that about half the population support more climate action. More recent surveys show a growing awareness of the climate emergency and the need to act to increase Canada's climate ambition. A growing awareness, and lived experience, of more dangerous storms and climate damages are also contributing to the increased support for more climate ambition. Yet, underscoring this awareness is a deep polarization against carbon pricing and climate action more generally. Indeed, the discourse in Canada over the last decade or more can be characterized as a very polarized discourse about how to tackle the climate change problem. This discord has meant that increasing Canada's mitigation ambitions is not without political risk. Still, Canada has moved significantly in the last five years to implement a comprehensive policy package that can increase ambition to its 2030 GHG target¹ and net-zero beyond.

A willingness to move on climate change. Opinion surveys prior to 2012 found that 81% of Canadians believed climate change is happening but only 47% thought climate change is caused *mostly* by human activities. By 2016, [this had changed](#), with a majority to three-quarters of Canadians agree that human activities contribute to climate change. While this arc

¹ Canada recently committed to achieving a 40% to 45% reduction in greenhouse gases below 2005 levels in 2030.

of climate support continued upward, in the lead up to the Paris Agreement, the Canadian public was **not yet having its “climate moment”**. Notably, as many as one in ten in 2016 did not believe that human activities have any meaningful impact on climate. Mildener et. al (2016) found broad support for implementing climate policy across Canada, but it was differentiated by the type of instrument, with support for cap-and-trade systems but less for carbon taxes.

More ambition and a sense of urgency needed.

By 2019, dangerous climate change was no longer an abstract threat impacting people somewhere else or at some time in the future, with three-quarters of Canadians surveyed said they or someone close to them **had experienced the effects of climate change**. More extreme events and associated damages, including wildfires that shut down significant portions of industrial production, and resulted in significant air quality problems in major urban centres, resulted in a noticeable shift in public sentiment towards more ambition. A growing awareness of the impacts of climate change on Canada did much to create political space for politicians to increase ambition.

Recent opinion surveys show Canadians think there is a need to do more to reduce carbon pollution, with **two-thirds of Canadians** think governments, companies, and individuals need to do more to deal with issues relating to climate change. About half said they would be willing to pay more to fund adaptation and mitigation. In 2002, for example, a full 2/3 of Canadians think climate change is as **serious** as COVID. But in this regard, Canadians trailed global sentiment by about 8 percent on the need for governments to act on climate change. Still, in 2020 Canadians saw an **upside in more ambitious targets** with 72% believing that countries that set more ambitious targets will have stronger economies than those countries adopting less ambition.

Yet continue polarization is risk to more ambition.

By 2021, despite polls indicating the majority of Canadians leaning towards more climate action and a growing **sense of urgency to act**, views remained polarized. A sizeable number of Canadians hold very strong opinions against action on climate. An entrenched opposition to climate action has been a defining challenge for Canada for well over a decade, making ambitious climate action a continual challenge for politicians.

This polarization has its roots in political attacks on

carbon pricing by right leaning conservative politicians who sought to wedge against competing political platforms. Right leaning political opposition first emerged against a centralist **carbon tax and green shift** platform in the 2008 federal election and then became entrenched against a **left-leaning cap-and-trade** proposal in 2012. These continued attacks on carbon pricing and climate action more broadly draw upon **populist themes** of the policies unfair burden on **working families**.

This polarization culminated in the **repeal of the Ontario cap and trade system** which was linked through the Western Climate Initiative to California and Quebec. A right leaning conservative government, swept into power on a wave of populism, scrapped the “tax on everything” as one of its first acts. With so many years of shaping the norms of the conservative base of supporters, climate action will continually face opposition from many on the political right. The federal government’s use of carbon tax revenue to give **Climate Action Rebates** to households directly while committing to revenue neutrality did much to assuage the public’s opinion of the carbon tax. Canada’s carbon pricing system is discussed in more detail in the section below.

NATIONAL GOVERNANCE

Canada is a federation with shared jurisdiction over energy and pollution control between the provinces, territories, and the federal government. Provinces and **territories have broad jurisdictional powers** to regulate greenhouse gas emissions, fuels, and facilities. They can do so directly through regulations, but they also can impose carbon pricing through provincial taxation powers as well as imposing regulatory charges under environmental protection laws. Ontario’s now defunct cap and trade program is a good example of these broad powers, which was enabled as a **regulatory charge** under the Environmental Protection Act. The federal government under the Canadian Constitution can regulate greenhouse gas emissions using several different mechanisms. It can regulate some industries directly that are under its jurisdiction, including aviation and shipping. Under criminal law, six greenhouse gases are listed as a toxic substance under Schedule 1 of the *Canadian Environmental Protection Act*, enabling the federal government to regulate these

emissions directly. Emissions standards for vehicles and engines imported or transported across provincial borders are regulated under [federal trade and commerce powers](#).

Given the shared jurisdiction of climate policy in Canada, and ongoing effort by the provinces and territories to implement carbon policy, the [Pan-Canadian Framework on Clean Growth and Climate Change \(PCF\)](#) and was developed in 2016. The PCF was driven by the then newly elected federal government that had made carbon pricing an election issue but was developed in consultation with the provinces, territories, and some Indigenous Peoples. The PCF provides the basis from which federal, provincial, and territorial cooperation on climate policy is being pursued.

The PCF is organized under four pillars that include pricing carbon pollution, developing complementary climate actions to address market barriers where pricing alone is insufficient, adapting and building resilience to climate change, and developing a low carbon economy by promoting clean technology, innovation, and jobs. Two important governance frames are also provided including reporting regularly and transparency to Canadians on progress towards emissions reduction targets as well as taking stock of policy effectiveness. The need for governments to recognize respect and safeguard the rights of Indigenous Peoples is also a core principle of the PCF.

The PCF has been an important step in coordinating climate action and strengthening climate governance within the Canadian federation. The provinces and territories are not obligated to follow the federal government on climate action, and as such the federal government uses spending powers to help coordinate and promote joint climate action.

Commencing in 2020, the federal government imposed a [carbon tax and large emitter](#) industrial carbon pricing program under the *Greenhouse Gas Pollution Pricing Act, 2018* (GGPPA). The Act sets up a backstop federal carbon price system where provinces or territories who do not meet a federal standard for carbon pricing² will have the federal carbon pricing program imposed upon them. The federal carbon pricing backstop was developed in recognition that several provinces had forged ahead with their own carbon pricing programs,

including British Columbia's carbon tax, Alberta's large emitter program, and Quebec's cap and trade program. Prior to the federal backstop being introduced, 38% of Canada's total GHGs in 2016 were under some form of carbon pricing. In 2022, 78% of Canada's emissions were covered by a carbon price of CDN \$30 per tonne escalating to CDN \$50 per tonne in 2022.

The carbon pricing backstop includes two separate programs: a fuel charge applied on all fossil fuels; and, a large emitter program focused on emission intensive and trade exposed heavy industry. Part one of the GGPPA, [the fuel charge](#), is administered by the Canada Revenue Agency (tax authority) and applies to 21 types of fuel and combustible waste. This is essentially a carbon tax on the distribution, importation, and sale of fossil fuels. Part 2 of the GGPPA imposes a large emitter program known as [Output Based Pricing System](#) (OBPS), which establishes an emissions intensity limit on specified industrial emitters and enables emissions trading for compliance. Environment and Climate Change Canada operates the OBPS.

Reflecting the ongoing politicization of carbon pricing in Canada, the legality of the federal carbon pricing backstop was challenged all the way to the Supreme Court of Canada by the provinces of Alberta, Saskatchewan, and Ontario. These right leaning jurisdictions questioned the constitutionality of the federal government to impose carbon pricing. In March 2021, the Supreme Court of Canada ruled that the [federal carbon pricing law is constitutional](#), effectively scoring both a political and legal win for carbon pricing in Canada. The [Canadian Net-Zero Emissions Accountability Act](#) was introduced into the federal parliament in November 2020 and became law in June 2021, establishing a legally binding process of five-year national emissions reduction targets starting in 2030. These five-year milestones or targets are intended to be developed with the best available scientific information and reflect Canada's international climate change commitments. A series of routine stock-taking, and emissions reduction plans are to be developed to provide transparency on the progress of setting the five-year milestones. [An independent advisory council](#) is also established to provide advice to the responsible minister. The Act represents an important step towards developing the [accountability framework needed](#) to keep Canada on track to meet its climate targets. It will also likely serve as a much-needed focal point to

² Either a quantity-based cap-and-trade program with a hard cap that meets or exceeds Canada's 2030 emissions target or a price-based carbon tax with a price schedule rising to CDN \$50 in 2022.

help coordinate joint federal, provincial, and territorial action on climate policy.

ACTIONS AND POLICIES

Collectively, the federal government, provinces, and territories have implemented a carbon mitigation policy architecture that includes a set of performance regulations, carbon pricing, fiscal incentives, and innovation programs. These policies cover most of Canadian emissions and are often layered on top of the same emissions sources (**Figure 1**).³ Below is an abbreviated list of some of the major policies that have been implemented.

Performance regulations are an important tool adopted by governments to implement carbon mitigation policy. These performance regulations are designed to provide compliance flexibility so that cost-effective compliance is achieved. For example, Canada's light duty vehicle regulations provide vehicle manufacturers the ability to generate credits from the manufacture of low emitting vehicles to offset the emissions intensity of higher emitting vehicles such that the overall fleet intensity is falling in time. Notable performance regulations implemented to date include:

- **Energy efficiency standards** for buildings and equipment have been implemented for years. The routine **updating of building codes** to set expectations about the future energy performance of new construction;
- In the **electricity sector**, Ontario's coal phaseout was the single largest reduction policy implemented in the country, with all coal-fired electricity generated in Ontario stopped in 2014. In 2018, the federal government implemented regulations to phase out the use of coal fired power by 2030. Other coal phaseout programs exist in Nova Scotia and Alberta.
- In **transportation**, most provinces and the federal government have **biofuel mandates** while the federal government has a new **Clean Fuel Standard**⁴ based on California and British Columbia experience;
- The Government of Canada is requiring 100% of

car and passenger truck sales be **zero-emission by 2035 in Canada**;

- **Federal methane regulations** in the oil and gas sector came into force in 2020 while Alberta, British Columbia, and Saskatchewan have their own regulations. If the federal government determines the provincial regulations are of equivalent stringency to the federal regulations, the provincial regulations can regulate the emissions in the provincial jurisdiction.

Carbon pricing is a key element of Canada's efforts to achieve its emissions reduction targets and net-zero beyond. Prior to 2016, successive federal governments were reluctant to impose a national carbon policy on the provinces and territories, especially a national carbon price. Instead, the federal government implemented a few sector-based regulations related to controlling emissions from electricity, improving energy efficiency standards in buildings and equipment, and harmonizing energy efficiency standards for light duty and heavy-duty vehicles with the United States.

A light regulatory touch by the federal government then led a few provinces to chart their own climate policy course. Carbon pricing was implemented in several jurisdictions including British Columbia with its carbon tax, Alberta with its emission intensity-based credit and trade program for industrial emitters, and Quebec with its cap-and-trade program aligned with California under the Western Climate Initiative.

But in 2016 and with the implementation of federal carbon pricing backstop in 2020, this all changed. Canada's carbon pricing programs now cover 78% of national emissions through a diverse set of price-based taxation systems, cap-and-trade systems, and large emitter credit and trading systems. These programs typically coexist within the provinces. Often the federal government implements one aspect of its carbon pricing backstop, for example, the federal fuel charge on liquid fuels, while the province implements its own large emitter program. **Figure 2** provides an overview of how these programs coexist within the country. **Figure 3** indicates how liquid fuels are being covered by the carbon taxes while **Figure 4** identifies how large emitter programs are being implemented.

The carbon price schedule is set to rise from CDN \$30 per tonne in 2020 to \$50 per tonne in 2022. In December 2020, the Government of Canada committed to a carbon price rising to **\$170 per tonne in 2030**. This patchwork of policies is not necessarily a risk

³ Sawyer, D., S. Stiebert, R. Gignac, A. Campney, and D. Beugin. 2021. 2020 Expert Assessment of Carbon Pricing Systems. Canadian Institute for Climate Choices. <https://climatechoices.ca/reports/the-state-of-carbon-pricing-in-canada/>

⁴ Government of Canada, 2020. "Canada Gazette, Part I, Volume 154, Number 51: Clean Fuel Regulations." <https://gazette.gc.ca/rp-pr/p1/2020/2020-12-19/html/reg2-eng.html>

Figure 1. Canada's Climate Carbon Policy Architecture

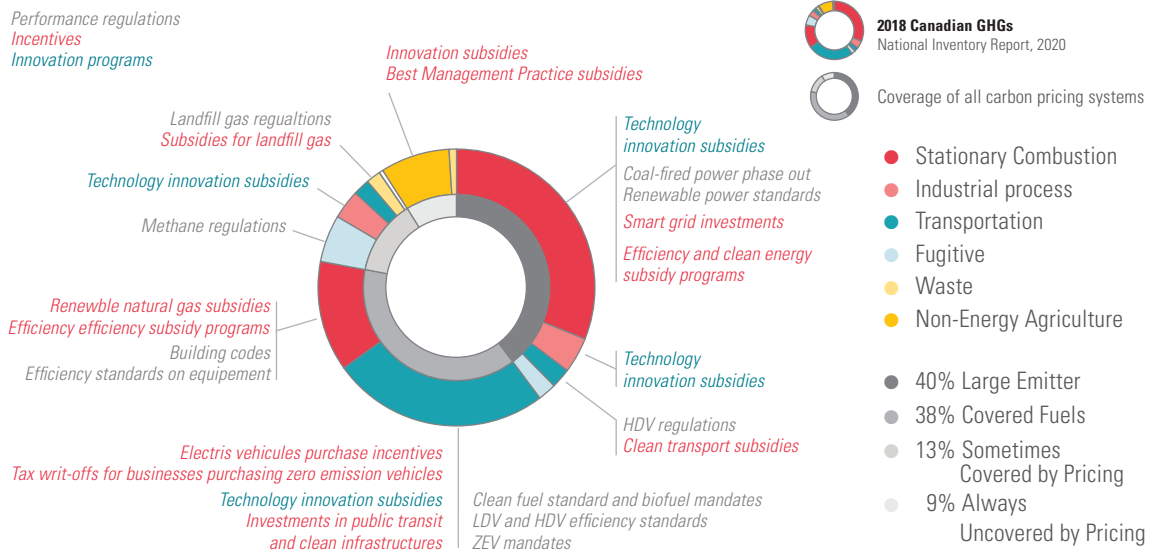


Figure 2. Carbon Pricing Groupings Operating in 2020: five programs exist, covering 78% of 2018 national emissions.

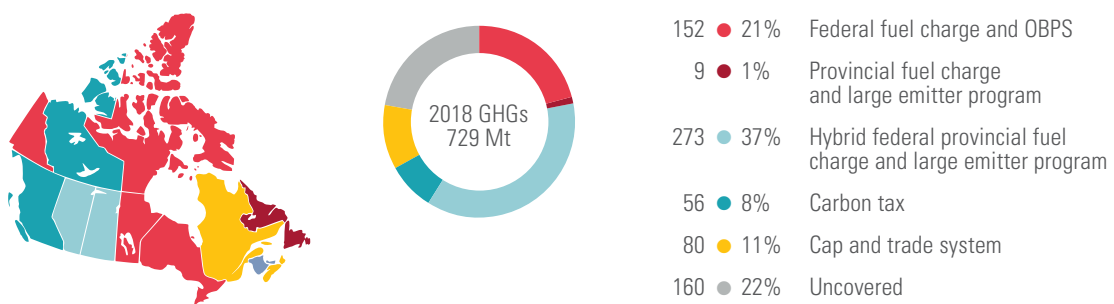


Figure 3. Carbon Pricing for Covered Fuels: covered fuels are 38% of national emissions.

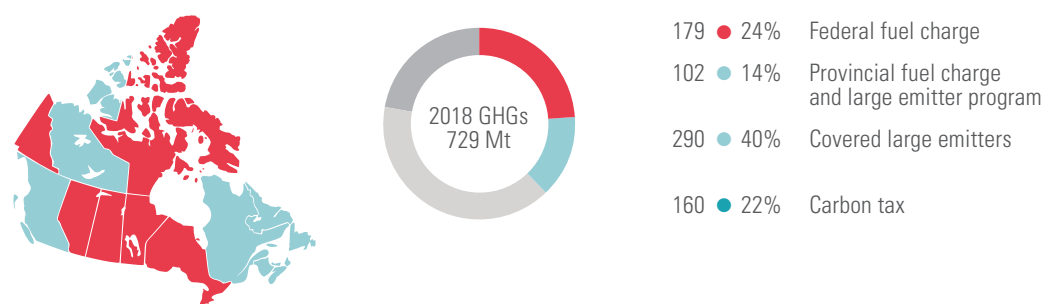
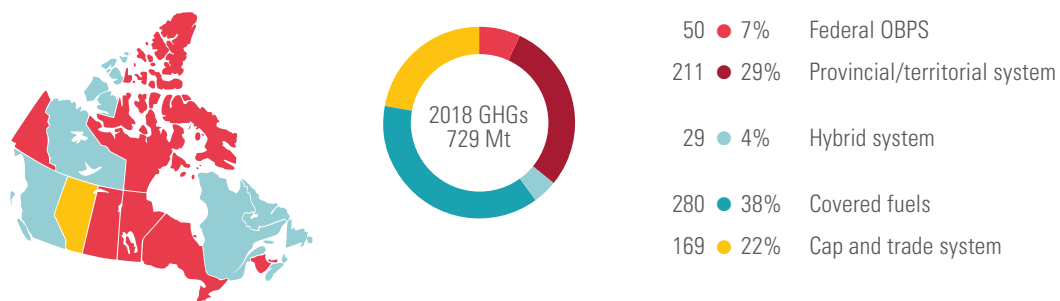


Figure 4. Carbon Pricing for Large Emitters: large emitters are 40% of national emissions.



Source: Sawyer, Stiebert, Gignac, Campney, and Beugin, 2021

to overall cost-effectiveness. If these programs seek broad emissions coverage and implement stringent carbon prices, effectiveness can be assured. One risk identified in the Canadian patchwork, however, is the use of exemptions of emission sources or point-of-sale rebates that mute the carbon price signal to consumers by offsetting the carbon price with the reduction in another tax, for example the excise tax on gasoline. These approaches are typically designed to shield some segments of society or businesses from the financial impact of the carbon price. A better approach adopted by many Canadian carbon pricing programs to address income concerns is to rebate carbon proceeds back to households and businesses in a manner that is unrelated to the quantity of fuel purchased. Notably, the federal carbon tax system rebates 90% of all proceeds collected back to households in the form of a flat income tax rebate on a per capita basis. This flat rebate approach also [addresses tax regressivity issues](#) caused when carbon pricing imposes disproportionately high costs on lower income families.

A broad set of **fiscal incentives** are being implemented by all levels of government in Canada. These range from public transit spending, industrial decarbonization programs, electric vehicle incentives, and subsidies for energy efficiency initiatives such as energy retrofits for buildings. Canada has committed to the phaseout of inefficient fossil fuel subsidies, with some movement by the federal government but there is [still much work to do](#). Provinces still tend to subsidise oil and gas development to promote activity in high cost and more technically challenging areas. **Innovation programs** are being implemented across a broad spectrum of emission sources including in the industrial, transportation and buildings sectors.

FIVE YEARS BEFORE AND AFTER THE PARIS AGREEMENT

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This brief draws special attention to selected developments that took place in Chile over the last 10 years to illustrate the progress on climate policy and support the appraisal of the country's capacity to align with the Paris Agreement mitigation goal.

It does not aim to be comprehensive, as it rather relies on expert judgement from the authors.

CLIMATE POLICY AND CLIMATE DISCOURSE IN CONTEXT

Chile took an important boost and commitment in the fight against climate change, following the adoption of the Kyoto Protocol and the presidency of COP 25. Despite this, the uncertainties associated with the pandemic and social conflicts, together with the usual resistance of the main emitting sectors, mean the risk of not achieving these goals is very significant.

The month of October 2019 and its associated complex political situation eventually led to an agreement to draft a new Constitution. To this end, the 155 members of the constituent assembly who will draft the new Constitution over the next two years were recently elected. Thus, this instrument is expected to open a path to enhance the credibility of institutions, political parties and, in particular, to address the underlying problems of equity and minimum rights present in the Chilean society.

In addition to the above, the COVID-19 pandemic has deeply affected the economic situation and the mood of the country. By the end of this year, Chile will hold a presidential election for the next four-year term.

In the transformational context described above, environmental awareness, climate change, biodiversity, the use of natural resources and energy poverty have become particularly relevant affairs. For example, the first Framework Law on Climate Change¹ is currently being discussed in the Chamber of Deputies and is

¹ <https://leycambioclimatico.cl/leyccchile/>

likely to become a Law of the Republic before the end of the year. On the other hand, the plan for the retirement and/or reconversion of coal-fired units was announced by the end of 2019 as a result of a voluntary yet binding agreement between the private sector and the Government². Recently, in July 2021, the early retirement of other coal-fired plants by 2025 was added to this announcement, adding 1,000 MW to the previously agreed plan³. A specific law for the early phase-out of coal-fired generation plants by 2025 is under discussion in the Senate⁴ as well.

Despite the progress made, Chile continues to be highly dependent on fossil fuels, adding up to 57% of their final energy consumption. In this context, renewable energy has had an unprecedented development since 2015 (See figure on the Evolution of Solar installed capacity in the Addendum).

Furthermore, the first 110 MW concentrated solar power tower plant in LATAM came into operation in Chile this year. Renewable technologies now represent 52% (13,500 out of 26,000 MW) of the total installed capacity of electricity generation in the country. Solar, wind, biomass and mini-hydro power account for 28% (7,300 MW) of installed capacity and have already exceeded 20% of the annual generation. Although renewable energy development has been impressive, it still represents a very low percentage of Chile's estimated potential of 1,800,000 MW⁵ and growing. The country accordingly sees a great opportunity in the future of renewable energy development that creates an exporting trend of these resources.

Also, the energy efficiency law has been enacted, which is expected to reduce energy intensity by 10% at a national level, in addition to producing significant monetary savings and reducing GHG emissions⁶.

In this context, "we should not forget that not only climate change represents a risk factor in accelerating, strengthening, amplifying and multiplying situations of uncertainty, conflict, violence and political crisis in the future, but proposed control and mitigation measures may also generate conditions of instability. Climate risks will be increased by the local conditions of poverty and inequality, but they may be controlled

by means of adequate investments in institutional response and adaptation capacities, which implies structural transformations that strengthens the social fabric, the preparation of the population and governance conditions. On the contrary, the adoption of inappropriate policies may accelerate or even amplify uncertainty and conflict. The current social crisis in Chile is a stark reminder of these two types of enabling conditions that we need to consider." [1].

Although the constituent process is still undergoing its organization stage and that the runners for the presidential office have not yet shown clear leadership, it has been noted that most of the government programs proposed so far have climate change, clean energy and sustainable development as key pillars for the future development of the country. This augurs well for the performance of climate policies and associated efforts in the country.

POLICIES AND ACTIONS: NDC UPDATE

Chile's increased ambition is reflected in the updated NDC, notably reflecting a growing conviction across the board on the need for environmental protection plus the impulse from the Paris Agreement to structure domestic commitments in an international context of progression. Achieving the long-term goals requires setting an adequate allocation of sectoral responsibilities in mitigation and adaptation, and resolving how to make most advantage of the country's renewable potential in end-use sectors such as mining, transportation and commercial/residential.

Chile submitted its INDC to the UNFCCC secretariat in September 2015, which included five pillars: i) mitigation, ii) adaptation, iii) capacity building, iv) development and transfer of technologies; and v) financing. For the mitigation pillar, Chile chose to submit its contribution by employing an emission intensity format (CO₂ equivalent tons per unit of gross domestic product in million (CLP\$ 2011)). The mitigation commitment included all sectors excluding those comprised of land use, land-use change and forestry (LULUCF). The reason for this is that LULUCF is both a net sink of CO₂ emissions and – also due to the high annual variability of their capture and emissions – less dependent on economic growth.

² <https://n9.cl/y6ld>

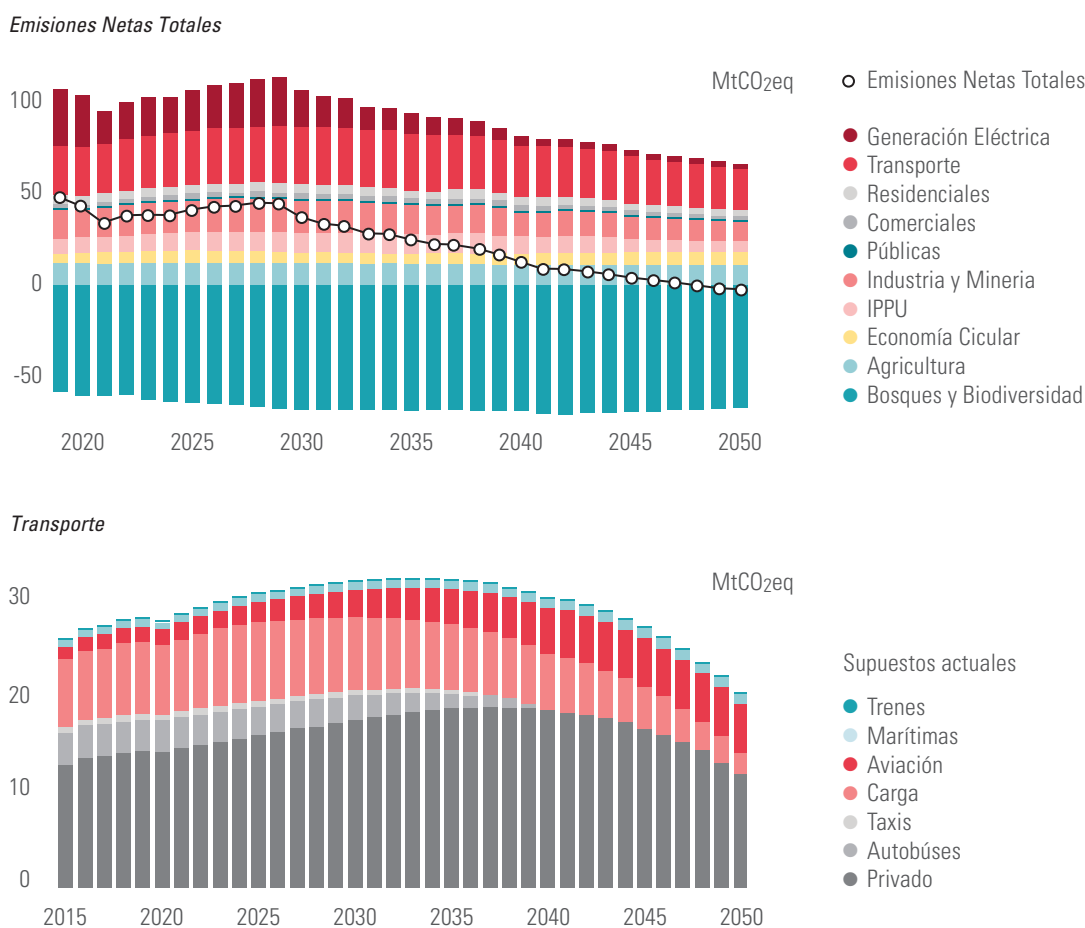
³ <https://n9.cl/vepk3>

⁴ <https://n9.cl/4jemu>

⁵ <https://n9.cl/caha4>

⁶ <https://energia.gob.cl/ley-y-plan-de-eficiencia-energetica>

Figure 1. Options for achieving carbon neutrality by 2050 in Chile under conditions of uncertainty (IADB, 2021).



In April 2020, Chile was one of the first countries to officially submit an updated Paris Agreement target to the UNFCCC⁷. It endorsed a GHG-neutrality target by 2050. Consortiums like The Climate Action Tracker recognizes that Chile has increased its climate ambition. Nevertheless, the rating just moved from “Highly Insufficient” to “Insufficient”⁸.

We believe that the main reason behind the qualitative step forward in the level of ambition is that Chilean society, regardless of the political sector, has a growing conviction towards the need for environmental protection. It is a more empowered society that has managed to stop emblematic projects such as the Hidroaysén hydroelectric dam and nuclear energy in 2010. The issues of air pollution in the capital city of Santiago and the country’s vulnerability to climate change have also

contributed to this awareness. Finally, the Paris Agreement has undoubtedly played a key role in structuring a path to formalize agreements on a domestic basis and transform them into international commitments. The main challenge for the long-term climate strategy is to achieve an adequate allocation of sectoral responsibilities in mitigation and adaptation. Given the significant share of the energy sector in Chile’s national emissions (almost 80%, see section 2), this sector plays a critical role in the climate change mitigation actions. In this sense, the sectors that have been most resistant to change are the mining, transportation and commercial/residential sectors. The following figure shows that these sectors only manage to stabilize their emissions. In the case of transportation, the trend is set by private transportation and aviation⁹.

⁷ <https://n9.cl/b761s>

⁸ <https://climateactiontracker.org/countries/chile/>

⁹ <https://n9.cl/4iu9h>

Private transport electrification in Chile will directly depend on international prices; there is no local industry to set specific conversion targets as in Europe. The determination of standards or fuel taxes become the main instruments to promote this transformation. The possibility to (and authorization to operate) convert internal combustion vehicles into electric vehicles is an option that the authority is currently assessing.

The mining sector has set targets for reducing greenhouse gas emissions, which are based on the electrification of their processes and the future use of hydrogen in their mining trucks (CAEX), however this does not allow for a significant reduction in direct emissions. In the Addendum, a list of commitments and strategies by the sector's main stakeholders can be found.

In Chile, firewood is one of the major energy sources for residential heating and cooking, representing the second most important energy resource in the country (20%) after oil!

There are different initiatives to achieve an actual substitution of firewood as an energy source in households in order to defeat the harmful effects on health caused by its domestic use. Regulating the market and substituting the use of firewood with other energy sources without increasing the cost to the household is a great challenge. Additionally, there are no district heating developments or other clean options that could become a real solution in the south of the country.

The best way to take advantage of these renewable resources in the country is probably a combination of both: substitution via electrification and the use of district heating, together with improvements in the thermal conditioning of housing.

INSTITUTIONAL DEVELOPMENT

Although there is still a long way to go for Chile to have a robust climate change institutional framework, significant progress has been made in the last 10 years. The main concern is not being able to advance at the sufficient pace demanded by climate urgency decisionmaking.

Within the current climate change governance set-up we have the role of the Climate Change Office (CCO) at the Ministry of Environment to keep and

report countries' climate change-related progress to the UNFCCC. This includes the keeping, coordinating and updating of the National Greenhouse Gas Inventory, the Biennial Update Reports and NDC, among others. In order to deliver these commitments, the CCO coordinates with all other relevant government institutions. In this context, the MAPS¹⁰ (Mitigation Action Plans and Scenarios) initiative that has its roots in the Long-Term Mitigation Scenarios Project designed in South Africa between 2005 and 2008 was developed between 2012 and 2015. The project, whose main objective was to develop evidence for decision-making on climate change issues (exploration of possible emission pathways), received the support of 7 ministries and created a participatory process that involved around 150 stakeholders. The project generated a series of tools that served as a basis for future studies and capacity building at the local level. On the other hand, from the governmental point of view, the difficulties in ensuring energy security constituted an essential objective of the work of the newly established Ministry of Energy (2010), which during 2014-2015 developed the long-term energy policy "Energy 2050"¹¹. This strategy, that also involved changes in the law for the electricity auctions mechanisms and transmission planning, and enabled a radical change in the composition of the energy matrix with a spectacular development of wind and solar power plants, taking up more than 20% of the matrix, without government subsidies, and with a fall in electricity prices. In the update, the E2050 incorporates the 2050 carbon neutrality objective. For this purpose, the ministries have working teams and tools at their disposal with which they can develop this type of analysis on an internal basis.

During 2017, the Ministry of Environment (MMA) coordinated a Working Group from the Public Sector focused on discussing the 2020 NDC updates (WGPS-NDC), as required by the Paris Agreement. Additionally, 2018 saw the creation of the new Chilean Ministry of Science, Technology, Knowledge and Innovation. One of the relevant goals for this ministry is to become the source of evidence for the development of robust public policies. Consis-

¹⁰ <https://mapschile.mma.gob.cl/>

¹¹ <https://n9.cl/wkbr5>

tently, a Scientific Advisory Committee on Climate Change (SC) was appointed by this Ministry in April 2019 to coordinate the contributions of the scientific community towards the 2019 United Nations Conference on Climate Change COP25¹². The Committee was formed by seven working groups: two cross-sectional groups- Mitigation and Adaptation-; and five sectorial groups- Water, Biodiversity, Cities, Cryosphere and Oceans. Since its creation, as mentioned in the previous section, the SC – supported by the national scientific community – has provided information for decision-making in different areas, including: sectorial reports, advice for the Framework Law on Climate Change, Climate Observatory, Long-Term Climate Strategy, Seminars and Workshops.

In this context, it is important to highlight the positive evolution of knowledge on the mitigation of GHG emissions across the country. In higher education institutions, most have included the topics of renewable energy, energy efficiency and climate change in their educational curriculum, while in the public sector, the technical teams of the main ministries involved have been strengthened, and new tools have been developed (such as the National Foresight System), among others.

ACTION LANDSCAPE: CHALLENGES AND OPPORTUNITIES

In the context of the current pandemic, climate policy is expected to be pressured into different directions. On one hand, the economic impact on households will exert influence on the management of the transition, its costs and distribution. On the other hand, greater attention will be given to the unique opportunities that Chile has, for instance on decentralized energy solutions and the potential as energy exporter country, to enhance both the recovery and the social condition of country's citizens. Research and innovation will need to be enhanced to support the transformations ahead.

Chile presents great challenges in achieving energy transformation towards sustainability. However, at

the same time, it has a unique opportunities offered by its renewable resources and the growing conviction of its inhabitants to take care of the environment for future generations.

Energy, comfort and income of households

The pandemic has had a strong impact on household resources (economy), where the cost of energy services can reach 17% of the monthly budget. In a country of near 19 million citizens, more than 700 thousand customers have not been able to pay their electricity bills. Furthermore, there are 30 thousand homes with no access to electricity in Chile, while 11% of the families are in the need of hot water services. There is also the need to improve the thermal comfort standards of homes, and reduce the hours of blackouts that today have an average of 12 hours with some places exceeding 22 hours a year¹³. This situation will be included in the social demands that Chile will present in the upcoming months.

We can refer to the recent legal initiative to reduce in 50% the specific tax on automotive gasoline and diesel oil¹⁴ as an example. This is a sign of the current pressure to reduce transportation costs given the economic situation which goes in the opposite direction of being able to reflect about the negative externalities of these fuels.

Decentralized energy solutions

A decentralized energy solution (DES) is characterized by setting the energy production and management facilities close to the location of energy consumption and use. Energy technologies based on decentralized solutions are emerging strongly in the world after a long hegemony of centralized solutions.

DESs include, for example, distributed electricity generation, microgrids, electromobility, prosumers, demand and generation aggregators, demand management, virtual generators, combined heat and power plants, smart heat/cold (e.g., heat pumps and air conditioners), energy efficiency, smart meters, among others. Chile has unique advantages for DES, however, the low penetration that

¹² <https://www.minciencia.gob.cl/comitecientifico/>

¹³ <https://n9.cl/yoeyb>

¹⁴ <https://n9.cl/3q3ge>

these sources have compared to large plants (close to 0.2 GW compared to near 7 GW of installed capacity of solar and wind energy) is not reflecting it yet. Current initiatives to mitigate climate change and the assessment of integrated solutions in the fields of energy, water, food, and health as a result of the pandemic and confinement situation support the existing potential.

Recent studies show that the reduction in transmission costs is capable of offsetting the higher development costs and lower plant factors of distributed generation compared to large-scale generation in many areas of the country [3].

Specifically, the analyses reveal that efficient installation levels would be around 6.22 GW of generation and 14.6 GWh of distributed storage by 2040 in average scenarios, where distributed generation would account for about 40% of the new capacity between 2020 and 2040. These results could even be conservative. The study also quantifies some impacts not captured by the expansion model, particularly in terms of employment, where a positive impact of distributed solutions may also be noticed. The base scenario creates 96,257 direct job-years in the construction stage by 2040, and 231,103 total job-years. This overview makes it essential to define a national strategy for the development of distributed energy resources.

Chile as an energy exporting country

The fact that a scenario for renewable energy exportation from Chile has not been considered by the current available analyses and studies is a limitation. This exportation can be performed by a combination of electricity networks in LATAM (Latin America), production of synthetic fuels (i.e. hydrogen), or the attraction of foreign energy intensive industry to Chile. The economic impact of this type of scenarios should be assessed in new studies.

This context is the basis for the green hydrogen development strategy that was recently proposed by the Government¹⁵. The competitiveness of Chile in renewable energy production and the global need for clean energy carriers will open the door to the creation of an economic sector that could rival the

magnitude of the Chilean mining sector. The proposal is to start by accelerating the deployment of green hydrogen-specific applications to build local supply chains and gain experience. Thus, an industry of green ammonia production and exportation will be carried out through the support of GW-scale consortiums. Offtake and investment commitments for ammonia and hydrogen exports will be secured. In a final step, Chile should exploit synergies and economies of scale to grow as a global supplier of clean fuels. Although hydrogen can be produced in Chile at low cost (1-2 USD/kg), it faces the challenge of being located far from consumption centers for export purposes.

A study is underway to provide in-depth recommendations and a roadmap to establish a comprehensive and well-targeted economic instrument scheme in Chile to catalyze the energy transition needed to comply with Chile's NDC and its carbon-neutrality commitment (Ministry of Energy and World Bank with the support from local consulting teams). The assessment should specially consider the role of carbon pricing instruments in accelerating the growth of a green hydrogen industry in the country. The economic instruments should aim to incorporate climate externalities in fuel and energy carrier markets, by harmonizing existing instruments and recommending new ones. The implementation of this strategy is expected to begin before the end of the year.

In general terms, Latin America (LATAM) has a great renewable energy potential that can play a key role in sustainable development on a global scale. No previous studies have addressed the contribution of LATAM's energy potential in a context of climate change and global economic impact. Preliminary results based on an adapted economic and climate assessment model show that [2]: (i) the export of renewable energy on a global scale and from LATAM to the different regions of the world generates economic benefits for all regions, but is not able to reduce the effects of global warming and, on the contrary, ends up aggravating it; (ii) if renewable energy exports are carried out accompanied by policies that discourage the use of polluting energy sources (e.g. Pigouvian taxes), it is possible to slow down global warming and, in turn, generate significant economic gains for all regions against the case with no exports. (iii) Although all regions benefit from exports,

¹⁵ <https://n9.cl/mfiqa>

LATAM experiences economic gains of around 5 times the global average; (iv) delaying the development of exports reduces economic gains not only in the period of delay, but also in the years following the start of exports. The simulations and sensitivities presented with respect to tax levels and future uncertainties, allow us to argue that exports of renewable energy from LATAM to other regions, together with policies that reduce carbon emissions, give rise to a virtuous scenario that reduces climate change. This exporting vision of LATAM changes the way of thinking about electrical interconnections at a regional level. Thus, it is possible to move away from bilateral cooperation schemes to multilateral objectives that allow us to take advantage of LATAM's great renewable potential.

Attracting foreign energy-intensive industry to Chile is an unexplored possibility. This would avoid facing the costs of transporting hydrogen and its derivatives or the losses and infrastructure to export electricity through electrical grids. For example, circular economy initiatives could position Chile as a center for the recovery of valuable materials. However, these ideas will face criticism for possible environmental impacts. With all of the above, the export of these resources – as is the case of copper resources in Chile – can become a source of income for Chile to address the eradication of energy poverty. To this end, we are discussing the creation of a development model that is not a copy of the oil industry, but rather one that effectively offers an opportunity for the sustainability of the country and its export destinations.

Additionally, this type of strategies will contribute to the positioning of Chile in terms of the cooperation schemes under the Paris Agreement. There is a need to better understand the role of Article 6 in implementing its NDC and whether Chile is going to use cooperative approaches in this context. Recent studies by the World Bank and the International Emissions Trading Association set out that this Article 6 has the potential of substantially reducing the costs of NDC implementation by mid-century, together with reducing global emissions in a relevant portion.

Research and innovation

Science budget today in Chile only amounts to 0.38 percent of the country's GDP, far below the 2.4 percent average investment of OECD countries in this

area, and much further away from others such as Israel and China, where this investment is close to 4 percent¹⁶.

This is still a great challenge when considering facing the energy transformation that Chile is seeking. There is also the need for technical personnel training and a service network that reduces the costs of product development and new solutions.

Energy transformation also requires active participation of the private sector and options for the development of demonstration projects. The removal of market and knowledge barriers would then become feasible.

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¹⁶ <https://n9.cl/tasw6>

ADDENDUM: ADDITIONAL INFORMATION

Evolution of Solar installed capacity

Figure 2 Show developments in solar energy installed capacity.

NDC Update: Additional information

Figure 3 summarizes the current targets according to its enhanced NDC ¹⁷.

In the context of the development of the NDC, data between 2005 and 2016 was obtained from the National GHG Inventory, while 2017 to 2018 are estimates, and those from 2019 to 2050 are the projections of two scenarios. The green and the red areas have been shaded for illustration purposes, and represent the commonly expected uncertainties associated with the projections, which increases the further the time horizon is.

Regarding the level of ambition of the NDC mitigation proposal [1]:

- GHG-neutrality target for Chile by year 2050 is aligned with the climate change agreement reached in Paris (COP 21) and the 1.5 °C target.
- The level of ambition of the updated NDC proposal is clearly higher than the INDC (expressed in the reference scenario from the figure). In fact, under the BAU scenario, current NDC increases annual GHG emissions by year 2030.
- Following the recommendations for the presentation of information on contributions (Katowice Measures) and international trends, the NDC update has integrated absolute targets, the carbon budget and maximum peak per year. Compared with the current NDC, this change is a clear progress in the type of metrics adopted, thus improving the transparency of the commitments and monitoring systems. In addition, specific studies have sought to provide the necessary evidence.
- The mitigation actions studied for the NDC proposal are consistent with GHG-neutrality by year 2050. Nevertheless, these results are highly dependent on LULUCF capture levels (65 MtCO₂eq yearly). This

issue is identified as a relevant uncertainty. For instance, the fires during year 2017 increased Chile's net-emissions in around 50,000 ktCO₂eq.

- Additionally, the voluntary phase-out plan for coal-fired power plants is also a major uncertainty that should be considered, as it is not legally binding. In addition, this transition is associated with the need to coordinately incorporate flexibility resources in electricity systems (reserves for frequency control, expansion of transmission systems, storage systems, demand-side management, among others).
- On the other hand, specific nature-based and non-energy solutions have not been considered in these strategies, so they are described as a great potential and challenge for systematic studies in the near future. To focus on such measures may offset – to some extent – the risks associated with the forestry sector, in addition to their positive impacts on biodiversity and environment in general.
- Moreover, a macroeconomic assessment of scenarios with and without mitigation measures should become a key element in the future methodology that supports Chile's NDC.
- Having a climate observatory has also become relevant. Although the government has begun to structure this initiative, the low budgets allocated are jeopardizing the availability of an efficient system to validate the commitments made and to provide proper evidence for future decisions.

Development in the mining sector

Table 1 summarizes the commitments and strategies proposed¹⁸.

¹⁸ <https://consejominero.cl/areas-de-trabajo/energia-y-cambio-climatico/>

¹⁷ <https://n9.cl/9qf0t>

Figure 2. Evolution of installed solar energy capacity in Chile

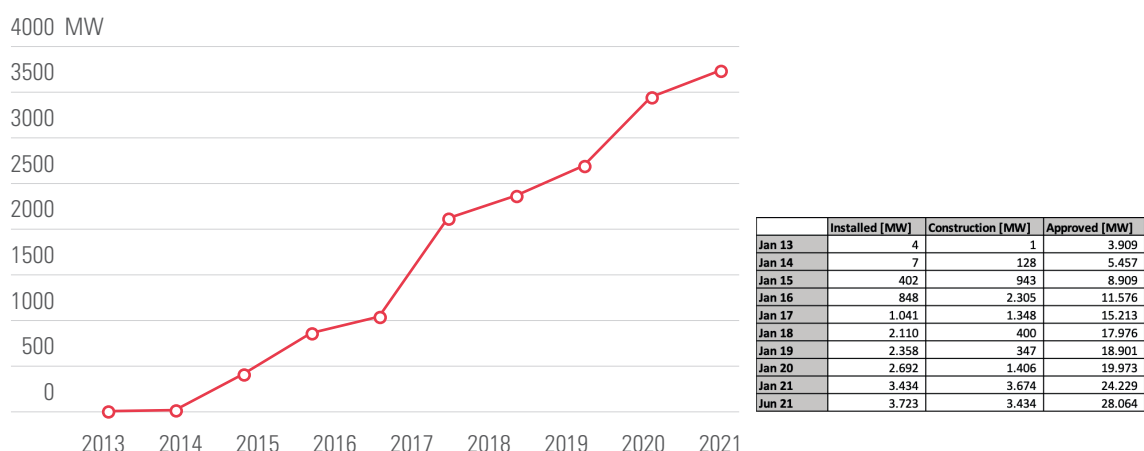


Figure 3. Summary of Chile's updated NDC.

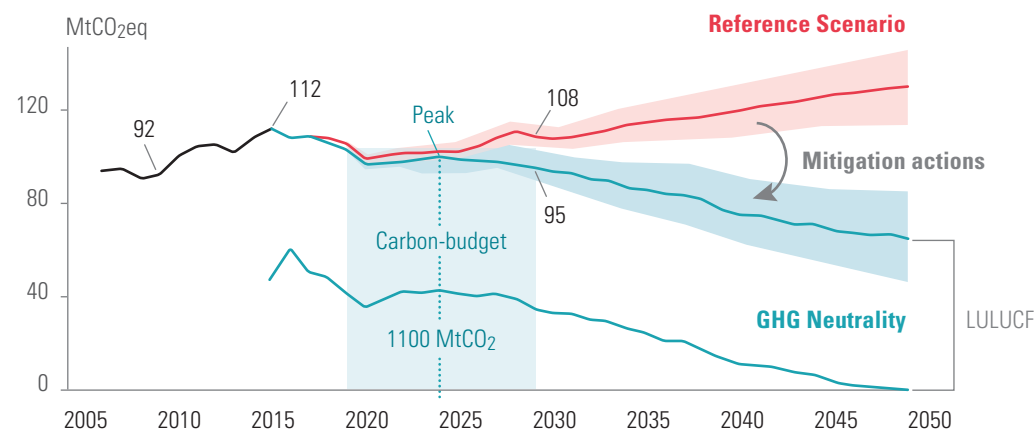


Table 1. Mining sector commitments.

Company	Greenhouse gas emissions reduction target
Anglo American	Overall reduction of 30% by 2030 compared to 2016, and carbon neutrality by 2040, with 8 carbon neutral operations by 2030.
Antofagasta Minerals	Reduction of Scope 1 and 2 emissions by 30% by 2025 compared to 2020, equivalent to 730,000 tons of CO ₂ e, and carbon neutrality by 2050.
Barrick	Overall reduction of 10% or more by 2030 compared to 2019.
BHP	Global reduction of 30% by 2030 against 2020, and carbon neutrality by 2050. As for Chile, 70% of emissions reduction by 2025.
Caserones	Zero Scope 2 emissions from 2021.
Codelco	70% reduction in emissions by 2030 compared to 2019.
Candelaria	Reduction of 80% or more of Scope 2 emissions by 2023.
Collahuasi	Zero Scope 2 emissions from April 2020 and net zero balance of Scope 1 and 2 emissions by 2040. Scope 1 and 2 by 2040.
Freeport McMoRan	As for the Americas, 15% reduction in emissions per copper cathode by 2030 compared to 2018. Zero Scope 2 emissions by 2021.
Glencore	Global reduction of 40% of Scope 1, 2 and 3 emissions by 2035 against 2019, and carbon neutrality by 2050.
KGHM	In Sierra Gorda, 40% reduction of Scope 2 emissions by 2021 and 100% by 2023.
Rio Tinto	Overall reduction of 30% in emissions intensity and 15% in absolute emissions by 2030 compared to 2019, and carbon neutrality by 2050.
Teck	33% reduction in emissions intensity by 2030 compared to 2019, and carbon neutrality by 2050.



A LOCAL STORY ON CLIMATE AMBITION SINCE THE PARIS AGREEMENT

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This article provides a brief overview of developments in China's climate policy over the past five years. Due to the limitations of space and the author's knowledge, it is not possible to provide a comprehensive overview of developments in China's climate policy in this article, and therefore the developments selected in this article reflect only the author's personal assessment.

DOMESTIC DISCOURSE

China's most notable policy development after the Paris Agreement was the announcement of its carbon neutrality target in September 2020 and the update and enhancement of its Nationally determined contribution (NDC) from 'peak emission around 2030' to 'peak emission by 2030'.

In September 2020, China President Xi Jinping, speaking at the general debate of the 75th UN General Assembly, proposed that China would adopt stronger policies and measures to increase its NDC under the Paris Agreement. President Xi announced that China is striving to peak its CO₂ emissions by 2030 and working towards carbon neutrality by 2060. This announcement raises China's climate ambitions under the Paris Agreement in two ways: firstly, it advances the time to reach the peak from "around year 2030" to "before 2030"; secondly, it puts forward the goal of carbon neutrality for the first time. Although the scope of carbon peaking and carbon neutrality was unclear in the early days of the announcement, on 24th July 2021, Mr Xie Zhenhua, China's Special Envoy for Climate Change Affairs, further clarified that China's carbon neutrality target includes not only carbon dioxide, but also CH₄, N₂O and F-gases. Therefore, China's carbon neutrality target is a "climate neutral" target that includes all greenhouse gases. As the IPCC 1.5 degree special report states that in order to achieve the global 1.5 degree temperature rise target, global

CO₂ emissions need to be net zero by around 2050 and all greenhouse gases need to be net zero by around 2070. China's goal of achieving "climate neutrality" by 2060 is therefore consistent with the global 1.5 degree temperature rise target.

There is a lack of public awareness investigation of climate change in China, but a recent Deloitte survey of millennials and Generation Z shows that young Chinese are becoming more aware of global environmental issues such as climate change, which will be crucial in driving future action on climate change in China.

A global survey conducted by Deloitte at the end of 2019 revealed that the top three global challenges of concern to millennials in China are: healthcare, climate change and income inequality, with 39%, 28% and 18% of concerns respectively. The top three global concerns for millennials in all 43 countries are: climate change (28%), crime (22%) and unemployment (21%). Compared to global millennials and Generation Z, Chinese millennials and Generation Z are more positive and optimistic about tackling climate change. In the survey of global millennials, 51% of global millennials believe it is too late to fix the damage of climate change, while only 40% of global millennials are optimistic about taking action to protect the planet. In contrast, only 42% of Chinese Millennials believe it is too late to repair the effects of climate change, while nearly 63% of Chinese Millennials are optimistic about taking action to protect the planet. This contrast is even more pronounced among Chinese and global Generation Z.

The attitude to climate change of Generation Z and the Millennials in China is fundamentally important for China's future climate policy, because they represent 40% of China's population. Millennials in China have following characteristics: well educated, able to surf information sources via the internet, growing up at a time of rising Chinese power, and supporting China's political system in a more confident and positive way. Like millennials across the globe, Chinese youngsters are also more global-minded and more concerned with environmental issues like climate change. The political growth of Chinese millennials is also a major reason why the Chinese government has become more active in its climate change policies.

NATIONAL GOVERNANCE

The Department of Climate Change (DCC) is the main government department in charge of climate change in China. This department was transferred in 2018 from the National Development and Reform Commission (NDRC), which is responsible for economic planning, to the Ministry of Ecology and Environment (MEE), which is responsible for the environment. This transfer has raised concerns about a weakening of climate policy in China, but in fact it has strengthened rather than weakened China's policy action to climate change.

The Department of Climate Change was established in 2008 and is responsible for the formulation, planning and implementation of China's climate policy. The department was formerly part of the National Development and Reform Commission (NDRC). As the main government department that sets China's five-year plans, the NDRC is considered one of the most powerful ministries in China. The integration of climate change functions into the ministry responsible for economic planning is also considered a feature of China's institutional set-up for climate governance. However, in the 2018 institutional reform, the DCC was transferred from the NDRC to the Ministry of Ecology and Environment. This transfer was made to implement the Chinese government's thought of ecological civilisation, and climate change as an important part of ecological issues was then incorporated into the responsibility of the Ministry of Ecology and Environment. As the Ministry of Ecology and Environment is weaker than the NDRC in terms of both political resources and policy coordination, some observers have thus argued that this may lead to a weakening of the importance of China's climate policy. However, the importance of China's climate policy has actually been strengthened rather than weakened by the transfer of the DCC. As the Ministry of Ecology and Environment's main responsibility is ecological and environmental issues, and climate policy is more aligned with ecological and environmental protection objectives, it is easier for climate policy to be agreed first within the department and then to reach the central policy-making level. Whereas when the Climate Department was part of the

NDRC, climate policy was often difficult to agree within the department because it conflicted with objectives such as energy security and economic development. The transfer of the DCC from the NDRC to the MEE effectively marks a more independent climate policy.

Climate change has become a priority policy agenda for the Chinese government, and to strengthen the implementation of carbon peaking and carbon neutrality targets, a leading group on new carbon peaking and carbon neutrality has been established at the central level, and similar bodies are being set up by local governments.

After the announcement of climate neutrality target, climate change has been listed as a top policy priority for China. This can be proved by following evidence: firstly, President Xi Jinping has reiterated China's carbon peaking and carbon neutrality targets more than 20 times in different venues. Secondly, climate change was listed as the key topic in several highest level economic work meetings, such as the Central Economic Work Conference and the Central Finance and Economic Commission meeting. In those meetings, the carbon neutrality target was described as "a major test of the ability to govern the country". Furthermore, those meetings have set up an accountability system for "improving the supervision and evaluation mechanism" and attribute the responsibility to "all levels of government and party committees". Therefore, the achievement of carbon neutrality have been allocated to responsibility of local governors and linked to their political promotion.

To coordinate the actions to achieve the carbon peaking and carbon neutrality, China also set up a new leading group on carbon peaking and carbon neutrality in May 2021. The central government ask the NDRC to host the office of this leading group due to its strong capacity of coordination. However the CCD and MEE are still the focal point on climate change. It is still not clear at this stage how the NDRC and MEE divide work among themselves. Corresponding to the central government's leading group, different provinces and municipalities have also set up carbon peaking and carbon neutrality leading groups, with the provincial governors and municipal mayors acting as group leaders and specifically responsible for the development

and implementation of the province's carbon peaking and carbon neutrality plans. The Leadership Group is a unique governance mechanism in China, which involves the inclusion of different government departments in the Group to form a regular coordination mechanism, usually chaired by the Chief Executive, to deploy resources to fulfil the Group's responsibilities. As climate change involves a number of sectors such as energy, transport, buildings and industry, which are often fragmented, there is a need to establish a co-ordination mechanism through the leading group to co-ordinate actions across sectors.

The significant reduction in the cost of emission reduction technologies, such as renewable energy, is an important technological driver for carbon neutrality targets. At the same time, both domestic and international pressures are pushing China's energy-intensive industries to transition to carbon neutrality, with even more ambitious carbon neutrality targets than the national target.

In 2008, China's National Development and Reform Commission (NDRC) first approved four photovoltaic power projects at an approved tariff of RMB 4/kWh, which was the first time that a PV feed-in tariff was explicitly proposed in China. And on April 2nd, 2020, the National Development and Reform Commission released the PV feed-in tariff for 2020, with a guideline tariff of RMB 0.35, 0.4 and 0.49 per kWh for centralised PV power plants in I-III resource zones. From 2008 to 2021, the PV feed-in tariff was decreased by over 91%. In most provinces, PV feed-in tariffs are already lower than coal feed-in tariffs. The feed-in tariff for wind power has also fallen significantly over the same period, with the feed-in tariff for Class I resource areas falling from 0.51 RMB/kWh in 2009 to 0.29 RMB/kWh in 2020, a 43% drop. The significant reduction in the cost of renewable energy generation is an important technological driver of China's commitment to peak carbon and carbon neutrality. Because one of the central government's key concerns is the price of electricity and energy costs, which is an important policy consideration for the government to control CPI and protect manufacturing competitiveness. When renewable energy costs are lower than coal, the government can create a win-win situation between carbon neutrality and economic

goals, therefore a much stronger incentive to move to carbon neutrality.

Following the announcement of China's carbon neutrality target, some Chinese energy-intensive companies have also set targets for achieving carbon peaking and carbon neutrality. For example, National Energy Group and State Power Investment have proposed to achieve carbon peaking by 2023, 7 years earlier than national target; while Baowu Steel and Sinopec have proposed to achieve carbon neutrality by 2050, ten years earlier than national target. The pressure to reduce emissions in these energy-intensive sectors comes from two combining sources: on the one hand, these sectors will be included in the domestic carbon market in the near future. The domestic pressure to reduce emissions is driving these high energy-consuming enterprises to advance on their carbon reduction targets. In addition, some of the high energy consuming companies are also facing international competition and increasingly stringent emission requirements internationally. For example, Baowu Steel is China's and the world's largest steel company, producing over 100 million tonnes of steel annually. Baowu Steel announced in January 2021 that it targets to achieve peak emissions by 2023, a 30% reduction by 2035 and carbon neutrality by 2050. In explaining its motivation for achieving carbon neutrality ten years earlier, Baowu Steel cited the fact that other international steel companies have set 2050 as the target date for achieving carbon neutrality and the requirements of EU customers for product emissions as important factors for their decision making.

ACTIONS AND POLICIES

China's 14th Five-Year Plan for economic development, adopted on 11th March 2021, will provide fundamental direction for China's development over the period 2021-2025 and also sets important targets for China on climate change, including the introduction of total carbon emission controls in the 14th Five-Year Plan period.

The Five-Year Plan is China's most important policy tool, on which national ministries and local government will base their specific sectoral and local plans, including China's first five-year plan dedicated to ad-

ressing climate change, currently being developed under the leadership of the Ministry of Ecology and Environment. In the 14th Five Year plan, China plans to reduce CO₂ emissions per unit of GDP by 18 per cent by 2025. At the same time, the '14th Five-Year Plan' also clearly states that the share of non-fossil energy in energy consumption should be increased to about 20% by 2025. The '14th Five-Year Plan' also states that local governments, key industries and enterprises that are in a position to do so should be encouraged to take the lead in reaching emission as soon as possible. In addition, this plan also emphasises the importance of climate adaptation, and will strengthen the observation and assessment of the impact of global warming on vulnerable areas of China.

China is also likely to implement total carbon emission control during the 14th Five-Year Plan. The 14th Five year plan clearly states that it will "implement the 2030 nationally determined contribution to addressing climate change, and formulate an action plan to achieve carbon emissions peaking by 2030. Improve the dual control of total energy consumption and energy intensity, with a focus on controlling fossil energy consumption. Implement a system that focuses on carbon intensity control, supplemented by total carbon emission control". The Ministry of Ecology and Environment also announced on 19 March that it would "actively promote the development of an action plan to achieve CO₂ emissions peaking by 2030, and promote the implementation of policy tools such as total carbon emission control." One of the highlights of the 14th Five-Year Plan is therefore the development of a dual control system for carbon emissions intensity and total emissions, and the subsequent 14th Five-Year Plan for Energy and 14th Five-Year Plan for Climate Change will specifically refine the control system and targets for total energy and total carbon emissions. In addition, the control of total fossil fuels also provides "double guarantee" for the control of total carbon emissions, because once the target for the control of total fossil fuels is set, it is also equivalent to indirectly setting the target for total carbon emissions.

China will undertake policy actions for carbon peaking and carbon neutrality in ten key areas, including energy, industry, buildings, trans-

port, circular economy, technology innovation, green finance, incentive policies, carbon markets and carbon pricing, and nature-based solutions.

To implement the carbon peak and carbon neutral targets, China will take policy measures and actions to accelerate transformation and innovation in ten areas. In the energy sector, the main focus will be on optimising the energy mix and controlling and reducing coal consumption. "During the 14th Five-Year Plan period, China will strictly control the growth of coal consumption and gradually reduce it during the 15th Five-Year Plan period. China will develop nuclear power, hydropower, wind power, solar energy, biomass, ocean energy, geothermal energy and green hydrogen energy. China has announced that by 2030, it will have installed wind and solar photovoltaic power generation capacity of 1.2 billion kW, build a new power system with new energy sources as the mainstay, promote industrial electric mobility and improve energy efficiency. In the industrial sector, it will mainly promote industrial and industrial optimisation and upgrading. It will curb the development of energy-intensive and emission-intensive industries, promote the optimisation and upgrading of traditional industries, develop information technology, high-tech equipment, new materials, biology, new energy, energy conservation and environmental protection and other strategic new industries, and strive to build a highly efficient, clean, low-carbon and circular green manufacturing system. In the building sector, it will promote energy-efficient and low-carbon buildings and low-carbon facilities. Accelerate the development of ultra-low energy, net-zero energy and low-carbon buildings, encourage the development of assembly-type buildings and green building materials, implement green and low-carbon concepts in all aspects of infrastructure construction and operation management, and build low-carbon intelligent cities and green villages. In transportation sector, China will build a green and low-carbon transport system. It will optimise the transport structure, promote the priority development of public transport and develop clean, zero-emission vehicles such as electric hydrogen fuel cells.

In the field of circular economy, China will improve the efficiency of resource use, strengthen legislation,

adhere to the extended production responsibility system, and encourage the promotion of remanufacturing. In the field of science and technology, China will promote green and low-carbon technological innovation. It will research and develop technologies such as renewable energy, smart grids, energy storage, green hydrogen energy, electric and hydrogen-fuelled vehicles, carbon capture and storage technologies. In the area of green finance, China will expand financial support and investment, establish and improve a green financial system, support financial institutions in issuing green bonds, innovate green financial products and services, and actively promote the construction of a green "Belt and Road Initiatives". China will strengthen incentive policies and further introduce economic policies and reform measures. It will improve fiscal, tax, price and other incentive economic policies to guide the flow of capital and technology to green and low-carbon areas. In the area of carbon markets, China will gradually expand the coverage of the market and enrich the varieties and trading methods. Finally China will implement nature-based solutions. It will actively promote action and cooperation in this area, promote afforestation to protect natural ecosystems, and also continue to promote initiatives for international cooperation in related areas with the United Nations and relevant countries.

China has officially started the operation of its national carbon market in July 2021 and will gradually include other energy-intensive sectors in the future to become the largest carbon market operating in the world.

On July 16th, the national carbon market was officially launched, and the first compliance cycle of the national carbon market included more than 2,000 key emitters in the power generation industry, covering about 4.5 billion tonnes of carbon dioxide emissions annually. Since its launch, the national carbon market has been actively trading, with a steady rise in trading prices and smooth market operation. As of July 23rd, the total turnover of carbon emission allowances in the national carbon market was more than 4.8 million tons, with a total turnover of nearly 250 million yuan. The carbon price is about 50 RMB/tCO₂.

Other energy-intensive industries will be included in the national carbon market in the future. In con-

junction with the preparation of the national emissions inventory, China has organised data accounting, reporting and verification for emission intensive industries such as iron and steel, cement, aviation, petrochemicals, chemicals, non-ferrous and paper, and has a relatively solid data base in these industries. The Ministry of Ecology and Environment has commissioned relevant industry associations to study and propose emission benchmarks and standards that meet the requirements of the national carbon market, which will further expand the scope of industries covered by the carbon market and give full play to the important role of the market mechanism in controlling greenhouse gas emissions, promoting green and low-carbon technological innovation and guiding climate investment and financing.

A SMALL COUNTRY WITH BIG AMBITIONS

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Costa Rica has an extensive tradition of nature protection and leadership to fight climate change. Its existing policies led to almost 100% renewable electricity^[1] and forest coverage of approximately 60%^[2]. We summarize here the efforts made over the last years in climate policy which resulted in its National Decarbonization Plan (NDP)^[3] and National Determined Contributions (NDCs) compatible with a 1.5°C pathway^[4]. We try to be comprehensive in the description, but we also recognise that it relies on expert judgement from the authors.

DOMESTIC DISCOURSE

Costa Rica's leadership in climate action has translated into public awareness on climate change. However, bigger steps are needed to translate awareness into an earnest social dialogue.

Climate change in Costa Rica has been an important subject since the 1980s, when a massive reforestation process started. In fact, it could be argued that it even initiated around 1950, when the main electricity company was created by law and mandated to ensure electricity production for the country using mainly renewable sources^[5]. This resulted in protected territories that correspond to more than 25% of Costa Rica, a forest coverage close to 60%, and a now close to 100% renewable electricity mix^[6].

Costa Rica's legacy in nature protection is still ingrained in the idiosyncrasy of its people. In a 2021 survey, almost three out of four people who live in Costa Rica (72%) said that climate change is extremely or very important to them. For 82% of the people who answered the survey, climate change should be a high or very high priority for the government^[7]. Climate action is expected and celebrated by the people who live in Costa Rica, and it is a center point of discussion during election season amongst candidates. While some of them argue the importance of cutting emissions by 2030 via investments in public and non-motorized transport and support to enable the electrification of transport targeting a net-zero economy by around mid-century, others suggest ex-

exploitation of petroleum and natural gas in the country as local transition fuels towards decarbonization. The country must pursue sustainable solutions avoiding carbon lock-in.

While people's awareness is high, the subject has not been in daily conversations. In fact, in the same 2021 survey, only 29% of people said that they talk about the issue frequently with their social circles. Furthermore, the strategies to tackle climate change seem abstract for many; 47% of surveyed people said they need more information on how to avoid climate change^[7]. In a positive manner, people living in Costa Rica are willing to take personal actions to tackle climate change (i.e. most people are willing to take steps such as recycling or using public transportation and 40% have stopped buying a product because of its negative impact to the planet), but they do not participate in climate actions in social and political instances (e.g., meetings, public calls, or organizations)^[7].

Climate change concerns and the need to fight its effects are still encapsulated in the personal sphere of Costa Rica's people, and it does not broadly transcend to social and democratic spaces. Fortunately, population involvement in the climate movement is rising. There has been an upsurge of societal organizations concerned about climate change such as the Costa Rican Youth and Climate Change Network and social mobilisations for improved public transportation and urban planning. There has also been societal participation in important climate processes like the NDC update and long-term strategy formulation and the development of recent plans have always involved civil society.

Climate change is now a protagonist of the narrative of policy-making and long-term strategies formulation in Costa Rica among stakeholders.

Climate change is currently accounted for in existing policies. The National Adaptation Plan 2018-2030 (NAP)^[8] and the NDP^[3] are clear examples of this. The former supports and guides the adaptation of cities, and the latter presents the long-term vision to reach net-zero emissions by 2050. The NDP has been communicated as the country's long-term low-level GHG strategy, in accordance with Article 4 of the Paris Agreement. There are ongoing activities to produce the National Strategic Plan 2050 (NSP) which will

present a roadmap to a 3D economy (digitized, decentralized and decarbonized) by 2050. The NSP is linked to the NDP and it considers the United Nation Sustainable Development Goals.

The creation of climate policy in the country has been based upon a co-creation principle. Ministries, organizations, civil society and technical experts (national and international) have been part of the multiple workshops used to design the NAP, NDP, and the same approach is currently being used in the creation of the NSP. To bring some numbers up, the formulation of key aspects within the NAP and the NDP considered over 500 participants (in total) from different sectors. Costa Rica also believes in science-based policy. These policies, and many other policy-making processes, have also been supported by modelling tools which have also been co-created in participatory processes with key policy-makers and stakeholders of the country. In fact, the policy actions in the NDP, particularly those in the transport and energy sectors, were based on a modeling tool that was produced in-house by a modeling team hosted at a local university^{[6],[9]}.

An increased awareness and optimism on climate action has been visible in the agricultural sector, where groups of coffee and cattle farmers have taken part in the design and implementation of mitigation actions. A big incentive to do so, as they have expressed, are the co-benefits in production of implementing sustainable practices.

Users have also taken part in the design of deployment strategies of electric vehicles and electric industrial boilers, thousands have installed solar systems for water heating or electricity production purposes, and a few have purchased an electric vehicle.

In addition, the COVID-19 pandemic has increased awareness in the country about the harsh socio-economic impacts of climate change on Costa Rican households and business. The immediate priority for the Costa Rican government is stopping the health crisis, attending its social impacts, and restarting the economy. The good news is that there are opportunities to recover in a way that addresses many of the pre-COVID-19 social, environmental, political, and economic challenges in Costa Rica. It is paramount that decision-makers consider a green post-COVID-19 recovery that not only tackles the catastrophic health crisis, but that it also creates jobs and fiscal opportunities for a sustainable economic growth.

NATIONAL GOVERNANCE

Climate governance has been crucial in the success of developing climate policy.

About a decade ago, in 2010, the Directorate of Climate Change (DCC) was created and mandated to lead and coordinate between ministries the design of climate policy. DCC has pushed for creating policies based on science and with support from many multilateral organizations. In 2012, DCC created the Carbon-Neutrality Country Program to help organizations, communities, and civil society joining the ambition to decarbonize the country^[13]. The program considers five categories: organizations, schools, products, events, and cantonal. To recognise the efforts made by actors within any category, DCC makes a public announcement. The program has involved over 200 organizations, 21 municipalities (representing 38% of the national territory), and 2 districts. The social benefit of the program is estimated at \$45 million. Since its creation, the program has reduced or compensated the equivalent of almost 631 TCO₂ and has removed about 450 TCO₂.

In 2015, DCC led the formulation of previous NDCs to cut emissions according to a 2°C pathway. In parallel, it conceived a long-term energy planning tool to formulate a roadmap of the sector in line with low emissions trajectories. Non-energy sectors were also studied but with lower levels of detail. From 2018 to 2020, the country developed in-house tools to study the decarbonization roadmap of the entire economy. A crucial step towards GHG emissions mitigation in Costa Rica was the announcement of the NDP in 2019. Its creation has led to multiple and coordinated efforts to enable the transition towards a green economy in all sectors. In a recent study, it was shown that the transformation promoted in the NDP to reach net-zero greenhouse gas (GHG) emissions by mid-century will bring a net economic benefit estimated at US\$41 billion between 2020 and 2050^[11]. The NDP was also used as a baseline for the updating process of the NDC^[4].

In 2020, Costa Rica used modeling tools that technically support the updated NDC. The use of tools to inform policy has become commonplace. The creation of an open data repository has supported this^[10]. Through a decree, the government is promoting the creation and use of common open data to study dif-

ferent aspects of climate change. It is expected that SINAMECC^[10] will become the source of data to modeling tools and the interface between modelers and policymakers through dynamic and easy-to-understand visualizations. SINAMECC is also anticipated to work as an open access monitor of the advances in policy-making, goals, climate actions, and climate data to all the population.

The government also introduced the Territorial Economic Strategy during the first months of 2021^[12]. This, alongside the NSP, will trace the route for Costa Rica to have a 3D economy by 2050. This strategy spots the potential of specific regions of the country, and the link between economic development in each of them and decarbonization.

ACTIONS AND POLICIES

Climate change is now part of wide-ranging plans and climate actions aiming to decarbonize Costa Rica's economy, while maximising the benefits of this transition.

Climate change has traditionally been in the government agenda; although it has taken greater relevance in recent years. Incentives to low emissions vehicles have been in place since 1997. Changes were constantly made through decrees until 2018 when the law 9518 was officialised^[14]. It officially cuts taxes to electric vehicles for a period of five years and enforces the development of charging infrastructure to support the transition. Electromobility in Costa Rica will benefit from its renewable electricity system. The law was a catalyst to the creation of the National Plan of Electric Transport^[15]; a plan aligned to the National Energy Plan^[1]. The National Energy Plan represents the country's roadmap to promote the transition to a greater participation of renewables in the energy mix, as well as the modernization of energy systems along with energy efficiency measures.

The advances in electric transport policy led to an important deployment of charging stations. There are over 100 charging points in the country and an order to install 43 fast chargers in the next few years. This is expected to kick-start the adoption of electric vehicles in the country, as the charging points will be strategically located to make trips by electric vehicles around the country possible^[16]. Public banks have also

improved their credit options to ease electric vehicles acquisition. Public institutions such as the post office, electricity distributors, transport regulators and public universities have also started the electrification of their vehicle fleet. Most recently, the German Government donated three electric buses that are currently used in the first pilot project in public transportation. The low-carbon livestock strategy drives the transformation in the agricultural sector^[17]. It strives for stimulating livestock farming as a profitable and low-carbon activity by implementing training to farmers, promoting research in the sector, and deploying practices such as improved pasture management, silvopastoral systems, use of concentrates, among others. This strategy works alongside an already designed and presented Nationally Appropriate Mitigation Action (NAMA) for the sector, which is already being implemented in more than 100 farms in the country^[18]. Its implementation is expected to not only reduce emissions, but also increase productivity and reduce operational costs bringing benefits to farmers. The country also introduced the world's first agricultural NAMA: Costa Rica's coffee NAMA^[19]. The goal is to reduce GHG emissions and improve the efficiency of the activity through an improved use of fertilizers, a more efficient use of energy and water in coffee production, financing to farmers and research. Costa Rica's coffee NAMA reports a total of 8972 trained coffee producers, 24770 acres of coffee using sustainable practices and a mitigation of 71763 TCO₂e. One of the reasons for the success of this action are the co-benefits that farmers experienced from its implementation; it is a mitigation strategy, but a promising marketing strategy and beneficial practice for the farmers as well. There are ongoing efforts to extend the NAMAs to other agricultural activities such as sugar cane crops, as well as to other sectors such as waste. In terms of the waste sector, the country expects to treat 100% of its wastewaters by 2045, according to its National Wastewater Sanitation Policy^[20], which includes an investment plan for sewerage and treatment plants as well^[21]. In the same sector, the government launched in 2021 the Integral Waste Management Plan, and local governments have been leading recycling campaigns to promote the circular economy in solid waste.

Costa Rica plans to continue with its legacy of nature protection and forest restoration. In 2020, the govern-

ment announced a program aiming to restore land in the north part of the country by planting 200 thousand trees. The project will include secondary forest restoration, frutal trees plantations and the promotion of agroforestry systems, and will generate 200 direct jobs^[22]. Since the country was awarded with resources from the Green Climate Fund, these are planned to strengthen and extend the Payment for Environmental Services Program in rural and indigenous land, which has been working since 1996. These are projects that go beyond carbon capture, and tackle issues such as green job generation, air quality, and conservation. Costa Rica's economy has advantages to face the transformation towards decarbonization. There are challenges to be overcome, but its ambitions are greater.

Costa Rica's historical investment in natural capital and its renewable electricity mix give the country an upperhand to jump-start a transformation towards a decarbonized economy. There will be challenges including the fiscal impact that lower fossil fuel sales will cause in the income of the government. Public transport needs to be modernized and fully electrified. Waste management needs to be truly considered to make the most of its co-benefits. Investments to enable non-motorized transport will be paramount; bike and pedestrian pathways in the country are limited, mainly due to a growing deployment of private vehicles in the early 2000s. Costa Rica's success regarding GHG mitigation in the coming years will depend on its ability to revert these infrastructure lags, and relocate investments into low and zero-carbon mobility options.

People's willingness to have a better future however surpasses the barriers. Most of the presidential options for 2022 elections are also aware of the climate change needs. Costa Ricans' past experiences show that the country is willing to take ambitious steps towards climate change. The country launched the National Decarbonization Plan which proves that a green economy is more beneficial than the traditional approach. Costa Rica is a small country, about 0.5% of Europe; however, its ambition is as big, or even bigger, and its people will make the needed actions to enable a better future to upcoming generations.

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CLIMATE AMBITION

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ON DOMESTIC DISCOURSE

At this moment, a vast majority of Europeans (78%) perceives climate change as a *very serious problem*¹. In the latest special Eurobarometer, *climate change* (18%) has been identified for the first time by European citizens as the single most serious problem facing the world, ahead of both (17%) *poverty, hunger, lack of drinking water* and the *spread of infectious diseases*. Doing so, despite the ongoing pandemic, highlights the **growing concern of European citizens regarding an issue that steadily ranked higher in terms of priority over the years following the Paris Agreement**². However, conducting an analysis at national level reveals that there are still some important disparities between Member States. For instance, in some Northern countries, over a quarter of respondents are likely to mention climate change as the most serious problem whereas less than one in a ten respondents are likely to do so in Southeastern Europe. To address these divergences of opinion, Ursula von der Leyen presented on December 2019 a new growth strategy aiming to drive a just and inclusive transition for all while making Europe the first climate-neutral continent by 2050: the *European Green Deal*. The climate neutrality objective by 2050 was first mentioned by the European Commission in a communication released in November 2018³, following

¹ [Eurobarometer \(europa.eu\)](https://ec.europa.eu/eurobarometer/eurobarometer).

² Climate change was ranked fourth in 2015, third in 2017 and second in 2019. However, the comparison with the 2021 results should be made with caution as three new answers items were introduced in the survey published in 2021.

³ [EUR-Lex - 52018DC0773 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/reg/2018/1315/oj)

the IPCC report issued a month earlier. However, as the Juncker's Commission was entering the last effective months of its mandate, no regulatory initiative has been formally taken. For its part, a few months prior to the European election of May 2019, the European Parliament issued a resolution⁴ endorsing it. Consequently, **the European election acted as a catalyst for the blooming of the Green Deal**. Due to its critical size, the *European Union* (49%)⁵ was (and still is⁶) identified by its citizens, alongside *national governments* (55%) and *business and industry* (51%), as one of the main actors responsible for tackling climate change. Coinciding with the European voting, the occurrence of climate mobilizations played a major role and raised both the visibility and the stakes of the election. Following the example of Greta Thunberg, protests spread all over Europe, especially among the youngest generation. As a result, the overall turnout rose by 8 points to reach 50.66%. Within the younger generations, participation drastically increased: by 14 points for under 25 years old (42%) and by 12 points for the 25-39 category (47%). Additionally, behind *economy and growth*, *climate change* was acknowledged by respondents who took part in the ballot as their second reason for voting⁷, building up the *momentum* for Member States, the European institutions and the private sector to fully play their part.

In the wake of the Green Deal announcement, the European Council endorsed⁸ a wording supporting climate neutrality. However, despite the climate emergency, the fact that the conclusions explicitly mentioned that "*One Member State could not commit to implement this objective at this stage*" illustrates the difficulty to reach a unanimous resolution (in this case, due to the Polish government's position). Among the other institutions, the European Investment Bank adopted a renewed Energy Landing Policy in 2019 in order to phase out the financing of unabated fossil fuel energy projects as well as a Climate Roadmap to align all financing activities with the goals of the Paris Agreement.

In addition, the European Central Bank pledged to factor climate change into its monetary policy strategy starting 2022. Indubitably, these announcements contributed to shake at least part of the decision-makers of the European business and industry sector, particularly among some major polluters too often protected by their national governments. As an illustration, five European oil and gas companies (Shell, Total, BP, Equinor, Repsol) have so far committed to be net-zero by 2050 (by all direct emissions) while none of their international counterparts did yet. However, the IEA recently reported⁹, that "Majors" oil companies (such as BP, Total or Shell) only account for 12.3% of the world reserves while National Oil Companies (Saudi Aramco, Rosneft, National Iranian Oil...) own 56%, highlighting the magnitude of the change required¹⁰. Moreover, as often, the devil is in the details. For instance, the net-zero pledges made by Shell, while applying to direct emissions (production, refining and processing fossil fuels), do not fully cover the emissions created by its consumers (scope 3). As for Total, the scope 3 is entirely covered but only for the use of its products across Europe, meaning that it is excluded from its worldwide operations. Similarly, BP's pledge regarding the scope 3 *de facto* only concerns 60% of its oil production. Moreover, none of the aforementioned companies has formerly given up the possibility of approving new extraction projects as they intend to rely on ambitious reforestation and carbon capture storage scenario rather than decreasing their emissions. Unfortunately, bad habits are always hard to break. According to estimates made by Reuters¹¹, investments in renewables will remain way lower than those on fossil fuels for the 2021-2025 period whether it is for BP (\$30.6B vs. \$58.4B), Shell (\$15B vs. \$99.5B) or Total (\$12B vs. \$58B). Moreover, oil and gas companies also remain active behind the scene to safeguard their polluting business model. From January 2020 to May 2021, gas lobbyists held 323 meetings at governmental levels to ensure that gas will be acknowledged as a "transitional activity" under the European taxonomy

4 [Texts adopted - Climate change - Thursday, 14 March 2019 \(europa.eu\)](#)

5 [Eurobarometer on climate change 2019](#) published one month prior to the European Parliament election.

6 In the 2021 climate change Eurobarometer, national governments (63%), business and industry (58%) and the EU (57%) remain the main actors perceived as responsible for tackling climate change.

7 [en-post-election-survey-2019-report.pdf \(europa.eu\)](#).

8 [European Council conclusions, 12 December 2019 \(europa.eu\)](#).

9 <https://www.iea.org/reports/the-oil-and-gas-industry-in-energy-transitions>

10 "Independents" such as Repsol and "International" Oil Companies like Equinor respectively accounting for 22% and 9.7%.

11 [Big Oil back to boom after pandemic bust, aiding climate push | Reuters](#)

regulation which is about 9.5% more than from the January 2018 to July 2020 period¹². In addition, oil and gas companies are trying to loosen emission threshold required for hydrogen production to be qualified as “low carbon” by accepting either blending or carbon capture system. Not only would this delay the transition to green hydrogen¹³, but this would also allow oil companies not to devote their investments to renewables and energy efficiency and to continue their fossil fuels operations for a very long period. **Even though we can witness a better recognition of climate change and sustainability issues by the historical major polluters, the European Union will have to increase the regulatory pressure in order to deliver carbon neutrality through its fair Green Deal.**

EUROPEAN AND NATIONAL GOVERNANCE

Formerly Vice-President in charge of Better Regulation, Inter-Institutional Relations, Rule of Law and the Charter of Fundamental Rights within the Juncker's Commission, Frans Timmermans is an experienced and well-established European politician. In that regard, he was appointed as **European Commission Executive Vice-President for the European Green Deal in charge to deliver and implement the new sustainable and growth strategy**. In order of protocol, the Commissioner comes right after Ursula von der Leyen. The Vice-President for the European Green Deal thus coordinates the work of six other commissioners (Energy, Transport, Health and Food Safety, Environment, Oceans and Fisheries, Agriculture, Cohesion and Reforms) to ensure a cross-cutting approach regarding the proposals and reforms that need to be carried out in time such as the *European Climate Law*. Published on July 9 2021, **the European Climate Law set up a reduction target of 55% of greenhouse gas emissions by 2030 and enshrines the EU's binding objective of reaching climate neutrality by 2050**. To meet these objectives and

ensure that everybody moves in the right direction the EU has set up several safeguards.

On one hand, a **European Scientific Advisory Board on Climate Change** will be created in order to provide independent scientific advice to help policymakers reach the climate goals and align EU policies accordingly. Annual reports will be issued by fifteen independent experts that will be appointed by the European Environmental Agency for a four year mandate. Monitoring the ongoing progress will also help complement the provisions of the 2018 Governance Regulation that requires EU Member States to develop medium (NECPs) and long-term planning instruments. In concrete terms, the expected update of the NECPs by the end of June 2024 will highly benefit, among other scientific data (IPCC's report released on 9 August 2021, State of the Energy Union...), from the latest recommendations of the newly created body.

On the other hand, to **enhance the participation of civil society and foster social acceptance**, the European Commission launched various initiatives such as the **Climate Pact**. As it intends to gather and connect people so that they can learn about climate change, share knowledge, and elaborate scale up solutions altogether, this initiative was severely impacted by the COVID pandemic. However, the Pact's ambition to discuss about greening transports, buildings or skills at local level should be an important tool to ensure that beyond the elections, citizens remain involved. At a higher level, the **Conference on the Future of Europe**¹⁴ offers the possibility to either make or react to proposals on four main topics including climate change, environment and health. The results will be submitted afterwards to a panel of 200 randomly selected European citizens in charge of making political recommendations aimed at the institutions. However, the success of such an initiative will mainly depend on whether or not the European institutions take over the proposals and bring their ideas to life.

Infringement procedures also play a crucial role, as Member States are sometimes late or even reluctant when it comes to implementing and applying EU law, especially when the chosen EU instrument

¹² [Out with Science, In with Lobbyists: Gas, Nuclear and the EU Taxonomy - Reclaim Finance](#)

¹³ See In focus: Hydrogen – driving the green revolution | European Commission (europea.eu) that gives a definition of the different colours that are often linked with hydrogen.

¹⁴ [BP_210616_ConferenceAvenirEurope_Verger-Couteau_EN.pdf \(institutdelors.eu\)](#)

is a directive. Therefore, the choice of the regulation directly applicable to all addressees without a transposition into national law should always be the preferred approach to ensure a level playing field. During the 2017-2020 period¹⁵, the European Commission opened 4.046 new infringement cases. A fifth of those were related to either environment (657¹⁶) or energy (252¹⁷). In 2020, out of the 1.786 cases that remained open, 444 were related to environment (highest number of any policy area) and 186 to energy. This trend is also reflected when we take a closer look at new delayed transposition cases (156 cases out of 599) or new EU pilot cases (49 out of 212) for the year 2020 where environment is again the main incriminated policy area. These important figures demonstrate that, despite ambitious domestic discourse, Member States are far from being faultless as they sometimes even choose to actively delay the implementation of EU climate policy. While progress has been made, law enforcement still is difficult within the EU. As it stands, 50 “green” breaches remained unresolved despite a ruling by the European Court of Justice. The permanence of this behavior from Member States may, in the long run, jeopardize the implementation of the Green Deal. The latter heavily relies on all sectors playing their role and on cooperation of all parts of the society.

Now that carbon neutrality is legally binding, judges could become key players in the fight against climate change. In that regard, civil society could also play a bigger role in the future thanks to the new agreement recently reached on the Aarhus Regulation widening the scope of decisions that can be brought into court for breaching environmental laws. Climate litigation directed towards national governments such as in Belgium, Germany or France or against private companies like in Netherlands could flourish. However, regarding the latter decision, the willingness expressed by Shell to appeal the Dutch Court ruling on climate goals shows that private companies will use all the legal means to delay profound changes in their business model. Time remains money for them.

¹⁵ [2020-annual-report-eulaw_en.pdf \(europa.eu\)](#)

¹⁶ 369 were related to non-communication, 259 to non-conformity/incorrect application and 29 to regulations, treaties, decisions.

¹⁷ 125 were related to non-communication, 99 to non-conformity/incorrect application and 28 to regulations, treaties, decisions.

ACTIONS AND POLICIES

On 14 July 2021, the Commission presented the *FitFor55*, a legislative package aiming at revising and updating the EU climate legislation to reduce EU GHG emissions by 55% by 2030. As all sectors will have to contribute, quantified targets were proposed to measure progress over time. This method was initially set up in 2007 with the 20-20-20 Package¹⁸. While following the same pattern, the **FitFor55 intends to draw conclusion from the 2020 package to design targets that better suits the possibilities offered by each sectoral regulation.**

Beyond initial expectations, EU27 GHG were reduced by 24% between 1990 and 2019¹⁹. Depicted as the cornerstone of the EU climate policy, the EU Emission Trading System (ETS) played a major role in that regard as actual emissions from stationary sources (power generation and industry) have declined by around 35% between 2005 and 2019²⁰ and even dropped by 9.1% between 2018 and 2019. Following regulatory reforms (such as the Market Stability Reserve in 2018) the EU carbon price of allowances increased in the last few years and recently started to become relevant enough to trigger change (€50/tCO₂ as of today)²¹. The ETS accelerated the phase-out of coal power plants that were replaced by renewables but also by natural gas power plants: since 2013, hard coal and lignite power emissions have fallen by 58% while gas power emissions increased by 23%²². In its current shape, the revamped ETS would have been able to deliver -51% emissions reduction in 2030. While the initial target was -43%, the FitFor55 aims to raise it at a -61% by 2030. Even though some analysts argue that the carbon price could be at €100/tCO₂ by 2030, the Commission adopts a more conservative hypothesis with a price per t/CO₂ being between €45-€70 from 2026 to 2030 and between €50-€85 in 2030. Such a scenario implies that the Commission expects the shift from coal to gas to carry on at the actual pace while relying on other sectors to take over to reduce

¹⁸ By 2020, cut GHG from 1990 by 20%, have 20% of EU energy coming from renewable and 20% improvement in energy efficiency.

¹⁹ [Progress made in cutting emissions | Climate Action \(europa.eu\)](#)

²⁰ 2021 ETS Impact Assessment.

²¹ [JDI-E3G-paper_innovation-in-the-ETS_final.pdf \(institutdelors.eu\)](#) see figure 2 p.4.

²² [Gas power plants overtook lignite in 2020 to become Europe's #1 power sector emitter - Ember \(ember-climate.org\)](#)

emissions by the additional 10%. The inclusion of the maritime sector is more than welcome (it emits around 4% of all EU CO₂ emissions), but creating an adjacent ETS to the heating and the transport sectors appears to bring little added value. It would indeed require a higher carbon price (more than €100/tCO₂) to drive changes while having little impact on CO₂ emissions reduction. Finally, given the revised objectives, industry will have to take a greater share of the collective burden. It is worrying that industrial emissions have stagnated and only dropped by 1% between 2012 and 2018²³. As the price is expected to grow, the carbon border adjustment mechanism will help prevent the risk of carbon leakage. However, as it stands, the current proposal gives too much room for maneuver to industry through free allocation of emissions allowances²⁴ as their phasing out will only start in 2025 and ends in 2036. Negotiation will have to focus on ending free allocation earlier since 90% of industrial carbon pollution currently does not carry any cost for the polluting companies²⁵ while the remaining costs were passed onto consumers.

Electricity demand in the EU is now close to pre COVID levels and part of the power generation coming from fossil fuels has been replaced by renewables²⁶, resulting in emissions being 12% lower. In the medium to long term, ETS price will help deploy renewable electricity sources²⁷. Given that the EU barely achieved the 20% renewable target in 2020, the FitFor55 proposed several sectoral binding targets such as in heating and cooling (an annual 1.1% increase for Member States) or in the transport sector. **However, the EC did not pursue its logic up to the end by not committing to binding targets at national level, which could hinder the RES deployment in some Member States that are either reluctant or lack financial capacity.**

Defined within the Governance Regulation that entered into force in December 2018²⁸, the energy ef-

iciency first principle is the cheapest way to reduce CO₂ emissions. As it was not made binding for Member States at the time, the 20% target, was not met by 2020²⁹ which should have acted as a stronger warning for the EC. Modeling scenario from the Commission shows that a 3% gap should be expected regarding the 32.5% energy efficiency target by 2030. To address that gap the FitFor55 not only reviewed to -39% the primary energy consumption and to -36% the final energy consumption but also required countries to establish measures to cut their final energy consumption by 1.5% every year starting 2024. Paradoxically and sadly, Member States had been more willing in 2007 than in 2020 regarding national binding targets. **Member States might have to step up on that file and take responsibility if they want to maintain the Green Deal's credibility.** Hence, in spite of the checks made by the Commission within the Governance Regulation, there remain many disparities between Member States' respective NECPs³⁰ commitments. Relying on the goodwill of the Member States will not be a recipe for success. This could just call for more judiciary interventions at national level as now witnessed.

Unfortunately, Member States see too often the EU as a provider of public funding for the transition. The more binding the EU objectives are, the more the EU should provide the money. Many financial instruments have been set up in the last decade, more and more oriented towards the climate objectives such as the Funds dedicated to the Just Transition, the Innovation or Modernization of infrastructures whose endowment will be increase. This is a slow process as the projects to be financed are not spontaneously climate compliant. To initiate a complete paradigm shift, the EU also established minimum thresholds that must be allocated towards the fight against climate change such as within the NextGenerationEU budget (30%), or the Recovery and Resilience Facility (37%). The EC also proposed the creation of a Social Climate Fund to support the transition for vulnerable households to ensure a fair transition.

Finally, talking about credibility also implies to avoid *greenwashing*. In that regard, the taxonomy regula-

²³ [The EU Emission Trading System – carbon pricing as an important tool to achieve the objectives of the Green Deal - Carbon Market Watch](#)

²⁴ [Official Journal C 302/2021 \(europa.eu\)](#)

²⁵ [The EU Emission Trading System – carbon pricing as an important tool to achieve the objectives of the Green Deal - Carbon Market Watch](#)

²⁶ [European Electricity Review: H1-2021 - Ember \(ember-climate.org\)](#)

²⁷ [European Union 2020 – Analysis - IEA, p.292.](#)

²⁸ [EUR-Lex - 32018R1999 - EN - EUR-Lex \(europa.eu\)](#)

²⁹ Only 9 MS were on track in 2019 to meet the 20% target.

³⁰ [NECP Tracker reveals: the EU needs better plans to implement the enhanced climate and energy targets – UNIFY \(caneurope.org\)](#)

tion that aims to define what belongs to the “green investment” category should also be mentioned as the accelerator of the European transition as it will allow to earmark private investments towards cleaner products. Unfortunately, lobbying from business circles and some Member States may hinder the effectiveness of a proposal that could, on paper, be a game changer. **Short termism and fossil fuels vested interests remain the main obstacles to the completion of the European Green Deal objectives.**

CLIMATE AMBITION SINCE THE PARIS AGREEMENT

Nicolas Berghmans, IDDR1

This brief exposes selected developments that took place in France since 2015 which illustrate the progress made in climate policy and the overall alignment of the country to the Paris agreement mitigation goal.

AN INCREASED FOCUS ON CLIMATE IN THE DOMESTIC DISCOURSE.

Since 2015, Climate has become more important in the domestic policy debate in France. To some extent, this derives from the role France played in the run up of the Paris agreement and hosting the COP21. A strong consensus emerged across the political spectrum to contribute to preserve and reinforce the acquis of the Paris agreement, seen as a major achievement of the French diplomacy. The French government illustrated this by actively inciting the EU and foreign countries to ratify the Paris Agreement, proposing a strong political response to the US withdrawal announcement in 2017 and launching several high-level political summits on the environment called the One Planet Summits.

The aftermath of the Paris agreement saw and increased public awareness on climate¹, changes in the political discussions and stakeholders' narrative integrating climate to a greater extent. The debate focuses now on whether France is doing enough on climate and how domestic decarbonization can be accelerated in conjunction with social justice.

At the domestic level, climate change did not break through as an important topic of the 2017 presidential election; however, the public perception on the impor-

¹ Recent studies show this has not been reversed by the Covid-19 crisis. Ademe, BOY Daniel, RCB Conseil (2020) Rapport. Les représentations sociales de l'effet de serre et du changement climatique, 40 p. Available at www.ademe.fr/mediatheque

tance of climate change clearly increased over the few following years. In a regular poll produced by Ademe², 15 % of French citizens cited environment as the most important issue faced today by France, three times more than in 2015. Among the environmental issues, climate change was cited as the first one by 34 % of the respondents. This increase was already noticeable in 2016 and 2017 following the hosting of COP21; however, it clearly accelerated between 2018 and 2019 in conjunction with the wave of climate mobilisation in Europe. The resignation in September 2018 of the environment ministry Nicolas Hulot, a well-known environmental activist, also contributed to diffuse in the public the idea that the government was not doing enough on climate at the domestic level. At the end of 2018, the Yellow Jackets protest movement initiated on a refusal of a carbon tax increase perceived as unfair. It led to a long period of public debate over 2019 and 2020 on how to combine the ecological transition with social justice³ and the creation of an innovative policy experiment, the Citizen's Convention on Climate (CCC). The convention's organization contributed to keep climate policy under the spotlight and ended up with a large amount of proposals on climate policies⁴.

During this period, French stakeholders also included climate largely in their priorities and activities. The French business community vocally supported the Paris Agreement and organised a common initiative to communicate their climate pledges⁵ with 99 companies among the biggest in France participating. They tend to support climate policy as a way to position the economic activity on innovative industries to increase the competitiveness of the French economy and frequently ask for carbon trade adjustments for productions from countries with less ambition on climate. Trade unions also integrated climate in their narrative and recommendations on several occasions

by promoting common solutions for a just transition in partnerships with environmental organisations⁶. On top of these initiatives and supporting the climate strikes movement, environmental organisations concentrated their action on increasing the public authorities' accountability on climate, first by proposing a framework to assess regularly the progress on climate action⁷ and then by starting a climate litigation action against the French state⁸ that gathered the support of more than 2 million signatories.

The rise of climate in the domestic political discussion also influenced national political parties. The 2019 European election seeing all major parties referring to climate in their political platform and major gains for the Green party was a pivotal moment. Then, during 2020 municipal elections, an unprecedented number of mayors were elected on an Ecologist platform. Overall, the political debate in France is not whether climate should be a public policy topic but rather on the kind of climate policy that should be implemented and whether the government is doing enough to address climate change. On one-side, ecologist and leftist parties promote stricter governance mechanisms for enforcing climate objectives regulatory instruments and the inclusion of a redistributive agenda linked to climate policy, while the centre political majority in government promote an ecology based on solution and right-wing parties support climate innovation and oppose most regulations. Finally, from the outset of the Covid-19 crisis, the need for a recovery plan with a strong green component has been central in the French policy debate. Several contributions from Think tanks⁹, Business leaders¹⁰ or NGOs and Unions¹¹ highlighted the multiple co-benefits of investing in the ecological transition¹². In addi-

² Ademe, BOY Daniel, RCB Conseil (2020) Rapport. Les représentations sociales de l'effet de serre et du changement climatique, 40 p. Available at www.ademe.fr/mediatheque

³ See Saujot M. et al (2019) After the carbon tax freeze, what are the priorities for the French ecological transition?, Iddri Policy Brief n°2019 : <https://www.iddri.org/en/publications-and-events/policy-brief/after-carbon-tax-freeze-what-are-priorities-french-ecological>

⁴ See Saujot M. et al. (2020) The Citizens' Climate Convention: 149 measures for a new vision of the transition, Iddri Study n°7/2020 : <https://www.iddri.org/en/publications-and-events/study/citizens-climate-convention-149-measures-new-vision-transition>

⁵ See French business climate pledge (2019) <https://www.medef92.fr/uploads/media/node/0001/20/9e52f6c8203a85aeaeef8d2aa11000e8da2f9292.pdf>

⁶ See Pacte du pouvoir de vivre <https://www.pactedupouvoirdevivre.fr/> or <https://plus-jamais.org/>

⁷ Observatoire climat-énergie : <https://www.observatoire-climat-energie.fr/>

⁸ L'affaire du siècle : <https://laffairedu siecle.net/>

⁹ I4CE (2020) Relance, comment financer l'action climat https://www.i4ce.org/wp-core/wp-content/uploads/2020/07/I4CE-Relance_FinancementActionClimat-52p-2.pdf

¹⁰ https://www.lemonde.fr/idees/article/2020/05/03/mettons-l-environnement-au-c-ur-de-la-reprise-economique_6038523_3232.html

¹¹ See for example, Le Pacte du Pouvoir de vivre (2020) Les 15 mesures indispensables pour le pouvoir de vivre dès la fin du confinement <https://www.pactedupouvoirdevivre.fr/wp-content/uploads/2020/05/DOSSIER-DE-PRESSE-OK-15mesures.pdf> et

¹² Terra Nova and I4CE (2020) C-bénéfices environnementaux et sanitaires de l'action publique: it's (also the economy, stupid ! https://tnova.fr/system/contents/files/000/002/013/original/Terra-Nova_Cycle-Covid19_Co-b_n_fices-environnementaux-et-sanitaires-de-laction-publique_070520.pdf?1588781732

tion, the Citizen's Convention on Climate¹³, which was ongoing when the Covid-19 crisis hit, produced a special contribution to the economic recovery including 50 proposals from its work in April 2020¹⁴. All these contributions showed that greening the recovery was a priority among many different stakeholders and laid the ground for an ambitious uptake by policymakers.

EVOLUTION NATIONAL GOVERNANCE

The past five years have seen climate change being elevated to the highest political level. Noticeable evolutions include the regular organization of interministerial environmental security councils¹⁵, the creation of the High Council for Climate, the adoption of a new climate neutral target for 2050 and two climate laws and the organization of a Citizen's Convention on Climate.

The energy transition law voted in 2015 laid the foundation of the French climate governance system by making it mandatory to produce every five years a 2050 decarbonization strategy linked to a prescriptive framework of action including the definition of carbon budgets for the next 15 years and the definition of an operational energy plan for the next 10 years. The long-term strategy and carbon budgets cover territorial ghg emissions from all sources including land-Use, land-use change and forestry (LULUCF) and agriculture. All these planning documents must be revised every five years. The last cycle due to be finalized in 2018 was extended until the end 2019 but saw some positive evolutions. First, the learnings from the new IPCC report on the 1.5°C¹⁶ have been reflected at the domestic level with the adoption of an updated 2050-climate neutrality target instead of a pre-existing – 75 % ghg emissions target. Sec-

ond, an extensive consultation with stakeholders took place during the process, including a public debate on the 10-year energy plan¹⁷. This led to produce a first comprehensive roadmap of the French economy towards achieving the Paris agreement goals that also recommended accelerating the decrease in fossil fuel consumption to reach – 40 % by 2030. During the process, major points of controversy appeared, among them the respective share of bioenergy and renewable electricity in the energy mix and the inclusion of biodiversity in the definition of the decarbonization strategy. These controversies are still very much in the debate and could trigger significant revisions during the next cycle. The need for a more regular evaluation of climate policy performance and overall progress on climate performance became also apparent. It led to the creation at the end of 2018 of a new independent body, the High Council for Climate (HCC), charged with issuing advice and recommendations to the French government on climate performance of policies and measures and provide independent insight on government climate policy. Modelled after the example of the UK Climate Change committee, the HCC is formed by 13 members selected according to their scientific expertise. Since its creation, its productions serve as a reference for the public debate on climate policy. Finally, it has also been decided that the main objectives of the next 10-year energy plan due in 2023 will be debated and voted in parliament in collaboration with the HCC, which will increase its political clout. All of these changes were included in a Climate and energy law voted in 2019.

In the aftermath of the Yellow vest protest movement and the French carbon tax freeze¹⁸, the French government decided to organize an innovative democratic experiment. It consists in mandating a panel of 150 randomly selected French citizens, representative of the French population, to select and propose policy measures to achieve the French 2030 climate objective in a spirit of social justice¹⁹. During eight months, they learned about climate change from experts, then deliberated, and proposed to the French government

¹³ The CCC is an innovative policy process launched in October 2019 involving 150 randomly selected citizens to propose measures to reach the French 2030 climate target in a spirit of social justice. To learn more : <https://www.conventioncitoyennepourleclimat.fr/en/>

¹⁴ Convention citoyenne pour le climat (2020) Contribution de la CCC au plan de sortie de crise <https://www.conventioncitoyennepourleclimat.fr/wp-content/uploads/2020/04/Contribution-de-la-CCC-au-plan-de-sortie-de-crise-1.pdf>

¹⁵ See : <https://www.elysee.fr/emmanuel-macron/conseil-de-defense-ecologique>

¹⁶ IPCC (2018) Special Report: Global Warming of 1.5 °C : <https://www.ipcc.ch/sr15/>

¹⁷ See : <https://cpdp.debatpublic.fr/cdpdp-ppe/index.html>

¹⁸ Following yellow vest demonstrations, the French carbon tax was frozen at 44.6 €/tCO₂ while its level was previously supposed to raise every year to reach 56 €/tCO₂ in 2020 and 100 €/tCO₂ in 2030.

¹⁹ To learn more about the French Citizen's Convention on Climate see: <https://www.conventioncitoyennepourleclimat.fr/en/>

149 measures to be implemented related to all relevant sectors (transport, buildings, food, production and consumption) to accelerate climate action in France. It led to the adoption in parliament of a climate and resilience law in 2021, the second climate law voted in two years, aimed at translating some of the citizen's proposals in law. The citizen's convention on climate also proposed to include the fight against climate change in the French constitution leading to a policy debate on whether a referendum should be organised on the topic, however the proposal was then blocked in the Parliament. Overall, the organization of the CCC can be seen positively because it proved that citizen's, when left with time and information about climate, tend to support ambitious measures on climate and measures that are generally supported by the general public.²⁰ It also help putting in the public debate measures not applied or included in the current climate policy-mix such as regulating advertisement, aviation line restrictions and speed limit on highways²¹. It is still to be seen if other citizen's convention will be organised again on climate or other policy areas but several governmental communication suggest this could be the case.

ACTIONS AND POLICIES

French recovery measures brought additional funds to climate mitigation actions

French economy, as all major economies, has been severely hit by the Covid-19 crisis with a -8.3 % Gdp recession in 2020. France played an active role in setting up an European recovery plan²² and, in line with stakeholder's recommendations, made environment one of the three key priorities, with competitiveness and cohesion of its "France relance" plan, earmarking 30 out of the 100 bn euros to environmental and climate actions. The main priorities where additional

public funds are proposed are building energy retrofitting, transport infrastructure, a new hydrogen plan and low carbon innovation especially related with aviation greening. This is an important achievement because most of the initiatives correspond to areas where climate progress has been too slow until now. However, the extent to which the recovery plan contributes to climate objectives heavily depends on existing and future sectoral regulation and policy changes, such as building renovation support and incentives for clean car purchase and freight transport modal shifts. **By providing additional climate funding in sectors where emissions reduction has been lagging, the French recovery plans have so far contributed to climate mitigation, however its ability to put France on track to achieve its 2030 and 2050 climate objective is uncertain and depends on additional policy changes.**

An occasion to adjust the sectoral regulations took place with the Climate & Resilience law, following the CCC final recommendations published in June 2020²³. However during the writing of the law, several citizen's proposal were delayed or have been cutback, lowering their climate ambition. Several studies showed that there is still a significant gap to reach the -40 % GHG target, even after taking into account the additional measures brought by the new law. This is illustrated by an impact assessment²⁴ commissioned by the Environment Ministry showed that out of the 107 MtCO₂ necessary emissions reduction between 2018 and 2030 to reach the national 2030-climate target, only 21 MtCO₂ are likely to be achieved with existing measures. The same impact assessment estimated that 29 MtCO₂ are difficult to achieve with existing measures whereas 57 MtCO₂ can be achieved if existing or new measures are implemented voluntarily. **The Climate and resilience law is therefore a step in a good direction but still insufficient to put France on track to reach its 2030 climate objective that** will need to be reinforced in line with the new EU climate objective of -55% ghg emissions by 2030.

²⁰ See Adrien Fabre & Bénédicte Apouey & Thomas Douenne & Louis-Gaëtan Giraudet & Jean-François Laslier & Antonin Macé (2020) "Convention Citoyenne pour le Climat : Les citoyens de la Convention comparés à des échantillons représentatifs de la population française. Note de travail," PSE Working Papers

²¹ Saujot M. et al. (2020) The Citizens' Climate Convention: 149 measures for a new vision of the transition, Iddri Study n°7/2020 : <https://www.iddri.org/en/publications-and-events/study/citizens-climate-convention-149-measures-new-vision-transition>

²² Initiative franco-allemande pour la relance européenne face à la crise du coronavirus : <https://www.elysee.fr/admin/upload/default/0001/07/d4fe338244d28de018c5bf0c538c83c337285d0e.pdf>

²³ Convention Citoyenne pour le Climat (2021) Rapport final : <https://propositions.conventioncitoyennepourleclimat.fr/le-rapport-final/>

²⁴ See for instance MTES (2021) Evaluation climat des mesures du quinquennat : https://www.ecologie.gouv.fr/sites/default/files/2021_03_01.Etude_BCG_Evaluation.climat.des_mesures_du_quinquennat.pdf or Carbone 4 (2021) L'Etat français se donne-t-il les moyens de son ambition climat ? : <http://www.carbone4.com/wp-content/uploads/2021/03/LEtat-franc%CC%A7ais-se-donne-t-il-les-moyens-de-son-ambition-climat.pdf>



CLIMATE AMBITION

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This short summary of Hungarian climate policy aims to give a brief overview on how the domestic climate action has shifted into a higher gear in the last couple of years, however its aim is not to provide a comprehensive overview, but to show the rise of ambition. The summary was compiled by the colleagues of the Hungarian think tank, [Green Policy Center](#); Fanni Nyíró and Tibor Schaffhauser.

ON DOMESTIC DISCOURSE

Even though the perception of the seriousness of climate change is below the EU average in the country, the majority Hungarians consider it as a very serious problem. This general opinion is rather underestimated by politics, especially since the COVID-19 pandemic.

Climate change is among the most severe problems facing the world according to Hungarians, a Eurobarometer report¹ reveals. In 2021, 81% of them considered the issue as very serious (the EU average is 79%). However, it is not the most serious one – according to the report, only 8% of the Hungarian people believe that climate change is the most severe issue which is below the EU average (18%). Nonetheless, two thirds of the people stated to have recently taken action to fight climate change, and 96% of them agree with the EU becoming climate-neutral by 2050. Moreover, 71% of Hungarians believe that the government is not doing enough to tackle climate change, according to the report. In 2019 before the COVID-19 pandemic, when people's take on the seriousness of climate change hit its peak across the EU, the issue was considered

¹ https://ec.europa.eu/clima/sites/default/files/support/docs/hu_climate_2021_en.pdf

as the second most severe in Hungary². Hungarian people were also affected by the IPCC special report of 1.5 degrees Celsius and consequently the wave of global movements. Young locals have created the Hungarian branches of Fridays for Future and Extinction Rebellion and alongside many smaller demonstrations they organised the largest Hungarian climate strike in the fall of 2019 where thousands have participated across the country³. Traditional NGOs have mobilised - and some reformed - themselves as well, which resulted in a more intense cooperation in the green civil sphere. As green issues became more important to Hungarian people, political parties started to reflect on climate change as well. While climate change became a priority among some opposition parties in 2019, the governing party's communication took some turns over the past few years on the issue. They made several statements on being sceptical about the green movements both on a domestic and international scale and at first vetoed the EU's 2050 carbon neutrality plans⁴ before adopting it at the end of 2019. However eventually both the Government's communication and actions have taken a turn and green issues are being taken more seriously than before. Meanwhile there is an urgent need for the inclusion and dialogue of stakeholders from different sectors in decision-making. The ever-growing gap between civil organisations and the government can eventually backfire on the efficiency of domestic climate action.

Despite all, fighting climate change does not play a significant role when it comes to voting. With the approach of the general elections in 2022, the issue is rarely mentioned by the parties, regardless of their ideology. However, citizens are only vaguely – if at all – informed on how the parties are willing to handle the problem, even though according to the above-mentioned Eurobarometer reports, they are concerned about it. Thus, including climate issues to the public discourse in a less simplified way would be crucial for the efficiency of the Government's climate action.

NATIONAL GOVERNANCE

Based on new policy documents, strategies and organisational structure, Hungary has elevated the topic of climate change which was also underlined through the adoption of a climate law adopting a 2050 climate neutrality target.

Since there is no dedicated ministry of environment in Hungary, climate change topics within the national administration have received a higher recognition with the formation of the current government in 2018, when climate and energy policies were merged under one state secretariat within the newly formed Ministry for Innovation and Technology under the leadership of Mr Péter Kaderják, an internationally renowned energy expert. This was a long-expected step, since the Hungarian public has become more and more climate-conscious in the last couple of years as discussed earlier. This move has made better coordination possible among energy, climate, and transport topics. During the new set-up, several important strategic documents and policies have been adopted, such as the Second National Climate Change Strategy⁵, the new National Energy Strategy⁶ or the National Energy and Climate Plan (NECP)⁷. Later in the beginning of 2021 the portfolio of the state secretariat has been extended to cover the topic circular economy under the leadership of Mr Attila Steiner. In the meantime, a dedicated department for climate diplomacy has also been set up within the Ministry of Foreign Affairs and Trade (MFAT) to support international climate policy. The MFAT has also set out to organise the Planet Budapest 2021 Sustainability Expo and Summit⁸; a sustainable development event for the Visegrád Countries between November 29 and December 5, 2021. Climate change has been also a top priority for the head of state of Hungary, Mr János Áder, by organising a dedicated Directorate for Environmental Sustainability of the Office of the President and setting up the Blue Planet Foundation⁹. The Foundation's goals are to support environmental education, research, and green start-ups in the country.

² https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2019_en.pdf

³ <https://hungarytoday.hu/climate-strike-budapest-draws-thousands/>

⁴ <https://www.forbes.com/sites/davekeating/2019/06/20/eu-decarbonization-plan-for-2050-collapses-after-polish-veto/?sh=31ffbc2030b2>

⁵ <https://mkogy.jogtar.hu/jogszabaly?docid=A18H0023.OGY>

⁶ <https://zoldbusz.hu/files/NE2030.pdf>

⁷ https://ec.europa.eu/energy/sites/ener/files/documents/hu_final_necp_main_en.pdf

⁸ <https://planetbudapest.hu/en>

⁹ <https://kbka.org/>

In order to also give legal recognition to the importance of the topic, on 3 June 2020, the Hungarian Parliament adopted Act XLIV of 2020 on Climate Protection¹⁰. This legislation stipulated at the legal level that Hungary would reach the state of climate neutrality by 2050. With this, Hungary was among the first countries in the world to set this important goal in legislation, making it mandatory for all Hungarian stakeholders. This climate neutrality target was already included in the Paris Agreement itself (although it uses a different terminology: it prescribes a balance between emissions and removals), however, it was not tied to a well-defined date. It was the IPCC who said basically that if we want to keep climate change under control, we need to achieve climate neutrality globally by 2050, at the latest. But we know that the global goal can only be a set of combined nation-state efforts. Fortunately, more and more countries have set themselves the goal of achieving this climate-neutral state by 2050 at the latest, including the largest emitters. However, this is still enshrined in law in only a relatively few places. Therefore, the significance of this move by Hungary is difficult to overestimate, however, as the saying goes: it is not the end but the beginning of an important process.

To support this process and provide policymakers with the reliable scientific data, the Hungarian Scientific Panel on Climate Change (HUPCC)¹¹ was founded in 2020. Prior to its official founding, two preparatory conferences were already co-organised with the government in 2018 and 2019. The HUPCC summarises the Hungarian implications of the latest knowledge and research on climate change in scientific evaluation reports, based on the nationalised model of the UN Intergovernmental Panel on Climate Change (IPCC). It facilitates the process of preparing reports by organising work meetings, workshops, conferences, other events, as well as collecting missing data and literature. To achieve its goals, the HUPCC co-operates with state agencies, decision-makers, environmental and professional organisations, and research institutions. The government has published two calls at the end of 2015¹² and in the beginning of 2018¹³ to support the

development of regional and local climate strategies and awareness raising projects. Since then, most of the regions and major cities have started to develop or already adopted local climate strategies in line with the Second National Climate Change Strategy. Budapest, the country's capital and also biggest city, has also recently adopted its Sustainable Energy and Climate Action Plan¹⁴, planning to cut its emissions by at least 40%, raise the use of renewables by 50% and grow the amount of green public spaces by 350 hectares by 2030.

ACTIONS AND POLICIES

Increased political recognition of climate change has led to more ambitious domestic climate and energy targets, policies, and actions in Hungary.

As discussed in the previous sections, the Hungarian Government has started to gear up its environment and climate policies in the last couple of years. Its new flagship policy document on climate and nature protection is the Climate and Environment Action Plan (CEAP)¹⁵ adopted in 2020. The CEAP has actions organised under 8 thematic groups: elimination of illegal waste disposal sites; banning the distribution of single-use plastics; protection of rivers; supporting green technologies and entrepreneurship; afforestation; commissioning 6,000 megawatts solar capacity by 2030; support the wider availability and use of affordable electric mobility; introduction of Green Government Bonds. The current domestic actions and communication of the Government are mostly guided by this CEAP. The following section will highlight some of these actions and accompanying policies.

The Hungarian NECP currently states an at least 40% GHG emissions cut by 2030, an increase of the share of renewable energy sources to at least 21% within gross final energy consumption and that the country's final energy consumption does not exceed the value of 2005 in 2030. In comparison to these objectives proposed in the country's NECP, the CEAP introduced later, goes

¹⁰ <https://mkogy.jogtar.hu/jogszabaly?docid=A2000044.TV>

¹¹ <https://hupcc.hu/hungarian-scientific-panel-on-climate-change/>

¹² <https://www.palyazat.gov.hu/doc/4532#>

¹³ <https://www.palyazat.gov.hu/kehop-121-helyi-klmstratgik-kidolgozsa-valamint-a-klmatudatossgot-erst-szemlletformls-1#>

¹⁴ https://budapest.hu/Documents/klimastrategia/BP_kl%C3%AD-mastrat%C3%A9gia_SECAP.pdf

¹⁵ https://2015-2019.kormany.hu/download/5/07/c1000/Climate%20and%20environmental%20protection%20action%20plan_EN.pdf

beyond in several aspects, therefore a rise in domestic ambition can be clearly seen. One of the most important changes is that while the conversion of the Mátra Power Plant (MPP) and Hungary's coal exit was foreseen in the NECP for 2030, the new target is to phase out the use of coal already by 2025. Hungary has already started a LIFE Integrated Project¹⁶ not only to phase-out of the lignite-fired units of the MPP and to retire its open-pit lignite mines, but to support the low-carbon transition of the single largest coal region in Hungary. The headline decarbonization goal of the Government and its CEAP is to make 90% of energy generated in Hungary carbon-neutral by 2030. To reach this goal, there is an increased support for solar power generation capacity, available both for large-scale and household-level power plants. The draft recovery and resilience plan submitted by Hungary also placed high emphasis on supporting penetration of renewable energy in households, however at the moment of the writing of this summary, the plan is still not adopted. Nonetheless the CEAP aims to incentivise the commissioning of 3,000 megawatts solar power generating capacity by 2022, and at least 6,000 megawatts by 2030.

In line with the decarbonization of the power sector, the Government is also heavily supporting electric mobility through purchase support programmes for electric cars, bicycles and green buses. The framework of the support for future mobility is described in the latest National Electromobility Strategy¹⁷. Besides purchase support, Hungary provides tax and other incentives (like free parking, use of bus lanes, etc.) for electric vehicles. Besides private transport, the Government is also supporting the greening of public transport through its Green Bus Programme¹⁸, with the objective that the new buses in all settlements with a population of over 25,000 must be electric from 2022. By 2030 every second bus in Hungary has to be environmentally friendly and to make this possible, the Government has set aside HUF 36 billion for the programme's 10-year timeframe.

To further support decarbonization and increase the security of supply, Hungary has just recently adopted its National Hydrogen Strategy¹⁹. Its main goal

is to produce large volumes of low-carbon and decentralised carbon-free hydrogen in the amount of 36,000 t / year by 2030. The first large scale hydrogen project in Hungary worth HUF 2.9 billion has also been launched in 2020²⁰.

To finance all these actions and to green the financial sector itself, the Hungarian Government has issued its first green bonds, where due to the increased interest of investors, the country could sell 50% more bonds than originally planned²¹. In parallel, the Hungarian National Bank has also announced its Green Programme in 2019²², which was followed by other policies and actions, such as a preferential green capital requirement treatment for housing loans²³, an assessment of the financing of the Hungarian renewable energy sector²⁴ or the introduction of its Green Monetary Policy Toolkit Strategy²⁵. In the meantime, Hungary has also become active in international climate finance by setting up its international development agency, the Western Balkans Green Center which has already supported 24 different climate and environment projects in the Western Balkans regions in the worth of around EUR 2,2 million²⁶ since its funding in 2019.

As discussed above, the Hungarian recovery and resilience plan at the moment of the writing of this summary is not yet adopted, since the European Commission has asked for some amendments on the plan. It is indeed important that the Hungarian Government gets the plan right, since it could mean a once in a lifetime opportunity for climate action meanwhile it could also contribute to close the gap between Hungary and its western counterparts. A green and innovative plan accompanied by inclusive policymaking where stakeholders, experts, industry and the civil sector is involved throughout the process, could help Hungary going further or faster in terms of climate action.

¹⁶ https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuse-action=search.dspPage&n_proj_id=7886

¹⁷ https://www.jovomobilitasa.hu/_upload/editor/Strategiak/Hazai_elektromobilitasi_strategia.pdf

¹⁸ <https://magyarokozlony.hu/dokumentumok/471a-27274da48580d77782f7f15a184728f261d3/letoltes>

¹⁹ <https://cdn.kormany.hu/uploads/document/a/a2/a2b/a2b2b7ed5179b17694659b8f050ba9648e75a0bf.pdf>

²⁰ <https://hungarianinsider.com/hungarys-first-hydrogen-project-enters-an-important-stage-7395/>

²¹ <https://www.bloomberg.com/news/articles/2021-04-22/longest-sovereign-green-bond-anyone-hungary-is-seeking-buyers>

²² <https://www.mnb.hu/letoltes/mnb-green-program-en.pdf>

²³ <https://www.mnb.hu/letoltes/notice-preferential-green-capital-requirement.pdf>

²⁴ <https://mnb.hu/letoltes/20210121-financing-the-hungarian-renewable-energy-sector.pdf>

²⁵ <https://www.mnb.hu/en/pressroom/press-releases/press-releases-2021/the-magyar-nemzeti-bank-announces-the-green-monetary-policy-toolkit-strategy>

²⁶ <https://www.wbgc.hu/en/projects>

CLIMATE POLICIES POST PARIS

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DOMESTIC DISCOURSE AND DEVELOPMENTS POST PARIS

For a global net-zero by 2050, individual countries must achieve net-zero emissions sometime in future. Industrialized countries have to become net-zero around 2040. Countries like India can aspire for a net-zero status around the late 2070s or 2080s. At the same time, the industrialized countries have to leave some sufficient global carbon space to allow developing countries like India to meet their developmental aspirations under sustainable development goals (SDGs). Conceptually, no country should have any objection to peaking and net-zero, however timing will play an important role.

The traditional argument made is that among the G20 countries, India has the lowest GDP per capita, low final energy consumption per capita, lowest power consumption per capita and lowest greenhouse gas (GHG) emissions per capita, and that it will meet and exceed its climate commitments. The merits of this position notwithstanding, the world must move to a positive discussion focusing on the solution space.

To put it in a global perspective, India would have no objection to net-zero target which must be preceded by peaking of emissions. The year and levels are not known though and no declarations have been made in this connection. Industrialized countries that have pledged to achieve net-zero by 2050 peaked their

emissions in the 1990s-early 2000s, thus getting 40-60 years' time gap between their peaking and net-zero. India is likely to peak around during 2040s. India is likely to peak around 2040. The same time and equity-based logic would imply that India could be expected to become net-zero around 2075-80 and anything before that would be a bonus. The Indian policies and commitments to climate change capture the challenges and opportunities of balancing development with GHG emissions mitigation. These are synchronizing sustainable development and carbon neutrality in the long run. It would need a global carbon space to develop while simultaneously keeping an eye on decoupling growth with GHG emissions. It may be noted here that the developed countries have consumed around 75% of the global carbon budget since industrialization, and should they reach net-zero even by 2050 as perceived, the US would have consumed 22% of remaining global budget, the EU about 15%, and China another 70% making negative emissions a necessity for the world, without any current proven technologies at scale. The net-zero challenges would therefore only increase in future.

Indian public as well as private enterprises pledging towards carbon-neutrality¹.

The world's biggest coal company, Coal India Limited, public sector undertaking (PSU) is committed to invest USD 763 million by March 2024 to build 14 solar projects to decarbonize its processes, help power its mining operations and cut costs². Government-owned Indian Railways have also committed to achieving net-zero carbon emissions by 2030 by leveraging solar energy to meet its energy consumption needs.

Similarly, large Indian private firms such as Tatas – a USD 100 billion plus conglomerate (Tata Power, Tata Motors, Tata Chemicals, Tata Steel, Tata Consultancy Services), Reliance (over USD 200 billion), Mahindra Group, ITC, Infosys, Dalmia Cements, Ambuja Cements, Associated Cement Companies (ACC) Limited, Arcelor Mittal, Nippon Steel, Essar Oil &

Gas Exploration & Production, Jindal Steel Works Group, Sun Pharma, Vedanta Limited and Hyderabad-based Banka Biolo are committed to their own decarbonization strategies and some of which include net-zero targets by 2030. The strategies include stop future construction of coal-fired plants, shift to renewable energy, investment in energy efficiency projects, expand to include electric vehicles, and some isolated projects on carbon capture and storage technologies. Mahindra Group is the first Indian company to announce an internationally benchmarked carbon price (\$10/ton CO₂) to fund green investments internally, while major cement companies (Ambuja and ACC for example) have announced internal carbon prices beyond USD 35 per ton. Reliance, Mahindra Group and Infosys are committed to net-zero carbon in 2035 and 2040 respectively, while Wipro is committed to net-zero GHG emissions by 2040. It is also interesting to note here that e-auction of coal mines for 16 mines had to be cancelled in 2020 due to no interest shown from industrial buyers in new coal mines. Therefore, it seems that Indian industries are gradually committing to low carbon futures individually.

NATIONAL GOVERNANCE ON CLIMATE CHANGE

India follows federal structure, where the Constitution specifies the distribution of legislative, executive and judicial powers. The division of power for legislation are listed into Union List³, State List⁴ and Concurrent List⁵. The Indian central government is working on revising its current NDC willing to increase its current pledges and considering long-term strategies to decarbonize the its current economy. The Indian central government is working on revising its first NDC willing to increase its current pledge and considering developing long-term strategies to decarbonize its current economy.

The National Action Plan on Climate Change (NAPCC) in India was launched in 2008 and is the central piece of federal policy on climate change. The

¹ <https://changestarted.com/big-indian-companies-that-have-made-climate-commitments/>

² <https://www.reuters.com/article/coal-india-solar-idINKBN2830Z2>

³ Central Government makes laws regarding 100 items

⁴ States have exclusive powers to legislate with regards to items on the State List, however a few articles (249, 250, 252, and 253) can be legislated by the Union government (61 items)

⁵ Both forms government can legislate a list of 52 items.

NAPCC is founded on the philosophy of balancing India's developmental priorities while simultaneously meeting objectives related to climate change mitigation and adaptation. The NAPCC has outlined actions and steps through eight national missions namely, solar mission, mission for enhanced energy efficiency, mission on sustainable habitat, water mission, mission for sustaining the Himalayan ecosystem, green India mission, mission for sustainable agriculture, mission on strategic knowledge for climate change. Currently the government is actively considering including three more missions – mission on health, coastal mission, and mission on transformative mobility and battery storage. Various other line ministries of federal government such as coal, road transport, railways, power, shipping, urban development, and rural development are mandated to support and provide policy guidelines to states for implementing elements of NAPCC.

Indian government has also been actively engaging with countries at bilateral and multilateral forums and expressing its standpoint on net-zero targets at international level. The central government and various ministries (Ministry of Coal, Ministry of New and Renewable Energy, Ministry of Petroleum and Natural Gas, Ministry of Railways and so on) in their individual capacities are committed to decarbonizing the Indian economy. Additionally, India has been a leading or member country of international alliances such as International Solar Alliance (ISA)^{6,7}, Mission Innovation^{8,9} and Coalition for Disaster Resilient Infrastructure (CDRI)^{10,11}. In April 2021, U.S.-India launched a partnership to scale up

clean technologies¹² and strengthen climate action by mobilizing finance¹³. In May 2021, EU-India agreed on synergies to a safer, greener, cleaner, more digital, resilient and stable world, in line with the 2030 Agenda for Sustainable Development and the Paris Agreement^{14,15}.

Self-reliant India Mission (Atma Nirbhar Bharat) takes a hit due to successive waves of COVID19 pandemic.

During COVID19, PM Modi launched the mission to focus on economy, infrastructure, system, demography and demand. The central government as measure to boost the slumped economy announced stimulus packages USD 420 billion (15% of GDP) in five phases (Unlock 1.0-April 2020, Unlock 2.0 – May 2020, Unlock 3.0 – July 2020, Unlock 4.0 - August 2020, Unlock 5.0 – September 2020). The first phase focused on medium and small businesses, followed by phase II, which supported the poor (including migrants and farmers). Phase III, IV and V focused on agriculture, encourage new growth (by privatizing commercial mining in coal and mineral sector, enhance self-reliance in defense production, and encourage private partnership in building airports, power distribution in Union Territories, building airports and space, and link robust start-up to nuclear sector) and government reforms (improve ease of doing business, increase allocation in MGNREGS to provide employment boost) respectively ^{16,17}.

Subnational governments are pushing towards implementation of Climate Change Action Plans (State Actions on Climate Change Phase II).

The Ministry of Environment, Forestry and Climate Change (MOEF&CC) motivated the State Governments to prepare their State Action Plans on Climate Change (SAPCC) in line with the strategies outlined

⁶ <https://isolaralliance.org/about/background>

⁷ Launched by India along with France at COP21 is a coalition of 86 member countries to establish networks and develop synergies to scale up solar energy applications and mobilize USD 1000 billion by 2030.

⁸ <http://mission-innovation.net/our-members/>

⁹ Global initiative of 24 countries and the European Commission (on behalf of the European Union). These 25 members have committed to seek to double public investment in clean energy RD&D and are engaging with the private sector, fostering international collaboration and celebrating innovators.

¹⁰ <https://www.cdri.world/index.php/cdri-overview>

¹¹ Partnership of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development. CDRI promotes rapid development of resilient infrastructure to respond to the Sustainable Development Goals' imperatives of expanding universal access to basic services, enabling prosperity and decent work.

¹² To decarbonize sectors including industry, transportation, power, and buildings; and build capacity to measure, manage, and adapt to the risks of climate-related impacts

¹³ <https://www.state.gov/u-s-india-joint-statement-on-launching-the-u-s-india-climate-and-clean-energy-agenda-2030-partnership/>

¹⁴ https://ec.europa.eu/clima/news/eu-and-india-pledge-collaborate-more-closely-climate-action_en

¹⁵ <https://www.consilium.europa.eu/media/49516/eu-india-connectivity-partnership-8-may-2.pdf>

¹⁶ <https://www.india.gov.in/spotlight/building-atmanirbhar-bharat-overcoming-covid-19>

¹⁷ https://www.indiabudget.gov.in/economicssurvey/doc/vol2chapter/echap01_vol2.pdf

in NAPCC 2008. Till date, 33 States/UTs have prepared their SAPCCs and work is ongoing in various states to submit their second SAPCC. These are now closely linked with NDCs. Although SDGs and NDCs have a high degree of political backing from the Central government, the onus of implementation largely lies with the states. The state governments are currently revising their individual SAPCC in reference to India's NDCs. MoEF&CC also provided financial support to states for enhancing their capacities to undertake climate change activities. Projects on adaptation and mitigation measures are also funded as demonstration projects under Climate Change Action Programme (CCAP). In January 2018, MOEF&CC urged the States to revise their SAPCC by undertaking ambitious mitigation as well as adaptation action by considering the evolving context of climate science, policy and actions.

ACTION AND POLICIES

India has revised and committed more ambitious climate targets post Paris Agreement. Incidentally the present federal government came into power in May 2014 and has been taking climate proactive measures since then. Paris happened in 2015 and in a way the Indian government aligned well with it, with co-initiating International Solar Alliance with France at COP, and gradually retching up its own renewable targets. National Solar Mission (NSM) target were increased from 20GW by 2022 to 100 GW by 2030. The total renewable energy target was been fixed at 175 GW by 2030 and has been further enhanced in 2020 to 450 GW by 2030. This is a huge jump considering that the highest single day load in India has hovered around 200 GW.

Steep targets have been given to about 480 industrial units for reducing their specific energy consumption under the Perform Achieve and Trade (PAT) scheme pre-Paris (2013-2016). It (National Mission of Enhanced Energy Efficiency) resulted in a total savings of approximately 13.28 Mtoe and avoided emissions of 31 Mt-CO₂. Post Paris, the coverage of plants and sectors has been enhanced considerably rolling out six PAT cycles until 2025 with a total of 1073 DCs covering 13 sectors. It is projected that total energy savings of about 26 Mtoe translating

into avoiding of about 70 million tonnes of CO₂ will be achieved by March 2023.

In power sector, about 144 old thermal stations have been assigned mandatory targets for improving energy efficiency and at the same time a retirement of a total of 170 old thermal generation units having a cumulative capacity of 10.64 GW has happened post Paris. Additionally, under Ujjwal Discom Assurance Yojana (UDAY) scheme, it is targeted to reduce Aggregate Technical & Commercial (AT&C) losses leading to emission reductions of 7.99 MtCO₂ for 2015 and 6.07 MtCO₂ for 2016.

In transport sector, government has provided incentives for adopting and manufacturing electric vehicles leading to 1.8 million of electrified two-and three-wheelers in 2019. It may be noted here that about 62% of total annual gasoline consumption in India is by two-wheelers and converting them to EV first has been the government policy. Moreover, 30% of all new cars coming to the market have to be electric by 2030. Metro rail which had a coverage in 4 to 5 major cities before Paris Agreement, expanded over 650 km of metro rail operational in 18 cities of India by 2020.

In building sector, about 26 electric appliances are covered under mandatory and voluntary regime to reduce energy demand (55.7 BU), thereby reducing emissions (45.67 MtCO₂e). There has been increase in energy efficient buildings leading to 0.36 MTCO₂e savings per year from about 6000 green buildings. As on December 2020, a total of 287.4 million households have LPG connections for cooking (including PMUY beneficiaries) – over 3/4^{ths} coming post Paris. LPG is replacing biomass and kerosene, thus increasing GHG emissions but making cooking much cleaner and contributing to reduced mortality and morbidity due to indoor air pollution in India.

In agriculture sector, under Energy Efficient Pump Programme, 74136 energy efficient pumps have been installed post Paris, resulting in estimated energy savings of 191 million kWh per year with avoided peak demand of 35 MW, and GHG emission reduction of 0.14 MtCO₂ per year.

Forestry sector will play an essential role in India's mitigation efforts by increasing the carbon sink through expansion of forests (afforestation, reforestation), densification of forests and agro-forestry (trees outside forests). Forest area comprises little more than 20% of India's geographic area and more than 50% of its population depend on agriculture. Hence, agro-forestry is not only consistent with climate mitigation targets but also consistent with Atma Nirbhar initiatives. Additionally, these efforts have strong synergies with forest conservation and SDG goals.

From adaptation perspective, micro-irrigation area covered 8.7 million hectares till November 2019. Under Swachh Bharat Abhiyan (Clean India Mission), more than 6.2 million individual toilets and 0.59 million community and public toilets have been constructed. As on December 2020, under the mission, 4340 cities have been declared ODF, while 100 per cent door-to-door waste collection has been achieved in over 83,434 wards. Cities will be one the main sites of low-carbon development under Smart Cities Mission (100 cities) and AMRUT scheme (500 cities – ensure basic infrastructure) (BUR1, BUR3).

Key international enablers¹⁸

Five aspects of the solution space must be considered.

First, acknowledging that climate action needs financing. India puts in about \$100 billion each year for climate adaptation and ring-fencing its population and systems. This is likely to touch \$300 billion by 2050. It is high time that the industrialized countries make good on their promise of providing \$100 billion each year by 2020 and till 2025. Not even 10% of this amount has been provided so far.

One way for these transfers could be linking 'excess' per capita emissions of each country over the global average per capita GHG emissions. Each country will contribute funds equal to their excess emissions, multiplied by some agreed value per ton. If the total collection has to equal \$100 billion a year, this will be

around \$10 per ton of GHG emissions. This should be applicable to all countries, including India.

Additionally, there is need to facilitate the provision of cheaper finance through global financial institutions for climate change actions especially for MSMEs that employ over 110 million people in India.

Second, creating a common technology development pool in which industrialized and developing countries are equal partners.

These technologies should include battery storage for the power sector and for electric vehicles (EVs), CO₂ capture utilization and storage (CCUS), hydrogen, advanced bioenergy and nuclear power. An important aspect for India is the question of energy security and making it clean. Coal is the mainstay of the Indian energy system.

India has retired 16,400 MW of old and inefficient coal-based plants recently, and plans to retire another 6,000 MW in the next 3-4 years. The plant load factor of existing coal plants is around 50% — almost half the time they are not producing power. Alongside is the very ambitious renewable energy plan of 450,000 MW solar capacity by 2030. To take in so much renewable power in the national power grid, India needs to create flexibility in the system. Storage and green hydrogen production could be the main methods for this.

Global battery storage technologies are not ready at scale, and may take a few years. The price of power has to remain affordable for masses, but wide spread storage deployment could double the price of power. This does not mean that India does not enhance efficiency of its power generation, transmission, distribution and usage. India should also bring climate change-supportive technologies into the 'Make in India' basket.

Third, involving business and industry in climate change discussions and action.

As already mentioned, many Indian industrial and business houses have already committed to GHG mitigation targets. Cheaper financing could make implementing their pledges and attracting more players easier. Finance could be made available to businesses at the same terms as those in the industrialized countries — at a cheaper cost of capital. These are now not

¹⁸ <https://economictimes.indiatimes.com/industry/renewables/view-how-india-can-achieve-its-net-zero-emissions-goal/article-show/81901910.cms?from=mdr>
<https://economictimes.indiatimes.com/news/india/view-in-the-net-zero-war-gle-its-india-that-has-ma/articleshow/82174780.cms?from=mdr>

available. However, the \$100 billion a year funding could be used for 'interest rate subsidy', reducing the cost of finance by about 10 percentage points. This way the \$100 billion could finance \$1 trillion worth of climate actions every year. Furthermore, climate change-dependent risk disclosures should be made compulsory for businesses along with their energy and GHG emissions (SEBI guidelines reported earlier), especially for those with high exposure to climate change. Risk awareness and management should be promoted to curb the risks on general public.

Fourth, net-zero is for the basket of all six GHGs and not CO₂ alone. Around 15% of India's total GHG emissions are in the form of methane and NO₂ from the agriculture sector. These are very hard to mitigate due to the micro and dispersed nature of livestock and crop production. Agriculture would require special solutions and international institutional inputs on the lines of the Green Revolution.

Fifth, bringing back the adaptation discussion to the table along with net-zero. We cannot forget climate change impacts on the vast poor population in India, adaptation needs for them, and the concepts of climate equity and justice.

CLIMATE AMBITION SINCE THE PARIS AGREEMENT, AFTER NDC AND LTS

Rizaldi Boer, Ucok Siagian, Annuri Rossita, Lukytawati Anggreni

This brief presents some notes concerning the developments and progress of Indonesia in climate actions over the last 5 years, especially in the NDC targets and implementation and preparation of the Long-Term Strategy.

DOMESTIC DISCOURSE

Indonesia's position across the equator brings about high and relatively uniform temperatures. Furthermore, its location between Asia and Australia exposes Indonesia to monsoon storms. Variation in regional temperature is influenced by elevation rather than altitude. In 30 years (1991-2020), various regions in Indonesia have experienced an increase in temperature. The rate of increase in temperature varied across locations, between 0.01°C and 0.06°C per year, with an average of 0.03°C each year. Despite its vulnerability to climate change, only 81% of Indonesia's population is aware of the climate change term, and less than 20% listen to weather forecasts and prepare for extreme weather¹.

Prior to the initial year of NDC implementation, the COVID-19 pandemic has resulted in negative GDP growth and made it harder for Indonesia to maintain the GDP growth to 5-6% as stated in Medium-Term National Development Plan (RPJMN). Under this particular condition, the Government of Indonesia (GoI) has been preparing 89 national strategic projects as part of the green recovery process. In addition, GoI has received its first Result Based Payment (RBP) from REDD+ in 2020. Referring to the Ministerial Law of MoEF No.70/2017, people living around the forest will be able to access financing from REDD+. The first priority from the incentive is income generated programs, while the second priority is forest patrol guards for forest protection. The presence of this incentive

¹ <https://www.weadapt.org/placemarks/maps/view/953>

scheme is expected to increase community trust in Government as to witness the economic benefit from land-based mitigation efforts.

NATIONAL GOVERNANCE: NDC AND LTS PREPARATION AND SUBMISSION

Under the Paris Agreement, each country is required to prepare, communicate, and maintain the successive **nationally determined emission reduction contributions** (NDCs) that it intends to achieve. Parties are expected to implement domestic mitigation measures, with the aim of achieving the objectives of the reduction contributions. NDCs are submitted every five years to the UNFCCC secretariat and are expected to represent a progression in ambition every time. Parties are requested to submit the next round of NDCs (new NDCs or updated NDCs) by 2020 and every five years thereafter (e.g., by 2020, 2025, 2030), regardless of their respective implementation time frames. Before the Paris Agreement and the NDC, in 2010 the Government of Indonesia voluntarily pledged to reduce emissions by 26% on its efforts, and up to 41% with international support, against the business-as-usual scenario by 2020. Indonesia has promulgated relevant legal and policy instruments to the pledge, including the national action plan on GHG emissions reduction as stipulated in Presidential Regulation No. 61/2011 and GHG inventory through Presidential Regulation No. 71/2011.

Post-2020, Indonesia envisions a progression beyond its existing commitment to emission reductions. Based on the country's most recent emissions level assessment, Indonesia has set an unconditional reduction target of 29% and a conditional reduction target of up to 41% of the business-as-usual scenario by 2030. Under the BAU scenario, national emissions would increase from 1334-million-ton CO₂e in 2010, to 2,869-million-ton (Mton) CO₂e in 2030. With NDC mitigation actions, emissions are expected to be lower i.e., 2,034 Mton CO₂e in 2030. With this lower emissions level, Indonesia would have an emissions reduction of 835 Mton CO₂e, which is equivalent to 29% of the BAU emissions in 2030. Of the 835 Mton CO₂e reductions, the energy and the AFOLU sectors are targeted to contribute 314 Mton CO₂e and 506 Mton CO₂e, respectively. With international support,

the emissions reduction target becomes 398 Mton CO₂e and 654 Mton CO₂e, respectively.

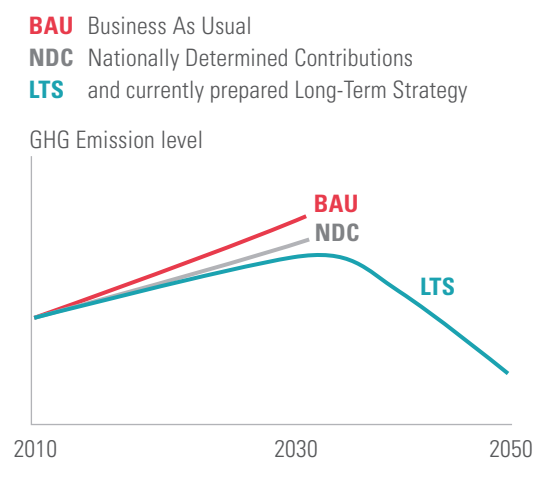
One of the Indonesian Government activities subsequent to the NDC submission to the UNFCCC was to prepare the plans on how to implement the NDC actions and to achieve its targets. The plans are drafted and formulated in the form of an NDC implementation roadmap. The Ministry of Environment, in consultation with all line ministries and stakeholders, conducted several meetings to prepare the roadmap. Earlier this year, subsequent to the publication of the Initial [NDC Synthesis Report](#), the UN Climate Change urged nations to increase their NDC ambition, to submit stronger, more ambitious national climate action plans in 2021 in order to achieve the [Paris Agreement](#) goal of limiting global temperature rise by 2°C—ideally 1.5°C—by the end of the century. The major emitters are expected to step up with much more ambitious emissions reduction targets for 2030 in their Nationally Determined Contributions well before the November UN Climate Conference in Glasgow.

In response to the UN Climate Change expectation, the Indonesian Ministry of Environment, which is the country's focal point and coordinator for climate change matters, conducted several consultation meetings with line ministries and other stakeholders, to discuss the possibility of increasing its ambition with the submission of an updated NDC. Based on the latest progress of the consultation, the government will not pledge more ambitious mitigation targets. However, there will be some updates in the adaptation section of the NDC.

The government has also recently submitted the country's **Long-Term Strategy** (LTS). In accordance with Article 4, paragraph 19, of the Paris Agreement, all Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies. The COP, by its decision 1/CP 21, paragraph 35, invited Parties to communicate, by 2020, to the secretariat mid-century, long-term low greenhouse gas emission development strategies.

Indonesia's Long-Term Strategy has been developed through an in-depth participatory process led by the Government of Indonesia and guided by detailed research analysis of transition pathways exploring different technical and socio-economic trajectories from the present to mid-century. In its most ambitious pathway,

Figure 1. Illustration of GHG emission level



the LTS describes options for peaking national greenhouse gas emissions in 2030 and reaching 540 MtCO₂e in 2050 (equivalent to 1.61 tCO₂/cap), with the possibility of achieving carbon neutrality in 2060 or sooner.

According to the observation of the authors, although Indonesia has not explicitly expressed the increased ambition in the updated NDC, it has implicitly increased ambition, embedded in the LTS trajectory, as illustrated below in **Figure 1**. As can be seen in the illustration, the emissions level of the LTS in 2030 would be lower than the NDC, implying an increased ambition of the emissions reduction target.

ACTIONS AND POLICIES: MAIN ADVANCEMENT AFTER THE PARIS AGREEMENT

After the Paris Agreement, the Government of Indonesia has made bolder moves towards climate ambition through the establishment of innovative policies, climate budget tagging, the Environmental Fund Management Agency (BPDLH), innovative financial mechanism, and currently in process of formulating a carbon economic value.

One of the strategic approaches of Indonesia's NDC implementation is mainstreaming the climate agenda into development planning. Recognizing the need to integrate climate change into development and spatial planning and the budgeting process, Indonesia will

include key climate change indicators in formulating its development program's targets.

In 2016, the Ministry of Finance made an effort in conducting **climate budget tagging**, of which in the near time, the budget tagging system will also be aimed at SDG-related programs to trace the SDG implementation in a more quantifiable output. The capacity to conduct climate budget tagging needs to be upscaled to funding institutions and project implementers, as it holds an important aspect for funding mobilization and potentially increases the Public-Private Partnership (PPP) funding system.

Referring to the limited mitigation cost covered by the state budget (20%), the majority of the sources (80%) are expected from the non-state actors. Under this condition, Indonesia is in the process of moving from the concentrator paradigm, a paradigm of fully burdening all the funding demand to public funding, to regard environmental services as the prospective business. In supporting this shifting paradigm, Indonesia has developed various instruments for alternative funding, for example, the issuance of Green Bonds/Sukuk as innovative financing to fund green and SDG-related projects.

In addition to that, the Ministry of Finance developed an **Ecological-based Fiscal Transfer Mechanism (TAPE/TAKE)** in 2019. The rationale behind this instrument was to support the green province initiative to strengthen the participation of the cities/districts under the provinces by providing an incentive scheme. As the incentive should be based on a commitment to protect the environment, the implementation of the scheme is to add ecological variables (e.g., forest area) in determining the amount of fund allocation from higher government level (province/district) to lower government level (district/village). To support the fiscal transfer governance, it is necessary to formulate regional regulations to mainstream the planning and regional funding.

As a starting point of the domestic carbon market, the Government of Indonesia is preparing **Presidential Regulation on carbon economic value on carbon pricing instrument**. The regulation sets four main areas of NDC target achievement, carbon economic instrument, transparency framework, and low carbon development. The regulation will also state the role of the party/PS and non-party stakeholders/NPS (e.g., sub-national government, private sectors, and

communities) in NDC implementation. It is expected that the presence of a domestic carbon market will increase NPS participation in low carbon transformation, including its transition process.

Through Presidential Regulation No.77/2018, Gol developed the **Environmental Fund Management Agency** (BPDLH). BPDLH aims to collect, manage, and distribute environmental funds, under the principles of transparency and accountability to meet international governance standards. The fund is collected from state budget, provincial budget, and others (e.g., tax, retribution fund, international cooperation agreement). BPDLH has the authority to manage the fund through banking instruments and the capital market. The goal is to be able to manage funds more optimally and synergistically, as well as optimize the use of funds and mobilize funding resources from both domestic and international sources.

Environmental funds can be distributed under various mechanisms: carbon markets, loans, grants, endowment fund, etc. Under a grant mechanism, the environment fund for instance can be used as an incentive scheme for a village that conserves and restores degraded peatlands. Compared to grants, loans and endowments are the most sustainable systems, as the funding will afterwards return to BPDLH. BPDLH is now discussing the technical processes related to the endowment fund system (e.g., percentage return according to the activity risk, return year, etc.). It is expected that the endowment fund will be able to accommodate the forestry business under the social forestry scheme.

For the AFOLU sector, the breakthrough policies that have developed since Paris are the forest and peatland moratorium, the multi permit scheme, Indonesia's palm oil certification (ISPO), the sustainable jurisdiction agenda, and the utilization of villages' fund for peatland restoration costs.

The **permanent extension of forest and the peatland moratorium policy** are the supporting policies for Indonesia's REDD+ commitment. While the moratorium policy is aimed at natural forests outside the concession area, the one located inside the concession area is regulated by a multi permit scheme. The idea of a multi permit scheme is to utilize natural forests for non-timber forest products (NTFP) and environmental services and to reduce the extent of unproductive land under conflict by

utilizing the land that is already occupied by the community together with the private sector. In Indonesia, the transaction costs to address tenurial issues in concession areas is still high, leading to a slow planting rate of timber plantations (HTI). It is expected that the multi permit scheme could fasten the planting rate of the HTI while addressing tenurial issues.

In 2011, Gol established ISPO as a **palm oil domestic certification scheme**. To date, ISPO has been improving along with recently published Presidential Regulation No.44/2020 which was ratified in March 2020. The regulation is replacing the previous Ministerial Law of Agriculture No.11/2015, with the main amendment being a more independent ISPO process compared to the previous process, a monitoring process from an independent party, public participation in the certification, and mandatory for all oil palm plantations with a 5-years grace period.

It is expected that the ISPO certification system could be a bridge to sustainable jurisdiction certification, as one of the National Development Planning Agency (BAPPENAS) main agenda. Jurisdictional certification is a collaborative effort by local governments, producers, and civil society organizations, supported by donors and buyers, to meet sustainable and inclusive palm oil standards. In addition, certification at the jurisdictional level will reduce the cost of certification, specifically for smallholder plantations.

In the energy sector, the NDC action plan consist of energy conservation measures, use of renewable in the power sector (hydro, geothermal, biomass, solar PV), use of biofuels in transport and industry, use of clean coal technology (higher efficiency coal power plants), and use of less carbon-emitting fuels (substitute of coal by gas in industry, substitute kerosene by gas for cooking).

The government policy that is used as a reference in formulating the NDC is Government Regulation No. 79/2014 on **National Energy Policy**. This policy set out the ambition to transform, by 2025 and 2050, the primary energy supply mix with shares as follows: (a) new and renewable energy at least 23% in 2025 and at least 31% in 2050; (b) oil should be less than 25% in 2025 and less than 20% in 2050; (c) coal should be minimum 30% in 2025 and minimum 25% in 2050; and (d) gas should be minimum 22% in 2025 and minimum 24% in 2050.

As the government strives to accelerate the target of net-zero emissions by increasing the new renewable energy mix, support from the private sector plays an important role in realizing the acceleration of this target. One example of collaboration between government and private sector is that on April 22, 2021, the government (Coordinating Ministry for Maritime and Investment Affairs, Ministry of PUPR, Ministry of ESDM, Ministry of ATR/BPN, Ministry of Environment and Forestry, Ministry of Investment/BKPM) together with North Kalimantan Provincial Government and Papua Provincial Government conducted a Joint Statement of Intent with two private companies to develop renewable energy to encourage green industry.

The decarbonization of the energy sector requires the substitution of the use of fossil energy by renewable energy and nuclear energy and the implementation of energy efficiency measures. Implementation of energy efficiency measures, decarbonization of power sector using large renewable and coal+CCS, biofuels in transport will be able to achieve the mitigation targets so that in 2050 the carbon emissions of the energy sector would reach around 550 ton/year in 2050 (which would be compatible with the Paris Agreement).

Green financing is important to support decarbonization in the energy sector, such as renewable energy, energy efficiency, and pollution prevention and control. The Ministry of Finance issued **Green Sukuk Ritel** ST-006 in November 2019. The green Sukuk/bonds showed the commitment for green financing for green energy, sustainable cities and communities, and climate change mitigation and adaptation action. Besides green bonds and green Sukuk, Gol will also invite private and state-owned companies to get involved in green projects and sustainable development. In addition, the International Finance Corporation (IFC) in partnership with the Financial Service Authority (OJK) developed a Sustainable Finance Roadmap, a comprehensive plan to promote sustainable finance. In July 2017, OJK issued a regulation that required banks to develop action plans for sustainable financing and to report their green financing.

CRITICAL BLOCKING POINTS

Despite the improvements that the Gol made since Paris, there are still critical blocking points that need to be tackled urgently, namely:

a. **Low capacity to execute Monitoring, Reporting, and Verifying (MRV)**

At present, there is still a low capacity for the regional government to do the MRV process. Conducting MRV at the regional level will support the alignment of regional government goals with SDGs and climate action. In addition, the MRV process will assist the process for climate budget tagging, under the effort of “greening the budget”.

b. **The disparity of climate knowledge across regional government**

After 1999 and during the reformation era, Indonesia is entering a decentralization regime. Decentralization enables the regions to administer and manage their governmental affairs, meaning a transfer of responsibilities and authorities to the regional government. Under this regime, regional governments and their vision are key to the implementation of climate-related policy. Though policies and innovative schemes are developed and available at the national level, the implementation at the regional level is varied, affected by the capacity and knowledge of the government per se.

c. **The role of local governments has not been well developed**

Before, there was no integrated system that provided information regarding climate actions by multiple actors (PS and NPS) at the local level. In this case, the local government was running their programs without acknowledging activities by other actors in their area, hence it led to overlapped programs. This condition also made mitigation activities heavily burdened to the state budget, with low/no Public-Private Partnership (PPP). In 2016, the Ministry of Environment and Forestry, through Ministerial Regulation of MoEF No.84/2016, established Climate Village Program (Proklam). The objective of the program is to increase the participation of the community and other stakeholders to strengthen adaptive capacity and decrease GHG emissions. Under Proklam, PPP is one of the prerequisites for the program, as it is part of the institutional arrangement for Proklam implementation.

d. **Food estate program that risks natural forest and peatland ecosystems**

During the first year of the covid-19 pandemic, Indonesia's economy experienced a recession.

As one of the programs for economic recovery, President Joko Widodo declared food estate as one of the national strategic programs 2020-2024. Food estate projects are located in four provinces, namely North Sumatra, South Sumatra, Central Kalimantan, and Papua. The area utilized for this project is the ex-Mega Rice Project peatland area.

Despite rejection from scientists regarding this top-down decision, the program is still running. Deforestation risk from the program is increasing when MOEF released Ministerial Regulation No.24/2020 which allow food estate inside forest area, including production and protected forests. In addition, there is new terminology for the food estate under forests area, namely Food Security Forest Area (KHKP).

Whilst communities and private owners are allowed to invest and manage the food estate area, there is a high possibility that the private will be the main target for this program, while communities remain marginalized.

e. Regional execution of Strategic Environmental Assessment far from pleasing

Through Regulation No.46/2016, the GoI provides rules and procedures for National and Sub-national governments in undertaking Strategic Environmental Assessment (KLHS), especially for spatial planning. At present, the implementation of KLHS is still far from satisfying due to unavailable, inaccessible, and inconsistent data as there is a lack of coordination between the regional government and the Agency for Regional Development (BAPPEDA). In addition, climate knowledge at the regional level is also one of the limitations (as mentioned previously).

As currently KLHS only accommodates short-term development plans, and in the near future, the KLHS implementation should include land use optimization process, where there is sufficient land for agriculture, forestry, bioenergy and solar cell with a minimum level of ecosystem degradation and declined ecosystem services.

f. Weak cooperation between the government and universities/research centers

Even with a poverty level under 5%, poverty is still the main issue in Indonesia, including nutritious food and high-quality education. One of the

main reasons for this is policymaking with poor theoretical engagement and no peer review and academic freedom. In addition, it is estimated that the government expenditure in research was only 0.2% of its GDP.

Without a rigid scientific basis, policymaking is prone to be inconsistent and lead to public confusion and trust issues. Achieving the Paris Agreement objectives require cooperation between government and academics/scientist to enable science-based policymaking.

g. Less harmonized climate programs across ministries and sectors

The achievement of the net-zero emissions target must be in line with the target of increasing industrial sector growth. For this reason, harmonization of the strategic plans of the Ministry of Energy and Mineral Resources and the Ministry of Industry is needed. Currently, most industrial sectors still use fossil energy as raw materials and energy. The industry do not only require electricity but also thermal energy that is difficult to replace by renewable energy. At present, cement, ceramic, chemical, textile raw materials, smelters, and other factories that require high heat use coal and gas.

Lower GHG emission intensity for the industry is expected after utilizing CCS in industrial fossil energy systems, electrification of industrial equipment, and use of renewables (especially hydropower in metal industries). However, its realization depends on the carbon content of the electricity supplied by the utilities and the access of the smelter industry to hydropower resources.

h. Stranded assets

Decarbonization of the energy sector requires the substitution of the use of fossil energy by renewable energy and nuclear energy and the implementation of energy efficiency measures. However, this substitution of fossil energy by renewable energy will cause an economic problem since it will leave assets unexploited and left underground, which will become stranded assets. This certainly will have economic implications for countries that are endowed with fossil energy resources.



NATIONAL PROGRESS ON CLIMATE AMBITION SINCE THE PARIS AGREEMENT

Matteo Leonardi,
Luca Bergamaschi,
Ecco Climate

DOMESTIC DISCOURSE

While the public perception on climate change has shifted and public mobilization has increased since the Paris Agreement, this hasn't been translated in higher political representation and in energy policy choices aligned to the Paris Agreement goals. Political parties and politicians are still trailing behind their European counterparts in understanding climate policy, including its consequences of success and failure, and in promoting strong Italian climate leadership. This may start changing under the leadership of Premier Mario Draghi, although questions remain.

Since the Paris Agreement the perception of climate change as a threat but also an opportunity for increased prosperity has fundamentally shifted in Italy. Today, climate change is ranked on top of global threat for Italian as the **2020 PEW research shows**. Also, **research during Covid from More in Common** in 2020 shows that Italians, who were among the first and most affected by the pandemic, are not only the most empathetic people in Europe but also the first in Europe to be in favor of a "Green New Deal" that allows government investment on a large scale to recover the Italian economy in a more environmentally friendly way. Italians are the first in Europe (with 81%) to think that the reduction of CO₂ emissions during the lockdown shows that it is possible to reduce our impact on the environment if we really want to. However, while 59% believe in

the importance of taking the opportunity given by Covid to make important changes in the country, only one third of them think that these changes will actually take place. In fact, Italians are among the first in Europe to think that the government is not doing enough for the climate and to be concerned (75%) that the commitment to environmental protection and climate action slows down or stops after Covid. As far as Italy's international engagement is concerned, 62% of Italians believe that Covid has demonstrated the importance of working more closely with other countries and international institutions to address important challenges such as pandemics and climate change. These findings are confirmed by a new survey from [YouGov for E3G](#): 85% of the Italian public support the Italian government providing poorer, developing countries with the financial and technological support to help them transition to clean energy, while just 10% oppose. Also, 62% say the Italian government should maintain its promises to developing countries on this matter, despite the context of the pandemic, while just 25% say circumstances have changed sufficiently that the government should go back on previous pledges. And finally, 62% think that "we will all suffer the consequences of climate change, so it's in the interests of Italy to help poorer countries make the transition to clean energy" while 32% think the government should put the needs of its own country and people first and leave poorer countries to fund their green transition themselves. This rise of awareness since the Paris Agreement was led by four main factors: climate impacts are becoming ever more tangible; the Fridays for Future movement has been a new driving force of youth mobilisation since 2019 and has established itself as strong presence and voice in the public debate; the Italian media are increasing their coverage of climate-related news also thanks to increasing available climate risk data and assessment available for Italy (such as [the first comprehensive report on climate risk for Italy](#) in 2020); and the void left by the Trump Administration on climate increased the pressure for Italy to step on climate change and fill the void, especially during the 2017 G7 Presidency.

While the Italian Prime Minister Mario Draghi has for the first time introduced a much stronger narrative on climate change in the public debate, do-

mestic energy policy choices do not reflect the new rhetoric. The biggest risk at the moment is for Italy to embark in a slow decarbonization journey whereby renewables energy, energy efficiency and electric mobility receive a lower ranking compared to extending the life of existing and gas assets and building new ones. The political debate and policy choices are dominated by an energy agenda and narrative controlled by the powerful Italian gas industry, which has unmatched access to politicians and media, as [recent research shows](#). The state-controlled oil & gas company ENI as well as the Italian gas system operator SNAM – Europe's biggest – are aggressively advocating both in Rome and Brussels for a decarbonization strategy almost exclusively focused on bio-gas, bio-fuels, hydrogen, and CCS while actively blocking electrification efforts. On the other front, the state-controlled electricity utility ENEL is instead shifting its main focus on renewable deployment, smart grid and electric mobility although questions remain on ENEL's gas assets in Italy. The outcome is that the interests of a few big established gas companies are over-represented in politics and media ([whose revenue increasingly depend](#) from the royalty of gas companies), while the interests of citizens and the businesses of the zero-carbon economy – populated mostly by small and medium enterprises with a few exceptions – do not find representation in politics, media and policy terms.

NATIONAL GOVERNANCE

Climate change has only recently taken a higher space in the national political agenda. The new government set up some institutional developments, but the lack of long-term strategic vision on climate actions is still significantly putting at risk the national transition.

The national governance structure of climate issues has changed recently. In February 2021, two new Ministries were created: the Ministry for the Ecological Transition (MITE) and the Ministry for Sustainable Infrastructures and Mobility (MIMS). In particular, the former Ministry for the Environment (MATM) and the energy's directorates of the Ministry for the Economic Development (MISE) have been merged to

create the new Ecological Transition Ministry. MITE has the remit on environmental, energy, and climate policies. While MITE and MIMS are responsible for most climate policies, other ministries contribute to the definition of sustainability-related policy actions. This merging mirrors similar dynamics that are taking place within other European governments (such as France), where an integrated policy approach is promoted. However, while in France the merging is leading towards a growing integration of environmental and energy policies with housing and transport policies, this has not happened in Italy where the delivery of an integrated vision is still hampered by traditional structures that tend to work in silos and avoid cooperation.

In parallel to Ministerial-level changes, Italy has created two new cross-ministerial committees to ensure coordination between Ministries: the Interministerial Committee for Sustainable Development (CIPESS) and the Interministerial Committee for the Ecological Transition (CITE). They are both chaired by the Prime Minister and have the mandate to coordinate ministerial action and approve national strategies regarding sustainable development and the ecological transition.

Setting up *ad hoc* supportive bodies is becoming a common feature for improving European and national policy-making. However, some essential elements must be preserved in order for these bodies to properly contribute to a better governance system. This notably involves their legal entity (i.e. being independent), have a clear mandate to provide policy advice and ensure policy consistency with climate objectives, and set up mechanisms to hold accountable other public institutions. These are all still missing from the Italian landscape at the moment. As other European examples show, an Italian Climate Law would help centralise all these elements and provide the policy and legal framework to design a governance system fit for purpose.

In 2019, Italy submitted its National Energy and Climate Plan (NECP) to the European Commission based on its 2017 **National Energy Strategy**. Overall, the European Commission judged the plan **positively**. The targets on GHG emissions reductions, energy subsidies, renewables, and energy efficiency were considered sufficient, and in general, the Commission recommendations were largely met. Nonethe-

less, the Commission criticised the over-reliance on new gas infrastructure that will not be needed, the lack of precise indications on the LULUCF sector, the absence of a long-term renovation strategy on energy efficiency, and the lack of research and innovation measures. While the Commission praised Italy for the good practices highlighted in the plan, it also expressed some concern about the difficulty of evaluating whether GHG emission reductions will be fully achieved. In line with the European requirements, public consultations and thematic groups have been organized to collect feedback and integrate new proposals in the final text. However, the Italian NECP will need now to be revised to integrate the adopted and updated 2030 and 2050 European emissions reduction and sectoral targets, the national breakdown of which is currently under discussion at the EU's level.

As far as the **Italian Long-term Strategy** is concerned, it was published in January 2021 but not yet submitted to the UNFCCC. It presents two scenarios for 2050, emphasising how, with the decarbonization scenario, Italy can reach climate neutrality by 2050. It shows the evolution of the energy system, and focuses on five sectors: industry, buildings (residential and tertiary), transport, agriculture, and LULUCF. It also analyses the developments regarding adaptation and the initiatives meant to align financial and economic flows to the Paris Agreement's goals. Even if the strategy has been only recently made public, the Italian government committed to review it before COP26 as part of the 2021 G7 Summit communique. However, due to the strict time constraints, revising the LTS before the COP26 may prove challenging. Indeed, the pledges made within the strategy will have to be reviewed considering the new European target of reducing GHG emissions in the EU by 55% by 2030 compared to 1990, and the reform of several pieces of the EU climate legislation that will be released in July as part of "Fit for 55" package.

While local and regional authorities are responsible for implementing **the majority of climate legislation**, at the moment their actions are not coordinated with national or international commitments. Many small municipalities often lack the necessary funds or technical capacity to implement ambitious environmental policies within their territories. None-

theless, many Italian municipalities developed their climate plans and are very active in the **Covenant of Mayors initiative**.

ACTIONS AND POLICIES

National climate objectives are defined in the National Energy and Climate Plan (NECP). In the energy sector, which accounts for 23,7% of Italy's CO₂eq emissions, coal-fired power stations should be phased out by 2025 as per national policy (electricity generation from coal is just below 10%). The Government is planning to mostly replace them with gas-based generation with additional 3-6GW of new capacity according to different storage development assumptions). Beyond coal phase out, most relevant NECP climate objectives include the development of renewables at 32%, of which 55% in the electricity sector, 34% in the heating and 22% in the transport sector and a 43% efficiency improvement over primary energy as compared to reference scenario (PRIMES2007) for energy efficiency target resulting in an absolute primary energy demand from 142 Mtoe in 2020 to 125 Mtoe at 2030 (pre-Covid data).

There is not a proper implementation strategy to achieve the coal phase-out of the remaining 8.000MW (2018) coal power stations. The target is pursued by a combination of measures in the electricity sector, including the development of some 40-45 GW of new renewable, the installation of some 10GW of hydro pumped and electrochemical (grid connected and distributed) storages, the development of new grid infrastructure and the commissioning of 6.000MW of new gas capacity.

The development of new gas capacity is achieved with the introduction of an explicit capacity market mechanism which in late 2019, with two auctions with delivery at 2022 and 2023, has purchased new capacity for some 6.000MW. The new capacity will be remunerated for 15 years at the auction cap price of 75.000€/MW. In May 2021 the Italian TSO has released a consultation document to update the auction mechanism in order to have new capacity auctions for 2024 and 2025. The demand of capacity required by the TSO is not known, yet. The capacity market design has been widely criticized for discriminating in favour of new gas capacity and excluding demand-side management measures and storage capacity. Following

the introduction of capacity market over 15.000 MW of new gas plants have filed an Environmental Impact Assessment application. A recent Decree 77/2021, connected with the National Recovery and Resilience Plan (NRRP) governance, introduces simplified procedure for gas infrastructure permitting, including EIA. Notwithstanding NECP targets, Italy is lagging behind the implementation of an effective renewable policy, because of its cumbersome permitting procedures (split between central and regional governments), market and regulatory barriers. Italy has developed most of its renewable capacity in the early 2010s thanks to feed-in like incentive schemes mostly for wind and PV technologies. Since 2012 the renewable programme has slowed down, given the high level of expenditures having reached 10bln €/year, and been suspended for grid PV. Decree 04/07/2019 establishes an auction mechanism for mature renewable technologies, mostly wind and PV, for a total capacity of 8000 MW. The auctioned capacity to be allocated in 2020-2021 corresponds to less than 20% of NECP target, still only a fraction of capacity is assigned during the auction sessions and there is no certainty about the future mechanism to promote renewable capacity. The cumbersome permitting procedures is currently limiting new renewable development to some 1.000MW per year as compared to some 5.000MW which would be needed to be on track with NECP target (55%). Assuming a new target of some 72% of renewable in electricity market by 2030, as publicly announced by Prime Minister Draghi and Minister of Ecologic Transition, the required annual growth of renewable is estimated at some 6-7.000MW/year, well above current trend. The National Energy Strategy 2017 and the NECP have also indicated the need to develop renewables in grid parity without public support, with the promotion of PPA (power purchase agreement) contracts, also as a public procurement practice. But to date, a regulatory framework for a successful PPA development is not in place.

The Decree 77/2021 intends to speed up permitting procedures for renewables.

Energy Efficiency (EE) policy is mainly structured in two main measures. Energy Efficiency Certificates (EEC) to support EE mainly in the industrial sector, and a tax rebate mechanism to incentive EE investments in private and public buildings.

Energy efficiency certificates mechanism was introduced in 2005 establishing an obligation for energy supplier to promote a minimum level of energy efficiency measures on final uses. The obligation is increased on an annual basis up to 2024. Energy efficiency in the industrial sector is also promoted with a credit incentive within the 'industria 4.0' programme supporting innovation for the productive sector, including SME.

Private and public building energy efficiency is promoted by a tax rebate mechanism. The mechanism consists in paying back, in 10 years, a percentage of energy efficiency refurbishment costs. The percentage, originally set at 55%, has been increased at 65% and, as a Covid-19 recovery measure, increased to 110% with Decree 34/2020. Individuals and social housing agencies may access the incentive. The tax credit can be transferred to third parties.

The incentive is assured providing minimum technical requirements, including the improvement of at least two energy classes, are met. The mechanism is criticized for its uncertainty over time - the mechanism has to be confirmed annually in budget law - and for its effectiveness with reference to energy efficiency quantitative targets, considering the high incentive cost involved (110% for an improvement of two energy classes only). In addition the mechanism still allows fossil fuel technologies, such as gas boiler, in the technologies accessing the incentive.

For transport, NECP priority is given to policies to contain the need for mobility and the increase of collective mobility, in particular by rail, including the shifting of freight transport from road to rail. There is a target for electric vehicle, currently set at 6 million vehicles sales by 2030 but there is not a proper roll-out strategy for electric mobility in place, nor for the development of the recharging infrastructure. Periodically the Government approves an incentive scheme to purchase new vehicles, but the largest amount of incentive is directed to 60-135 gCO₂/km vehicles. Italy is among EU countries with highest percentage of owned car over population (over 600/1000 resident) and the climate target can uniquely be met with a coordinated strategy switching mobility mode, promoting public transport, increasing shared and slow mobility and renewing vehicle fleet. This needs a climate governance between the central Government and

the regional/local one which is still not in place. Municipalities are asked to produce local mobility plans, but it is not clear the connection between those plans and national transport policy. Battery storage strategy is under discussion at national level. The Italian National Recovery and Resilience Plan (NRRP) is the largest in Europe with a budget of 261 billion €. The plan is composed by 191,1 billion € from the Recovery and Resilience Facility, 13,5 billion € from React- EU and additional 30,5 billion € from a nationally financed Complementary fund and 26 billion € of additional national resources for high speed train infrastructures to be spend within 2032. The Plan and its resources have been mainly directed to socio-economic needs and weaknesses, already present in pre-Covid time and now exacerbated by the pandemic. The Italian NRRP consists in six major missions and three main horizontal dimensions: climate change, digital impact, and national cohesion. The Italian NRRP declares 40% expenditure in climate change, 27% in digital impact and 40% in national cohesion with investments directed to southern regions. The Plan does not contain measures or projects which can be considered harmful for the environment.

The climate budget covers two missions:

- **Green revolution and ecological transition**, for a total of 68,7 billion €, including projects in agriculture and circular economy, renewable energy and electricity infrastructure, hydrogen development, energy efficiency, resources for local transport and biodiversity and adaptation.
- **Infrastructures for a sustainable mobility**, for a total of 31,4 billion €, focusing on railway infrastructure development for the completion of a high speed train network and its connection with the regional network.

Although the plan is able to reach the required 37% of climate expenditure according to EU regulation, it is not convincing in its climate impact. The sum of NRRP climate projects does not make an effective climate strategy, this is to say the money are spent in climate aligned projects but not in transformative sectors able to contribute to the long term decarbonization target. The impact in terms of CO₂ of financed projects is only reported in a few sections. The total impacts quantified by the Plan show a contribution to just 3% of the 2030 goals, or 5.6 Mt CO₂ eq.

Other measures, such as supporting local transport, the possibility of transitioning the steel industry towards sustainability and making buildings energy-efficient will lead to further reductions. However, the lack of a quantitative assessment of the measures means it is impossible to measure their efficacy, or to weigh up alternative options which may be more cost-effective or have a greater impact. The very fact that the measures are not quantified shows that decarbonization is not being considered the motivation for spending. In addition, as assessed by the green recovery tracker¹, the Plan is weak in supporting transformative projects in the three key climate flagships: renewable, energy efficiency and infrastructures for electric mobility.

¹ <https://www.greenrecoverytracker.org/>

NARRATIVE ON CLIMATE AMBITION SINCE THE PARIS AGREEMENT

Kentaro Tamura

Japan has raised its climate ambition by declaring its commitment to achieve carbon neutrality by 2050, and by setting a new target of reducing its greenhouse gas (GHG) emissions by 46% against 2013 levels by 2030. This brief provides a perspective on how Japan's ambition has evolved since 2015, in terms of domestic discourse, governance to strengthen ambition, and action on the ground to implement the necessary measures.

DOMESTIC DISCOURSE

Ahead of the declaration on carbon neutrality by 2050, there were two significant changes in perception towards climate measures in Japan. First, in June 2018 at the Council on Investments for the Future—a top body to determine the general direction of national economic policy—the then Prime Minister Abe stated, “Combating climate change is no longer a cost for companies, but a source of competitiveness. And companies that are proactive in dealing with environmental issues will attract funding from around the world, enabling them to grow and take further action.”¹ This statement marked a turning point in perception on climate change policy among key decision-makers (previously, climate measures were seen as costly and burdensome for business activities). The statement was repeated in key policy documents such as Japan’s long-term low GHG emissions development strategy in June 2019, and the declaration of 2050 carbon neutrality in October 2020.

The perception that combating climate change is no longer a cost for companies but rather a source of competitiveness was driven by actual changes in business. For example, there is a rapidly growing number of Japanese companies that are engaged in RE100, Science-based Target initiative (SBTi) and the Taskforce on Climate related Financial Disclosures (TCFD). In addition, pro-climate action business groups like the Japan Climate Leaders’ Partnership

¹ See the meeting minutes of the 17th Council on Investments for the Future, <http://www.kantei.go.jp/jp/singi/keizaisaisei/miraito-shikaigi/dai17/gijiyoushi.pdf>.

(JCLP) have seen a marked increase in their membership². The market size of ESG investments in Japan increased from JPY 57 trillion in 2016 to JPY 231 trillion in 2018, an increase of 306%. Finally, immediately preceding the declaration on carbon neutrality by Prime Minister Suga, two significant announcements were made. The first came from the chair of *Keidanren*, Japan's biggest business association including members from the energy-intensive sectors, who proposed innovation for 2050 carbon neutrality at the Council on Economic and Fiscal Policy.³ The second announcement was that JERA—the biggest power generation company in Japan, producing about 30% of Japan's electricity—also pledged to achieve carbon neutrality by 2050.⁴ It is these changes to the way business perceive climate measures that have paved the way for climate ambition.

However, one consequence of putting climate change measures in a key component of a growth strategy is that the focus of the measures tended to be on industry-oriented technological innovation. For example, the Japan's long-term low GHG emissions development strategy highlighted hydrogen and carbon capture, utilization and storage (CCUS), while providing few specific discussion of innovation in socio-economic systems or lifestyles. A more balanced discourse is needed in the course of achieving carbon neutrality.

Secondly, climate change-related disasters have also had a major impact on public perception. Climate change began to be viewed as a threat to society, requiring the fundamental response of carbon neutrality. In 2018, Japan was hit by three exceptionally extreme weather events, causing economic damage of USD 27.5 billion.⁵ Then in 2019, two record-strong typhoons caused economic damage of USD 25 billion.⁶ According to German Watch's Global Climate Risk In-

dex, Japan was ranked the country most affected by climate change in 2018, and the fourth most affected country in 2019. Furthermore, thanks to the development of a branch of climate science called extreme event attribution, the Japan Meteorological Agency began to point out the linkages between global warming and these specific events,⁷ which were reported by mass media and started gaining the attention of the general public.

Responses to these climate change-related disasters put a considerable economic burden on local governments. Many of them began to declare a state of climate emergency, and others announced their commitment to carbon neutrality by 2050. Prior to Prime Minister Suga's declaration on carbon neutrality, 168 local authorities, covering 62% of Japan's total national population, declared their commitment to achieving carbon neutrality by 2050.⁸ In addition, private companies also face the growing risk of physical damage due to climate change, which threatens their business operations and assets.

These changes in perception has provided the domestic basis for raising ambition.

NATIONAL GOVERNANCE

Japan's recent move to raise its climate ambition was accompanied by three developments related to national governance of climate issues. First, the commitment to carbon neutrality by 2050 was enshrined in law. Second, there was a change in the process for formulating Nationally Determined Contributions (NDC). Third, a Cabinet Office Minister for Climate Change was appointed to accelerate coordination across all levels of government.

Regarding legislation, the Act on Promotion of Global Warming Countermeasures was amended to stipulate the goals of the Paris Agreement and the government's declaration of carbon neutrality by 2050 as basic principles and position them in the law. The Act entered into force in 1998 as the first climate-dedicated law in Japan, and serves as

² Member companies of JCLP are 186 with the total sales of 144.8 trillion yen as of June 2021. See <https://japan-clp.jp/en>

³ The Council on Economic and Fiscal Policy became a top body to determine the general direction of national economic policy, after the Council on Investments for the Future was abolished.

⁴ JERA's press release "Towards Zero CO₂ Emissions in 2050." Available at https://www.jera.co.jp/english/information/20201013_539

⁵ Eckstein, et al. "Global Climate Risk Index 2020" German Watch Briefing Paper. Available at https://www.germanwatch.org/sites/germanwatch.org/files/20-2-01e%20Global%20Climate%20Risk%20Index%202020_14.pdf

⁶ Eckstein, et al. "Global Climate Risk Index 2021" German Watch Briefing Paper. Available at https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf

⁷ Imada, et al. "The July 2019 High Temperature Event in Japan Could Not Have Happened without Human-Induced Global Warming." *Scientific Online Letters on the Atmosphere (SOLA)*. Vol.15A (2019) Available at https://www.jstage.jst.go.jp/article/sola/15A/0/15A_15A-002/_article

⁸ As of June 2021, the number of local governments announcing the 2050 carbon neutrality reached 416 covering 88% of the total population. See <https://www.env.go.jp/policy/zerocarbon.html>

a framework legislation for climate change policy. By clearly setting out the direction and continuity of the policy, the amended Act aims to provide predictability to all actors, including citizens, local authorities and businesses, and to promote initiatives and innovation.

With regard to Japan's NDC, a new target of reducing GHG emissions by 46% against 2013 levels by 2030 was announced in April 2021, though this has not yet been officially communicated as the updated NDC. The basis for the 46% emissions reduction target is not known. If a straight line is drawn between zero emissions in 2050 and current emissions, however, there will be around 46% reduction in emissions by 2030 compared to 2013 levels. This new target is a significant increase from the previous target of a 26% reduction (the first NDC).

When Japan's first NDC was formulated in 2015, energy policy provided a framework within which the 26% reduction target was set. The Strategic Energy Plan provides the general direction of national energy policy for the next two decades, and has been revised every three to four years. Based upon the Fourth Strategic Energy Plan of 2014, the Long-term Energy Supply and Demand Outlook of July 2015 provided "macro-framework" (GDP and economic activities) and an "energy mix" for 2030, which in turn became a basis for bottom-up calculation of the emissions reduction target for 2030 (METI, 2015). However, due to a deadlock in the discussions on energy policy, in particular with regard to nuclear power, the Fifth Strategic Energy Plan of 2018 did not amend the 2030 energy mix. This led to a situation where NDC could not be substantially changed even though Decision 1/CP.21 requested Parties to communicate or update their NDCs in 2020.⁹ As a result, the Japanese government updated its NDC in March 2020 without any change to the emissions reduction target.¹⁰

Since changing the emission reduction target for 2030 would require a change in the 2030 energy mix, it was expected that Japan's NDC would not be changed until after the summer of 2021, when

the new Strategic Energy Plan would be formulated. However, at the urging of the Biden Administration in the US, a new 2030 emission reduction target was announced at the Climate Leaders' Summit in April 2021 before the new Strategic Energy Plan was developed. At the same time, the targets were raised from the original assumptions. This meant that the new Strategic Energy Plan has to be developed in line with the new 2030 emission reduction target, and must also take into account carbon neutrality by 2050. In other words, climate targets provided a framework within which energy policy would be formulated.

At the time of writing, it is not clear whether and how this new process whereby energy policy is designed to achieve a climate target will be institutionalised. However, this provides an opportunity to develop a new governance system for integrating energy policy and climate policy. Under current legislation, the Plan for Global Warming Countermeasures is mandated by the Act on the Promotion of Global Warming Countermeasures, while the Strategic Energy Plan is mandated by the Basic Act on Energy Policy. These two sets of policy differ in terms of the timing and process of revision, thereby resulting in significant obstacles to enhancing emissions reduction targets. Integrated climate and energy policy is required to make the domestic policy process consistent with a five year cycle of NDC submission.

One positive step toward cross-governmental coordination was the establishment of a Cabinet Office Minister for Climate Change. In March 2021, Prime Minister Suga appointed Environment Minister Koizumi as the Cabinet Office Minister for Climate Change, assigning him with coordinating powers across all ministries.¹¹ There are more than 10 bodies under the Cabinet Office, the Ministry of Economic, Trade and Industry, the Ministry of the Environment the Ministry of Land, Infrastructure, Transport and Tourism, and the Ministry of Agriculture, Forestry and Fisheries that discuss and review climate and energy policy. The role of the newly-established Cabinet Office Minister is expected to coordinate climate action across government with the aim of enhancing the level of climate ambition.

⁹ <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>

¹⁰ Japan' submission of updated NDC. Available at [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Japan%20First%20SUBMISSION%20OF%20JAPAN%27S%20NATIONALLY%20DETERMINED%20CONTRIBUTION%20\(NDC\).PDF](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Japan%20First%20SUBMISSION%20OF%20JAPAN%27S%20NATIONALLY%20DETERMINED%20CONTRIBUTION%20(NDC).PDF)

¹¹ <https://www.env.go.jp/annai/kaiken/r3/0309.html>

ACTIONS AND POLICIES

One of the most important actions put in place over the past five years with notable potential for the achievement of climate objectives was establishing targets for approving offshore wind power of 10 GW by 2030 and 30-45 GW by 2040.

Surrounded by the sea on all sides, Japan has huge potential to generate offshore wind power and must use this to the maximum extent in order to achieve carbon neutrality by 2050. However, the deployment of offshore wind power is significantly lagging behind. The feed-in tariff (FIT) scheme gave a boost to the deployment of solar PV, but failed to develop offshore power projects. The capacity of offshore wind power installed in Japan is currently around 0.2GW, mostly from government-funded demonstration projects. The government did not set clear targets for introducing offshore wind power. Due to a poor outlook for the domestic future market, major Japanese wind turbine makers withdrew from the business.

In April 2019, to boost the deployment of offshore wind power, the Japanese government brought into force the «Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources.» This Act allows offshore wind power developers to occupy a registered area up to 30 years after consultation with relevant ministries and local stakeholders, such as fisheries and local residents, with a view to reaching a consensus. The government will set five areas where operation of renewable energy will have started by FY2030.

In addition to legislation, the Japanese government consulted with the private sector, and outlined its vision and targets for offshore wind power. The vision included a 60% local content requirement by 2040 as well as a target of reducing the cost of fixed foundation offshore wind power generation to JPY8-9/kWh sometime between 2030 and 2035.

It is essential for the Japanese government to commit itself to creating an attractive domestic market and to attract both domestic and overseas investment. Along with the government's initiative, major wind turbine makers like Vestas Wind Systems and GE announced the establishment of strategic partnership with Toshiba and a joint venture with

Mitsubishi Heavy Industry, respectively.¹² This has strengthened expectations of the rapid deployment of offshore wind power in Japan.

¹² Press release from Mitsubishi Heavy Industry, available at <https://www.mhi.com/jp/news/210201.html>; Press release from Toshiba, available at https://www.toshiba-energy.com/info/info2021_0511_02.htm

CLIMATE AMBITION SINCE THE PARIS AGREEMENT

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CLIMATE CHANGE DISCOURSE

From Cancún to the Paris COP, Mexico's active climate diplomacy allowed Mexico to raise the profile of climate change within national policy while presenting itself as a global climate leader.

In the years prior to COP 21, Mexico was praised for both its national and international engagement with climate change. Following on from its successful hosting of COP16 in 2010, it adopted the 2012 General Law on Climate Change Law (LGCC as Spanish acronym) which framed the country's long-term climate ambition.

The Paris Agreement provided further stimulus for Mexico to advance its climate credentials by presenting its NDC earlier than most countries (March 2015) and promptly delivering (November 2016) its Mid-Century Strategy in response to paragraph 19 of Article 4.

While public concern with the climate change increased, this did not translate into ambitious climate action. The perceived importance of climate has receded as international visibility has declined.

More recently, the AMLO administration has abandoned the goal of being perceived as a leader. By re-iterating the 2015 GHG reduction targets within its 2020 NDC update, Mexico failed to address the credibility challenges stemming from recent energy

policy measures, while showing disregard for the widespread shift in international discourse towards 1.5°C and “net-zero” targets.

Research by the Pew Research Centre found public opinion concern on climate change increased from 52 to 80 per cent between 2013 and 2018 (significantly above US and Canada in North America). A recent public opinion study from Mexico's Senate research institute shows climate change ranked seventh from a set of nine environment concerns, with air quality and deforestation at the top.¹ Thus, climate action is often seen as a co-benefit to other forms of environmental policy.

Important segments of the business community have equally not embraced a vision of structural transformation, including supporting the expansion of the fossil fuel industry as a development strategy.² Mexican companies have shown little interest in joining climate initiatives along global peers. For example, only nine publicly listed companies have pledged to use TCFD Disclosures recommendations, and only three companies have targets under the Science-Based Targets initiative, despite the country's position as major global exporter and OECD economy.³

INSTITUTIONAL FRAMEWORK AND LEGACY POLICIES

Despite the transformational potential of the LGCC, the energy liberalization reforms of 2013–2015 reaffirmed the domestic commitment to a fossil fuel economy

The unanimous adoption of the LGCC by the Mexican Congress during the final months of the Calderón administration (2012) remains the most significant achievement of national climate policy to date. The law set targets broadly in line with limiting global warming to 2°C, reflecting the ambition Mexico derived from COP16 in Cancún. The LGCC drove significant policy work during the

2013–2015 period to roll out its stipulated institutions and planning instruments, including the establishment of the National Institute for Ecology and Climate Change, the creation of the National Council for Climate Change, and the National System for Climate Change. At the national level, the National Strategy for Climate Change and Special Plan for Climate change laid out a national vision for mitigation and adaptation over 10, 20 and 40 years and concrete action plan for the ministries over the 2012–18 timeframe, respectively, while numerous State and Municipal level plans and laws were also adopted.

Crucially, none of these instruments nor institutions sought to link short or medium-term targets with the long-term national goals, nor was an overall roadmap for a low-carbon transition developed⁴. As a concrete example, all policies from 2013 to 2021 simply restated the power sector climate goals first established in 2010 (goals for low emissions electricity to reach 35 per cent by 2024 and 50 per cent by 2050) without relating them to the demands the 2050 emissions target will make of the 2050 power sector. These goals had been originally established in 2010 and already by 2015 were known to misalign with the domestic climate legislation.⁵

This lack of agreed short-term milestones meant the LGCC's long-term goals were not a significant input for the Energy Reform which happened immediately after its adoption.

Policies and actions since 2013 have increased investment in oil production and locked in a greater dependency on natural gas across electricity, industry, and other sectors, unhindered by LGCC, NDC or LTS commitments

In 2013, the newly instated Peña Nieto administration started an energy sector transformation with the primary objectives of directing foreign investment into oil production and reducing the

1 Buirra, Daniel, Jordi Tovilla, Jamil Farbes, Ryan Jones, Ben Haley, and Dennis Gastelum. 2021. 'A Whole-Economy Deep Decarbonization Pathway for Mexico'. *Energy Strategy Rev*

2 For instance, the business think tank Mexican Institute for Competitiveness (IMCO) defined as a goal to increase oil production by 50 per cent and more tripling natural gas from shale gas production

3 TCFD Supporters and SBTi membership consulted on 22 June 2021.

4 Buirra, Daniel; Arredondo, Juan Carlos. 2019. "Mexico's Mid-Century Strategy: Lessons in Planning for the Paris Agreement". <https://www.wri.org/research/mexicos-mid-century-strategy-lessons-planning-paris-agreement>

5 Buirra, Daniel, Jordi Tovilla, Jamil Farbes, Ryan Jones, Ben Haley, and Dennis Gastelum. 2021. 'A Whole-Economy Deep Decarbonization Pathway for Mexico'. *Energy Strategy Reviews* 33 (January): 100578; Veysey, Jason, Claudia Octaviano, Katherine Calvin, Sara Herrerias Martinez, Alban Kitous, James McFarland, and Bob van der Zwaan. 2016. 'Pathways to Mexico's Climate Change Mitigation Targets: A Multi-Model Analysis'. *Energy Economics* 56: 587–99.

cost of energy for the economy. Structural choices included constitutional changes to enable foreign investment in hydrocarbons and development of pipeline infrastructure to allow increased imports of low-cost shale gas from the USA for power generation and industry. The policy objective of increased competitiveness in the fossil fuels industry found domestic and international support. International institutions like the IMF applauded the reform for its capability to accelerate use of natural gas in the system.⁶ Many in Mexico embraced natural gas epithets as 'bridge fuel' and 'clean fuel' and looked to Mexico to join the 'Golden Age of Gas' so-called by the IEA.

This commitment to natural gas had direct repercussions on Mexico's climate policy. For example, a carbon tax on fossil fuels was first rolled out in 2014 as part of LGCC implementation (directly charged at point of sale on fuels according to their CO₂ density), with a price of 3.50 USD per ton, with natural gas fully exempt from the tax.⁷ The small cost did little to impact the energy economy, while favoring natural gas over other fuels across all uses.

This context limited the scope for Mexico's NDC, which followed a sectoral approach of emissions reduction with respect to a baseline to establish a whole-economy mitigation commitment for 2030 of reducing GHG emissions by 22% with respect to business-as-usual⁸ The NDC contained no mention of structural change, nor any reference to how targets related to the 2050 emissions limit set by the LGCC. Mexico's Mid-Century Strategy of 2016 did not address this gap, largely repeating previous policy statements.

Furthermore, since 2015 Mexico has included black carbon as a climate pollutant alongside its GHG accounting – both for the NDC commitments of 2015 and subsequent GHG inventory updates – despite this being inconsistent with relevant IPCC

guidelines.⁹ This made the substitution of diesel, coal and fuel-oil with natural gas (which has lower emissions of particulate matter) present a far greater apparent climate mitigation than what would result from applying IPCC guidelines. Thus, by deciding to diverge from accepted GHG accounting practice, Mexico's environmental authorities reinforced the belief – espoused by both private and public sector – that climate targets can be achieved by switching to "clean" fossil combustion, even though this message is inconsistent with national (LGCC) and international (Paris Agreement) goals.

The expectation of natural gas demand growth led the government to use state-owned companies to expand pipelines by 40% and increase of import capacity from the US of more than 220%, with additional import capacity additions under construction.¹⁰ By 2018, Mexico had transformed the electricity state-owned company in a top natural gas trader in North America and a committed advocate of the gasification of the economy, with contracts on US produced natural gas well into the 2040s.¹¹

Renewable energy has remained an afterthought within electricity policy, itself secondary to the fossil fuel reform, despite some positive policy developments

The 2013-2015 reforms made important contributions to decarbonization in the electricity sector reform: the establishment of a renewable auction system which successfully de-risked private investment in solar and wind energy projects, coupled to a requirement that power producers surrender a certain number of Clean Energy Certificates (CEL) each year to ensure demand for their low-carbon

⁶ Alvarez, Jorge, Fabián Valencia, Fabian Valencia, Herman Kamil, Robert Rennhack, Ernesto Revilla, Alberto Torres, and Alejandro Werner. 2015. 'Made in Mexico: Energy Reform and Manufacturing Growth'. WP/15/45. IMF Working Paper.

⁷ Mexico's 3 Big Steps Towards Comprehensive Carbon Pricing Juan-Carlos Altamirano and Julia Martínez <https://www.wri.org/insights/mexicos-3-big-steps-towards-comprehensive-carbon-pricing>

⁸ Intended Nationally Determined Contribution, Government of Mexico, 2015 <https://www4.unfccc.int/sites/NDCStaging/Pages/Search.aspx?k=mexico>

⁹ Black carbon, commonly known as soot, is made up of small particles of solid carbon remaining from imperfect combustion which are dispersed into the atmosphere within the resulting smoke. A sample of emitted black carbon will therefore not be made up of a standard molecule, such as CO₂ or CH₄, but rather will contain a potentially enormous variation of particle sizes depending on fuel used and the technology and quality of combustion. Particle size and meteorological conditions present at the time of combustion or afterwards influence how long the black carbon remains in the atmosphere, with its warming impact further depending on the surrounding environmental conditions. In addition to climate impacts, black carbon has important negative health effects, usually included within particulate matter considerations when studying air quality.

¹⁰ Gobierno de México, *Sexto Informe de Gobierno*, 2018, p. 128-134.

¹¹ See <https://www.naturalgasintel.com/mexicos-cfei-climbs-two-spots-in-ngis-4q2020-natural-gas-marketer-survey/>

power. By 2018 Mexico had proven a successful mechanism to de-risk investment in wind and solar energy. Still, the country missed its 25% target clean electricity by 2018.

While these achievements are welcome, the proportional investments made during the Peña Nieto administration, as shown in the government investment report from 2012-2018 period, show the country's priorities: while more than 160,000 million USD were directed to oil and gas production, investment in gas pipelines was 12,000 million USD, and 8,600 million USD were presented as "observed or committed to clean energy".

CURRENT POLICIES AND OPPORTUNITIES

The current AMLO administration's developmentalist policy program has re-directed infrastructure investment, halting the expansion of private investment in some segments of the fossil economy while expanding SOE participation in others.

In December 2018 the AMLO administration took power under an electoral platform which seeks to recuperate the value creation opportunities of the state-owned energy companies rather than pursuing fossil fuels per se. For instance, it has rejected ventures in offshore oil and inland shale hydrocarbons, the expansion of airflight capacity in Mexico, and long-term contracts to import natural gas from the US. But it is committed to deliver on an expansion of refining capacity owned by the state-owned oil company, Pemex, as showcased by the development of a greenfield refinery at Dos Bocas and the purchase of the outstanding 50% of the Deer Park refinery in Texas.

In the electricity sector, the government has challenged legacy policies developed by regulators in the late 2000s and 2010s that directly reduce the market share of the state-owned utility CFE. Firstly, the bilateral contracts for large consumers that benefited with discounted transmission rates and other regulatory benefits. And secondly, the long-term renewable energy auctions that de-risked private investment, effectively blocking further rollout of renewable generation and putting previous investments at risk. This

falls within the AMLO administration's general revision of policies that historically favored private foreign investment.

While some authors blame these recent challenges for the bulk of Mexico's lack of climate ambition,¹² others (including us) consider many of the weaknesses of the climate regime as a structural feature present since the early implementation of the LGCC (2012).¹³

Looking forward, decision-makers of different political persuasions should view a structural transition to a low-carbon economy as a source of growth to be incorporated within their development models, rather than as an ideology in its own right.

Mexico's development towards achieving its climate ambition requires an acceleration and a redirection of investments. In electricity this includes renewable generation assets and electricity grid technologies to manage a solar and wind energy based system. Economy-wide, the change in direction includes the electrification of energy use across transportation, industry, and buildings. National demand for fossil fuels will decline along with international demand in a context where the world economy is moving to structural changes consistent with the objectives of the Paris Agreement. This represents a challenge to existing investment logic in the public and private sector, creating important stranded assets with labor and regional development implications. But it has the potential to generate concrete opportunities for growth for Mexico, given its extensive renewable resources, skilled workforce, industrialized economy, and access to global markets – regardless of the political or market model under which this activity is guided.

¹² See a number of opinions quoted in "Nothing can shake Mexico's fossil-fuel fixation", *The Economist*, 23 May 2020. <https://www.economist.com/the-americas/2020/05/21/nothing-can-shake-am-los-fossil-fuel-fixation>.

¹³ Lüpke, Heiner Von, and Mareike Well. 2020. 'Analyzing Climate and Energy Policy Integration: The Case of the Mexican Energy Transition'. *Climate Policy* 20 (7): 832–45; Villarreal, Jorge. 2019. 'La Amenaza Climática y La Gestión Energética: Reflexiones'. In *Alternativas Para Limitar El Calentamiento Global En 1.5°C. Más Allá de La Economía Verde*. Ciudad de México: Heinrich Böll Stiftung; Valenzuela, José María, and Isabel Studer. 2017. 'Climate Change Policy and Power Sector Reform in Mexico under the Golden Age of Gas'. In *The Political Economy of Sustainable Energy Transitions*, edited by Douglas Arent, Channing Arndt, Mackay Miller, Finn Tarp, and Owen Zinaman, Online ed. Oxford: Oxford University Press.

State-owned companies can be catalytic to rapid decarbonization due to their significant asset-based, large workforce and historical legitimacy if they are entrusted with the mandate to decarbonize and plan for the decline of fossil fuel economy

Today, the federal executive and majority in Congress are committed to the rehabilitation of state-owned companies as a locally appropriate instruments of economic governance. Is decarbonization compatible with such an paradigm? What might it look like? Given one of the characteristics of democratic institutions is the potential for frequent changes in the political platform of governments, it is worth considering the challenge of aligning climate ambition across the ideological spectrum by ensuring that policies are robust within varied political programs, for example, by making state-owned companies greener rather than making them smaller. There are important reasons to consider in the context of Mexico

Firstly, dominant state-owned companies like electricity CFE effectively pool business risks across its value chain and can shift well-remunerated workers across business lines. For example, in contrast to legal battles and politically protracted processes of negotiation to close coal power generation (seen in Europe), the state-owned company could develop a managed transition for the closure of the two active coal power stations without the need for major tax-payers' compensation. Secondly, in the oil sector, the decision to suspend new lease bidding rounds is a window of opportunity to plan for declining oil and gas production at least at the pace of domestic fuels consumption reduction. Thirdly, the revision of the tax regime could fill loopholes on natural gas and increase the effective rate of carbon tax with the explicit objective of funding domestic infrastructure for climate actions that result in other economic, health and environment benefits. And, finally, the development of infrastructure by existing or new state-owned companies can lead to structural changes in demand, especially in transportation, with inter-urban train across Mexico's regions and electrified mass urban transport. The ambition of these mass-transportation solutions should result in a noticeable reduction in fuel demand during this decade. These new ventures

include forming joint-ventures between the CFE and state-governments on locally relevant renewable energy programs.¹⁴

Thus, in addition to work towards finding a place for successful experiments like renewable auction system, it is plausible to nurture a discussion on a state-manage low carbon infrastructure development, and to view Mexico's concrete low-emissions development opportunities in this light. In some areas the presence of state enterprises will be beneficial.

Lack of accountability internationally and domestically over past plants and action (or lack thereof) will remain a major challenge to work on the barriers and opportunities to move from the fossil fuel economy.

Our retrospective on Mexican climate ambition has found that that the diplomatic leadership of 10 years ago, followed by the 2012 Climate Change Law, have remained largely on the margins of national policy ever since. As different administrations have promoted contrasting development paradigms, each with its corresponding vision for the energy economy, the climate question has had little relevance on major policy choices. Concrete climate achievements, such as the Renewable Electricity Auctions, while welcome, have been minor in scale, and constrained to where they do not interfere with the stated direction of travel.

Recent action has not been better, challenging the most distinctive achievements of the previous administration and emphasising an environmental view focused on the safety and wellbeing of communities as long as this does not collide with fossil fuel interests. Meanwhile, doubling down national investments on the hydrocarbon value chain, based on expectations of global and domestic oil market resilience over the coming decades, is a direct bet against global decarbonization.

There are at least two domestic and one international institutional condition that contribute to this unfortunate outcome. The first condition is a perennial misalignment between energy and environmental policy in general and climate change in particular, which

¹⁴ See, for example, the recent announcement of a 1GW solar power plant co-developed by the State of Sonora. (<https://www.elfinanciero.com.mx/estados/2021/07/13/sonora-y-cfe-instalaran-planta-solar-con-inversion-de-mil-685-mdd-en-puerto-penasco/>).

has been widely documented by scholars in politics and administrative sciences.¹⁵ The second condition is the lack of formal rules or practices on accountability over government targets. Officials are not assessed publicly about the failure to meet stated goals and there are not even reviews of achievements of past targets.¹⁶ Mexico missed its renewable energy and GHG mitigation targets in 2012 and 2018, without institutional accountability. Finally, the integration to a North America economic community has meant the alignment to the socio-technical system of the United States which has promoted the expansion of fossil fuel production, including under the promise of “cleaner fossil fuels”.

Policymakers, business leaders, and civil society must understand the potential of resilient low-carbon development on its own merits as relates to economic and social growth through investment, jobs creation, and greater social equality, and find how it can be included within whichever development vision is chosen. Only in this way can sustainable development translate across the political spectrum. Until this occurs, our country will remain a climate laggard.

¹⁵ Lüpke, Heiner Von, and Mareike Well. 2020. 'Analyzing Climate and Energy Policy Integration: The Case of the Mexican Energy Transition'. *Climate Policy* 20 (7): 832–45; and Pacheco-Vega, Raul. 2020. 'La Gobernanza Policéntrica de Mitigación y Adaptación Al Cambio Climático En México En El Contexto de La Arquitectura Global de Política Climática'. In *México Ante La Encrucijada de La Gobernanza Climática*, edited by Israel Solorio. Ciudad de México: UNAM.

¹⁶ Only the Congress auditing office has pointed to failures to reach targets in their budget and expenditure auditing work, however, these have not resulted in any form of public accountability.

CLIMATE AMBITION BEYOND THE NDC

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This short essay provides a brief account of the progress that Nigeria has made on addressing climate change since Paris Agreement in 2015. The essay is based on personal observations and experience working with several groups of stakeholders in the country. The account is not intended to be exhaustive but to highlight some of the most significant developments from the perspective of the country's transformations towards carbon neutrality. The essay is structured in three parts as follows: (a) domestic discourse, which deals with the level of awareness, and dominant views on the reasons for climate (in) action; (b) national governance, which covers institutions and processes at national and sub-national levels for steering the Nigeria's transformation (or lack of it) in the face of climate change; and (c) concrete policies and actions.

DOMESTIC DISCOURS

From a low base, public awareness of climate change in Nigeria has grown since the Paris Agreement helped by a charismatic environment Minister but research suggest that awareness remains shallow and superficial

There are no definitive large-sized studies on the perception of climate change among Nigerian citizens as exists in many developed countries. However, several localized studies that measure the perception of climate change among various regions and demographics find that awareness can be as high as up to 80% with equally a high percentage feeling that the issue is serious enough to warrant concerted attention by government and other stakeholders.^{1,2,3} However, many of these publications also report that when pressed, not many respondents are able to elaborate on the possible measures of climate action or on the positive steps being taken by the government to transition Nigeria to a low carbon future. The general perception therefore is that awareness is broad but shallow and superficial.

- 1 Badmos, B. K., Sawyerr, H. O., Awopeju, S. O., Salako, G. A., & Abdulrasheed, A. A. (2017). The Socioeconomic/Demographic Determinants of Public Perception about Climate Change in Ekiti State of Nigeria. *Journal of Geography, Environment and Earth Science International*, 9, 1-10.
- 2 Nche, G. C. (2020). Beyond Spiritual Focus: Climate Change Awareness, Role Perception, and Action among Church Leaders in Nigeria. *Weather, Climate, and Society*, 12(1), 149-169.
- 3 Esan, V. I., Lawi, M. B., & Okedigba, I. (2018). Analysis of cashew farmers adaptation to climate change in South-Western Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 1-12.

There is evidence that the Paris Agreement has had some impact in increasing public awareness of climate change in Nigeria not least because the preparation process of the Intended Nationally Determined Contributions (INDC) in the run to the Conference of Parties (COP) in France in 2015, although somewhat rushed to meet UNFCCC deadline, incorporated a number of medium-sized stakeholders' consultations especially in Abuja and Lagos metropolis. For many stakeholders, the consultations exercises represented the first real opportunity to engage the government in a meaningful discussion on the implications of climate change to Nigeria's economic development and more importantly to make inputs to a document that would help to determine the policies and measures that Nigeria would adopt to tackle climate change.⁴

The appointment of charismatic Ms Amina Mohamed who was previously serving as the Special Adviser to UN Secretary-General Ban Ki-moon on post-2015 development planning as the Minister of Environment in November 2015 also had strong positive impact in increasing public awareness of climate change in Nigeria during and immediately after Paris Agreement. Ms Mohamed was media savvy and very visible during the Paris Agreement. She played a major role in helping to broker a deal on Adaptation Goal which was a priority issue for the African Group of Negotiators (AGN) during the Summit. She also had a more open approach to government than many of her predecessors and encouraged meetings and inputs from a wider section of the Nigerian public. After signing the Paris Agreement, the government invested some effort into public engagement including holding consultations in the different geo-political zones that make up Nigeria. A series of National Consultative Workshops on gender and climate change supported by Ms Mohamed which was launched in 2016 was also used as a means of broadening public awareness of climate change and engaging Nigerians to take the INDC and the Paris Agreement forward from pledges to action.

As part of the revision on the NDC process which is ongoing, the WRI funded a national project on Promoting Public Engagement with Nigeria's NDC Revision and Climate Action implemented by CCCD

at AEFUNAI designed to generate independent analysis on critical aspects of climate change and also increase public engagement stakeholders' engagement in the revision and subsequent implementation of the revised NDC. The project was intended to strongly compliment the current government-led NDC revision process with the support of the NDC Partnership through the Climate Action Enhancement Package (CAEP), by injecting academic analysis and more public debate into the process. Through the project there has been series of publication and national virtual dialogue to provide opportunity to national and international experts to analyse various aspects of the NDC. However, while awareness continues to grow, it is not clear that the momentum or political will is shifting in the direction that will engender a radically shift the trajectory of development towards a green economy.

The dominant discourse promoted by the government is that action on climate change can help build a resilient economy

The key government narrative is that ambitious climate action will foster low carbon economy, sustainable growth and the building of a climate resilient society.⁵ Examples of the positive relationship between taking ambitious action and building a resilience society often touted by the government include increase in renewable energy use as a means of addressing energy poverty, reforestation as part of the effort to tackle aggressive desertification that is ravaging the northern parts of the country, and oil spill clean-up and land remediation in the Niger-Delta which is claimed will recover the carbon sink potential of about one thousand square kilometers (1,000 KM²) of mangrove ecosystem that had been affected by oil pollution.⁶ However, there remains a significant percentage of Nigerians that question the "win-win" philosophy and suggest that Nigeria's preoccupation should be on the pursuit of industrialization and rapid economy growth needed to pull its citizens out of poverty. These ones argue that climate change is a "White Man" problem which should not be allowed to distract government's concentration on economic development.

⁴ <https://www.environmentnigeria.com/nigeria-puts-finishing-touches-indcs-stakeholders-validate-draft/>

⁵ INDC, Federal Government of Nigeria, 2015

⁶ <https://www.thenigerianvoice.com/news/281875/full-text-of-president-buharis-speech-at-the-united-nations.html>

Among the wider Nigerian population climate awareness and discourse may have been shaped the multiple impacts of climate change on the livelihood of the people especially through drought and flooding. Nigeria is among the most vulnerable countries to climate change in the world according to the ND-GAIN index⁷ score which measures country's climate vulnerability based on exposure, sensitivity and ability to adapt to the negative impact of climate change. Nigeria's forests have been massively depleted at an annual rate of 3.5% with the FAO estimating that between 1990 and 2015, the country lost about 35% of its remaining forest resources and over 50% of other wooded land, making it a country with the highest rate of deforestation in the world.⁸ Over 25 million Nigeria's are exposed to the risk of flooding and an estimated 27 to 53 million people in the country may need to be relocated with a 0.5 m increase in sea level.⁹ Oil infrastructure worth trillions of dollars are in the coastal area that are risk of sea-level rise.

Agriculture employs over 70% of Nigeria population and 86% of all crop farming is rain-fed and vulnerable to even small changes in weather pattern.¹⁰ Climate change is causing a decrease in productivity of many of the staple food crops and worsening the state of food insecurity in the country. Significant changes in rain fall pattern in the last 10 years and the resulting drought and famine have stimulated a lot of national conversation on climate change and served to increase awareness among the population. Climate change is a major driver of desertification in the North and the shrinking of Lake Chad which in turn is driving cattle-rearers down to the South, increasing farmers-herders conflict and amplifying insecurity in the country. At the same time Nigeria has witnessed an unprecedented number and intensity of flooding events in the last 5 years. In September 2020 alone it was reported that flooding 192,594 people across 22 states in Nigeria including 826 injuries, 155 fatalities and

about 25,000 displacements.¹¹ Several news reports of the droughts, crop-failure, famine, flooding, heat-waves and other extreme weather events in Nigeria linking these events to global warming and climate change and this has served to increase awareness. Already Nigeria has one of the highest numbers of internally displaced people in the world. Moreover, the almost sole dependence of Nigeria on oil export for foreign exchange earnings (about 85%) means that Nigeria runs the risk of suffering a catastrophic economic consequence that will involve massive job losses, inflation, and huge amounts of stranded assets in the event of a global transition to the green economy.

A new wave of Civil Society Organizations (CSOs) has helped to increase awareness but these lack the capacity to pressure government and businesses for real action

The post Paris Agreement has also witnessed the proliferation of civil society organizations seeking to broaden public awareness of and engagement with climate change. These include groups like the Climate and Sustainable Development Network (CSDDevNet) representing the PanAfrican Justice Alliance (PAC-JA), the International Climate Change Development Initiative, Creative Youth Community Development Initiative, the International Student Environmental Coalition (ISEC), and Women In Renewable Energy Association (WIRE-A). A key focus of these groups many of which are driven by youth climate activities has been the promotion of climate education (often with tree planting components) in primary and secondary schools as well as local communities. Another topical issue is the promotion of clean cooking and renewable technologies such as solar lanterns, solar PVC, LPG cylinders and improved cooking stoves. These CSOs have also contributed to keeping climate change on the political agenda even after COVID-19 with references to the need to build back better and leverage COVID-19 stimulus package to take action on climate change.¹²

However, many of these NGOs are small and nascent. They do not have capacity to undertake major works or initiatives that can put pressure on policymakers and businesses to increase their ambition on climate

7 <https://gain-new.crc.nd.edu/ranking/vulnerability>.

8 FAO cited in Emmanuel Oladipo. (2021). *Analysis Of The Adaptation Components That Could Be Included In Nigeria's Nationally Determined Contributions (NDCs) Revision*. Center for Climate and Development, Alex Ekwueme Federal University Ndufu-Alike Nigeria Discussion Paper.

9 TNC

10 Onyeneke Robert and Emekwe Chukwemeka (2021). *Options for promoting climate-smart agriculture in the new NDC in Nigeria*. Centre for Climate and Development, Alex Ekwueme Federal University, Ndufu-Alike, Nigeria Discussion Paper.

11 <http://www.floodlist.com/africa/nigeria-floods-october-2020>

12 <https://nnn.ng/csos-advocate-green-recovery-out-of-covid-19-in-nigeria/>

action. Moreover, there is a sense that most of the narratives on climate change in Nigeria are still at a superficial level and lack the level of rigor required to trigger meaningful and strategic decarbonization of the economy. While there is a recognition of the positive synergies that exist between climate action and sustainable development in Nigeria there remains a lack of deep understanding of the almost far-reaching threats of climate change to Nigerian economic future and possibly its survival as a country.

For example, while the NDC is hailed as ambitious, the data and analyses on which it was built has been judged very suspect given the absence of a comprehensive national emission registry, the emissions from most of the key sectors (energy, transport, and forestry) on which the NDC was based were best guess projections. Although the NDC makes reference to ending gas flaring, the country's main economic plans such as the Vision 2020 and the Economic and Growth Recovery Plan (EGRP) and the Post COVID-19 National Economic and Sustainability Plan (NESP) all emphasize the commitment of the government to increased oil exportation.¹³ A Petroleum Industry Bill (PIB) which was intended to deregulate the oil sector has been lying remains a hostage to political brinkmanship and horse-trading in the Federal Houses of the Parliament. Government has touted the need to diversification the economy away from its current dependence on oil but this has remained a lofty ambition with the economy heavily reliant oil receipts which are dwindling because of COVID-19 pandemic and the global green economy transition.

ON NATIONAL GOVERNANCE

A vibrant Department of Climate Change Drives Climate Governance in Nigeria but capacity is low and higher level of coordination apparent.

Responsibility for the governance of climate falls under the Federal Ministry of Environment. Initially, the coordination of climate change activities was done by a Special Climate Change Unit (SCCU) within the

Environment Ministry. However, in recognition of the growing importance of climate change and the need to elevate its governance at the national stage, the government in 2011 elevated the Special Unit to a full Department of Climate Change (DCC) with the head of the Special Unit promoted to the position of director. The DCC remains the focal point and Designated National Authority (DNA) for Climate Change in Nigeria.

Nigeria has had the good fortune of having Directors of DCC that are relatively vibrant and keen to elevate climate governance in the country. As a result of the dynamism of the two previous directors and the current acting director the DCC has managed to make a decent representation in the annual COPs and keep pace with the creation of international climate policy documents as demanded by the UNFCCC. The DCC drove the creation of the NDC in 2015 and has coordinated the drafting of a number of many other important documents and plans such as the Nationally Appropriate Mitigation Action (NAMA), the Building Nigeria Response to Climate Change (BRNCC) and the Second and Third National Climate Communication, the latter of which especially involved a measure of stakeholder consultation and validation exercises.

There also exists an Inter-ministerial Committee on Climate Change, convened by the Minister of Environment, with representation from the ministries of Finance, Agriculture, water Resources, Energy Commission, Nigeria National Petroleum Corporation (NNPC), Foreign Affairs, Nigerian Meteorological Agency (NIMET), and industry to promote horizontal integration of climate action in Nigeria. Interestingly the Committee also has representatives from the Civil Society Organization and two Research Centers¹⁴. A National Council on the Environment, also convened by the Minister of Environment, comprising state governors and representatives at the federal level also meet periodically to review the state of the environment and make policy recommendations. The council also provided a strong endorsement for the formulation of an ambitious renewable energy policy

¹³ Chukwumerije Okereke and James C. Okeuhie (2021). Aligning Nigeria's Nationally Determined Contributions (NDC) and The Covid-19 economic stimulus, Center for Climate and Development, Alex Ekwueme Federal University Ndufu-Alike Nigeria Discussion Paper

¹⁴ NGOs rep is Nigerian Environmental Study/Action Team), and the Academic Reps are Centre for Climate Change and Fresh Water Resources, Federal University of Technology Minna; Centre for Energy, Research and Development, Obafemi Awolowo University Ile-Ife; and Abubakar Tafawa Balewa University, Bauchi.

and a renewable energy master plan in the months immediately after the Paris Agreement.

Government also creates ad hoc interministerial committees to engage with or help manage climate change initiatives that are deemed of national importance and requiring coordination across ministries. For example following President Buhari promise in his speech at the 74th United Nations General Assembly in New York in 2019 that Nigeria would plant 25 million trees to address deforestation, climate change and increase carbon sink among others, the government convened an inter-ministerial committee to oversee the implementation of the pledges¹⁵. More recently the government has also convened another inter-ministerial committee to help steer the production of low emission development pathways for the country which is being undertaken as part of the Deep Decarbonization Project coordinated by IDDRI.

However, there remains a sense that the current institutional arrangement for the governance of climate change in Nigeria lacks the coherence and leverage that matches the scale and urgency of the challenge. Despite these existential threats, there has not been any urgency to elevate climate action to the level comparable to national security or macro-economic growth in the country. For the large part, climate change discussion is confined within the Ministry of Environment and its Department of Climate Change and the role of many critical stakeholders such as businesses has remained largely limited. The government does not as yet have a National Green Growth Plan or any other plan to ensure the integration of climate action across ministries or mainstreaming of climate change into the core of aspects of economic plan. There have been calls for a Special Envoy on Climate Change, a Presidential Special Adviser on Climate Change or a Special Climate Change Fund National Climate Change Commission as ways to elevate the status of climate governance and increase horizontal coordination, however these calls have largely gone unheeded.

¹⁵ Membership comprised the Forestry department, the Climate Change Unit, the unit in charge of drought and desertification, the National Park Services, the National Agency for the Great Green Wall, Representatives of Governors Forum, Civil Society Organizations, the private sector, Wood Export Association, Dangote Foundation and Ministries of Agriculture, Water Resources and Women Affairs.

There is need for vertical integration in the governance arrangement of climate change and new legislations to achieve greater coherence and focus.

While the effort at horizontal integration is generally moderate, vertical integration is all but lacking. Nigeria is a big country with 36 federating units. However, the bulk of climate governance instruments and institutions have concentrated at the national level and awareness and governance at the state and local government level is woefully lacking/inadequate. Of the 36 states, only a handful of states such as Lagos state in the West and Ebonyi State in the South East have a state climate change policy. The government has made some effort to address this gap through the creation of climate change desks officers at the state level but the desk officers lack clear mandate and powers to drive meaningful climate governance at the state levels.

There have been two unsuccessful attempts to pass a climate change law that would elevate the political profile of climate change, and strengthen both horizontal and vertical coordination in climate governance. The first attempt was between 2014 and 2015 when the Senate Committee on Ecology and the Committee on Climate Change at the National House of Representatives both passed a bill on Climate Change which among other sought to create a National Commission on Climate change. However, Dr Jonathan Goodluck who was President at time refused to sign the bill into law on the basis that the government had a commitment to curb the "proliferation" of government agencies. Following the signing of the Paris Agreement a second attempt was to pass a bill to create a National Climate Change Agency and a National Council on Climate Change to raise the political standing of climate governance in the country. But again, having passed through the two houses of parliament, President Buhari also in 2019 refused to sign the bill into law.

Government has recently started the process of creating a long-term low greenhouse gas emission development plan in compliance with Article 4 of the Paris Agreement. It is hoped that the plan will for the first time articulate a clear a clear vision for carbon neutrality for Nigeria and the pathways for achieving such a vision. So far, the formulation of the plan has involved engagement with several other ministries, departments

and agencies in the country bearing in mind the extensive amount of coordination that would be required to achieve such a vision. However, the process has only just started with the first drafts expected to be published before COP26 and it is not yet clear what impact the process and the plan will have in shaping the carbon neutrality discourse in Nigeria.

POLICIES AND ACTION

There is a lot of commendable development and efforts in Nigeria with regards to climate action but a general lack of depth, rigor and urgency in driving decarbonization

A hotchpotch sectoral policies drive mitigation of climate change and are not specifically targeted at decarbonization or synchronized with Nigeria's NDC. Nigeria climate policies and actions are scattered across different sectors and institutional frameworks without sufficient concretization of interventions towards the ambitious goal of achieving carbon neutrality in 2050. There is a raft of initiatives especially in the renewable energy and forestry sector many of which are driven by multilateral organizations and UNFCCC commitments. A major sign of progress was recorded when the government signalled through the Nigerian Renewable Energy Masterplan and Vision 30:3030 a commitment to increase the renewable energy share of the energy supply-mix by 30GW by 2030.

Several international development partners have sought to encourage government along these lines by funding a variety of clean energy programmes across the country. The government has commissioned a number of distributive renewable energy (RE) programmes including the Rural Electrification Agency's Energizing Education projects through which solar energy installations were made in some Nigerian Universities and several across rural communities in the country. The Energizing Education project is supported by both the World Bank and the African Development Bank. The Energy Commission of Nigeria (ECN) has also carried out a number of renewable energy projects over time including 10 on-grid and off-grid project that were recently given approval through PPAs by the government bulk-purchasing company (NBET) to proceed to development.

The renewable energy sector in Nigeria remains hamstrung by several constraints including lack of policy initiatives and limited public and private sector investment. As a result, the share of RE in the energy mix is still very minimal. The benefit of scaling up private sector investment has been recognized and government has granted some PPP licenses as means of unlocking investment from private sources but a complex regulatory and political environment continues to limit progress.

Some notable progress has also been made in the AFOLU sector. These include the establishment of a National Agricultural Resilience Framework (NARF) on policies required to successfully implement a national climate smart agricultural programme¹⁶ and the completion of a national forestry plan. There has been an increased yield in rice production boosted with injection of financial grants through an Anchor Borrower Scheme that provided soft loans to smallholder farmers. Government has embarked on some successful REDD+ schemes in the different ecological zones to maintain forest resources in its pristine state, and earn carbon credit for the country. These REDD++ schemes have consolidated the country's efforts to reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks. Several of the flagship reforestation and renewable energy projects in the country have received funding support from the two Green Bonds projects launched by the Federal government in December 2017 and June 2019 which raised 10 billion Naira, (USD 30 million) and 15 billion Naira (USD 42 million) respectively.

An important emission reduction policy which is rarely projected as a climate policy in the country is the pockets of rail infrastructural development being undertaken by the government. Transport infrastructure in Nigeria is not only grossly undeveloped but poorly maintained. To curb reliance on inefficient transportation mode the federal government initiated and completed two major rail lines from Abuja to Kaduna, Lagos to Ibadan. Additional new lines from Calabar to Lagos and Kano to Marradi in Niger Republic are at different stages of construction while light rail line is at formative stage in the Federal

¹⁶ www4.unfccc.int/submissions/INDC/submissionpages/submissions.aspx

Capital Territory, Abuja. Lagos state government is the only state where there is high presence of green transportation infrastructure with an extensive energy efficient BRT buses in operation and a light rail line project planned. A positive development in line with NDC outlook of moving freight to rail is the construction and commencement of moving freight from the much-congested Apapa port to container terminals in Ibadan. This measure not only eased traffic congestion at the Apapa axis but also reduced cost of goods and pollution from trucks.

Urbanization has increased the incidence of managing Municipal Solid Waste (MSW). Solid waste accounts for 3% to Nigeria's carbon emissions with agriculture contributing a total of 30m tonnes/year of waste. One measure so far adopted to reduce MSW is the Solid Waste Program Interventions organized by the Federal Ministry of Environment to implement an integrated solid waste management programme. Different states around the country participated actively and offered to elaborate policies within their areas of jurisdiction. However, poor waste management remains a major issue in the country and virtually none of the several large waste-to-energy schemes talked about in the country has proceeded to project execution stage.

Gas flaring remains the largest single-point source of GHG emission in Nigeria accounting for over 50 million metric tons of CO₂ per year. Ending gas flaring by 2030 is one of the big targets of the NDC. In 2016 the government launched an ambitious Nigerian Gas Flare Commercialization Programme ("NGFCP") which is aimed at selling the previously flared gas to private investors so they can convert to other economically viable uses such as CNG, LNG, and LPG. Government recently says that a contract has been signed with over 100 entities to participate in this program but it is not clear when the operation will start. More recently the government has also launched a National Gas Expansion Program (NGEP) aimed to deliver 1million autogas vehicles by 2021. However, government has recently expressed frustration that the country is encountering resistance from international development partners which do not see natural gas as part of the future for Nigerian green transition. This frustration may be a sign of the crisis that awaits

Nigeria if it fails to get its act together to take a proactive approach towards the diversification and decarbonization its economy in line with the global transition towards neutral world by 2050. In sum a huge gap remains between rhetoric and action and with limited capacity many of the CSOs are not able to bring pressure to bear on the government to follow through with the commitments it makes at several international fora.

BUILDING AND ACHIEVING OUR CLIMATE CHALLENGE (NDC)

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This document has been prepared with the aim of presenting Peru's progress on climate policy and the country's capacity to translate climate objectives into long-term structural changes during the period 2016-2021 to align them with the mitigation and adaptation objectives of the Paris Agreement.

The content of the document is based on a literature review, as well as the expert judgment of the authors and analysis undertaken as part of the Climate Change Management Support Project (GestiónCC) - Phase 2., It seeks to contribute to the international debate in the run-up to COP26.

INTERNAL DISCOURSE ON CLIMATE CHANGE

Peru is currently going through a difficult time due to the health, economic and social crises generated by COVID-19. Moreover, the political crisis is creating an atmosphere of considerable uncertainty; nevertheless, climate change remains the biggest challenge facing the country and considerable efforts have been done to address it.

In 2014, COP20 was held in Lima, which involved not only being the host country of such a great event but also to facilitate the path towards achieving the first binding global agreement on climate change for the world. During the following year, work continued on negotiating the text in preparation towards the Paris Agreement, in complete collaboration and articulation with France.

According to the 2017 Study on Knowledge and Perception of Climate Change¹ conducted by the Climate Change Management Support Project, the majority of the national population (92%) had heard about climate change, and the subject was gaining greater strength and awareness in the population of Lima and Callao (95%). Similarly, the national

¹ GestiónCC, 2017. Study on the Knowledge and Perception of Climate Change. Climate Change Management Support Project, Phase 1. Available in: <https://sinia.minam.gob.pe/documentos/conocimiento-percepcion-peruano-cambio-climatico-nivel-nacional>

population recognized that the effects of climate change are counterproductive to the development of the country and its citizens. Hence, people consider it necessary and important for the state to intervene and invest in curbing the effects, taking center stage alongside other major problems in the country such as crime and corruption. Also, according to the study «Earth Day 2020»² 71% of Peruvians would be totally in agreement, or with a tendency to agree, with being «discouraged to vote for a party if it does not seriously address climate change».

In 2019, COP25 was held in Madrid and although it ended without results that would have led to the culmination of increasing climate ambition, Peru did not stop in its commitment to face climate change. Indeed, Peru joined the Climate Ambition Alliance to increase the ambition of its NDC in 2020 and to achieve carbon neutrality by 2050.

Similarly, it signed the San José Principles for High Ambition and Integrity in International Carbon Markets with 29 other countries and a declaration to incorporate oceans into the climate change discussion.

At the 2020 Climate Action Summit, Peru reaffirmed its commitments under the Paris Agreement by increasing its ambition to reduce carbon emissions from 30% to 40% in 2030 (30% of which is unconditional), with the firm prospect of becoming a carbon neutral country by 2050. In 2021, the Peruvian government rebranded the NDC to make the term more understandable and broadly known. «Nuestro Desafío Climático» (Our climate challenge) is the new acronym for NDC, for internal discourse purposes.

COP20 in Lima was a key moment for the country in terms of putting climate change on the national agenda. However, the Paris Agreement and its milestones have also directly influenced national climate policy. The NDC is the key instrument around which the legal and institutional basis has been built. The 2020 milestone to both increase ambition of the first NDC and produce long term strategies have directly affected the qualitative

and quantitative increase in climate ambition and the current priority to update the climate change strategy with a long term view.

In July 2021 Peru will celebrate two hundred years of being a Republic and this celebration is framed by a context of health, economic and social crises due to COVID-19 as well as a political crisis due to the presidential elections, which as of late June 2021 are yet to be concluded. However, the climate crisis remains the greatest risk facing mankind with regard to their development, and Peruvians seem to be increasingly aware.

According to the study carried out by Libélula, Institute for Global Change (2021) «Traffic Light of the Proposals of Government Plans in the General Elections 2021 (Climate Traffic Light)»,³ climate change is present in a significant part of the political agenda of the parties running for the 2021 elections. However, in most plans, the proposals are broad without explaining the mechanisms for implementation, or are too specific mentioning technicalities in the field of governance. Similarly, of the two political parties that have gone to the second round, neither has given the issue the necessary priority it deserves.

The involvement of non-state actors is key to achieving the overall objectives of the Paris Agreement; and in the case of Peru the Ministry of Environment has been very active involving constituencies such as indigenous peoples, civil society, youth, academia and the private sector. The private sector has an important role for the success of comprehensive management of climate change. In light of this, the Peruvian state promotes and strengthens joint work to optimize the results of integral management in the face of climate change. A clear example of this can be seen in the case of the National Society of Mining, Petroleum and Energy which has approved a climate change principle and has been promoting initiatives related to irrigation infrastructure, water security, recovery of wetlands, reservoirs and forest management that include reforestation and conservation.

² Ipsos, 2020, Title: «Earth Day 2020», 29 Available at: <https://www.ipsos.com/sites/default/files/ct/news/documents/2020-04/earth-day-2020-ipsos.pdf>

³ Libélula Institute for Global Change, 2021. Traffic light of the Proposals of Government Plans in the General Elections 2021 - Climate traffic light. Available in: <http://www.peruvotaporelclima.com/>

NATIONAL GOVERNANCE

Work on climate change is being undertaken at the highest political level, via the High Level Commission on Climate Change (CNACC), under the Framework Law on Climate Change and its Regulations, the National Adaptation Plan and a National Strategy for Climate Change to 2050, currently under construction in a collaborative process.

The Peruvian State has made great progress in the comprehensive management of climate change. After having ratified the Paris Agreement in July 2016, through Supreme Resolution No. 005-2016-MINAM, it created the temporary Multisectoral Working Group in charge of generating technical information to guide the implementation of the Nationally Determined Contributions (GTM-NDC). After multi sectoral work over 22 months, 91 adaptation measures and 62 mitigation measures were approved that are part of the Nationally Determined Contributions (NDC) of Peru, whose goal is to achieve a reduction of GHG emissions of 20% by the year 2030, with respect to the base year of 2010 and considering a *Business as usual* (BaU) scenario of increasing emissions.

Similarly, Peru approved the Framework Law on Climate Change and its Regulations in 2018 and 2019 respectively, which require that each public entity at the national level reports adaptation and mitigation actions and ensures that management instruments, development planning and sectoral investment include such actions. In addition, it grants the Ministry of the Environment (MINAM) the responsibility of administering the System for Monitoring Adaptation and Mitigation Measures, which allows public monitoring, reporting and continuous dissemination of progress in the implementation of adaptation and mitigation measures; as well as identifying mechanisms to access and increase national and international funding to implement adaptation and mitigation measures that contribute to the comprehensive management of climate change and the implementation of NDCs. Another important milestone with regard to institutional progress is the creation of the Action Plan on Gender and Climate Change, thus making Peru the first country in South America to have such a management instrument, which will strengthen capacity building of the populations most vulnerable to the adverse effects

of climate change, allowing equal opportunities and rights for their sustainable development.

In order to contribute to the implementation and socialization of comprehensive management in the face of climate change, the strategy being used is the «Dialogues on Climate Change» process. This process convenes multiple social actors in the search for solutions to face climate change, generating confidence to implement the NDC within the framework of the Paris Agreement.

In 2020, Peru once again reaffirmed its commitment to strengthen at the highest level, the national response to climate change in a comprehensive, inclusive, multi sectoral and multilevel manner, with the creation of the High Level Commission on Climate Change (CANCC). The CANCC is composed of 14 ministries, the National Center for Strategic Planning (CEPLAN), regional and local governments, and has the task of proposing climate change adaptation and mitigation measures expressed in the NDC; to work on updating the National Climate Change Strategy to 2050 to move towards low-carbon development that is resilient to climate impacts; and prepare the Updated Report on Nationally Determined Contributions (NDC) to 2030, submitted in December of the same year to the Secretariat of the United Nations Framework Convention on Climate Change.

In June 2021, the Peruvian Government approved the National Adaptation Plan (NAP)⁴, with the objective of “orienting national climate change adaptation planning with clear priorities focused on reducing exposure and vulnerability and increasing adaptive capacity”. In compliance with international and domestic commitments on NDC and LMCC, a monitoring and evaluation (M&E) system was developed through which advances would be measured. It also presents the current status of finance for adaptation and key communication actions to effectively implement the NAP. Currently, one of the Government’s priorities is to update the National Climate Change Strategy (ENCC) to 2050 to achieve carbon neutrality and resilience of the population, the ecosystems, livelihoods, and productive and infrastructure systems, fulfilling its commitments under the United Nations Framework Convention on Climate Change and the Paris Agree-

⁴ MINAM, 2021. Resolución Ministerial N° 096-2021- MINAM. Disponible en: <https://www.gob.pe/institucion/minam/normas-legales/1955977-096-2021-minam>

ment. To this end, the participatory process for the elaboration of the ENCC by 2050 is being carried out, in which MINAM makes available to all key actors the necessary information to discuss and analyze collectively the four deliverables that are part of the ENCC by 2050. Once the preparation of the 4 deliverables is completed, everything will be integrated into a single ENCC proposal by 2050, which will undergo a public consultation process.

Regional Governments are also pushing climate action in each of their territories. To this end, they develop, approve, implement, monitor, evaluate and update their own Regional Climate Change Strategies, in accordance with the ENCC, the NDC and their current territorial management instruments. 88% of the regional governments, that is, 22 of the 25 have an ERCC but only 7 regions have their respective Implementation Plan. This reflects the need for technical support to regional authorities in order to carry forward the implementation of nationally determined contributions (NDC) and of raising their ambition; and reflect on learnings and inputs for policies and instruments, generating concrete results during the year. For this reason, MINAM, in collaboration with the Climate Change Management Support Project - Phase 2, designed and implemented in 2021 the «Program of Public Management for Climate Action in Peru», proposed on the basis of three main pillars in order to increase knowledge on climate change and public management, strengthen their soft skills and leadership capacities, and create a network for climate action.

ACTIONS AND POLICIES

Peru has more than 150 concrete measures to address climate change with a view to their implementation at the regional and sectoral levels. There is an opportunity in the context of economic recovery, but increased implementation and ambition will depend on the priority given to climate change by the new government and non-state actors.

Peru is committed to the implementation of the Paris Agreement, and in doing so, the work of the temporary Multisectoral Working Group in charge of generating technical information to guide the implementation of

the Nationally Determined Contributions (hereinafter GTM-NDC, created by R.S. No. 005-2016-MINAM),⁵ carried out between February 2017 and December 2018, is particularly relevant.

A total of 153 actions were formulated, 91 for adaptation and 62 for mitigation. In adaptation, the measures are distributed among the thematic areas as follows: Agriculture, 17 measures (19%); Forests, 12 measures (13%); Fisheries and aquaculture, 18 measures (20%); Health, 14 measures (15%); and Water, 30 measures (33%). Regarding mitigation, the measures are distributed in five emission sectors defined by the IPCC: Stationary Energy-Combustion, 23 measures (37%); Mobile Energy-Combustion, 14 measures (23%); Industrial Processes and Product Use, 2 measures (3%); Agriculture, 6 measures (10%); LULUCF, 8 measures (13%); and Waste, 9 measures (14%).

The process for the elaboration of the 153 measures employed a multisectoral, multilevel and multi-stakeholder approach, due to the need to involve and engage all levels of the state, regional and local governments; as well as a wide range of non-State actors, such as indigenous peoples, the private sector, youth and the general public. To this end, the participatory process «Dialogues on NDCs» was established, which facilitates implementation and increase in ambition of the country's NDCs.

In accordance with the provisions of the UNFCCC, Peru updated its NDCs to 2030, presenting improvements⁶ over those outlined in 2015. In the area of GHG mitigation, the improvements are expressed in three key aspects: (i) a lower level of emissions in the target year; (ii) greater methodological robustness; and, (iii) transparency for its measurement and reporting. Similarly, improvements in adaptation are expressed in: a) the establishment of a conceptual

⁵ Formed by the Ministry of the Environment, which acts as President and is in charge of the Technical Secretariat; Ministry of Foreign Affairs; Ministry of Agriculture and Irrigation; Ministry of Economy and Finance; Ministry of Energy and Mines; Ministry of Transport and Communications; Ministry of Production; Ministry of Housing, Construction and Sanitation; Ministry of Health; Ministry of Education; Ministry of Development and Social Inclusion; Ministry of Culture; Ministry of Women and Vulnerable Populations; and the National Center for Strategic Planning (CEPLAN). There are, then, thirteen ministries and CEPLAN the government sectors that make up the GTM-NDC, being able to be implementers or transversal according to their competences.

⁶ MINAM, 2020. Update Report period 2021-2030. Nationally determined contributions of Peru. Available in: <https://www.gob.pe/institucion/minam/informes-publicaciones/1682641-reporte-de-actualizacion-de-las-ndc-del-peru-al-2030>

framework for risk management associated with climate change, through which the problem has been identified and the priority objective for adaptation in the country has been established; b) the formulation of concrete adaptation measures, which have indicators, targets and deadlines for implementation, for each of the prioritized thematic areas presented in 2015; c) efforts to go beyond the diagnosis, produced information, generated scenarios, identified the risks to which vulnerable subjects or groups are and potentially will be exposed, in a permanent process of continuous improvement, for each of the prioritized thematic areas; and d) the identification of new priority thematic areas (tourism and transport), where concrete measures, indicators and targets will be identified.

The Peruvian economy has enjoyed constant growth for 22 years, however, it has registered a fall of 11.1% due to the impact of the pandemic caused by COVID-19. The hardest hit sectors are: mining and hydrocarbons (-13.16%); manufacturing (-13.36%); construction (-13.87%); trade (-15.98%); transport, storage and courier services(-26.81%); accommodation and restaurants (-50.45%) and; services provided to companies (-19.71%).

In this context, MINAM presented a «Proposal for economic reactivation with a focus on sustainability»,⁷ where it highlighted the country's opportunities to rethink and/or strengthen the link with nature and establish ways of working to conserve ecosystems to face climate change. Amongst the opportunities are new business models (Private public partnerships – APPs, and works for taxes - OXI); biodiversity in the age of natural capital; planning for integrated territorial management and renewable energies.

The proposal for economic recovery with a focus on sustainability is translated into four main lines or axes of action, which, in turn, translate into specific activities and outstanding benefits. For more detail see **Table 1**.

Implementation of the climate challenge is launched through the executive branch sectors and regional governments. At both levels, concrete actions are observed in the territory with an impact on the achievement of climate objectives. Some of the most important relate to changes in tax policy to increase

⁷ News: My city. (s.f.). Retrieved June 2021, from My City website: https://www.miciudad.pe/wp-content/uploads/2.-Gabriel-Quijandri%CC%81a_PPT-Reactivacio%CC%81n-Econo%CC%81mica-Verde.pdf

Table 1. Proposal for economic recovery with a focus on sustainability

Axis of action	Activities	Benefits
Encourage the increase and growth of sustainable entrepreneurship.	<ul style="list-style-type: none"> ▶ Promote the use of the General Guidelines to identify and promote eco-business and bio-business by public and private actors. ▶ Eco and Bio-business Promotion Strategy: Includes the promotion of spaces for the strengthening and scaling up of eco and bio-business using digital channels. Includes the following: a) Information Portal and Virtual Stores, promotion tools and b) Workshops and virtual trainings. 	<ul style="list-style-type: none"> ▶ Encourage the promotion of business activities that take care of the environment by emitting less CO₂ and applying eco-efficient practices. ▶ Promote the well-being of entrepreneurs and communities that value our biodiversity. ▶ Make available to citizens new digital sales channels to access products that conserve our biodiversity and make efficient use of resources.
Prioritize climate change response measures aligned with economic recovery.	<ul style="list-style-type: none"> ▶ Promotion of sustainable individual mobility (bicycles, scooters, etc.). ▶ Increase the share of Renewable Energy Resources (RER) in the national energy matrix. ▶ Segregation of inorganic solid waste for material recovery in collection centers. 	<ul style="list-style-type: none"> ▶ Reduction of local pollution (noise pollution and GHG) generating positive impacts on health. ▶ Access to low-cost energy nationwide. ▶ Reduction of solid waste destined for landfill sites, preventing them from contaminating water and soils.
Promote the circular economy approach.	<ul style="list-style-type: none"> ▶ Follow up on the objectives of existing Clean Production Agreements (APL, in Spanish). ▶ Sign new APLs with medium and large companies. ▶ Align results of APLs to the objectives of the Roadmap for Circular Economy. 	<ul style="list-style-type: none"> ▶ Reduction of pressure on natural resource use. ▶ Register the entry and exit of inputs and resources. ▶ Generate greater innovation and collaboration. ▶ Minimize solid and liquid waste. ▶ Reduces GHG emissions.
Promote specialized economic and financial instruments.	<ul style="list-style-type: none"> ▶ Finalize the signing of the Green Protocol with financial associations (2020). ▶ Carry out short-term tasks set out in the Green Finance Roadmap (2020). ▶ Carry out awareness-raising activities for the financial sector and regulators. ▶ Propose the incorporation of special lines aimed at facilitating credit, guarantee funds and insurance for sustainable startups. ▶ Propose the incorporation of the component of sustainability in non-financial instruments. 	<ul style="list-style-type: none"> ▶ Greater financial access for green projects. ▶ Generation of specialized green products. ▶ Eco-efficiency actions from the sector (waste management, carbon footprint). ▶ Homogenization of green financial terms. ▶ Greater financial access for sustainable startups. ▶ Favor the well-being of entrepreneurs and families that participate in the economic ecosystem of sustainable startups.

the penetration of cleaner technologies for transport, a sustainable purchases policy in the public sector, the creation of a special loan for green housing, an increase in the participation of non-conventional renewables in the energy matrix and for areas that are off-grid, and increased adaptation action at the local level. At the sectoral level, work agendas have been drawn for the 2021-2022 period in order to plan and organize the actions necessary for the implementation of the NDC and their enabling conditions. Similarly, at the regional level, priorities have been established in order to promote climate action, amongst which are the strengthening of regional and provincial bodies, such as the Regional Environment Commissions (CAR) and Municipal Environment Commissions (CAM), in addition to the Climate Change Working Groups (GTCC) and Regional Councils on Climate Change (CRCC); the implementation of enabling conditions of the NDCs as well as financing projects and land use planning; amongst others.

There is an opportunity in the context of economic recovery (the National Reserve Bank expects economic growth of 10% for 2021), but increased implementation and ambition will depend on the priority given to climate change by the new government and non-state actors.



CLIMATE AMBITION SINCE THE PARIS AGREEMENT

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DOMESTIC DISCOURSE

A broader reflection on Poland's climate action is a relatively recent phenomenon. Before 2010 the domestic discourse on climate change has been almost entirely dominated by the narrow circles of energy and climate experts whereas public opinion remained largely unaware of the problem. Later on, this picture started to change under the rising pressure of both external and internal factors such as the EU's 2020 climate targets, rising CO₂ prices, deteriorating financial stance of Silesian coal mining as well as increasingly noticeable technological progress in the renewable sector.

The pivotal moment came in late 2015 as a combination of several independent factors. The newly-elected right-wing government led by Prime Minister Beata Szydło started to openly question versatile policy decisions undertaken between 2007 and 2015 by her centrist predecessors: Donald Tusk and Ewa Kopacz. This included climate and energy policy that started to be pictured – by government officials and public media – as not properly serving the national interests. Prime Minister openly proclaimed the coal mining and coal-power sectors as a future of the Polish economy (Money 2016), vocally advocating for the development of the supercritical power block “C” in Ostrołęka and promising large scale investments in the new mining capacities in Silesia. This narrative was accompanied by the speeches and interviews of the newly elected President Andrzej Duda who on several occasions underlined that Poland has enough coal for at least 200 years and shouldn't neglect it as a valuable

energy resource for the future (Polsat News 2016). The semi-climate-scepticism and hard pro-coal rhetoric of the government unavoidably pushed the opposition and liberal media towards a more progressive stance on energy and climate policy. The topic that used to be perceived as too technical and uninteresting for public opinion started to dominate the newspaper headlines and political speeches of the opposition leaders. This created favourable conditions for climate experts and environmental NGOs that – through private mass media - managed to significantly increase the public awareness of climate change and the costs of the traditional energy system not only for the future of the planet but also for more domestic problems like air pollution and public health.

The debate on air quality achieved a critical mass in 2017 reaching the level that couldn't be ignored by the new – relatively more progressive – Prime Minister Mateusz Morawiecki, resulting in a slight revision of the official policy course. The issue of air pollution has been listed as a governmental priority (Serwis RP 2018) and the central administration was forced to begin work – which is still ongoing – on the development and implementation of a comprehensive clean air policy package. This has led to the introduction of standards for coal-fired boilers and (relatively unambitious) solid fuel standards. New retrofitting and heat source replacement programmes for buildings have also been launched though so far with moderate success, as the programmes are scaling up slowly and are still not promoting deep retrofits in line with longer-term climate neutrality goals. Simultaneously, in 2018, COP24 in Katowice has put a spotlight on the topic of just the transition of the coal region. As coal mining has already been a highly politicised topic on the national level, the central government presented the idea rather as a tool to prolong the transformation of the coal sector, than as a strategic framework to support inclusive but prompt diversification of the Silesian economy. Despite this rhetoric, the central administration has been since then cooperating pragmatically with the Silesian authorities and European Commission on the development of the pragmatic plan of regional socio-economic transformation with the help of EU funds. Since COP24 we can also observe the gradual evolution of the government position on coal transformation on the rhetorical and technical levels. The voices of politicians that openly question

the sense of transition in the mining sector became less frequent whereas most prominent officials like Polish President Andrzej Duda changed their position entirely. Whereas during COP24 he portrayed himself as a defender of Polish coal mining (Cire 2018), in 2020 he underlined several times that the transformation of the mining sector is only part of a broader climate policy that cuts across many industries and the key to it is a just transition, implemented through social dialogue (Money 2020). Also during the recent parliamentary elections (2019), it became apparent that net-zero became a mainstream topic and all political parties from the centre and left have made their declarations regarding the need for Poland to achieve net-zero in 2050.

Since 2017 the increasing price of EU ETS and global transition away from fossil fuels, have proved that it is becoming increasingly more difficult to implement and/or finalise fossil fuel investments, with the Ostrółęka C being a perfect example of a stranded asset (Business Insider 2021). Non-surprisingly over the last couple of years, one could also observe the gradual evolution of the official narrative regarding decarbonization in the broad sense. The government traditionally highlighted the social and economic costs of transition, while disregarding the risks of maintaining the business as usual scenario, the benefits for the quality of life, and associated business opportunities. Costs and the scale of effort needed, have been used on numerous occasions to justify a low level of ambition when it comes to climate action. Notably, these arguments have been used to justify that Poland has not ratified the net-zero target at the national level, agreeing only a target set for the EU as a whole. At the same time industry stakeholders' interest in the growing market for low-carbon technologies and change in public opinion on climate crisis started to play a greater role in shaping the official position on decarbonization. The government stopped delaying the change as a whole focusing rather on subsidising green solutions for the middle class and families (e.g. like EV or PV purchases, heating retrofit subsidies etc.), while still avoiding comprehensive measures which discourage pollution (e.g. taxation of coal for households). The government has also become much more open than before to discuss uptake and mainstreaming of new low-carbon technologies in the industry and power sectors. In particular, hydrogen and nuclear

energy are being promoted as potential easy fixes for the country's dependence on coal, with CCUS technologies also regaining stakeholder interest, especially in the heavy industry.

Changes seen in the private sector are mostly driven by the international actors, who are transposing best practices from their headquarters. Not, surprisingly only very few actors have joined net-zero initiatives (e.g. just two organisations are members of the Race to Zero campaign). This may start changing soon, as domestic companies are also facing increasing pressure – from the EU regulations and market pressure – to decarbonise rapidly. For example, a Polish private energy company ZE PAK which is preparing to shut down its lignite assets has recently joined Power Past Coal Alliance. That discussion is however limited to experts, industry sector stakeholders and representatives of the selected public sector agencies leaving out of the conversation broader society.

NATIONAL GOVERNANCE

The last ten years represent a largely lost decade for climate policy in Poland. Public authorities for years have been struggling to prepare and implement a multiannual, cross-sectoral decarbonization framework. The major domestic strategic document for the power sector “Energy Policy of Poland until 2030” was adopted by the Council of Ministers on November 10, 2009. As all previous strategies in this sector, starting from 1995, it should have been revised and amended 5 years later i.e. in 2014, especially as its assumptions quickly diverged from the EU climate policy. In fact, it wasn't revised till February 2, 2021, when the government accepted the new “Energy Policy of Poland until 2040” (MCE 2021) that – although more progressive than its predecessor – once again presented decarbonization pathways visibly less ambitious than those of the EU and Poland's neighbours like Germany or Czechia. The same can be said about National Energy and Climate Plan (NECP) for Poland that was prepared in several stages between 2018 and 2019. The initial version of the decarbonization pathway from this document was presented in 2019 and proved to be significantly below the EU goals for 2030 and not accommodating the general logic of the EU climate policy at this moment. Therefore the Plan had to be amended and the final version of the document was

accepted by the government on December 18, 2019 (MSE 2019).

NECP – like PEP 2040 – accepts the general direction of the EU's climate and energy policy, acknowledging the need to diversify the national energy mix. At the same time, the decarbonization ambitions visible in the document follow the pattern of postponing most of the investment effort after 2030 that – in consequence – will lead to Poland to diverge further from the EU-wide ambition level in the 2020s, delaying significant restructuring of the energy system by about a decade. It is worth noticing that both documents abandon the cheapest available technological option of onshore wind power, promoting the slowly progressing nuclear programme as the key factor responsible for catching up with the decarbonization of energy systems in Western Europe. Even though nuclear energy is strongly supported by the government on the strategic level (Polish Nuclear Power Program) (MCE 2020) defining basic tasks to be performed by the national administration, investor, nuclear supervision and other entities participating in the investment was accepted by the Council of Ministers on January 28, 2014, and its updated version on October 2, 2020), the decisions on real investment had not yet been undertaken and the fulfilment of the PEP2040 and NECP promises that first Polish nuclear power plant will be connected to the grid in the early 2030s might be hard.

Currently, the government is working on the preparation of the Long-Term Climate Strategy (LTCS) until 2050 that – under Energy Union Governance Regulation – should be ready by the end of 2019. Already delayed, the document is expected to become the first Polish climate strategy that would fully take into account the challenges associated with the new EU's 2030 GHG emission reduction target and the 2050 net-zero perspective. Although the works were commissioned already in 2019 and – according to the market knowledge – its text is already advanced, the ultimate publication date remains unknown. At the same time, many significant institutional changes have happened in recent years aimed at facilitating more coherent and swift policy in the future. In particular, the Ministry of Energy (MoE) was dissolved, while its responsibilities have been split between the Ministry of State Assets (MSA) and the Ministry of Climate and Environment (MCE). The MSA became

responsible for state-owned companies, including the energy and mining sector, whereas the MCE took over the policy activities related to the development of a low-carbon economy in the broad sense taking over tasks previously in the domain of the Ministry of Development. It is currently leading several initiatives aimed at exploiting opportunities associated with the dynamic development of low-carbon markets focused on inter alia development of electromobility, hydrogen economy, etc. Unfortunately, all of these initiatives are still developed in isolation from the strategic transformation frameworks, treated rather as separate topics, than a part of a discussion on decarbonization pathways and desired shape of the future energy mix. MSA exercising control over state companies but also being influenced by them has a possibly greater impact on shaping the energy transformation than MCE. In particular, PEP2040 (prepared in MoE but officially presented by newly established MCE) included provisions that the final shape of the document will be determined once the results of negotiations between the government (led by the MSA) and mining unions, the so-called Social Contract (MSA 2021), become available. The agreement between the parties has been reached in April 2021. According to the detailed timeline provided in the Contract, the coal mining phase-out is to begin in 2021 and the last coal mine will be shut down in 2049. The agreement states that the liquidation process will be financed from public resources. Moreover, every unprofitable mine will be subsidized by the state until its closure. The document was revealed on April 28th and will be sent for approval to the European Commission, which is a prerequisite step for state aid programs. However, solutions included in the Agreement are not in line with the established EU state aid framework and as such are not likely to be approved by the EC. Essentially the text of the contract is constructed to prolong the status quo, rather than approach the challenge of just transition strategically.

As experts, private sector stakeholders and other international actors await the publication of the Polish LTCS, some governmental agencies and ministries are introducing the net-zero perspective in their documents. In particular, the Long-term Building's Renovation Strategy (LTBR) (MoDLT 2021a) which has been recently prepared in the Ministry of Development, Labour and Technology and is scheduled to be accept-

ed by the government in the third quarter, already accommodates the net-zero perspective for 2050. The same ministry has also been responsible for the preparation of the Polish Industrial Policy (published in June 2021) (MoDLT 2021b) which includes aspects related to the European Green Deal and – together with the MCE - coordinates the works on LTCS. At the same time, experts from the National Institute of Environmental Protection (supervised by the MCE) in June 2021 have presented decarbonization scenario for selected sectors within the 2050 horizon (NIoEP 2021), delivering a second publicly available comprehensive net-zero study for Poland after McKinsey's report on "Carbon-neutral Poland 2050" that was published in 2020 (McKinsey 2020).

With so many actors being responsible for different fragments of the climate and energy policy, and with each of them having a slightly different vision for the development of a low-carbon economy it is unsurprising that the government struggles to develop a comprehensive economy-wide approach to decarbonization. The Polish government still does not seem to fully perceive climate policy as a key part of broader development strategy, where measures aimed at improving energy efficiency or reducing GHG emissions would represent an investment in new competitive advantages for the future. Treating climate policy as an external factor that merely influences development policy (but is not part of it) contributes to the low efficiency of adopted measures. At the same time however, climate governance is gradually improving which may – in this decade – transpose itself not only to the more ambitious strategic framework but also to much more efficient and stable implementation of the EU climate policy on the country level.

ACTIONS AND POLICIES

Decarbonization support systems supporting renewable development

The system of green certificates supporting the development of renewable electricity sources has been functioning in Poland since 2005. At the beginning of the last decade, it played a crucial role as green technologies were still relatively costly. Although the certificate system proved to be effective in delivering between 2013 and 2015 approx. 2.7 GW of new on-shore wind capacities, political scepticism gradually

increased, while prices of certificates were falling, eventually leading to the break in 2015 (Bukowski et al. 2020). Moreover, in 2016, the regulatory changes were introduced by the new right-wing government, including the 10H rule, which prohibited the placing of wind turbines in the proximity of residential buildings (the Distance Law). Together with the phase-out of the green certificate system, the new law inhibited the development of onshore wind farms for several years. At the same time, the certificate system was replaced with RES auctions. Initially, the migration of existing facilities from the green certificate system to the new one was a priority. This approach eliminated most of the new wind investment on commercial principles between 2016 and 2018. The breakthrough came at the end of this period when the threat of Poland failing to meet its RES target for 2020 became an apparent incentive for the government to launch large-scale auctions for new capacities (Bukowski and Śniegocki, 2020). The results of the first auction demonstrated that onshore wind farms can generate electricity at significantly lower costs than the current market equilibrium contributing to the change of sentiment towards wind energy in the ruling majority. One of the results of this change is the long-awaited law on investments in offshore wind farms that entered into force in February 2021, introducing Contracts for Difference for new investments on the Baltic Sea. The support has been divided into two stages, the first one lasting until 2023, where contracts are awarded based on administrative decisions, and the second, based on competitive auctions, with the first auction planned for 2025. The system will be financed by the overarching RES fee which also covers other renewables support mechanisms. The liberalization of the Distance Law affecting onshore wind farms is also expected in 2021.

In the case of solar energy, there has been a dynamic increase in installed capacity over the last three years, in particular in the form of prosumer energy i.e. energy produced by the households or small to mid-size firms primarily for their own needs but also for the market. It happened thanks to favourable rules of billing electricity supplied to and collected from the grid and the government program "My Power" (Mój Prąd) introducing a simple subsidy mechanism for small scale PV installations in private houses. In addition, new prosumers could take advantage of the so-called ther-

mo-modernization relief, which additionally increases the profitability of such investments. The government is currently preparing new regulations introducing the concept of the so-called virtual prosumer, allowing the connection of the electric bill with a power plant not located on the property. However, along with these regulations, there are also plans to reduce the benefits of the current billing rules of PV. The development of new solar capacities was so dynamic that Polish transmission grid operator started to show concerns about the technical stability and economic sustainability of the entire electricity system in Poland.

Nuclear programme

The success of GHG emissions reduction in PEP2040 to some extent relies on a very ambitious program for the development of nuclear power. To fulfil it, in 2021 the government presented the updated version of the nuclear power program that assumes the construction of six nuclear reactors till 2050, the first of which would be launched as early as 2033. Whilst nuclear power is likely to play a role in the process of the decarbonization of the economy before 2050, the declared timeline is very ambitious, given the lack of location, technology and appropriate regulations for the licensing, construction and operation of nuclear power plants. Choosing a technology provider will also involve a significant commitment in developing the know-how related to NPP construction, legal aspects, staff training, etc. but also possibly financial contribution. Lately, the government assured, that the choice of location is now in its final stage and it will be located by the sea. While there is still no specific government declaration on the technology choice, Westinghouse is starting with FEED study on the development of a nuclear power program in Poland (PAP 2021) and EDF has re-opened its office in Warsaw intending to participate in Polish NPP (Forsal 2021).

Energy efficiency and individual heating

With respect to energy efficiency, most of the current efforts of the government are focused on the flagship program addressed to households with individual heat sources called "Clean Air".¹ It allows for the replacement of heat sources and thermal renovation of the buildings with the hope of vastly decreasing the air

¹ <https://czystepowietrze.gov.pl/>

pollution in Poland before 2030. Initially, under the program, it was possible to subsidize the replacement of an ineffective solid fuel boiler with a more effective one (but still coal-based), which was not in line with the current European climate ambitions, and in the long run may lead to carbon lock-in in some households, especially those with low income and at risk of energy poverty, with further negative consequences such as higher energy prices. This year, changes were made that would not allow for the financing of coal-fired boilers from 2022. Substantial financial resources were also allocated to the program within the National Recovery and Resilience Plan (MoDLT 2021c). At the same time, the major support for the promotion of energy efficiency measures in the industry remains unchanged for the last decade taking the form of the white certificates system issued by the President of the Energy Regulatory Office. Certificates serve as a confirmation for enterprises that implemented projects to reduce energy consumption and they may be traded on the Polish Power Exchange. The current version of rules of the certificate system was defined in the Energy Efficiency Act of May 20, 2016, that replaced the previous regulation from 2011.

Transport sector and hydrogen economy

In the transport sector, the government intervention may be divided into three areas. First covers the fiscal policy measures. In 2018, emission charge was introduced in a form of excise taxation levied on fuel (10 grosz/litre), the revenues of which are to be used to support electromobility and low-emission transportation. The scope of potential covers, among other things, production of biofuels, biomethane and hydrogen, compressed gas (CNG) and liquefied natural gas (LNG) refuelling stations and infrastructure for charging electric cars and buses. Some of the money will also go to research and development and education in the field of alternative fuels. The second pillar of Polish transport sector policy refers to the hydrogen economy. The government is finalizing work on the Polish Hydrogen Strategy, which is to be adopted in August 2021. The strategy envisions the initial stage of development based on grey hydrogen from natural gas and indicates the use of gas infrastructure. It also includes an ambitious target of 2 GW of electrolyzers in 2030 which will produce 200 kt of

hydrogen annually. The third element of government action in the transport sector is industrial policy. The government actively supports the development of the Polish electric car through SPV called Electro Mobility Poland² (EMP) that was established in 2016 by four state-owned energy companies: PGE, Enea, Tauron and Energa. Up to date the company has built two prototypes of cars called Izera and identified a site in Silesia for the construction of a factory. In April 2021 Minister of Climate, Mr Michał Kurtyka suggested that the State Treasury would inject capital into EMP to enable the construction of the first production facility that should initially produce 100 thousand cars per year and employ 2 thousand people in Jaworzno (Green News 2021). The government hopes that the investment will generate substantial employment in a whole value chain reaching even 15 000 people when the production of cars exceed 200 thousand per year. Although the project is perceived by the market as extremely risky, the development of e-mobility and attracting investments to support further industrialization of the Polish economy remains a key priority for the government as a whole. It is worth noting that the e-mobility industry is actively developing in Poland beyond the Polish electric car project, including both domestic producers (e.g. e-buses, charging stations) and foreign direct investments (e.g. EV battery production). In most cases, this is supported by a broader policy framework, such as the availability of the EU funds for clean infrastructure investments or national FDI support policies.

² <https://electromobilitypoland.pl/en/home-2/>

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AMBITIONS IN COMBATING CLIMATE CHANGE, THE PROGRESS AFTER PARIS

CLIMATE TREATIES AND VISION BY 2050

Russia's role in climate change mitigation should and can be substantial. It is the world's largest country by territory with 20 per cent of global forests, 10 per cent of the world's arable land, 350 billion tons of oil equivalent (toe) of fossil fuels. Russia's greenhouse gas (GHG) emissions peaked in 1990 at 3087 MtCO₂e and since then declined by 49 per cent to 1585 MtCO₂e by 2019 (including LULUCF).¹ Russia's relatively cheap and abundant resources of fossil fuels pose strong barriers to decarbonizing the national economy. At the same time Russia owns huge resources of renewable energy sources (RES) that can provide zero-carbon alternatives to fossil fuels both for domestic supply and exports. The RES technological potential is estimated at 16,955 Mtoe per year in power and heat generation. All these considerations are important for understanding the country's climate policy challenges and, specifically, the behavior of Russian climate policy makers. Historically, Russia contributed a lot to international scientific programs on climate issues since the 1970s, played a meaningful role in the development of the UNFCCC in the early 1990s, it was crucially

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¹ Roshydromet (2021), The national GHG inventory submission to the UNFCCC by the Russian Federation. <https://unfccc.int/ghg-inventories-annex-i-parties/2021>

important for the entry into force of the Kyoto Protocol in 2004, and supported the Paris Agreement in 2015. However the country was reasonably criticized for the weak emission reduction target in the Nationally Determined Contribution (NDC) and overall lack of ambition in mitigation efforts. Evidently, the national Energy Strategy by 2035² and other related programs implied a further increase of production and export of fossil fuels, metals and other carbon intensive commodities without any serious plans for carbon emissions reduction. Some industry lobbyists insist on revising methodologies and recalculating carbon sequestration by Russian forests, which could "add" 1.5-2 billion tons of CO₂ of carbon sinks.

Probably, the main driver of change in Russia's perception of the climate change mitigation issue is the potential threat of the EU Green Deal's carbon border adjustment mechanism (CBAM) for Russian exports of carbon intensive goods, such as metals, chemical fertilizers, electricity, and, likely, fossil fuels. In 2020 the carbon footprint of Russian exports to the EU exceeded 1 billion tons of CO₂e.³ The carbon fee at the European border would essentially mean huge losses for the exporters and the Russian State budget, especially if the fee's level would be equal to the EU ETS price (above 50 Euro/tCO₂e). The announcement of mid-century climate neutrality targets by the US, Canada, China, Japan, Korea in late 2020 – early 2021 also affected decision making in Russia, as the carbon footprint of exports to these countries amounts to over 650 mln tCO₂e in 2020.⁴ Carbon pricing and other "climate protectionism" measures may cause additional losses for the domestic producers in the near future. Governments of over 100 other countries have been adopting or preparing their decarbonization plans and strategies, so the need for urgent action in Russia became more and more obvious.

In 2020 the Ministry of Economy presented the draft strategy for low carbon development by 2050, which included several scenarios of economic development. Surprisingly, GHG emissions in all these

scenarios were supposed to rise substantially by 2030, and the projected emissions by 2050 were 5-42 percent above the baseline level of 2017. The discussion of the draft strategy continued until April 2021, when President Putin announced the new national target 2021-2050 of emitting cumulatively less than the EU's emissions. Soon after, the presidential decree requested development of the decarbonization plan by October 1st, 2021.⁵

CARBON REGULATION

The federal law on carbon regulation was adopted on July 2nd, 2021. It provides regulatory power to the government, determines the annual reporting of the large carbon emitters over 150 thousand tons of CO₂e beginning in 2023, and allows voluntary implementation of carbon projects to offset emissions.

All provisions regarding the allocation of emission quotas to energy and industrial sources, carbon fees, the creation of a targeted climate fund, and a domestic carbon market disappeared from the original text, as provided by the Ministry of Economy in early 2020. The government is authorized to set the target level of emission reduction for specific periods, which will depend on dynamics of socio-economic development and progress in accounting of forest carbon removals.

The provisions on voluntary carbon projects are considered as a platform for generation of emissions offsets which could be used by the Russian emitters to compensate their emissions and, potentially, reduce the impact of the EU's CBAM regulation.⁶ For that, the rules and procedures for the development of project documentation, its validation and verification, registry and issuance of credits are to be adopted by the Ministry of Economy.

On December 28th, 2020 the Russian government adopted a roadmap for the implementation of an experiment on the regulation of carbon emissions

² Ministry of Energy of Russia (2020), The energy strategy by 2035 <https://minenergo.gov.ru/node/1026>

³ The authors' estimate based on the Russian export data by Federal Customs Service.

⁴ Ibid.

⁵ <https://rg.ru/2021/06/27/putin-poruchil-sostavit-plan-po-dekarbonizacii-ekonomiki.html>

⁶ The EU consultations on the Carbon Border Adjustment Mechanism https://ec.europa.eu/taxation_customs/news/mission-launches-public-consultations-energy-taxation-and-carbon-border-adjustment-mechanism_en

in the Sakhalin region⁷, aiming at creating special conditions for the introduction of low- and zero-carbon technologies, reporting and verification of greenhouse gas emissions and removals, support of carbon projects, and the creation of the green finance mechanisms. The new status requires significant amendments to the Sakhalin strategy of socio-economic development by 2035 as well as developing the Climate Program and Action plan for its implementation.

The first steps include: 1) GHG inventory and identification of the main sources of emissions and removals in 2021; 2) launch of the information system with the registry of emitting companies, climate projects and carbon units by April 2022; 3) registration of the carbon project results and trading deals in 2022-2023.

The law on the Sakhalin experiment on a carbon trading mechanism was submitted to the parliament in July 2021. The federal deputy prime minister has been coordinating the work of the ministries on economic development, energy, industry and trade, agriculture, and the Sakhalin government, as well as some financial and industrial majors, including the Bank of Russia, Sberbank, Rosneft, and the state development corporation "VEB.RU". These business partners wish to participate in the creation of green financing and carbon trading schemes which, as expected, may help reducing the risks of the EU carbon border adjustment mechanism. International energy companies, such as Shell, Exxon Mobile, Mitsui, Mitsubishi, could also be interested in offsetting greenhouse gas emissions via the purchase of the local carbon credits.

Some other provinces of Russia expressed interest in joining the Sakhalin's experiment, including the Kaliningrad region (the western exclave of Russia), Khanty-Mansiisk district (the oil rich Northern region), and Altai krai (Southern Siberia).

Subnational activities have also expanded in launching the "carbon polygons": areas for planting forests, carbon storage in agricultural soil, and some other measures. The Ministry of Science is supporting these initiatives at the federal level. Eight provinces

have already committed to establishing such polygons and provide finance for scientific research and measuring of carbon flows in the pilot territories.⁸

POTENTIAL FOR DECARBONIZATION

Russia possesses huge resources of renewable energy sources (RES) such as solar, wind, geothermal, tidal, wave, as well as biofuels. The total "technologically available" potential of these RES is 25 times higher than total primary energy produced in the country annually.⁹ The costs of green power generation have been declining in the last decades, which allow utilizing green energy sources much more effectively. However Russia's RES are generating 0.3 percent of the total electricity so far (excluding large hydro). By 2024, the government plans to rise RES's capacity from below 1 GW up to 5.9 GW, mostly focusing on wind, solar, and small hydro. The barriers to RES expansion in Russia include continuous pressure from fossil fuel lobbyists, excessive technical requirements for RES installations, and strict standards for RES equipment localization.

Probably the biggest potential in emission reduction in Russia is with energy efficiency. The national target of 40 percent reduction of energy intensity of GDP in 2007 through 2020 was missed (only about 12 percent reduction was achieved).¹⁰ The policy targets were postponed to 2030. The overall potential is estimated at 45 percent of Russia's total primary energy consumption.¹¹

Another "decarbonization pillar" for Russia is the rising demand for hydrogen in the world. In late 2020, Russia adopted a plan on developing its hydrogen energy strategy by 2024, setting a highly ambitious target of 20 percent share of the world's market in this decade.¹² There are some technological and scientific foundations for boosting hydrogen production in Russia, and the existing gas pipeline network may help with transportation to export

⁷ Ministry of Economic Development of Russia (2020) The Roadmap of Sakhalin regional experiment in carbon regulation https://economy.gov.ru/material/file/faf1abaae1e3f2be140971c9e934d0ab/dorozhnaya_karta.pdf

⁸ Ministry of Science and Education, Carbon polygons <https://minobrnauki.gov.ru/action/poligony/>

⁹ Bezrukikh et al (2007) The reference book on renewable energy sources in Russia [in Russian].

¹⁰ Ministry of Energy of Russia. <https://minenergo.gov.ru/node/5195>

¹¹ WB/IFC (2014) Energy Efficiency in Russia: Untapped Reserves.

¹² Ministry of Energy of Russia. <https://minenergo.gov.ru/node/19194>

markets. The question is which color this hydrogen should have? “Grey” and “blue” hydrogen produced from natural gas are currently the easiest options for Russia. “Orange” one made by using nuclear power is also possible due to the excessive power generation by the domestic Rosatom corporation. However the EU, Japan, Korea and North America prefer “green” hydrogen based on zero-carbon electrolysis using RES.

Second generation biofuels based on organic matter are highly demanded in the world markets. Russia has huge amount of biomass that can be used for that, including woodwaste, low grade wood, and agricultural residues. The technologies are known and available: the production of energetic bio-charcoal as a substitute for traditional energetic coal for power plants with much less pollution and zero carbon footprint, the production of bio-kerosene (extremely important for reduction of CO₂ emissions in international and domestic aviation) and bio-gasoline for automobiles (corresponding to Euro-5 standards, but with zero carbon emissions) and based on the Russian innovative technologies, the biogas production from organic waste as alternative to natural gas.

DECARBONIZATION PATHWAYS

Long term targets on climate neutrality for the national economy have not been adopted in Russia so far. As mentioned above, the draft decarbonization strategy by 2050 is due by October 2021. However, some research has been done by leading think tanks in recent years, which may shed some light on the opportunities for deep decarbonization in the country.

The analysis of energy CO₂ emissions in key sectors of the Russian economy based on the TIMES-RUSSIA model showed that oil and coal supplies will continue playing a leading role in the domestic energy mix by 2030, but the situation substantially changes in 2030-2050. The Active decarbonization scenario with emission reduction by over 85 percent below 2010 levels by 2050 (Figure 1) requires dramatic restructuring of energy supplies, leading to a 70

percent reduction of gas consumption by 2050 (compared to 2010), a deep decline in oil and coal use, a boost in biofuel use, solar and wind energy supplies, as well as introduction of CCS in about 40 per cent of fossil fuel-based power plants (Figure 2). The conservative estimates of economic impacts of different scenarios are based on: 1) the investment and operational (mostly, fuel use) costs of decarbonization in power and heat, industries and other relevant sectors, and 2) revenue loss from fossil fuel exports. The decarbonization costs are rising dramatically after 2030 in scenarios of enhanced ambition and active decarbonization, which can be explained by increasing costs of modernization and switching to low carbon technologies as well as higher losses of revenue from fossil fuel exports.

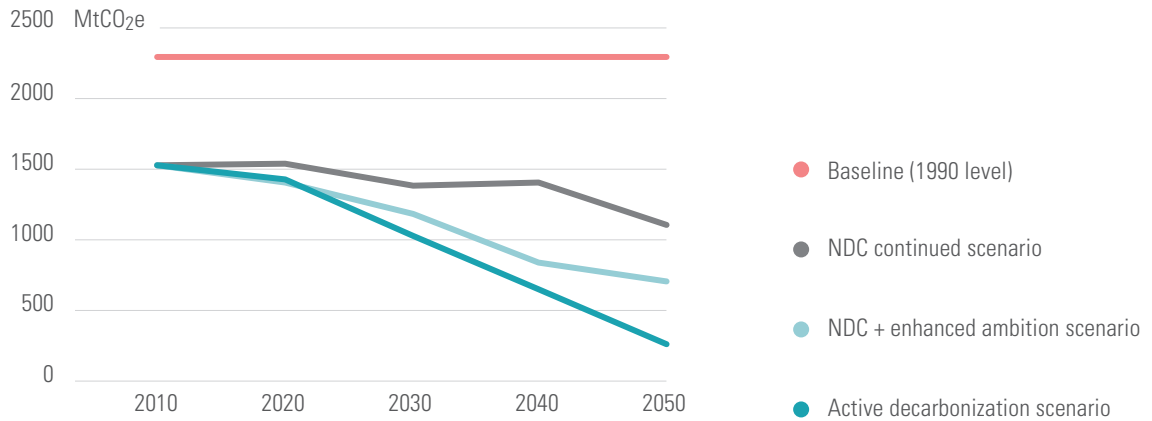
The costs of carbon emission reduction are expected to rise depending on the ambition and decarbonization targets. By 2030, emission reduction will unlikely cause any meaningful costs in the NDC scenario, which actually means the continuation of weak mitigation targets and mostly business-as-usual development. In more ambitious scenarios, emission reduction costs can reach 33-50 USD/tCO₂ by 2030 and then rise up to 110 USD/tCO₂ by 2040 and 145 USD/tCO₂ by 2050 (Figure 3).

The modeling provides quantitative estimates of decomposition of CO₂ emissions from energy use by the main sectors, including electricity, industry, buildings and transport. The total emissions are declining with different speed depending on the ambition of the scenarios: a relatively slow reduction in the NDC scenario; more rapid reductions in the “NDC + enhanced ambition” scenario mostly in electricity, industry and transportation sectors; and a sharp decrease of 87 per cent in the “Active decarbonization” scenario, in which emissions decline dramatically in all sectors.

These trends raise some outstanding questions for Russia on green export alternatives. If global demand for coal is shrinking, could gas substitute for coal, extending state giant Gazprom’s business in Europe and Asia? The latest modeling results from the CD-LINKS project database¹³ suggest that the

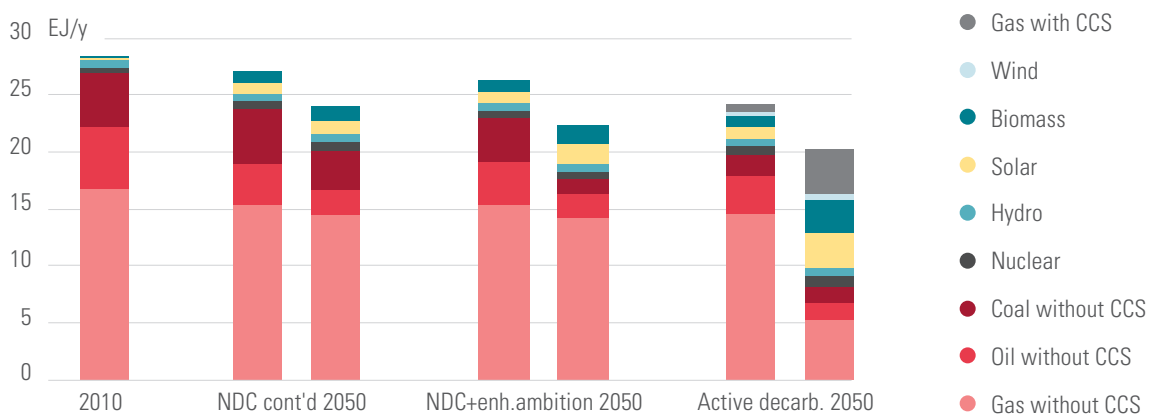
¹³ IIASA, CD-LINKS Scenario database <https://data.ene.iiasa.ac.at/cd-links/#/workspaces>

Figure 1. Projections of CO₂ emissions from energy use in Russia, 2010-2050



Source: 2010 – national GHG inventory data; 2020-2050 – authors' calculations.

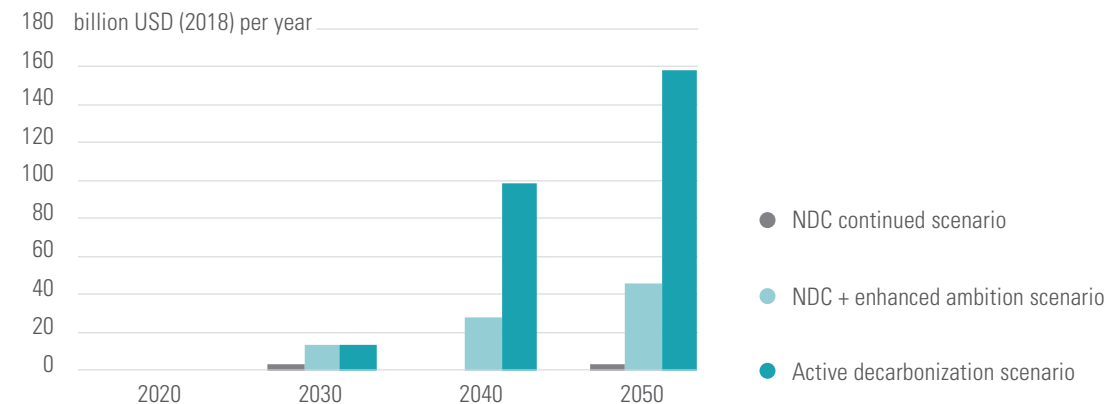
Figure 2. Total primary energy supply in Russia by energy source, by scenarios, 2010-2050



Source: 2010 – IEA data; 2030-2050 – authors' calculations.

Figure 3. Estimates of incremental annual cost for decarbonization in energy-related sectors of Russia in 2020-2050

(compared to 2020 level)



Source: authors' estimates.

role of natural gas as a bridge into a new energy future will be short-lived. In the most ambitious scenarios, demand for gas may decline in the EU by 22 percent, in China by 12 percent, and in Japan by 28 percent by 2030.

Russia's potential as a provider of green energy resources can become a big part of the national strategy for climate neutrality, which would allow the country to play an important role in decarbonizing the world's economy and avoid risks related to carbon regulation in the near term.

CLIMATE AMBITION BEYOND THE NDC TARGETS, AN ASSESSMENT FROM INSIDE THE COUNTRIES AND THE SECTORS

Samba Fall, Aissatou Diouf, Secou Sarr

Since the entry into force of the Paris Agreement in 2016, progress has been made in the development and implementation of Nationally Determined Contributions (NDCs). However, the country still faces major and multifaceted challenges that deserve special attention and appropriate responses. This work on Senegal (West Africa) is an attempt to take stock of the implementation of the NDC, the evolution of the discourse on climate change, governance of climate change and the flagship actions and measures launched in the country.

SECTION 1: THE EVOLUTION OF CLIMATE CHANGE DISCOURSE AT THE NATIONAL LEVEL SINCE 2016.

In view of the official declarations and documents as well as the actions taken continuously at the national and sectoral levels, the Government of Senegal and non-state actors seem to be entering a new political era in which they grasp the importance and urgency of the fight against climate change. A generalized awareness is noted on the perception of climate change with regard to its adverse effects on the vulnerability of populations and ecosystems

The achievement of the Sustainable Development Goals and the implementation of development policies, particularly Phase 2 of the Plan Sénégal Émergent (PSE) (2019-2023), which projects a trend towards emergence by 2035, remain highly dependent on current and future climate trends. This is notably reflected in projections made in the context of the revision of Sene-

gal's NDC (NDC, 2020), which estimates that the trend increase in temperature (from +1.17° to +1.41°C), the decrease in average annual cumulative rainfall (from 89 mm in general and 16 mm in Northern Senegal) and the frequent occurrence of extreme events (heat waves, drought, flooding, etc.) will have a negative impact on GDP and poverty levels in the short, medium and long term (World Bank, 2017; NDC, 2020).

At the sectoral level, the effects of these climatic factors are reflected in a downward trend in agricultural production (e.g. decrease of more than 30% of cereal production by 2025), the decline in fodder resources, continued degradation of land, etc. (CDN, 2020). In addition, the increase in sea surface temperature since 1980 (0.04 to 0.05°C) combined with the alarming rise in sea level and the average retreat of the coastline of about 1.25 to 1.30 m/year (DEEC, 2005) are factors that reinforce the climate risk in the coastal zone (salinization of agricultural land and groundwater), Senegalese fisheries (scarcity of important resources such as sardinella), etc.

Faced with the dilemma of the urgency of climate action and economic objectives, Senegal is resolutely committed to identifying and implementing climate change resilient options while at the same time working towards achieving the Sustainable Development Goals and the PSE 2.

The evolving and alarming picture of Senegal's climate situation has been identified as a real challenge and even a major risk to the operationalization of strategic pillar n° 1 and n° 2 of the PSE 2, which are respectively related to the structural transformation of the economy and the strengthening of human capital, social protection and sustainable development. Such impacts of climate change on its socio-economic structure and frameworks and on its development ambitions urges to the need to a strategic and political evolution of the consideration and integration of the climate dimension. On the other hand, it has been identified that action taken to address climate change can help achieve better economic objectives. In accordance with the economic analysis recently undertaken during the revision process of NDC, (NDC, 2020), the deployment of climate technology options prioritized into the NDC will contribute to the expected economic impacts of the pillars of the PSE 2.

Indeed, the NDC implementation might lead to a significant increase on GDP (annual growth rate of 9.1% and 7.1% respectively by 2023 and 2035) and on the poverty index (reduction of 9.4% and 6.3% over the same time horizons). This new political trend was recently materialized by the development of the Green PSE under the leadership of the Head of State.

Since the entry into force of the Paris Agreement, the involvement of non-state players, in this case local authorities, has increased because they are increasingly impacted by climate hazards at the territorial level and in the activity sectors of grassroots communities.

To curb climate change effects and develop adaptation measures, local elected officials are asserting their positions and concerns by actively participating in the various spheres of dialogue and influence on climate change at the national and international levels. On the other hand, associations and individual actors of the national private sector have made significant progress in the perception of the importance of climate change in view of the opportunities provided by the funding mechanism put in place (Green Climate Fund-GCF, Adaptation Fund-AF) for the investment of structuring projects on the priority technological options of the NDC. In this perspective, the support of the Senegalese National Designated Authority for the accreditation of La Banque Agricole to the GCF reflects the political will and trends of Senegal's interest in further boosting the interest and commitment of private actors in the mobilization of financial resources to implement climate

Box 1. Meeting with the Ministry of Environment and Sustainable Development

La Banque Agricole (LBA) confirms its commitment alongside public authorities in the implementation of Senegal's climate programme

....Access to the climate fund via La Banque Agricole (LBA) is an opportunity for Senegal to mobilize private investment for the climate in addition to public funds. During the meeting, the authorities reiterated their commitment to a synergy of actions in order to contribute efficiently to the achievement of the objectives of the Nationally Determined Contribution (NDC),

Source : <https://www.cncas.sn/index.php/mediatheque/actualites/rencontre-avec-ministere-de-lenvironnement-et-du-developpement-durable>

actions in line with the Senegalese NDC. The recent meeting with the Ministry of environment with the LBA outlined the evolving political to enhance the climate finance access for private actors (**Box 1**).

SECTION II: THE EVOLUTION OF CLIMATE CHANGE GOVERNANCE IN SENEGAL AND THE ENTRY INTO FORCE OF THE PARIS AGREEMENT

Notwithstanding the institutional and sectoral constraints and challenges noted, the domestic processes and institutions put in place for the development and submission of Senegal's CPDN prior to CoP21 and mobilized for the NDC revision in 2020 mark a major turning point in the improvement of the governance framework for climate action.

With regard to the effects and potential for adaptation and mitigation at the sectoral level, the MEDD, through its Environment and Classified Establishments (DECC), which is the focal point for the UNFCCC, used all of its power to influence and facilitate by coordinating the involvement, commitment and, above all, the technical contribution of all the sectoral ministries/departments in the analysis and development of the CPDN. In addition to the need to update sectoral data, this new situation in the power generation sector has prompted, among other factors, a revision process of the INDC submitted in 2015, involving all sectoral ministries and the Climate Change National Committee (COMNACC) (**Box 2**).

Indeed, the other component of climate governance in Senegal is represented by the COMNACC which is subdivided into thematic working groups (adaptation, mitigation, technology transfer, market mechanism,

Box 2. As part of environmental protection, 9 new forests have been declared classified forests in 4 regions

They cover a total area of 84,726 ha distributed in the regions of Kolda, Matam, Tambacounda and Sédhiou. This decision aims to consolidate the Green PSE and the realization of the continental project of the Great Green Wall.

Source: <https://lequotidien.sn/protection-de-lenvironnement-9-nouvelles-forets-classees-dans-4-regions-2/> article published on March 2, 2021.

capacity building). Indeed, this consultative entity made up of experts from the public sector, private entities, NGOs, university researchers, etc. contribute their technical expertise in the ex-ante review, implementation, monitoring and evaluation of most climate change adaptation and mitigation programmes and actions. In addition to its highly appreciated technical contribution to the climate negotiation sessions (SBs and CoPs), **the major innovation of the COMNACC lies in the recent appointment of a non-state actor, ENDA ENERGIE (NGO), to chair the committee.** This institutional evolution marks a dynamic of openness and collaboration of state authorities towards non-state actors in order to better take into account the challenges and needs of assistance in the fight against climate change. This revision process coordinated by the MEDD resulted in an inclusive political validation in 2020, marking the strengthening of the institutional framework in place, but also the inclusion of elected officials and parliamentarians despite their rather limited involvement in the climate governance bodies in place.

To mitigate forest and land degradation trends, the creation of the Senegalese Agency for Reforestation and the Great Green Wall is a key axis of the Green PSE marking an important milestone to improve the vegetation cover and regenerate degraded terrestrial and forest ecosystems in Senegal (**Box 2**).

In the post-2015 context of the Paris Agreement, it is important to note the significant effort made by Senegal's political authorities to take into account the effects of climate change, but also the need for urgent climate actions to be implemented in the short term. However, the integration or even long-term planning of the fight against climate change remains a major challenge given the complexity and slowness of management procedures at the decision-making level and the limited institutional arrangements for the decentralization of powers at the territorial level.

The collaborative approach adopted for NDC helps connect the climate discussion with economic planning, notably in the context of PSE2, and financial mechanisms.

In addition, the review process from INDC to the submission of the 2020 NDC was marked by a strengthening of the political and institutional architecture of climate change governance, notably through the

strategic collaboration and active participation of the departments and directorates in charge of economic planning and the bodies in charge of the PSE 2. The contribution of their technical expertise has instilled a new approach to prospective analysis of the effects of climate change and climate action on macro and microeconomic aggregates and on the strategic axes of the Priority Action Plan (PAP) of the PSE 2.

This collaborative approach was initiated through the mobilization and commitment of the sectoral ministries, which mainly consisted in developing sectoral strategies for the implementation of the NDC with the support of technical and financial partners. It is in this perspective that the SAGA project led by the FAO in collaboration with the MAER (Ministry of Agriculture and Rural Equipment) and the MEDD has been initiated to mainstream agriculture into the national adaptation program (NAP-Ag) which aims to support the adaptation component of the NDC. Considering the importance of technology transfer, the Designated National Entity being the Focal Point of the CTCN (Climate Technology Centre & Network) coordinates the elaboration and implementation of technical assistance projects in accordance with the technology transfer needs expressed by state and non-state actors.

In addition to the role of IPCC focal point in Senegal played by the ANACIM (National Agency for Civil Aviation and Meteorology), the role of Designated National Authority for the GCF and the Adaptation Fund is ensured by the DECC. This national mechanism put in place has facilitated and led to the accreditation of the CSE (Centre de Suivi Ecologique) to the financial mechanism (GCF and AF) to facilitate the mobilization of financial resources for micro-projects. Being aware of the growing demand and the multiple institutional

and legal constraints, the Designated National Authority (DNA) of Senegal, through the readiness programme of the GCF, was able to facilitate the accreditation of La Banque Agricole to the GCF, especially to boost the access of the national private sector to medium and large investment portfolios that would allow the deployment of priority technologies of the NDC.

The integration of non-state actors (local institutions, private sector, NGOs) in governmental processes has been improved but remains a key gap and a strategic need in the governance of climate change to address both climate action benefits and economic development ambitions.

At the territorial level, it must be recognized that the process of administrative decentralization has certainly allowed regional entities to develop a first generation of territorial climate plans (Fatick, Ferlo, Dakar), but the synergy and integration of local government climate action into the existing national institutional framework still remains a major challenge for climate governance (Box 3). Aware of the opportunities of climate finance and also being the main impacted by the effects of climate change, grassroots actors (local authorities, NGOs, etc.) continue to reaffirm their importance in the fight against climate change by participating as best they can in the dialogue and consultation bodies set up at the national level and by participating more and more in the national delegations on international climate negotiations.

The establishment of platforms or multi-stakeholder associations also represents a driver of information and networking for stakeholders and strengthens and completes the institutional mechanism of governance of climate action. The Climate Change in Agriculture and Food Security (C-CASA) platform and COPERES (Conseil Patronal des Énergies Renouvelables du Sénégal) have largely contributed to the coordination of the sharing of good practices in climate action and the commitment of the private sector in the respective fields of agriculture and renewable energy. But, despite the efforts made by the government to improve the governance of climate change and taking into account its cross-cutting nature, a number of challenges remain and relate mainly to the absence and/or weakness of mechanisms in place, including

1. Vertical alignment to enable local governments to localize the NDC and thus contribute significantly

Box 3.

"Despite the many efforts made by Senegal, the state of play at the local level (communes and departments) reveals the lack of new development plans in line with the new vision and issues related to climate change. The central place foreseen for communities in the texts in force in terms of involvement in the development and implementation of public policies is not always occupied by them in a practical way on the ground.

Source: Excerpt from the « Plaidoyer pour la reconnaissance du rôle majeur des autorités locales dans la lutte contre les effets du changement climatique Exemple du Sénégal » of the Association of Mayors of Senegal (2015)

to the achievement of its ambitions. The localization of the NDC at the level of the territories inevitably requires the appropriation of the climate policy by local governments through decentralized learning processes for the empowerment of local actors.

2. The weakness of the decentralization policy and the compartmentalization of the mechanisms and processes to combat climate change
3. Institutional and sectoral compartmentalization, which is promoted as a way to ensure a holistic and efficient approach to climate actions, continues to reinforce the weakness of organizational arrangements to take advantage of all the intersectoral and multi-actor synergies.
4. Lack of harmonization and monitoring and evaluation mechanisms for the contributions of non-state actors in achieving the ambitions of the NDC.
5. Limited access of non-state actors to climate finance and technology transfer mechanisms
6. The positioning of MEDD as a State ministry given its cross-cutting dimension will ensure an appropriate services delivery and enhance the national government architecture (a matter of precedence) especially for climate change matters. It's a way to provide strong responsibilities to the MEDD by moving as a simple ministry to a state ministry

SECTION III. CONCRETE ACTIONS AND POLICIES IMPLEMENTED

Considering the importance of the urgency of climate action and the objectives of the PAP of the PSE 2, the operationalization of the sectoral ambitions of Senegal's NDC relies mainly on the integration of adaptation and mitigation objectives through the development and implementation of State policies, plans, programmes, projects and the initiatives of non-state actors.

In view of the trend of the adverse effects of climate hazards, Senegal, through the MEDD, has undertaken since 2015 the development of the NAP (National Adaptation Plan) following a partnership approach between the sectoral ministries and bilateral and multilateral cooperation agencies or institutions.

After the NAP on fisheries developed with the assistance of the United States Agency for International Development (USAID), a second generation of sectoral NAPs (on agriculture, water resources, livestock, infrastructure, disaster risk/flood management, biodiversity, health, etc.) has been initiated with the financial and technical support of partners.

Since 2016, an important assistance is provided thorough BMU/GIZ funds to support the elaboration of vulnerability assessment and NAP process for the agricultural sector, water resources and coastal zones in Fatick district (in centre of Senegal). In addition to these sectors, the recent project funded by the GEF and launched in Mars 2020 will allow the Government of Senegal to elaborate the NAP on livestock infrastructures, disaster risk and health sector. To complement such dynamic of adaptation planning process, the PAN project approved through GCF readiness pipeline has been also started in 2020 and will be focus on livestock, biodiversity & tourism and water resources (AFD, Quebec/FAO, GCF, GEF/UNDP).

Aiming globally to contribute to the implementation of the adaptation component of the NDC, these sectoral NAPs conducted with the line ministries have made it possible to have exhaustive vulnerability studies, to improve the skills of state and non-state actors on adaptation planning and, above all, to contribute to the identification and deployment of technologies for land and water management, etc.

The extent of recurrent flooding in Senegal causing inestimable loss and damage has led to a new consideration of climate change in urban planning and development programmes. Coastal erosion in Senegal seems to be a major issue and one of the national priorities because it negatively affects not only the fishing sector but also constitutes a significant concern for the hotel industry. Aware of this climatic problem of high economic and social importance, Senegal, under the impetus and the real commitment of the President of the Republic has just concluded a financing agreement with the EU which should allow, in 2023, the elaboration of a sectoral NAP for the coastal zone. Given the marked and ongoing climate vulnerability of the agriculture sector, a recent analysis of climate change adaptation policy instruments and actions (Typoclim Project 2019-2013) shows the particular attention given to this sector occupying more than 60% of the active population. In the post-2015 era,

state actors with the support of financial partners have implemented several communication instruments, including the geoportals of climate projections in 2017 by the CSE, ANACIM and IRD, allowing policy makers and project leaders to better plan and integrate current and future vulnerability in the identification and implementation of climate change adaptation options.

Sectoral plans and programmes integrating climate risks and defining adaptation options have been developed, notably for the agriculture sector .

These include the Sectoral Policy Letter for Water Resources Development (2016-2025) which identified clearly the main climatic risks on water resources such as the sea level rise, recurrent flooding, etc. and had proposed to integrate weather and climate services into adaptation planning process. In addition to incentives for continuous research on improved seeds through the West African Agricultural Productivity Program (WAAPP), technical assistance has been initiated for adaptation in the sector in question, such as the vulnerability studies conducted through AFD's Adapt'Action facility. Similarly, the agricultural sector has been able to benefit from hybrid support combining simultaneously communicational means and incentive or financial support for the deployment of adaptation technologies such as the development of hydro-agricultural infrastructures, the integration of solar pumping, retention basins, the integration of climate information or land management. This has been made possible through specific programmes and projects mainly led under by the coordination of the ministry of agriculture and funding throughout multilateral agencies such the GEF, UNDP, etc. Such adaptation projects in the agricultural sector include including the Programme for Strengthening Resilience to Food and Nutritional Insecurity in the Sahel (P2RS), the Project for the Restoration of Saline Lands for the Improvement of the Resilience of Ecosystems and Communities in the Groundnut Basin (PROGERT), the Project for the Strengthening of Land and Ecosystem Management in the Niayes and Casamance (PRGTE). The PRACAS (Programme d'Accélération de la Cadence de l'Agriculture Sénégalaise 2014-2017), being the major agricultural project of the PSE, includes adaptation technologies even though the design angle of this programme was more focused on the expect-

tation of food and nutritional security. This observation is also valid for most sectoral development and socio-economic resilience projects where the integration of climate change was more justified to reduce the adverse effects of climate hazards.

To address the effects of climate change and the challenges of degradation of productive natural resources (water, land and soil), the initiative "Dynamique pour une transition agro-écologique au Sénégal" (DYTAES) launched by a group of non-state actors, has led a consultative approach of co-construction, support to development and scaling up of agro-ecological models in Senegal. In addition to the synthesis note for policy makers already produced (DYTAES), this initiative constitutes a multi-stakeholder platform that could play a significant role in the implementation of agro-ecological technologies that could contribute to the operationalization of climate change adaptation and mitigation objectives in the agricultural sector.

Several actions and partnerships have been established in recent years to organize international cooperation on finance and technologies in support of the implementation of mitigation actions in Senegal.

Regarding mitigation actions, after the political validation of the NDC in 2020, Senegal has just reached a new milestone in the operationalization of the NDC through the recent signature with the Swiss Confederation (July 6, 2021) of a bilateral cooperation agreement specifically related to Article 6.2 of the Paris Agreement. Even though the guidelines of this article are still being negotiated at the UNFCCC level, this voluntary partnership framework allowing for the exchange of Internationally Transferred Mitigation Outcomes (ITMOs) is a very strong signal of Senegal's commitment to access the carbon market and could serve as a good practice in West Africa. In order to address the difficulties in accessing multilateral climate finance funds, this clear political will on the carbon market would represent a significant niche for financing climate change mitigation measures already prioritized in Senegal's NDC, ranging from the promotion of energy mix (**Box 4**: Taïba Ndiaye wind park) to the deployment of eco-industrial parks and also the importance given to waste management and recovery. Moreover, the recent discoveries of the po-

Box 4. Taïba Ndiaye Wind Park

The President of the Republic, Mr. Macky Sall, presented the park as a way to achieve the goal of providing electricity to everyone in the country and to combat global warming. Taïba Ndiaye “will avoid the release of 300,000 tons of carbon dioxide per year. With the momentum we have launched since 2014, we are now at 22% of renewable energy available on our entire national grid,” he will say. The park will supply nearly 2 million Senegalese, out of a population of 15 million, with 450,000 megawatt hours per year - the amount of energy produced in one hour by one megawatt -. The president mentioned the possibility of a new contract to further increase this capacity.

Source: https://www.lepoint.fr/afrique/energie-le-senegal-rebondit-sur-l-eolien-25-02-2020-2364331_3826.php

tential for oil and gas exploitation that should begin in 2022 have instilled, among other things, a new dynamic and appreciation for the governance of climate change because it could represent more than 50% of emissions in 2022.

In view of the need for financing estimated at more than US\$13 billion by 2030, Senegal, through the NDA, has benefited from preparatory support programmes with the GCF in 2016 and 2020 respectively, which resulted in the development of the 2018-2030 country programme document, the development of a portfolio of concept notes, project proposals and, above all, the accreditation of the LBA in order to boost the commitment of the private sector in the implementation of climate actions.

In terms of technology transfer, the CTCN (Climate Technology Centre and Network) through the Designated National Entity and ENDA ENERGIE based in Senegal, a member of the CTCN consortium, provided technical assistance in the execution of two requests in line with the NDC which focused on the deployment of co-generation and tri-generation technologies in the tertiary sector and on the deployment of eco-industrial parks.

Strategic planning exercises with sectoral deep dives are launched in Senegal to guide decisionmaking towards low-carbon and resilient systemic transformations, with particular focus on the energy sector given notably opportunities and risks from recent important discoveries of oil and gas.

In addition, the GHG emissions profile in Senegal has often been characterized by the predominance of the agricultural sector, estimated at more than 45% in 2010 (base year of the GHG inventory), followed by the energy sector (34.8%), waste (11.2%) and industrial processes (8.7%). By 2030, the results of the NDC clearly indicate a substantial change in the profile of GHG emissions in Senegal, which would be more than 50% dominated by the energy sector. This would be mainly due to the new strategy focused on oil and gas exploitation (gas-to-power) to curb, on the one hand, the poor access to modern energy services in urban and rural areas and, on the other hand, to boost the industrialization dynamic of Senegal's economic fabric. In a perspective of carbon sobriety and resilience in the context of an oil producing country, the MEDD (Ministry of Environment and Sustainable Development) and MEP (Ministry of Energy and Petroleum) intend to collaborate through an initiative called DDP (Deep Decarbonization Pathways) to better explore and thus guide the strategic choice of sustainable economic development trajectories. This project funded by AFD (Agence Française de Développement) through the 2020 Facility to be implemented jointly by IDDRI (Institut du Développement Durable et des Relations Internationales) and ENDA ENERGIE is in line with the main purpose of Article 4, Paragraph 19 of the Paris Agreement. In addition to the energy transition, this analytical prospective initiative will also enable policy makers in the priority sectors of the CDN (agriculture, forestry, waste, industry, etc.) to have a long-term low-emission development strategy and resilient to climate change. This strategy should be based on systems and trajectories of systemic transition for the short, medium and long term.

Local actors, notably cities, are taking growing leadership on planning and implementing climate actions.

Complementing the efforts of sectoral authorities and departments, the development of Sustainable Energy Access and Climate Action Plans (SEACAP) by the cities of Dakar and Pikine, within the framework of the Covenant of Mayors of Sub Saharan Africa (CoM-SSA) under European Union funding, has allowed the identification of appropriate renewable energy technology options (Box 5). Although the implementation of these territorial climate action planning instruments still

Box 5: LAUNCHING THE CLIMATE CHANGE PROJECT

The City of Dakar is committed to the fight According to Soham El Wardini (Mayor of the City of Dakar), this fight against climate change is very important and it is part of the government's project to mitigate climate change. To do this, much cleaner energy infrastructure will be built. «The most important for us is the bioclimatic buildings that we will build at the center of Ouakam (...),» announced the mayor of Dakar.

requires additional financial and technical resources, these local government initiatives represent local climate solutions that can contribute to achieving the adaptation and mitigation objectives of Senegal's NDC.

In the same perspective, NGOs have developed and implemented programmes and projects similar to the EIPC (Programme de Bonne Gouvernance Écologique dans l'Entente Intercommunale de la Petite Côte (EIPC) pour une Gestion Intégrée des Zones Côtières (GIZC) led by ENDA ENERGIE with the support of the European Union in collaboration with the Jeunes Volontaires de l'Environnement (JVE Sénégal). This programme has enabled the communes of Mbour, Saly, Ngarparou, Malicounda and Somone to develop a Territorial Climate and Energy Plan (PCET) with a portfolio of inter-communal projects for a low-carbon and climate change resilient development.

Despite positive signs of progress, number of challenges remain when it comes to implement consistent and strategic action on climate change aligned with socio-economic objectives.

Despite all the efforts to combat climate change in Senegal, the measurement, reporting and verification (MRV) of climate actions and support received and/or needed still remains a significant challenge, although monitoring and evaluation initiatives are being developed at the sectoral level. In terms of transparency (Article 13 of the Paris Agreement), one of the challenges of operationalizing the NDC lies in the consistent and regular accounting of proven solutions and technological options deployed by local authorities, private actors, green solution incubators, etc. In addition, resilient and low-carbon economic development requires a better coordination of the national institutional architecture by further promot-

ing the strengthening of the skills of non-state actors and their coherent involvement in all of the forums of strategic influence on the fight against climate change (e.g. CoP 26) and access to technological (CTCN) and financial mechanisms (GCF, AF, etc.).

Despite the reaffirmed high-level political will in favor of the fight against climate change and the frequent references to climate change in speeches, including those of non-state actors (local authorities and civil society organizations), number of major challenges persist when it comes to translating them into concrete actions.

The operationalization of the political will expressed by decision-makers on climate change is still limited by institutional, administrative and technical obstacles throughout the financing chain of the defined climate actions. These constraints include, among others: i) the difficult access and mobilization of financial resources from sectoral departments, local authorities and private actors, ii) the ambiguous and uncoordinated process of planning and executing of the financing lines granted. As a result, political discourse largely fails to translate into an integrative approach to climate measures and actions in which they could also contribute structurally and substantially to critical socio-economic issues for the country, such as the fight against youth underemployment, migration and social inclusion. Also there is not a clear understanding and ownership in all decision-making spheres and sectors in Senegal of the positive impacts and financing opportunities of climate change adaptation and mitigation measures.

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MODERATE POLITICAL CLIMATE AMBITIONS IN SPITE OF THE INCREASINGLY GROWING PUBLIC SUPPORT FOR ACTIONS

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A narrative of climate ambition in the Slovak Republic

INTRODUCTION

This paper provides a framework assessment of the latest development of climate policies, discourses and investments in Slovakia *vis-a-vis* the Paris Agreement goals. It is written based on policy and discourse analyses and it is focusing on the period of the last 5 years (2015-2020) as a relevant period for making progress from the COP-21 meeting in Paris and the Paris Agreement (adopted by 196 Parties at COP 21 in Paris, on 12 December 2015).

Policy of Slovakia in the area of climate change is defined by the framework of the UN and European Union and mutually agreed goals and targets. According to the NDC Slovakia should aim to reduce its emissions by 12 percent (DC EU First NDC Updated submission, English18/12/2020). Yet more ambitious are gradually EU targets affecting Slovak climate policies. As a part of the European Green Deal, the Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55% compared to 1990. The share of Slovakia in reaching this figure is yet not specified, but the process already significantly shapes emerging national strategic framework for mitigation and adaptation to climate change.

Yet, in spite of commitment to the 2050 climate neutrality and increasing number/quality of the strategies, policies and legislation, the country often goes for low ambitions standards in its policy goal – i.e., fulfilling EU framework as the least common denominator, but avoiding stronger policies and goals. In addition, enhancement of the implementation and enforcement

of already existing policies and law remains a persistent problem.

On the positive note, in the past five years there has been strong improvement in energy efficiency (both households and industry), installations of renewable energy are growing and the Slovak 2020 targets in CO₂ emissions reduction were met. The country will by 2023 close its only remaining coal mining industry and development of regional decarbonization strategies is in progress.

However, there are problems arising. The so called "low hanging fruits" in emission reduction are decreasing and the EU 2030 and 2050 targets will impose on Slovakia challenging economic and social tasks. The country is increasingly exposed to climate change adaptation problems. The upcoming period would require stronger commitment of the governments and more support from the public.

DOMESTIC DISCOURSE

The main advancements regarding the domestic discourse on climate change since the Paris Agreement are visible especially in the last years and especially from 2018 onwards. While the first years after the Paris treaty were characterised by generally small media coverage and public interest, there were at least three recent factors improving the process: (i) International discourse transformed into national debate; (ii) Phasing out coal and decarbonization processes in progress; and (iii) Investment opportunities associated with the Recovery and Resilience Plan and other EU funding schemes.

The recent acceleration of the debate was generally stimulated by international calls for action and its domestic responses. *The Fridays for Future* as a new emerging civic platform in Slovakia organised its first protest in August 20th, 2018. Increasingly active has also been the platform *Worried Mothers: Let's not burn the future!* Here concerned mothers have joined forces in an initiative to protect the climate and the environment.

Perhaps the most important activity in this respect is petition „*Climate Needs You.*“ It started in 2020. By the summer of 2021 they collected more than 50 000 signatures, aiming for the target value of 100 000 (in the country of 5,4 million). The aim of the petition is to push the Slovak government to recognize the cli-

mate crisis as one of its main priorities and to declare a state of climate emergency, while also making the government commit to the preparation and approval of legislation, state policies and state projects with the goal of achieving carbon neutrality in 2040.

The Slovak Climate Initiative was created as an association that brings together NGOs, academia and the business sector. The founding members of SKI are Buildings for the Future, the Slovak Association of Photovoltaic Industry and RES, Friends of the Earth - CEPA and the Prognostic Institute of the Slovak Academy of Sciences. Slovak Euractive News and Information service branch has been very active in organising public debates and events and stimulated professional debate on climate change and energy related topics. Based on this and other activities, the situation is generally improving with regards to public engagement and interest in climate policies, programs and projects. Although, while there is growing interest among the professional organisations in the topic, there is still a rather small number of climate aware and active entities especially in the field of energy, transport and industrial policies. Another positive trend is the increasing engagement of academia and the business sector.

One of the important factors in generating interests and stimulating public debate has been phasing out coal. The future of coal mining in Upper Nitra opened a very important debate and the Government of the Slovak Republic decided that the coal mining should terminate by 2023.¹ There was decreasing support for the continuation of the coal mining subsidy system among the coalition and opposition parties and for the time being, there is practically no relevant political party or subject in Slovak Republic questioning the decision. Phasing out coal has support from NGOs, local municipalities and business community.² Decision and affiliated public debate helped to pave the way for future discussions on decision making on Slovak economy decarbonization and regional decarbonization plans.

Investment opportunities affiliated with the Recovery and Resilience Plan (RRP). The Partnership Agree-

¹ Resolution no. 580 (12 December 2018) on the *Proposal for the Transformation of the Region of Upper Nitra*.

² See, for instance, Future of the Region Roundtable outcomes <http://www.prievidza.sk/spravodajstvo/horna-nitra-je-zivotaschopny-region/>. The roundtable was organised on September 18, 2018 by the mayor of Prievidza.

ment 2021-2027 and other EU funding schemes helped to open a public debate on the needs and general future transformation of the country. The public debate on RRP priorities and its focus on decarbonization brought into the public debate important stimulus. Last but not least, because of the climate tags and fixed percentages in the financial instruments earmarked for climate investments, government has been forced to aim them very clearly to climate projects.

NATIONAL GOVERNANCE

A positive role in shaping public discourse is played by the President of the Slovak Republic and her office, bringing the issues into the public debate and supporting civic initiatives. Although the position of the president is relatively weak in the context of executive powers, it has a strong symbolic position and role in steering public debate.

The political statements by the government which support investments into decarbonization of the national economy are to some extent propelled by the general targets and goals of the EU and pressure for adjusting national investment priorities with technical climate-oriented requirements of the funding. On the other hand, there is no open opposition to the climate policies among the coalition and mainstream opposition parties.

An important step was establishment of the *Council of the Government of the Slovak Republic for the European Green Agreement*. It is an advisory, coordinating and initiative body of the Government of the Slovak Republic for issues related to the European Green Agreement. It coordinates the activities and cooperation of ministries, local governments and other state administration bodies. The Council will monitor the coordination of sectoral policies and monitor compliance with the transition to a carbon-neutral economy. On April 20th, 2021 there was an opening meeting of the Council, where six basic points were adopted to be followed by central government bodies in their strategies and policies. These include reducing greenhouse gas emissions, adapting to climate change, restoring and protecting biodiversity, promoting environmental sustainability, striving for progress in regenerative growth and the transition to a circular economy with no-pollution strategy.

ACTIONS AND POLICIES

The main vision and strategic document in climate change policies is adopted *Low-carbon development strategy of the Slovak Republic until 2030 with a view to 2050*. The strategy was approved by the Government of the Slovak Republic on 5th of March 2020 and it represents Slovakia's response to commitments to combat climate change. The aim of the strategy is to identify existing and propose new additional measures within the Slovak Republic to achieve climate neutrality by 2050. The document was created under the leadership of the Ministry of the Environment of the Slovak Republic in cooperation with experts at the national and international level (World Bank), while the starting document for the preparation of the strategy was the Low Carbon Study. It builds on modelling the development and impacts of individual policies and measures on the national economy, using the Compact Primes and ENVISAGE Slovakia (CGE) models. All relevant institutions as well as the general public also had the opportunity to participate in the preparation of the strategy through a designated public participation process. *Integrated National Energy and Climate Plan for the years 2021 – 2030* is currently in the process of revisions and should provide binding targets for the climate policies.

Implementation of Just Transition Mechanism (JTM) started with development of regional decarbonization actions plans. The pilot areas selected are self-governing regions of Trenčín, Banská Bystrica, and Košice. Decarbonization is also selected as one of the reform and priority activities in the newly adopted (June 2021) Recovery and Resilience Plan for the Slovak Republic.

The latest development (as of June 2021) is the start of the work on adopting a climate law in Slovakia. The government justifies the need for the law based on clarification of the legal climate framework and the need to follow-up to the European Climate Regulation and the "Fit for 55 Package" and by efforts to supplement/develop existing documents addressing the reduction targets of the Slovak Republic. The law should at the same time increase awareness and transparency in tackling climate change, therefore the process started with wide and open public participation.

NEXT STEPS

There is growing public support for more ambitious and imminent pro-climate policies and action in Slovakia and the network of policies and actions has been enhanced recently. The international and especially the EU framework proves to be crucial in this respect. In spite of COVID-19 pandemic, dominating public agenda since early 2020, climate change has enhanced its position in the public discourse. Slovakia is however far from a rapid transformation path to carbon neutrality and there will be lots of efforts needed to accelerate the transformation towards a decarbonised economy. The international framework of the global goals of the Paris Agreements needs to be enhanced by ambitious EU policies and supported by domestic political bottom-up pressure.

The coordination of policies among individual sectors (i.e., ministries) is weak, in spite of the newly established *Council of the Government of the Slovak Republic for the European Green Agreement*. A Climate Law under preparation, supported by clearly targeting investments into decarbonization may provide important impetus to the process.

The positive trend is that the public debate is not cantered by the issue of climate change per se – the existence of the problem is denied only by marginal political forces and parties. The core of the debate is about economic and social costs, speed of the transformation and its impacts to the Slovak industry, services and last but not least people. These are topics where politicians, academia, NGOs and business need to find solutions and frame the public debate on opportunities affiliated with the great transformation.

CLIMATE EMISSIONS MITIGATION POLICY AMBITION

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DOMESTIC DISCOURSES

The South Africa domestic discourse on climate policy and ambition has evolved over time in a context of significantly changing political, social and economic conditions. It has remarkably changed from a response to an international climate-driven agenda towards an in-country agenda of development, democracy and distributive justice.

Initial mitigation policy discourses based in climate science, techno-economics of mitigation, rights based constitutionalism and international multilateralism

South Africa has been a pioneer in climate change ambition and climate policy implementation among developing countries. It was an early mover in making an ambitious¹ voluntary emissions reduction commitment to the UNFCCC in 2009 and began to implement this in 2011 with a bold renewable energy electricity generation programme based on the Integrated Resource Plan (IRP2020-2030), which imposed an emission cap, and the internationally acclaimed Renewable Energy Independent Power Producer Programme (REI4P). By 2015, some 6GW of renewable energy had been built or was under construction and a further 2.3GW had been contracted, in total representing some ZAR 202bn of investment. In view of the fact that in 2010 renewable energy generation was significantly more expensive than coal which dominated South African electricity generation, this was a notable achievement.

¹ Evidence of the ambition was the resistance by large South African emitters to this policy

Discourses of patronage politics, corruption, state capture and economic decline

Another pioneering area has been South African experiences with resistance to implementation of fundamental systems transitions ². The REI4P programme became involved in a struggle with the incumbent coal regime which is entangled with national politics and corruption involving coal- electricity industry contracts at state-owned electricity monopoly Eskom. A patronage network organised around corrupt coal contracts, 'state-capture' and president Zuma gained ascendancy in government, with the REI4P being stopped in 2015. Emissions mitigation policy ambition also stalled - an INDC with a similar commitment to 2009 was submitted at the 2015 COP, which in effect constitutes a substantial regression in mitigation ambition.

Poor performance of the coal electricity generation fleet and loadshedding were associated with corruption, severe economic damage and loss of confidence in governance of the electricity system, the economy and government in general. In 2016 a high profile official report was issued, linking this to coal-electricity corruption and a patronage network of 'state capture'.

Constitutionalist and techno-economic discourses integrated into a 'just transition' (JT) discourse

Linked to loss of confidence in government and the upcoming national elections in 2018, in 2017 pro-constitutionalists narrowly defeated the patronage network anti-constitutionalists in an internal ANC election and installed Cyril Ramaphosa as president. Since then, Ramaphosa and allies have been regaining the ascendancy including rooting out coal-electricity corruption, re-starting the REI4P and publishing the update IRP2019 electricity plan with a significant expansion of renewable energy. These developments found alignment with international efforts to accelerate climate ambition after the surge in political support emerging from a universally approved and rapidly ratified Paris Agreement. Emissions mitigation governance was integrated by the National Planning Commission (NPC) with

procedural and distributive justice elements within the just transition (JT) concept.

Discourses of economic decline, social and political disruption, insurrection, rule-of-law, constitutionalism and economic re-vitalisation

In 2020 South African debt was downgraded to junk status. Unemployment steadily increased from 2010 to 43%³ in 2021 with 72% youth unemployment. Economic decline is intertwined with decline of the coal-powered electricity sector, corruption and a destructive struggle between ANC pro- and anti-constitutionalist factions. The Covid-19 pandemic exacerbated severe poverty and inequality.

The volatility of these socio-economic conditions, and the ongoing influence of an entrenched patronage network and anti-constitutionalists was linked to a violent insurrection of sabotage and looting following Zuma's imprisonment after being convicted of contempt of the Constitutional Court in June 2021. The presidency stated that: *"It is clear now that the events of the past week were nothing less than a deliberate, coordinated and well-planned attack on our democracy. The constitutional order of our country is under threat."* In 2021, metropolitan debt was downgraded to junk status. Four metropolises account for 50% of South African GDP. Yet, climate ambition has again become a mainstay in South Africa, including a political commitment to carbon neutrality by 2050 in the midst of this economically decaying environment.

Regaining a minimum level of economic re-vitalisation and supporting social and political stability to enable the constitutionalists to remain in the ascendancy requires a functional electricity system which, in turn, involves implementation of the renewable energy plan and the associated just transition. *"The only way in which South Africa can navigate the climate transition is by seizing the opportunities provided by changing market conditions at the same time as making sure that those who are most vulnerable to change are supported to adapt."* ⁴

² Baker Lucy and Jesse Burton Hilton Trollip (2020) 'The Energy Politics of South Africa', in Hancock, K. J. and Allison, J. E. (eds) The Oxford Handbook of Energy Politics. Oxford University Press.

³ This is the broad measure that includes 'discouraged work-seekers.' Youth unemployment

⁴ South African Presidential Climate Commission July 2021 - First Report: Recommendations on South Africa's draft updated Nationally Determined Contribution (NDC)

CURRENT GOVERNANCE

The national governance context is dominated by entangled factional politics in the ruling party with corruption centred on fossil-based electricity playing a large role

Until President Zuma was forced out of office in February 2018 and Cyril Ramaphosa was inaugurated as the new president, state capture under the Zuma-led government had continued to undermine constitutional, rule-of-law-based government in general, and progress in implementation of energy and climate policy in particular. The period since February 2018 has involved a steady process of dislodging corrupt individuals installed in the state capture period and re-building institutional capacity. This has been a delicate operation because of the narrow advantage held by anti-state capture allies in the balance of political power in the ruling ANC and the entrenched patronage network. The constitutionalists have a tenuous hold on power.

The establishment of the Presidential Climate Commission (PCC) is a huge step forward linking climate policy governance, equity and economic policy via commitment to JT structures and processes using competent technological governance

The PCC was established with Ramaphosa as the chair in September 2020, and held its first three meetings in April-June 2021 re-igniting progressive climate ambition governance. The Executive Director, Crispian Olver, is very experienced in the most senior management functions across a number of government portfolios, including a range of national and international roles in environmental policy. The 22 commissioners are from a wide array of organisations spanning interests from the major coal-related companies (and/or business associations), labour unions, civic and youth societies, environmental NGOs and specialist technical (law and science) organisations.

The JT process launched by the PCC is possibly the most comprehensive and optimistic, competent governance initiative currently operational in South Africa. Return to ascendancy of constitutionally mandated, rule-of-law, transparent, democratic governance exemplified in the setup and initial

proceedings of the Commission are a break-through after many years of stuck processes and behind-the-scenes covert “governance” which undermined the initial leadership and successes of South African climate governance.

Business has begun taking a proactive role in mitigation policy

The National Business Initiative (NBI) has been running a project for over a year which explores the question: “What would it take for South Africa to get to net-zero emissions?”. Business appears to acknowledge that survival will require embracing decarbonization, and the NBI has been actively supporting PCC processes. The NBI is undertaking a modelling exercise to map out a technically and financially feasible set of pathways for South African business sectors that would achieve carbon neutrality by 2050⁵. The NBI in this process with Business Unity South Africa (BUSA), previously a public critic of key aspects of mitigation policy, now participating, has carried out detailed modelling in consultation with a broad range of business stakeholders that supports the main findings of other models that a ‘renewables dominant’ electricity system is least cost. These are notable developments in a policy landscape where coal and emissions intensive industry has often had an adversarial relationship in mitigation policy processes, and are now leading public structured assessments on how to materialise the ambition embedded in the Paris Agreement.

RECENT PROGRESS IN POLICIES AND ACTIONS

Presidential Climate Commission recommends substantial reduction in draft proposed NDC update

In its ‘First Report’ the PCC recommends lowering the target range for 2030 from 398-440 Mtpa to 350-420Mtpa. While this was a necessary compromise it was the result of public discussions where a range of experts presented analysis and the wide range of commissioners could debate proposals.

⁵ NBI (National Business Initiative), 2021. Climate Pathways and a Just Transition for South Africa. Technical compendium for PCC. 20 May 2021. Unpublished (quoted from PCC First report).

Stakeholder inputs and discussions at the PCC made it clear that a number of stakeholders view a lower NDC as an opportunity to approach international climate funders. This creates a context of opportunity vs. a perception of burden.

The First Report also records that: "some of the largest emitters in South Africa have made commitments that support the country's goal of net-zero carbon emissions by 2050. Eskom, the country's largest GHG emitter, has committed, in principle, to net-zero emissions by 2050, while Anglo American has set a global target of achieving carbon neutrality by 2040. One of South Africa's largest coal miners, Exxaro, aims to attain carbon-neutrality by 2050, while SASOL is exploring pathways to achieving net-zero by 2050 (with an announcement expected in September 2021)."

A re-invigorated REI4P and IRP dominate emissions mitigation

Emissions mitigation is no longer primarily motivated by emissions reduction but by the need to replace decrepit coal power stations and expand national power generation with an accelerated renewable energy electricity generation programme, now that renewables have become the least cost source of energy.

The REI4P was resumed in 2018. The IRP2019 was published, with some 20GW allocated to renewable energy. In April 2021 new bid windows of the REI4P were opened, inviting proposals for 2.6 GW of wind and PV. Difficulties with environmental authorisations and withdrawals of financier support appear to make new coal generation unlikely to be built.

The breakthrough announcement for embedded generation.

In mid-June 2021 President Ramaphosa announced that the threshold for requiring a license for embedded generation projects would be raised from 1MW to 100MW. The energy minister who was present at the announcement had spent the previous years delaying this increase and arguing against it. This announcement has enormous political significance. It was an unambiguous signal that the president will override ministers and departments on the advice of a dedicated department set up in the presidency to facilitate reform efforts being thwarted by line ministries.

Since the refusal to sign REI4P contract in 2015 the electricity sector has been characterised by forms of delay. While this improved when Ramaphosa assumed the presidency with the signing of the outstanding contracts delays through inaction have persisted and a coal-supporting narrative has actually ramped up in the DMRE. A survey in January revealed that a suppressed supply some 5,000MW of embedded generation exists. If a substantial amount of this materialises in the next few years especially in the context of a national shortage of some 4,000 MW it will prove by example the benefits to industries that build this generation and to the upstream electricity renewable energy equipment manufacturing sector.

The just transition (JT) is now at the centre of mitigation policy and the 2050 net-zero ambition committed to in SA's low-emissions development strategy (LEDS). It necessarily involves international financial support for electricity transition in the medium term.

A low-emissions development strategy (LEDS) was filed with the UNFCCC in 2020 with a commitment to a net-zero economy by 2050. The president made a submission to the 2020 UN Climate Leaders Summit, committing to progressing the NDC and mentioning a 'Just Transition Transaction' (JTT) involving an "\$11-billion blended funding facility". This facility would use support from climate funds to leverage private sector investments to cover 'social costs' of electricity system decarbonization and accelerate the transition. Of this some US\$4bn would need to be concessionary finance from international climate funding. Much analysis has gone into what will be required to support the social costs of the transition out of coal and so far this is the only plan on the table which tackles this problem at national scale. However, organised labour has been critical of the REI4P because they view it as privatisation through the back door, a policy they are ideologically opposed to. Substantial work is required on detailed JT plans to provide sufficient levels of detail to address distributional issues. This would require specific plans detailing how economic benefits of renewable energy can be increased and distributed to address poverty and unemployment, especially in coal regions.

BUILDING ON RECENT PROGRESS – NEXT STEPS FOR SPECIFIC POLICIES AND ACTIONS

Policy and implementation mechanisms for the renewable energy roll-out exist but implementation needs to accelerate

The IRP2019 needs to be updated in at least three important respects: by incorporating pathway modelling of latest relevant technology cost assumptions and remove the irrational coal power previously forced in; by extending it to 2050, and; by including scenarios that factor in a successful JTT which mobilises finance to accelerate the phase-out of coal. The REI4P and/or similar⁶ need to be accelerated to implement the updated IRP. No new contracts have been entered into since 2014.

Overall governance and outline proposals for the JTT managed transition exist but need to be developed through to implementation through the PCC JTT process

A number of academic/technical studies have described potential requirements and elements of the JTT. The need for procedural justice is a central feature and a number of proposals have been made which include social plans for coal regions, retraining of coal sector workers, re-purposing of coal power stations including siting renewable energy generation in coal regions (economically viable despite not being optimal renewable energy resource areas) and assistance with economic diversification and establishment of renewable energy equipment manufacturers in coal regions within an energy/industrial policy that provides sufficient demand certainty from the renewable energy generation roll-out for local equipment manufacturers.

Ambition and implementation in industrial and transport sectors are tightly linked to what happens in the electricity sector in the next decade and international technology costs and trade measures such as border carbon adjustments (BCAs)

⁶ There have been ongoing debates about whether this should be via IPPs as in the REI4P (viewed as privatization via the backdoor by organized labour) and/or driven by state-owned Eskom monopoly ownership and/or various blends of social/community ownership.

In the technical and political dimensions, industrial decarbonization relies on the decline of the electricity sector being turned around and success in electricity sector decarbonization. The renewable energy electricity programme can have a number of linkages to industrial futures if industrial policy is integrated with energy policy and policy stability is achieved, which would provide a steady stream of demand from local industry for renewable energy equipment.

It has been problematic for government to impose on industry its policy of top-down sector and company emissions budgets while the state-owned electricity monopoly persisted with its pro-coal and anti-renewable energy actions. Addressing this policy contradiction will garner support from industry for mitigation policy. Also, international trade and technology developments have over the past three years very quickly changed fundamentals in the business context for many of SA businesses. SA business is now acknowledging that future survival, never mind success, lies in decarbonization. There has been a flurry of analysis of opportunities related to hydrogen and one specific commercial proposal is being developed for the iron and steel sector which involves export of beneficiated indigeneous iron-ore using green hydrogen generated from renewable energy⁷.

Similarly to electricity generation technology cost tipping points will drive decarbonization of transport. Policy may accelerate this but anomalies between government transport policies and potential performance of state-owned public transport sector institutions and infrastructure performance are problematic.

The JT will be integral to national security, the success of the democratic transition and addressing poverty and unemployment and achieving net zero by 2050

Addressing economic decline, poverty and unemployment is contingent on stabilising and re-building the electricity generation sector. Coal electricity generation is in inexorable decline. Without effective management this will lead to the rapid collapse of regional economies already in severe distress. A managed electricity system transition in the form of the JT being managed by the PCC could turn this around.

⁷ https://ddpinitiative.org/wp-content/pdf/GreenPrimaryIron_ZF.pdf

This will facilitate decarbonization of other sectors. Government has to be convincing that plans for the coal phase-out will include measures to address welfare in coal regions to regain/maintain security and social stability as a basis for sufficient support for the constitutionalists to enable investments in the renewable energy roll-out.



CLIMATE AMBITION SINCE THE PARIS AGREEMENT

Jessica Yun, Solutions for Our Climate

INTRODUCTION

In the years before South Korea signed the Paris Agreement, the Korean government received international attention for its “Low Carbon, Green Growth” policy direction and launch of the Korean Emissions Trading Scheme (K-ETS) – East Asia’s first nationwide cap-and-trade system – but these initiatives ultimately failed to reduce domestic greenhouse gas emissions as planned. While still considered an international climate laggard with a “highly insufficient” Nationally Determined Contribution (NDC),¹ South Korea has had notable developments in its domestic discourse, national governance, and policies since the 2015 Paris Agreement that signal potential shifts in its resolve to address the climate crisis.

DOMESTIC DISCOURSE

With more extreme weather events, higher perception of climate change as a crisis but with trailing decarbonization ambition

With the increasing severity and frequency of extreme weather events, public perception of climate change as a crisis has grown and remains relatively high when compared to that of other countries. In a 2021 survey of 1,000 adults residing in South Korea conducted by the Asian Citizen’s Center for Environment and Health, 86.7% of respondents recognized

¹ <https://climateactiontracker.org/countries/south-korea/>

current climate change as a “climate crisis.”² A survey of 1,500 participants in Korea conducted by Gallup in September 2020 found that 97.7% of respondents felt that the climate crisis was “serious,” and 95.8% had indicated that Covid-19 and extreme weather events had increased their perception of climate change as a crisis.³ Gallup and the Worldwide Independent Network of Market Research (WIN) also found that among 34 countries polled, Korea had among the highest perceptions of climate change as a threat to humanity.⁴ This public perception has led to 226 out of South Korea’s 228 local municipalities collectively announcing a climate emergency on June 5, 2020⁵ and the National Assembly, South Korea’s legislature, to pass a resolution recognizing the climate crisis as an emergency on September 24, 2020.⁶ Despite the relatively high perception of the climate crisis in South Korea, ambition to decarbonize the economy and confidence that the country can achieve deep emissions cuts are lower. In the same Asian Citizen’s Center for Environment and Health survey,⁷ only 62.1% agreed with the Korean government’s goal of achieving carbon neutrality, with 45.8% responding that reaching net-zero emissions by 2050 will be difficult, and only 32.4% responding that achieving such a goal is possible.⁸ Other surveys indicate more ambitious public sentiment; in the September 2020 Gallup study, 90.6% of respondents agreed that emissions should reach net-zero by 2050.⁹

Emphasis on individual action over government-led, system-wide changes could affect public ambition to achieve carbon neutrality. A study conducted by Korea’s Ministry of Culture, Sports and Tourism found that 27.1% of respondents believe that individual action is the most urgent task to tackle climate change, while 21.6% indicated central government

policies and legal systems, 19.2%, industry efforts, and 17.2%, international efforts, as most critical.¹⁰

Often, industry and government bureaucrats will point to South Korea’s manufacturing-oriented economy and its current high reliance on fossil fuels as challenges to achieving carbon neutrality. Vice Environment Minister Hong Jeong-kee has noted Korea’s “disadvantage” in reducing emissions compared to jurisdictions such as the European Union, where greenhouse gas emissions have peaked earlier.¹¹

In addition to extreme weather events, global climate mobilizations, international policy developments, and most recently, the political need to appeal to younger generations drive increasing mention of climate in Korea’s domestic discourse

As briefly mentioned above, extreme weather events in South Korea have played a major role in increasing the perception of climate change as a crisis. In 2020, the country faced the longest monsoon season on record of 54 days,¹² which caused prices of agricultural products to skyrocket and nearly US\$90 million in economic damage.^{13,14} Media coverage of wildfires abroad in Australia, the Arctic, Western United States, and the Amazon Rainforest has also brought awareness to the severity of global climate change.

International mobilizations for climate action have also impacted South Korea’s domestic discourse. The Fridays for Future movement and global climate strikes have spread to the East Asian nation, culminating in a climate strike in Seoul of approximately 5,000 participants in September 2019¹⁵ – which, while relatively small compared to other countries’, is still significant considering climate has not traditionally been a national agenda item.

² http://eco-health.org/bbs/board.php?bo_table=sub02_02&wr_id=924

³ <http://www.greenkorea.org/activity/weather-change/climate-changeaction-climate-change/84108/>

⁴ https://www.hani.co.kr/arti/science/science_general/999286.html

⁵ <https://www.donga.com/news/article/all/20200605/101383584/1>

⁶ <https://www.eco-business.com/news/south-korea-declares-climate-emergency-sets-net-zero-target-for-2050/>

⁷ http://eco-health.org/bbs/board.php?bo_table=sub02_02&wr_id=924

⁸ Ibid.

⁹ <http://www.greenkorea.org/activity/weather-change/climate-changeaction-climate-change/84108/>

¹⁰ korea.kr/archive/expDocView.do?docId=39294

¹¹ <https://koreajoongangdaily.joins.com/2021/06/17/national/socialAffairs/NDC-Hong-Jeongkee-Environment-Ministry/20210617170300395.html>

¹² <https://en.yna.co.kr/view/AEN20200816001300325>

¹³ <http://www.koreaherald.com/view.php?ud=20200916000782>

¹⁴ http://english.khan.co.kr/khan_art_view.html?artid=202008142114187&code=710100

¹⁵ <http://www.redian.org/archive/137497>

Global mitigation efforts, especially from economies seen as peers to South Korea, are also important drivers of climate in Korea's national discussions. Just weeks after China had pledged to achieve carbon neutrality by 2060 and days after Japan committed to reaching net-zero emissions by 2050, President Moon pledged that South Korea would also achieve carbon neutrality by 2050 in a budget address to the National Assembly on October 28, 2020.¹⁶

More recently, climate change has become a more popular issue among Korea's two main political parties given the identification of voters in their 20s and 30s as the swing vote in the April 7, 2021 by-elections.¹⁷ In order to appeal to younger voters, who face the larger generational burden of climate change mitigation and impacts, both parties are increasingly appealing to their climate ambitions.

NATIONAL GOVERNANCE

Government ministries, primarily the Ministry of Environment, Ministry of Trade, Industry and Energy, and Ministry of Economy and Finance continue to play key roles in South Korea's climate policymaking. The Presidential Office may also intervene directly on climate policy as demonstrated by President Moon Jae-in's 2050 net-zero announcement.

In addition, various institutions have been established in South Korea since the signing of the Paris Agreement to address climate policy. Whereas previously, environmental and climate issues were mainly discussed in government committees with a handful of experts and civil society voices, such as in the Presidential Committee on Green Growth, newer institutions are attempting to increase public participation in climate policymaking, though some civic groups find these efforts inadequate.

National Council on Climate & Air Quality

The National Council on Climate and Air Quality (NCCA) was launched in April 2019 in response to

growing calls from the public and National Assembly to tackle the country's "fine dust" pollution, and more secondarily, climate change. Unlike previous climate and environment-related committees, the NCCA, chaired by former UN Secretary-General Ban Ki-moon, offered a formal channel for expert and public participation through the National Policy Participation Group, using public polls and debates with a citizen panel of nearly 500 participants.¹⁸ These channels gave the Council the political legitimacy needed to propose bolder air pollution and climate measures to the Korean government.

One of the NCCA's most immediate short-term tasks was reducing fine-dust levels, which led the Council to propose to the Korean government a package of policy recommendations on air pollution measures including the partial shutdown of coal power plants during the peak air pollution season of December to March.¹⁹ In November 2020, the Council recommended to the government a policy package tackling mid-to-long-term air pollution and climate tasks, including urging for a ban on diesel vehicle sales after 2035 and the phase-out of coal power by no later than 2040 given the government's carbon neutrality pledge.²⁰ However, with the creation of the Presidential Committee on Carbon Neutrality, the NCCA has been defunct as of April 30, 2021.²¹

2050 Low-carbon Vision Forum and LEDS Development

The 2050 Low-carbon Vision Forum, which consists of experts from academia, industry, and civil society, was established for the preparations of Korea's Long-Term Low-Emissions Development Strategy (LEDS) submitted to the UN in 2020.²² The Forum drafted a proposal that was used for discussions between 15 relevant ministries including the Ministry of Environment. Opinions from stakeholders were collected through expert consultations, online surveys, and public hearings, such as a five-hour virtual online debate. However, civic groups have criticized the

¹⁶ <https://www.reuters.com/article/us-southkora-environment-greewdeal-idUSKBN27D1DU>

¹⁷ https://www.koreatimes.co.kr/www/nation/2021/06/356_310694.html

¹⁸ https://www.globalasia.org/v14no4/cover/air-quality-and-regional-co-operation-in-south-korea_tae-yong-jung

¹⁹ <https://www.theguardian.com/world/2019/nov/28/south-korea-to-shut-a-quarter-of-its-coal-fired-plants-over-winter-to-cut-pollution>

²⁰ <https://www.ncca.go.kr/cmnm/poli/1516.do>

²¹ <https://www.ncca.go.kr/>

²² <https://unfccc.int/documents/267683>

lack of transparency of LEDS discussions and failure to attract meaningful national participation.²³

Carbon Neutrality Committee

After the Korean government unveiled its commitment to achieve carbon neutrality by 2050 on October 28, 2020, a “2050 Carbon Neutrality Promotion Strategy,” which laid out plans to establish a joint public-private Presidential Committee on Carbon Neutrality, was announced on December 7, 2020. The Committee, which is tasked to lead the national vision of carbon neutrality and establish an implementation plan, was launched based on the 2050 Carbon Neutrality Committee Establishment and Operation Regulations in effect since May 4, 2021, by Presidential Decree.²⁴ According to the regulations, the Committee is to be composed of 50 to 100 members, including the heads of 18 central government institutions (15 relevant ministries) as ex-officio members and 77 civilian members selected for their expertise, including individuals from civil society, youth, industry, and labor.²⁵

The Presidential Committee on Carbon Neutrality was officially launched in May 2021 and absorbed the functions of the former Presidential Committee on Green Growth and NCCA. There are eight sub-committees to facilitate discussions: (1) climate change (2) energy transformation, (3) economy and industry, (4) green living, (5) fair transition, (6) science and technology, (7) international cooperation, and (8) public participation.²⁶ In 2021, the Presidential Committee on Carbon Neutrality will be reviewing emissions scenarios for 2050, and according to this scenario, providing input on the enhancement of Korea’s NDC.

ACTIONS AND POLICIES

In the years since the Paris Agreement, South Korea’s climate policy direction has shifted toward “carbon neutrality by 2050,” although a legal framework for mandating such pledge, a concrete emissions reduc-

tion enhancement by 2030, and a coal phase-out year have yet to be announced. Nonetheless, there have been significant announcements over the past several years that have contributed to greenhouse gas reductions.

Renewable energy targets set in Korea Renewable Energy 3020 Plan and 9th Basic Plan for Power Supply and Demand

In December 2017, the Korean government unveiled the Renewable Energy 3020 Implementation Plan, which set a target of sourcing 20% of total electricity generation from renewables by 2030. The Plan calls for a total renewables capacity of 63.8 GW, including 36.5 GW of solar and 17.7 GW of wind, by 2030.²⁷ In the 9th Basic Plan for Electricity Supply and Demand (BPE) (2020~2034) presented in December 2020, South Korea’s renewables target for 2034 was set as 77.8 GW, with 45.6 GW of solar and 24.9 GW of wind. The 9th BPE also accelerated nearer-term renewables ambition by increasing the supply targets of solar and wind from 21.4GW and 8.5GW by 2025 to 33.5GW and 9.2GW, respectively, by 2025.²⁸ However, according to a joint study by the Korea Advanced Institute of Science and Technology and Solutions for Our Climate, South Korea’s 2030 renewables target should be enhanced to 40% for the country to reach carbon neutrality by the mid-century.²⁹

Pledge for no new coal power project approvals and Korean government’s internal lifespan of coal power plants set to 30 years

During the 2017 presidential elections, then-candidate and now President Moon Jae-in committed to the cancellation of the 1,160MW Dangjin Ecopower coal power project and to not approve any additional coal power projects, though those already approved would be continued. As of June 2021, there have been no new coal power projects approved under the Moon administration, though 7GW of new coal power approved by previous administrations have not been canceled.

²³ <https://www.hani.co.kr/arti/society/environment/967018.html>

²⁴ <https://www.korea.kr/news/contributePolicyView.do?newsId=148888316>

²⁵ <https://www.korea.kr/news/contributePolicyView.do?newsId=148888316>

²⁶ <https://www.korea.kr/news/pressReleaseView.do?newsId=156454079>

²⁷ https://www.motie.go.kr/motie/py/brf/motiebriefing/motiebriefing404.do?brf_code_v=404#header

²⁸ <https://www.korea.kr/news/pressReleaseView.do?newsId=156429427>

²⁹ <http://www.fourclimate.org/sub/data/view.html?idx=40&curpage=1>

A key coal development in 2019 was the Korean government's implicit recognition of 30 years as the acceptable life period of a coal plant. In 2019, South Chungcheong Province, which hosts approximately half of South Korea's coal power fleet, successfully demanded the Korean government to stop retrofit aging (approximately 30 years old) coal power plants, which would have extended their lifetimes by one or two decades.³⁰

South Korea pledges to achieve carbon neutrality by 2050

One of the most notable announcements since the Paris Agreement has been President Moon Jae-in's pledge to achieve carbon neutrality by 2050. This announcement was welcomed by civic groups but also immediately raised questions on by how much Korea would enhance its NDC and accelerate the phase-out of coal power and ramp-up of renewables. On August 31, 2021, the South Korean legislature passed the "Framework Act on Carbon Neutrality," which forms the legal basis for the 2050 carbon neutrality vision and Presidential Committee on Carbon Neutrality. The Act also enshrines into law a minimum of achieving at least 35% national greenhouse gas emissions reduction compared to 2018 levels. ³¹

End of South Korean public overseas coal finance and wave of no-coal announcements from private financial institutions

Korea was the third-largest international coal power financier between 2007 and 2014, behind China and Japan.³² Between 2008 to 2018, Korean public financial institutions provided over US\$20 billion in support for coal power projects, about half of which was for overseas coal power projects, mostly in Southeast Asia.³³ In April 2021 at the Leaders Summit on Climate, Korea announced it would end public financing for overseas coal power projects,³⁴ though civil society has argued that the decision has come too late, as it failed to stop the financing of

key coal power projects in Indonesia (Jawa 9 & 10) and Vietnam (Vung Ang 2). Civic groups have also warned against potential loopholes, including public financial support for coal plant retrofits and coal power projects equipped with carbon capture and storage (CCS), which were indicated in ministerial discussions.³⁵

Driven by the growing controversy over coal projects, as well as a divestment initiative among sub-national governments led by South Chungcheong Province, there has been a growing shift of the Korean private financial sector away from coal, as well. In late 2020 and early 2021, Korea's top five financial groups (KB,³⁶ Shinhan,³⁷ Woori,³⁸ NH,³⁹ and Hana⁴⁰) made either no-coal or decarbonization commitments. In March 2021, a total of 84 financial institutions – including those that had already pledged to end coal finance – committed to end coal finance.⁴¹

South Korea's NDC enhancement to be made by 2021 with current proposed emissions cuts in the 40% range

In November 2020, South Korea's President Moon announced that Korea's NDC of 24.4% emissions reduction below 2017 levels by 2030 would be enhanced by the end of his administration.⁴² In May 2021, Deputy Prime Minister Hong Nam-ki committed to reviewing the level of Korea's 2030 NDC enhancement and submitting the strengthened NDC to the UN by the end of 2021.⁴³

Politicians have begun proposing potential NDC target figures. Jeju Province Governor Won Hee-ryong of the conservative opposition People Power Party

³⁰ https://news.jtbc.joins.com/article/article.aspx?news_id=NB11267587

³¹ <https://www.hani.co.kr/arti/society/environment/1009949.html>

³² <https://www.nrdc.org/experts/jake-schmidt/ending-73-billion-public-financing-overseas-coal-projects-new-report>

³³ <http://www.forourclimate.org/sub/data/view.html?idx=9&curpage=3>

³⁴ <https://english1.president.go.kr/BriefingSpeeches/Speeches/971>

³⁵ <https://www.sedaily.com/NewsView/22ME90BEE3>

³⁶ <http://www.koreaherald.com/view.php?ud=20200927000139>

³⁷ <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/shinhan-bank-hana-financial-to-exit-coal-financing-63115162>

³⁸ https://www.koreatimes.co.kr/www/biz/2020/12/126_300812.html

³⁹ <https://www.yna.co.kr/view/AKR20210204059500002?input=1195m>

⁴⁰ <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/shinhan-bank-hana-financial-to-exit-coal-financing-63115162>

⁴¹ <https://zdnet.co.kr/view/?no=20210309132244>

⁴² <https://carbon-pulse.com/115876/>

⁴³ https://www.moef.go.kr/nw/nes/detailNesDtaView.do?searchBbsId1=MOSFBBS_00000000028&searchNttId1=MOSF_00000000054954&menuNo=4010100

advocated for Korea's NDC to be adjusted to “at least 37.5%” compared to 2017 levels by 2030.⁴⁴ In June 2021, leader of the ruling Democratic Party of Korea Song Young-gil proposed an NDC of “at least 40%” below 2017 levels by 2030 to the party caucus in the National Assembly.⁴⁵ However, both of these figures remain insufficient from a climate perspective – the NDC would need to be enhanced to at least 59% below 2017 levels in order to be consistent with Paris Agreement temperature goals, according to a study by Climate Analytics.⁴⁶ Remaining NDC discussions will take place between the government and the Presidential Committee on Carbon Neutrality before Korea's NDC target – arguably the most important indicator of South Korea's climate ambition -- is finalized and submitted to the UN by the end of 2021.

⁴⁴ <https://zdnet.co.kr/view/?no=20210616110503>

⁴⁵ <https://www.icouncil.kr/news/articleView.html?idxno=48896>

⁴⁶ <https://climateanalytics.org/publications/2020/transitioning-towards-a-zero-carbon-society-science-based-emissions-reduction-pathways-for-south-korea-under-the-paris-agreement/>

A LOCAL STORY ON CLIMATE AMBITION SINCE THE PARIS AGREEMENT

Marta Torres Gunfaus and Anna Pérez Català, IDDR/

This brief draws special attention to selected developments that took place in Spain over the last five years which illustrate the progress made in climate policy and supports the appraisal of the country's capacity to align to the Paris Agreement mitigation goal.

It does not aim to be comprehensive, it rather relies on expert judgement from the authors and the inestimable contributions of Lara Lázaro principal researcher at the Spanish Elcano Institute; Marta Guadalupe, Agroecology Chair Director at the University of Vic; and Mariluz Castilla, senior advisor of the consulting firm PwC.

DOMESTIC DISCOURSE

Despite being severely affected by the COVID pandemic, Spain is seeing an increase of public awareness on climate change, but still lacks an earnest societal debate on how to decarbonize its economy.

Public perception of climate change in Spain has significantly changed over the last few years. Several polls published during 2020 identified climate change as a top threat despite the strike of the COVID19 pandemic. Against this backdrop, in 2020, 73% of Spaniards indicated in a survey that climate change will become a problem as big as the ongoing coronavirus crisis¹. This coincides with the Eurobarometer of March 2020², which found Spanish citizens are the most worried about climate change within the European Union. Data of the Pew Research Center shows the main global threat perceived in Spain in 2013³ was financial instability; in 2016⁴ it was ISIS' terrorism, and in 2020⁵ climate change, although global climate change held a high position in the ranking over the years.

1 <https://www.ipsos.com/es-es/7-de-cada-10-espanoles-considera-que-el-cambio-climatico-sera-un-problema-tan-grave-como-lo-es-hoy>

2 <https://ec.europa.eu/comfrontoffice/publicopinion/index.cfm/survey/getSurveydetail/instruments/special/surveyky/2257>

3 <https://www.pewresearch.org/global/2013/06/24/climate-change-and-financial-instability-seen-as-top-global-threats/>

4 <https://www.pewresearch.org/global/2016/06/13/europeans-see-isis-climate-change-as-most-serious-threats/>

5 <https://www.pewresearch.org/global/2020/09/09/despite-pandemic-many-europeans-still-see-climate-change-as-greatest-threat-to-their-countries/>

In the annual survey of the Spanish think tank Real Instituto Elcano⁶, when people were asked about top priorities for foreign policy, the top choice from 2011 to 2016 was terrorism, while since 2017 it has been climate change, showing an increased demand and preoccupation in society.

Fridays for Future and the raise of climate mobilisations across Europe and the world is one of the reasons for this increased awareness. Spain has seen the biggest demonstrations on climate change in history, and across many of its main cities. The country also hosted a last-minute COP25, which was widely covered in the national media and positioned climate change higher in the public agenda. The latest IPCC reports also played an important role, both inspiring the movements and opening new opportunities to engage with policymaking but also alerting society in spite of limited exposure in mainstream media. In a 2019 poll by Spanish Elcano institute⁷, interviewees proved knowledge on the already visible impacts of climate change as listed in the IPCC reports and considered insufficient the governments' action.

Societal conversation, however, rarely goes beyond acknowledging climate change as a threat. Spain still lacks an earnest societal debate on how to deeply decarbonize its economy, beyond technical discussions amongst small policy and businesses circles: a more nuanced approach which could include discussing concrete sector level pathways and enabling policies to effectively achieve net zero targets while coping with persisting economic and social challenges. The net zero emissions target is owned by the national government, some subnational governments and some NGOs, which means a U-turn change from pre-Paris Agreement mitigation mentality, but it not yet part of a broader debate to the extent that stakeholders and citizens are able to understand and discuss its implications to guarantee smooth implementation.

The increase on public awareness has changed government, parliament and private sector narratives on the need to act, but they are not

⁶ http://www.realinstitutoelcano.org/wps/portal/rielcano_es/publicaciones/barometro-rielcano

⁷ http://www.realinstitutoelcano.org/wps/portal/rielcano_es/contenido?WCM_GLOBAL_CONTEXT=/elcano/elcano_es/zonas_es/cambio-climatico/encuesta-espanoles-ante-cambio-climatico-sep-2019

sufficiently embarking on how this can be done in a consistent way with the Paris Agreement long term goal.

The rise in public awareness also had an impact on Spanish political parties. Except for the far-right, they all support a determined climate change and energy transition regulatory framework, and differ on the specific emissions reduction targets by only 15 points, while this convergence was not seen in Congress before. The type of solutions they present differ depending on the ideology of the party, with some more in favor of restrictive measures and others more inclined towards market solutions. However, similarly to what has been raised above, political parties very rarely engage in constructive discussions about the specific policies to fight climate change so voters can understand and decide between different models. Instead, conversations are more abstract about acknowledging the crisis and the importance of action.

This tendency of increased awareness can also be found in relation to the agriculture and land use sector, importantly following the publication of the IPCC Land report and the IPBES Global Assessment report on Biodiversity and Ecosystem Services. It opens an opportunity window to discuss the transformation of food systems and how they affect biodiversity and contribute to climate change, which did experts agree did not exist five years ago.

The Paris Agreement also marks a turning point in public opinion to influence decision-making in the Spanish business sector. Since its signature, interest on climate change and sustainability issues particularly by the IBEX35 listed companies has raised. The Agreement also led to the creation of company clusters to push for a greener economy, like the Spanish Green Growth Group⁸, which includes some of the biggest Spanish firms, aiming to convey an economic growth model that is compatible with the efficient use of natural resources. The challenge now is the inclusion of small and medium sized enterprises, which represent the bulk of the private sector, as well as managing the transition of the production and consumption patterns to serve a full range of the social demands. Companies are regarding sustainability as an opportunity and have

⁸ <https://grupocrecimientoverde.org>

started to calculate their carbon footprint, mostly on a voluntary basis. More recently, mitigation commitments -including these of carbon neutrality- are unfolding. Another key element -which is still poorly noticeable- will be the involvement at Board of Directors level, where strategic decisions on investments and products are made.

NATIONAL GOVERNANCE

Climate change has been elevated to a higher political level, with a vice presidency for ecological transition, a newly signed climate change law and an ambitious strategy for just transition.

A major progression in Spain regarding national governance has been the creation of a Ministry for *Ecological Transition* and Demographic Challenge. Led by well-known international climate policy expert, Teresa Ribera, this Ministry brings together traditionally split portfolios of environment and energy among others to coordinate the development of policies on the fight against climate change and pollution, biodiversity protection, transition to a more ecological, and productive social model and development of the government policy against the country's demographic challenges⁹. *The cross-cutting nature of the Ministry, along with the nomination of Teresa Ribera as a Forth Vice-President of the Government, has enhanced governance and brought the climate agenda to highest political level.*

One of the main priorities of the Ministry has been the establishment of a Climate and Energy Transition Law, voted in Congress in April 2021. The Law establishes the target of reaching climate neutrality before 2050, with a reduction of 23% of greenhouse gas emissions by 2030, an objective that can be increased by the Cabinet and is scheduled to be revised in 2023. The Law structures some of the policy actions that the country will have to implement in the coming years, such as energy efficiency and rehabilitation of buildings, forbidding internal combustion engine vehicle sales by 2040, or targets for deployment of renewable energy. It also includes considerations for the coordination of planning and action across differ-

ent spheres of governance. A Committee of Experts on Climate Change and Energy Transition will also be created, which will evaluate and make policy and action recommendations, which will be dispatched and discussed by the Congress.

The Climate and Energy Transition Law, along with the medium- and long-term planning instruments (National Energy & Climate Plan and Long Term Strategy) submitted to the European Commission, are considered a clear guidance by the private sector. By mandating large companies, financial institutions and insurers to prepare annual reports on the risks "of the transition towards a sustainable economy and the measures adopted to face those risks" with regards to their activity, the forthcoming Law is already promoting climate mainstreaming with investors and managers. Experts rank highly the advancements on transparency at corporation level, arguing that the law 11/2018 which transposes the directive 2014/95/UE on disclosure of non-financial and diversity information¹⁰ has made a difference to large and small companies efforts to address climate change as well involving the Board of Directors, who needs to sign off the declaration.

The Strategy for Just Transition is one of the pillars of the government's climate work, together with the recently created Institute for Just Transition¹¹. In 2018, Spain had 15 coal plants which generated up to 10GW, representing 14% of electricity. An unprecedented agreement¹² between the government, all the remaining coal power plants in the country and the workers' unions was signed, with the commitment to accompany the job transition and economic recovery of the areas affected by the closure of the thermal power plants. The Institute for Just Transition will be in charge of overseeing the measures and projects designed for all affected installations and will make sure COVID-19 recovery plans strive towards that direction.

Subnational governments are pushing for ambition, but greater understanding of their strat-

⁹ <https://boe.es/buscar/act.php?id=BOE-A-2020-4814>

¹⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:%3A32014L0095>

¹¹ <https://www.transicionjusta.gob.es/>

¹² <https://www.miteco.gob.es/es/prensa/ultimas-noticias/el-gobierno-firma-con-sindicatos-y-empresas-el-acuerdo-para-la-transicion-justa-que-ampara-desde-hoy-a-todas-las-centrales-termicas-de-carbon-de/tcm:30-524274>

egies and how they interact with each other's is needed to support their implementation

Beyond the central government and businesses, subnational authorities are key actors of the climate governance structure in Spain. Three of the seventeen Spanish autonomous regions have already their own climate change law and close to net zero targets -Catalonia, the Balearic Islands and Andalusia-, plus seven more are working on it. Additional efforts to coordinate and enhance collaboration between regions and between the central government and the regional governments are made in the context of the forthcoming Climate and Energy Transition Law. For example, the requirement for regions to develop their own Energy and Climate Plans is expected to facilitate a dialogue across geographical scales about the national strategies to inform the design of necessary policies and cooperation strategies.

ACTIONS AND POLICIES

Bringing hand-in-hand the economic recovery and the ecological transition has translated into concrete action on the ground

Starting from a delicate economic situation, Spain suffered in 2020 a further 11% GDP reduction due to the COVID pandemic, and the International Monetary Fund foresees a 6.4% growth only in 2021, with experts fearing the economy won't recover until 2023. Being at the tail of recovery within the European Union, this could hinder a more rapid transition to a decarbonised economy in a very key decade. The European recovery funds are a once in a lifetime opportunity to finance key enablers of the transition on condition that the Government has the necessary absorption and spending capacity. Plus, for these funds to effectively materialise transformational change, unambiguous taxonomy and precise conditionalities would be needed to ensure money is not directed to solutions that would put at risk or delay the transition. Actual investments should be made Paris-compatible, including large infrastructure such as airports, harbours or roads. Being able to inform these investments requires a granular understanding of the pathways to net zero emissions and their societal acceptance.

In this context, a key action by the Spanish Government has been the development of the Recovery, Transformation and Resilience plan – España Puede. Its green alignment has the support of Spanish society: 62% of Spaniards believe it is of utmost importance that the recovery plan includes actions that take into account climate change¹³. The plan will guide the implementation of 72 billion euros from European funds to 2023¹⁴. It establishes, as indicated by the EU, that 37% of said funds will be allocated to green investments and 33% to the digital transition. The initial evaluation of the plan by EU institutions is positive for its potential economic effect and its environmental and social ambition, and it was praised for its alignment with the EU Green Deal and the Sustainable Development Goals¹⁵. The plan will fund specific projects and actions, notably for the deployment of electric vehicles in the market and buildings retrofitting. It has brought a strong push towards sustainability actions, which is triggering strategic considerations by companies and employers and fostering action and innovation, for instance in relation to green hydrogen and energy efficiency solutions.

Strong signals coming from the international and EU spheres will support enhanced ambition and action in Spain. A strong outcome from COP26 in Glasgow with a clear rulebook for the implementation of the Paris Agreement will be important both for the government and for companies to reassure direction of travel and appraise current speed against third parties. Moreover it should support the progression on domestic discourse by further mainstreaming the concepts of net zero and the need for collaborative approaches to the serve the global goal. Experts state that strong Climate Law from the European Union and a clear compromise with the Green New Deal helps businesses to anticipate and plan for the required changes. For national financial institutions and investors, the alignment of financial flows and a strong taxonomy regulation within the Union is an essential enabler.

¹³ <https://www.ipsos.com/es-es/7-de-cada-10-espanoles-considera-que-el-cambio-climatico-sera-un-problema-tan-grave-como-lo-es-hoy>

¹⁴ <https://www.lamoncloa.gob.es/lang/en/presidente/news/Paginas/2020/recovery-plan.aspx>

¹⁵ <https://www.iddri.org/en/publications-and-events/blog-post/spains-recovery-resilience-and-transformation-plan-key-challenges>

Scrapping the sun tax has brought new opportunities for promoting renewable energy and self-consumption, also a surge of local conflicts around large scale facilities' projects

One of the most welcomed and well-known policies of the recent years is the scrap of the controversial levy on development of photovoltaic solar energy and self-consumption known as «sun tax». The Royal Decree on Self-Consumption of Electricity¹⁶ also regulates new conditions for self-consumption of electricity, which encourages collective self-consumption and establishes a simplified mechanism for compensation of self-produced and unconsumed energy. This policy adjustment has proven to revamp the development of renewables in Spain which had stagnated for most parts of the territory, though several challenges remain to achieve the required speed to be able to meet the set targets. In 2020 renewable energy produced 44% of the total energy in the country, making it the greenest year, generating a total of 110.450 Gwh and representing a 12.8% increase from 2019¹⁷.

Spain is also seeing the emergence of new business models for energy production and distribution. Barcelona, for example, created the largest public energy supplier of Spain, Barcelona Energia¹⁸. It sells 100% renewable electricity and allows individuals from the metropolitan area to sell surplus energy into the grid, thus promoting self-consumption. There is also a surge of smaller energy companies or energy cooperatives, who are increasing citizen participation and understanding of the energy sector, and getting society involved in the energy transition. With the scrap of the sun tax explained above and the new regulations, the interest for new renewable energy facilities, especially onshore windmills and solar panels, is spurring.

Over the last months, this has created conflicts in places where large number of large industrial installations are being planned. This has led to the rejection of large-scale renewables particularly by rural and historically marginalised communities where resource conditions are favourable, and land is more affordable. This shows that structurally taking

into account the social aspects of the transition such as jobs creation or involvement of the local communities in decision making, will be vital for a successful deployment of the required renewable energy capacity. The Climate and Energy Transition Law will contribute to this, as it currently states that “The deployment of renewable energies must be carried out in a way that is compatible with the conservation of natural heritage and adequate territorial planning. To do so, it will seek to reverse part of the wealth it generates in the territory to activate its economy and combat demographic decline”.

Spain has experienced a steadily shift to eco-friendlier mobility and coherent urbanism policies at city-level, which are expected to be revamped and expanded in scale with the entry into force of the national Climate Law.

The country is also experiencing a shift in passenger mobility and urbanism mindset and policies. Following a trend started before the COVID crisis, partly due to air quality concerns, and accentuated by the lockdowns, cities like Barcelona are rethinking public space by giving less room to cars and more to bicycles and pedestrians, thus promoting active mobility and healthier population and environment. Local policies are supported by the national Strategy on Safe, Sustainable and Connected Mobility¹⁹, and will also be strengthened by the Climate and Energy Transition Law. The law makes Low Emissions Zones compulsory in cities bigger than 50.000 habitants, in order to decrease air pollution and fight climate change, while also favouring electric mobility, cycling, and public transport. It also establishes the objective of reducing emissions from cars, reaching zero by 2040, and establishes obligations for electric vehicle charging points.

The Government has also driven an agenda to position Spain as a hub for renewable hydrogen for the industrial, mobility and electricity sectors. It recently designed the “Hydrogen Roadmap: a commitment to renewable hydrogen”²⁰, a planning to promote the deployment of this energy vector, which the Government argues will be key to Spain and Europe

¹⁶ <https://www.boe.es/buscar/doc.php?id=BOE-A-2019-5089>

¹⁷ <https://www.ree.es/es/sala-de-prensa/actualidad/nota-de-prensa/2021/03/2020-energia-mas-verde-gracias-record-eolica-y-solar-fotovoltaica>

¹⁸ <https://www.barcelonaenergia.cat/>

¹⁹ <https://www.mitma.gob.es/ministerio/planes-estrategicos/esmovilidad>

²⁰ <https://www.miteco.gob.es/es/ministerio/hoja-de-ruta-del-hidrogeno-renovable.aspx>

for achieving climate neutrality by 2050 at the latest. The plan aims to reinvigorate the industry with the creation of innovative industrial value chains in the country, technological knowledge and the generation of sustainable employment, contributing to the economic recovery thanks to a high added value green economy that can play a major role in serving Europe's needs.

A NARRATIVE OF CLIMATE AMBITION

Jim Watson and Steve Pye

Prior to the Paris Agreement, the UK had established strong domestic climate legislation, and was making progress on decarbonization, largely through a shift away from coal in the power sector. This brief discusses how the UK's ambition has evolved since 2015. It focuses on domestic discourses about climate change, changes in governance to strengthen ambition and institutional capacity, and action on the ground to implement the necessary policies to meet emissions targets.

DOMESTIC DISCOURSE

Strong civil society movements, the continued cross-party support for action and the hosting of COP26 later this year have ensured climate change has remained a prominent issue on the political agenda.

Despite the public discourse being dominated by the referendum decision to leave the European Union and the Covid-19 pandemic, climate change has become much more prominent in the past five years. This is shown by increasing levels of public concern about climate change. According to a government tracker survey, the number of people 'very concerned' about climate change has risen from 19% in 2012 to 37% in 2020; and the number 'concerned' from 65% to 81%.¹ During the same period of time, media coverage of climate change has increased – particularly around the time of the Paris Agreement in 2015 and more recently, due to the adoption of more stringent climate targets (see below)^[1]. Coverage has also broadened, with more popular tabloid newspapers joining in with campaigns for climate change action.² However, it is important to be cautious. There are still sections of the media where scepticism about climate science – or of climate policies - is common. For example, plans to switch home heating away from natural gas (which is used to heat the majority of UK homes) continues to be controversial. Civil society movements have also had a significant influence on public discourse, and arguably on moves to

¹ BEIS Public Attitudes Tracker, <https://www.gov.uk/government/collections/public-attitudes-tracking-survey>

² Tobitt, C. (2021). How UK press moved from denial to acceptance and now action on climate change. <https://pressgazette.co.uk/uk-media-climate-change/>

strengthen climate change targets. This includes direct action by Extinction Rebellion and the school strikes of the Fridays for the Future campaign. One of Extinction Rebellion's demands has been for a citizens assembly on climate change. Whilst it was not set up as a direct response, six cross-party committees in the UK Parliament commissioned a national citizens assembly (Climate Assembly UK) in 2019. The assembly comprised a representative sample of 108 people, and reported in September 2020^[2]. Their recommendations focus on how the UK should meet net-zero in 2050, including specific policy proposals on reducing emissions from homes, transport and food. During the same period, a number of local authorities have run their own citizens assemblies on climate change.

Partly due to the shift in social attitudes, all of the main political parties support legislated climate change targets, and policies to meet those targets. This reflects the influence this issue now has on voting intentions, at least according to a poll conducted before the last General Election.³ There is significant variation between political parties when it comes to specific policy priorities, including the extent to which climate action is high on their political agenda. As with media coverage, this does not mean that there is an unbreakable consensus on some of the actions required. There is a significant risk that climate change policy will be affected by wider political divisions that are reflected in the narrow majority in favour of leaving the EU.

The UK's joint leadership of the next UNFCCC climate change conference (COP26) has reinforced the government's high-level commitment to climate action in 2020 and 2021. These high-level commitments include explicit links to economic development – and the aim of 'levelling up' to ensure that poorer regions of the UK benefit from the transition to net-zero. It remains to be seen what this aim will mean in practice, and whether it will have a significant impact on regional disparities in wealth. There have already been several controversies because of inconsistencies in government policies at a national and local level. For example, a plan for a new coal mine in northern England has not been immediately ruled out by the government even though it is very unlikely to be compatible with climate targets.

³ Carrington, D. (2019). Climate crisis affects how majority will vote in UK election – poll. <https://www.theguardian.com/environment/2019/oct/30/climate-crisis-affects-how-majority-will-vote-in-uk-election-poll>

Similarly, there have been plans for significant spending on new roads, expansion of regional airports and for maximising oil and gas extraction in the North Sea.

NATIONAL GOVERNANCE

Since 2015, the UK has further strengthened its climate legislation by adopting a net-zero target for 2050. UK regions and local authorities have also become more active in pursuing similar climate targets.

The UK was one of the first countries to legislate for a long-term economy-wide GHG emissions reduction target. Under the 2008 Climate Change Act (CCA)^[3], it established a target of an 80% reduction by 2050, relative to 1990. It also set up a framework for putting interim targets in place (using five-year carbon budgets) to ensure that a necessary rate of reduction was achieved to deliver the longer-term goal. Finally, it established an advisory committee, the Climate Change Committee (CCC),⁴ to advise on strengthening the 2050 target, setting carbon budget levels, and monitoring progress towards climate goals.

Seven years later, the Paris Agreement was signed, and indicated the need for increased climate ambition. While the CCC initially advised against strengthening the 2050 goal^[4], the publication of the IPCC special report on 1.5°C changed thinking on this^[5]. The then Minister for Energy and Clean Growth, Claire Perry, asked for this to be looked at again, with the CCC advising that the UK Government should adopt a net-zero GHG target for 2050^[6]; this was then legislated in 2019.

Distinctive amongst other countries who have adopted similar legislation, the UK net-zero target in 2050 includes international aviation and shipping. This makes the target even more challenging, with these sectors accounting for 40 MtCO₂, and set to continue to grow. However, despite the CCC's advice that all mitigation should be undertaken domestically, the UK government has retained the option to partially meet its net-zero target with international carbon credits.

Since strengthening its long-term goal in 2019, the UK also legislated for its 6th carbon budget for the period 2033-2037⁵, based on CCC advice^[7]. This

⁴ Prior to 2020, the CCC was known as the Committee on Climate Change.
⁵ UK Government (2021). UK enshrines new target in law to slash emissions by 78% by 2035. <https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035>

means a 78% GHG emissions reduction by 2035, including international aviation and shipping. This is almost equivalent to the original 2050 goal of -80% but brought forward by 15 years. Since leaving the EU, the UK has also announced a Nationally Determined Contribution (NDC) target of a 68% reduction in emissions by 2030. This is in line with 5th carbon budget, which covers the period from 2028-2032^[8].

As discussed earlier, the cross-party consensus on climate change has meant that the legislation has survived the political cycles since 2008. Advice on targets from the CCC has largely been accepted. It is likely that the CCC will now take a much more proactive view on issues of implementation in the future, and the necessary policies to effect change. While target setting has been important, there is growing concern that the UK is considerably off track in climate action across most sectors (as discussed in the next section). The constituent countries of the UK also have their own climate governance in place, which is important as they have devolved powers to affect emission reductions in some sectors. It is estimated that they will account for almost a quarter of the UK's required reductions. Since 2015, the Scottish government has legislated for a net-zero target for 2045 and legally binding targets between 2020 and 2045. The Welsh Government have committed to setting a 95% reduction target in 2050, with an ambition to set a net-zero target if possible^[7].

At a subnational level, there has been a marked shift in the debate since 2018, with almost 75% of (or 300) local authorities (LAs) having declared climate emergencies. Many of these designate net-zero years, in most cases in 2030 or 2035. A third have some sort of planning or strategy document as to how to achieve this target^[9]. This is not a coordinated effort by central government to deliver action locally but rather a response by LAs to community concerns and the broader climate agenda. LAs do have some powers to help deliver the transition to net-zero such as through planning and waste management functions. However, the lack of coordination with central government policies, limits on funding, and limited power in key areas of policy raises questions about whether LAs can implement the systemic changes required to achieve net-zero emission communities.

ACTIONS AND POLICIES

Progress on decarbonization of the power sector has masked limited gains across other sectors, and a widening policy gap, particularly in the transport and building sectors.

While it is positive that the legislative framework is firmly established and has been strengthened in recent years to be more aligned to the goals of the Paris Agreement, the UK has yet to develop a comprehensive policy package that can be implemented now to deliver against this ambition.

Some important progress has been made, notably in the power sector. Historical shifts in industrial structure, improvements in energy efficiency and a move from coal to gas and renewable generation means that the UK is 50% below 1990 GHG emission levels.⁶ Recent gains have predominantly been in the power sector, as remaining coal plants shut down. There has also been a temporary reduction due to the effects of the Covid-19 pandemic, with an estimated 11% annual decline in 2020. As coal has declined, renewables such as offshore wind have boomed, persistently supported by policy and now cost competitive will fossil generators. Wind power currently provides 20% of UK electricity, up from less than 3% in 2010. In 2019, for almost 40% of the year, the UK was powered more by renewables than fossil fuels.⁷

The historical emission reductions and the ongoing power system decarbonization provide a good platform for further decarbonization of industry, buildings, and transport. However, the policy package is woefully thin across these sectors, bearing in mind that the Climate Change Act was passed some 13 years ago. The CCC, who mark the government's record on climate action each year, highlighted that 'progress is generally off-track in most sectors, with only four out of 21 of the indicators on track in 2019'^[10]. A considerable policy gap remains, and needs to be closed if the UK is to stay on track.

In November 2020, the Prime Minister announced his 10 Point Plan 'to lay the foundations for a Green Industrial Revolution'^[11]. These focus on some key technology areas but remain limited in policy detail, much

⁶ Evans, S. (2021). Analysis: UK is now halfway to meeting its 'net-zero emissions' target. Carbon Brief. <https://www.carbonbrief.org/analysis-uk-is-now-halfway-to-meeting-its-net-zero-emissions-target>

⁷ Evans, S. (2020). Analysis: UK low-carbon electricity generation stalls in 2019. Carbon Brief. <https://www.carbonbrief.org/analysis-uk-low-carbon-electricity-generation-stalls-in-2019>

of which it said to be released in the months leading up to COP26. One sector that has had recent strategy announcement is industry, where the UK government has committed to setting up low carbon industrial clusters, focusing on decarbonization of fuels and CCUS^[12]. However, the document remains light on policy detail. The transport sector constitutes the single largest source of emissions (34% including international transport), a level that has not changed since 2000. The headline policy measure in place is the ban of the sales of cars running on oil by 2030, and plug-in hybrids by 2035. This is much more ambitious than the previous sales ban year of 2040. Policies in other areas such as freight transport are not yet in place, and other areas seems misaligned with net zero goals, such as plans for future airport expansion and a large £27 billion road building programme. The building sector, which accounts for ~22% of current UK emissions, has made limited progress in decarbonization. The high dependency on gas for heating homes, coupled with a building stock that is has poor energy efficiency, means that solutions for heat decarbonization have been slow to implement. The two leading options, electrification and hydrogen, are still under debate with no clear policy direction on either. Given the need to deal with 29 million homes in the next 29 years to meet net-zero, this is 1 million per year that will need upgrade and / or low carbon heating systems installed. Given that the majority of new build homes are gas-connected, gas-based heating continues to grow at a faster rate than low carbon options^[13]. Recent efforts to improve build energy efficiency and introduce low carbon heating under the £1.5 billion green homes grant have been abandoned after 6 months. This follows earlier attempts to tackle poor building efficiency through the Green Deal policy, which also failed due to poor design and implementation. These recent failures followed more successful energy efficiency policies that were in place until the early 2010s. The UK is also developing research efforts to explore greenhouse gas removal (GGR) opportunities, and has developed a programme of research over the last few years focused on that. A research hub has recently been launched to set up a range of demonstrator projects across a range of GGR options, from enhanced weathering, tree planting, and peatland management.⁸ Govern-

ment are also funding a competition to develop direct air capture and GGR technologies, with initial projects selected.⁹ These efforts reflect a concern around residual emissions in the longer term, and the need to offset these with GGR options.

Without strong efforts to address the policy gap, particularly in buildings and transport, the UK is not going to be able to maintain the levels of reduction observed in recent years, and is likely to miss its carbon budget targets post-2025. This is an important year for the UK to get its policies in place, as it emerges from the Covid pandemic and into a post-Brexit era. There is an opportunity for radical policies and programmes of investment in the low carbon economy, to help kickstart regional economies, particularly in areas that are a focus of the Government's levelling up agenda and ensure that the country is on track to net-zero GHG emissions.

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⁸ UKRI (2021). UK invests over £30m in large-scale greenhouse gas removal. UK Research and Innovation. <https://www.ukri.org/news/uk-invests-over-30m-in-large-scale-greenhouse-gas-removal/>

⁹ BEIS (2021). Direct Air Capture and other Greenhouse Gas Removal technologies competition. <https://www.gov.uk/government/publications/direct-air-capture-and-other-greenhouse-gas-removal-technologies-competition>

COUNTRY PERSPECTIVES

Claire Healy, David Levai

*Despite the leading role that the United States played since COP15 in Copenhagen, in 2009, to reach the first universal climate agreement in 2015 in Paris, it significantly retreated from climate multilateralism over the past four years. **Political ideology at the federal level and a split Congress left the US isolated internationally, unable to deliver on its commitments domestically, nor to diplomatically help enhance ambition from other countries. The chilling effect was limited somewhat by the drive and determination of non-governmental stakeholders - companies, cities, States and the rest of civil society - who picked up the ball and compensated for US federal inaction. Recent political changes in the White House and in Congress since the Presidential Election in 2020 have reinstated climate action as a top-priority for the government, more than ever before. What remains to be seen is how much can actually be done over the coming years to decarbonize the US economy and reduce global emissions, and how long-lasting this new path can be.***

CHANGE IN DOMESTIC DISCOURSE

To describe how the US domestic discourse on climate action is changing we will take a brief look at polling numbers, the evolving narrative among political parties and influential institutions before a look at broader political dynamics.

A [detailed poll](#) from March 2021 provides a window into public support for international climate action. It shows how a majority of all registered voters believe global warming should be a high or very high priority for the president and congress (52%) and that developing clean energy is a top priority (60%). This is true across the political spectrum where Democrats and Republicans are in favor of policies such as tax breaks for renewable energy and electric vehicles or funding research. Opinions start to diverge when asked about regulating carbon dioxide, transitioning the US economy from fossil fuels to clean electricity, or setting limits or prices on carbon pollution. The perception on how much priority should be given to this issue compared to other policy agendas is also split. Democrats are in favor of these measures, but there is a schism between moderate Republicans and conservative Republicans with a strong decline in support amongst the latter. Despite general growing awareness and support for climate action, the gap between Democrat and Republican attitudes continues to widen; for example, 57% of Democrats believe scientists understand climate change “very well,” compared to only 14% of Republicans ([Pew Research Center](#)).

It is well documented how politically polarized the US has become. These trends manifest themselves in politics, in everyday life and with respect to climate

ambition. One impediment to building a consensus on climate action is the role of primaries which disproportionately favor voters at the extreme creating incentives for embrace of certain policy positions, despite majority support for progressive action. The extreme becomes mainstream and climate action has fallen victim to this phenomenon. People think it is angry vulnerable people leading the charge, but politicians frame the issues for voters, so it works both ways. **The fever shows no sign of breaking in the short term and climate remains a dividing line.**

However, there is a generational divide to be aware of that might propel political entrepreneurs to start calling for greater climate action. Younger Americans from both parties, but especially Republicans, are more likely to express interest in addressing climate change and reducing reliance on fossil fuels ([Pew Research Center](#)). America has shifted towards alarm over the last five years, with 'alarmed people' outnumbering 'dismissive people' three to one (26% to 8%) ([Global Warming's Six Americas, YPCCC](#)). **Currently, one in four Americans are alarmed about climate change and are demanding their government take more ambitious action.**

While the numbers are gradually trending in the right direction, the narrative has done a full 180°. '*Climate action is a job killer*' said Trump when pulling out of the Paris Agreement in 2017; it's now a job-creator according to the Biden Administration. Gina McCarthy, the National Climate Advisor, is unabashed about climate change being "a kitchen-table issue if you just talk about it from the standpoint of what kind of jobs are we going to create" ([Washington Post](#)). This shift in public discourse is indicative of the administration's larger foreign policy and approach to multilateralism which is above all worker-focused. Delivering for Middle Class America is their political strategy and modus operandi. It is through this prism that US climate action and ambition should be seen. Hence the *America's Job Plan*. And reluctance to talk about the end of coal domestically, preferring a 100% clean electricity target instead. The shift in center of gravity is evident across other national institutions. The media is doing a lot more on climate, covering the issue across 11 languages 38% more in 2020 than in 2016 when the Paris agreement entered into force, despite COVID-19 ([MeCCO](#)). Business groups, too: Nearly 600 companies have signed the Business Ambition for 1.5°C commitment and pro-

duced science-based targets aligning with the 1.5°C goal ([SBT](#)). The US Chamber of Commerce – the largest lobbying group in the US – has shifted its stance calling on policymakers to rise to the challenge of climate change saying '*inaction is not an option*'. Three of the six big US banks joined the Net Zero Banking Alliance – Morgan Stanley, Citi, and Bank of America. JPMorgan Chase, Wells Fargo, and Goldman Sachs did not. These six banks alone accounted for 31% of the fossil financing from the top banks in the world since the Paris Climate Agreement was adopted. **While a welcome step, Wall Street isn't going to confront the climate crisis left to its own devices and we need action and policy to make all these reforms stick.**

EVOLUTION OF DOMESTIC GOVERNANCE

US climate policy has in the past been the first victim of changes in political majority. This "stop and go" movement has damaged the credibility and efficacy of the United States government's response to the climate crisis. The issue is still politically divisive and the Congress, which the President needs to legislate, is split.

To further anchor climate into policymaking at the federal level, **the incoming Administration decided to adopt a "whole-of-government" approach, which makes climate a central pillar of government and a core policy priority.** This has meant it is woven into Covid recovery packages (even if it is not branded as such) and considered a top tier foreign policy issue. To mobilize the full apparatus of the Federal government machine in support of climate action in an era of high political volatility is contingent upon the tenacity and creativity of key personnel appointed to strategic positions, and new mandates given to specific offices and bodies. So far the Biden administration has made good on the 'Personnel is Policy' adage and **appointed an impressive array of individuals with broad and deep climate expertise** across government agencies and departments.

The President started *greening* the White House by creating two cabinet level positions - supported by strong and expert staff - leading the charge on climate, one for international issues led by former Secretary of State John Kerry, the other for domestic policy, headed by former EPA Administrator Gina McCarthy. He followed suit with every agency of the US Government, which is led by a climate champion, from intelligence

(Avril Haines) to trade (Ambassador Tai), from the National Security Council (Jake Sullivan) to the National Economic Council (Brian Deese), from Treasury (Janet Yellen) to Defense (Lloyd Austin) to Biden's own chief of staff (Ron Klain). To tie this together and ensure policy coherence, an intra-governmental climate task force was established: a first in the US, it brings the heads of 21 federal agencies together, meets monthly and makes its work transparent to the public.

There are still a few gaps to fill but there has been a decisive shift away from keeping all options open to using every tool and lever available to shift the economy away from fossil fuels and get to net zero emissions by mid-century. Choosing this transversal approach is a way for the Biden Administration to hardwire its climate ambition into the structures and processes of the Federal government, and through US board membership in international organizations. **The hope is that this strategy will make it more difficult for the US to slide backwards in the future, even if there were a change in political rule.** It is a smart strategy that allies should aid and abet.

At the State level there has also been substantial movement. Trump's decision to leave the Paris Agreement prompted a coordinated effort by States to form the US Climate Alliance (USCA). A bi-partisan effort, the USCA has helped states work together in strengthening their climate policies and has contributed to reinforce state governance of climate action. Today, among its 25 members, almost 40% have adopted net-zero targets before 2050, that are anchored in state legislation. **Change in local climate governance has also helped to bring along the private sector and civil society, and render long-term goals more credible and durable.**

IMPLEMENTATION: DELIVERING THROUGH ACTIONS AND POLICIES

Besides the immediate and symbolic move to rejoin the Paris agreement and the rest of the international community on day one, the new administration has spared no effort to quickly be seen as a climate leader once again. By convening virtually dozens of world leaders at the first ever Summit on Climate Change at the Head of States level, the US hoped to affirm its intent to take a leadership role in galvanizing climate commitments around the world. That being said, before asking any-

thing from its partners, the US needed to demonstrate it could step up its ambition. Hence, at the Summit, Joe Biden presented the new US contribution (NDC), aiming to achieve a 50% to 52% reduction in greenhouse gases emissions by 2030 (compared to 2005 levels). A big success for US NGOs who had been calling for such a target, **on par with efforts of ambitious partners like the EU, it also demonstrates the determination of the Administration.**

The same day, a newly designed climate finance plan was unveiled, pledging to spend \$5.7bn of public dollars per year by 2024. The announcement failed to receive praise as the numbers are only a fraction of what was expected and needed, far from what would be necessary to catch up with leading European nations such as Germany, France or the United Kingdom who will have quadrupled their commitment in 10 years (2015-2025), a period over which the US will have only doubled theirs. The World Resources Institute estimates that the US pledge for 2024 is less than a quarter of the funds already provided by the European Union and its member states in 2019 (\$24.5bn) although their combined economic weight is only three quarters of the US. **Thus, the climate finance plan highlighted a discrepancy between US climate ambition at home - focused on climate justice for those discriminately impacted and a just transition of the workforce - and international equity and solidarity.**

The gap between domestic determination and international climate finance ambition was reinforced by President Biden's plan to invest in jobs and infrastructure. Early on, the Biden administration presented three plans to stabilize, stimulate and structurally reform the US economy: the American Recovery Plan, Jobs Plan and Family Plan were proposals that had big numbers attached when they reached Congress, including enormous sums of money to invest in the low-carbon transition over the next eight years, as a way to tackle America's economic malaise, ensure innovation, growth and jobs and as a vehicle to deliver on its NDC. After months of political wrangling on the Hill, the US Senate in August passed in an uncommonly bipartisan 69:30 vote the \$1.2 trillion Infrastructure Investment and Jobs Act. \$550 billion of this is new money and includes investment mostly in traditional infrastructure such as rail, roads and bridges but also sizable investments in clean energy transmission, EV infrastructure and the electrification of thousands of the iconic yellow school buses across the country. While

the bipartisan infrastructure bill is a win, it represents a fraction of the total sum the administration had initially proposed when linking economic recovery to the fight against climate change. The Biden administration has been pursuing a complicated dual-pronged strategy: with one part of their agenda to be enacted in a bipartisan manner and another in a sprawling spending package - currently \$3.5 trillion - through the budget reconciliation process requiring only a simple majority with exclusively Democrat votes. The precise content of that package is still being negotiated among the moderate and progressive flanks of the Democratic caucus, as is the sequencing of votes and pathway to passage. It is expected to include a clean electricity standard, much more climate-related spending and a wide array of progressive priorities. **Suffice it to say a legislative outcome - or outcomes - is mission-critical for Biden's climate ambition and by extension US climate diplomacy.**

The US administration has made clear that it intends to use financial regulation as a key lever for climate action. Treasury Secretary Janet Yellen called climate change “*an existential threat*” and instructed the Financial Stability Oversight Council, a panel of top regulators, to consider future climate risks - the first time FSOC considered climate since Congress established the body in 2010. The group includes the heads of the Federal Reserve and the Securities and Exchange Commission. The SEC is considering new climate disclosure rules for public companies and is expected to release its recommendations ahead of COP. The Fed is intensifying scrutiny of banks' exposure to climate-related risks. Meanwhile, the Biden admin has released its guidelines to restrict US international finance for overseas fossil fuel projects - the “carbon intensive” restrictions - both through the World Bank and other International Finance Institutions as well domestic foreign-investments programs like the International Development Finance Corporation (DFC) and the Export-Import Bank. Trade is another real economy lever that could be deployed to hasten climate action. Candidate Biden pledged to introduce a carbon border adjustment mechanism but showed no signs of moving forward with this agenda item in near term. Yet in a surprise move a week after the EU published their proposal for a Carbon Border Adjustment Mechanism, Democratic Senators released a proposal for a US carbon border tax, allegedly with support from the White House and US Trade Representative. In parallel, a handful of Republican lawmakers have

publicly espoused the idea of a carbon border tariff as a way to counter China and protect US industries. This has politically elevated trade as a tool for climate ambition and makes it a priority to find spaces for open and broad dialogue on how the US can work with like-minded partners to align climate and trade policies, perhaps through Buy Clean and through aligned products and standards for clean products. At the moment, though, *Buy America* and other supply-chain concerns - post-Covid and vis a vis China - seem to be complicating the issue. As in other parts of the world, there is an open conversation about a proactive industrial policy, how to implement the polluter pays principle, and the need to invest in domestic clean energy and low carbon industries to shore up US economic competitiveness.

In the same vein, the US is using all its innovation arsenal in service of Biden's goal of a fully decarbonized power grid by 2035 and a net-zero emissions economy by 2050. The US rejoined platforms like the Clean Energy Ministerial and Mission Innovation, offered to host the ministerial meetings in 2022 and volunteered to lead international collaborations on decarbonizing shipping and developing hydrogen. The DOE's flagship \$40-billion loan program will now be targeted on clean energy technologies as will the agency's popular Advanced Research Projects Agency-Energy program. Secretary of Energy Jennifer Granholm alluded to the race to get as many policies and programs implemented as possible to meet the president's goals. She said the Biden administration has only four years guaranteed to work with, “That's less than 1,000 days if you exclude weekends. But we're going to work 24-7.”

Making up for lost time and changing gears in the largest economy in the world is not a simple task. The current president has nevertheless set the tone, and the expectations against which his actions will be judged, over the course of his four-year term, not the first few months. So far, his administration has engaged tirelessly on all fronts, including by shifting its own governance, but it is still too early to assess how much it can deliver and how fast it will change the system. It has adopted a pragmatic approach rather than a purist one with the hope of moving further if some battles are not fought. Current efforts are indeed a good start but much remains to be done since the current plans do not meet the scale or the pace of what science requires to keep temperature rise below 1.5°C.

A narrative of climate ambition in key hard-to-abate sectors

Land use sector

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The purpose of this chapter is to take stock of recent progress and remaining challenges for AFOLU¹ to become neutral in terms of its greenhouse gas (GHG) emissions before 2050, and a net sequestering sector thereafter, in a way consistent with the Paris Agreement. Beyond emissions trends, it considers the underlying enablers and remaining barriers of increased climate ambition for AFOLU, looking at economic, technological, social, environmental and institutional elements. After a cross-cutting overview in section 1, the chapter will consider more in-depth agriculture (section 2) and LULUCF (section 3). A fourth section discusses specifically questions around the governance of the global sink, while the final section touches upon transversal challenges, including integrating non-carbon objectives into policy, improving AFOLU finance, and the sustainability thresholds of bioenergy.

OVERVIEW

The Paris Agreement anchors the central and unique role of the AFOLU sector in achieving global GHG neutrality, but research also highlights that a contribution in the upper echelons of the identified sectoral mitigation potential risks trade-offs with other sustainability objectives and that climate change impacts increase the risk of carbon sink reversals and cause a declining sequestration capacity.

The AFOLU sector is widely acknowledged as having a key role in order to “achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (Article 4.1) through four complementary roles: i)

implementing deep reductions of sectoral emissions, which represent today 24% of global GHG emissions; ii) protect and expand its carbon sink, in particular through reforestation, afforestation and increases in soil carbon, iii) substituting fossil fuels by supporting the production of bioenergy (with or without carbon capture and storage); iv) changing the production mix toward low-GHG products (Svensson *et al.*, 2021). Altogether, recent global assessments show that AFOLU can provide between 4-40% (median 25%) of the mitigation required for a 1.5°C pathway until 2050, depending on the type of economy-wide mitigation and notably the mitigation ambition in other sectors (Roe *et al.*, 2019). Research also highlights the importance of keeping the deployment of bioenergy and BECCS to a sustainable scale, given than large-scale deployment and required land use would risk bringing close to or overstepping planetary boundaries (Heck *et al.*, 2018). Given their biological nature, large terrestrial biological sinks, such as tropical forest, are likely to suffer from the increasing impacts of climate change leading to increases in emissions due to extreme events such as fires and droughts or more complex diebacks (Shukla *et al.*, 2019; IPCC, 2021). Terrestrial carbon sinks also show signs of saturation to the CO₂ atmospheric fertilization, such that global terrestrial carbon sinks sequester a smaller share of global CO₂ emissions (IPCC, 2021).

The Paris Agreement has triggered a renewed interest and focus for mitigation action in the AFOLU sector in international and domestic climate policy.

The land use sectors have always been considered in climate discussions but have long featured in a rather limited role as illustrated by the modest inclusion of the sector in the Clean Development Mechanism (CDM) of the Kyoto Protocol and its exclusion from the EU's Emission Trading Scheme. The inclusion of the sector into carbon markets was considered to risk delaying mitigation action in other sectors, and to overflow

¹ AFOLU is short for *agriculture, forestry and other land use*, and is often split into the sub-sectors agriculture (comprising emissions from agricultural production) and LULUCF (comprising emissions and removals from land, including agricultural land). LULUCF itself stands for *land use, land use change and forestry*.

the emerging carbon markets with cheap credits from the LULUCF sector in the context of a non-universal agreement. During and since the lead-up to the Paris Agreement, the design of a universal agreement and the adoption of a very ambitious global goal ensured that the sector assumed a more central role in international discussions on mitigation and in the implementation on the ground. One concrete example is the EU's relatively recent *LULUCF regulation* – agreed upon in 2018 and in force since early 2021 – which strengthened the integration of the LULUCF sector into the EU's climate policy by setting out rules for accounting and reporting LULUCF emissions and removals toward the EU's climate targets. The regulation addressed several accounting challenges from the Kyoto Protocol. Furthermore, many countries have included activities related to the AFOLU sector in their NDCs. The inclusion of forest and agriculture in the UNFCCC negotiations through REDD+ by the adoption of the Warsaw Framework at COP19 and the establishment of the UNFCCC's Koronivia Joint Work on Agriculture (KJWA) at COP23 triggered number of large-scale collective processes in the margins of the multilateral processes addressing the sector directly. These include various initiatives to provide international finance to forestry (e.g. for REDD+ activities through the UN REDD Program, the Forest Carbon Partnership Facility and Initiative for Sustainable Forest Landscapes, the Amazon Fund, the Central African Forest Initiative), and to a lesser extent, other carbon sinks and agriculture (e.g. the 4p1000 initiative on soil carbon). Furthermore, there is an increased policy interest around the emerging concept of *Nature-based solutions*, which appeared in the adaptation context in particular related to cities but is now adopted by the mitigation community as a concept that not only considers mitigation but also adaptation and other services such as biodiversity (Griscom *et al.*, 2017).

The integration of AFOLU into national and international policy is faced with multiple important challenges, including regarding our understanding of- and capacity to quantify GHG fluxes in AFOLU. This capacity has improved over the last decade but remains flawed compared to other sectors.

The complexities of the carbon accounting in the LULUCF sector, and the challenge they pose for transparency, have been a key obstacle to the full consideration

of this sector in mitigation. Challenges are due to the biological nature of the emissions and removals, and the difficulty of separating anthropogenic emissions and removals from natural ones. This explains why the UNFCCC reporting continues to separate Agriculture (only anthropogenic emissions) from LULUCF (that include emissions and removals in managed lands as a proxy for anthropogenic emissions) despite the structural links between the two sectors. Nonetheless, our understanding of AFOLU GHG fluxes have improved since the early 2000s. Key advances include the continuous improvements of the guidance for estimates that led to subsequent IPCC Guidelines for National GHG Inventories, starting with the 2003 GPG for LULUCF, followed by the IPCC 2006 Guidelines volume 4 (AFOLU), and the recent 2019 Refinement of the 2006 Guidelines. Nonetheless, estimations of LULUCF GHG fluxes still feature very significant uncertainties, much higher than for energy-related emissions (Friedlingstein *et al.*, 2020). The high uncertainties in the LULUCF emissions and removals estimations lead the separate treatment of the sector under the EU's climate policy architecture (the sector is governed by the LULUCF regulation, as opposed to the Effort Sharing Regulation and the Emission Trading Scheme that governs other sectors). Many countries also still find it difficult to incorporate forest carbon flows into their Biennial Update Reports (BUR's) and Biennial Reports (BR's) (Lee and Sanz, 2017) – and this is likely to remain a problem in the Biennial Transparency Reports set to replace the BUR's and the BR's in 2024. This leads to the risk that policies to reduce net emission levels from forests take a backseat with regards to policies on emission sources accounted for in the BURs. Also, large discrepancies, estimated to 4.5 Gt CO₂eq. per year only for forest by Grassi *et al.* (2018), between top-down estimates by global models and the composite of national GHG inventories could create serious challenges for the 2023 Paris Agreement Global Stocktake. These gaps are caused notably by different treatment of non-anthropogenic emissions, feedback processes and impacts of climate change (Grassi *et al.*, 2021). Lately, efforts have been made to reconcile top-down global estimates with bottom-up estimates from aggregated national GHG inventory data (Grassi *et al.*, 2021). These disparities complicate the passage between national and global emission trajectories, making it difficult to evaluate national progress towards collective global goals.

Despite the increased focus on AFOLU in climate research and policy discussion, the sector does not feature ambitious emission reductions, reflecting a number of important remaining challenges to be overcome to trigger ambitious targets and actions for the sector.

Agricultural emissions have increased over the last decade by around 6% (FAO, 2020a), while global emissions from LULUCF have decreased only marginally over the last decade, and even increased in some regions such as Africa (FAO, 2020a). Little analysis has been conducted to understand why the numerous initiatives launched since 2008 that focused on reducing emissions from deforestation (such as the Forest Carbon Partnership Facility, UN-REDD, the Amazon Fund, the Biocarbon Fund Initiative for Sustainable Forest Landscapes (ISFL), and many bilateral and/or capacity building programs) have not been as effective as envisioned. Challenges posed by transparent and robust accounting of GHG emissions from the sector are one of the key obstacles to collective action on the sector supported by structured cooperation. Despite some technological challenges, for instance in relation to advanced biofuels, the key remaining barriers for unblocking further climate ambition in AFOLU are a combination of socio-economic, political, and institutional issues which require well-tailored policy packages and strong governance arrangements to address domestic drivers (i.e. for land tenure and carbon ownership), as well efforts in addressing international drivers (e.g. increasing demand of commodities such as palm oil, beef, wood, etc). Although many financial supports were given to capacity building and pledged for result base payments, a large gap remains for investments to implement policies and measures.

ADVANCES AND CHALLENGES RELATING TO AGRICULTURE

Global estimates identify limited technical mitigation potential in agriculture.

Global modelling assessments estimate the technical mitigation potential of agriculture at 0.3-3.6 GtCO₂-eq./year, which represents at best a reduction of about 50% by 2050, excluding demand oriented mitigation actions (Roe *et al.*, 2019). This limited potential reflects challenges for properly integrating mitigation options

of the sector in the global models (Grisscom *et al* 2017; Rogelj *et al.*, 2018; Roe *et al.*, 2019), but also intrinsic challenges of the sector, notably the "limited mitigation potential of key emission" sources (enteric fermentation, rice cultivation) without compromising food security, the marginal effect of currently known mitigation options on the emission intensity of production and the challenges posed by reduction of the demand of agricultural products in relation to evolving lifestyles which illustrate the complex linkages with the overall food system.

Even where technical mitigation potential is available, the progress on emission mitigation in agriculture can be limited by socio-economic barriers, such as risk aversion, the dispersion of agricultural actors and the lack of secure land tenure rights. Uncertain profits, high transaction costs, and lack of farmers' collaterals reduce investments in agriculture.

Because agriculture depends on the combination of human actions and natural processes (climate, pests, diseases, pollination), "outcomes in agricultural production are highly uncertain" and partly independent of human will. Farmers are therefore risk averse and might avoid innovative mitigation options that increase the perceived level of risk, especially if financial investment is required. This risk aversion, and the challenges it poses for agricultural mitigation, is not captured by global estimates of the total mitigation potential from agriculture when the concrete feasibility of technical potential is assessed. These assessments also do not capture risks from a changing climate (e.g. reduced yields due to changing weather patterns or more frequent heatwaves). Agricultural actors around the world are on average small enterprises, often constituted by families with few or no employees, notably in the developing world. It is estimated that there are about 570 million farms worldwide, including 500 million family farms (Lowder *et al.*, 2014). Farms are spread across the whole territory and depending on the quality of infrastructures and extension services, they might be hard to reach. This makes it more difficult for agriculture than for other sectors to transfer the appropriate new tools and/or skills for adoption of mitigation options and to design policies supporting changes in production methods. In this context, branch organisations have a key role to play. Farmers in certain countries have uncertain

claims to the land they cultivate (unclear land tenure), which means that they lack collateral for taking loans for investments, and create a certain unwillingness to make investments in land they risk losing. Both act as a barrier for investments. Even if income losses during the first years of certain mitigation practices could be largely compensated by higher gains in the medium and long term, farmers might not want to change practices. This is especially the case if they are tenant farmers, which would see the long-term benefits accrue not to them but to the owners of the land. Increasing the carbon stock in agricultural lands is one example. The carbon stock increases (for instance through planting trees, changing tilling practices) and the ecosystem services that come with (improved soil health and yields), take time. Costs, such as the labour for planting trees, are however immediate. Secure land rights is therefore a prerequisite for farmers to adopt practices that increase the carbon stock in the lands they cultivate.

Systemic approaches to the food system beyond supply side measures only, are necessary to unlock the potential for far-reaching emission reductions in the sector. Yet, agricultural demand policies are rarely explored.

Given the limited technical potentials and further socio-economic constraints with agricultural supply-side mitigation options, the reduction of agricultural emissions requires an integrated approach in which demand-side actions play a central role to engender structural changes in the production patterns. Important examples of such demand side actions in agriculture include replacing animal proteins with vegetal proteins in countries where animal products are consumed at levels above healthy diet reference levels, and reducing food waste. These levers are increasingly recognised as having an important mitigation potential, and as being synergistic between emission mitigation and other objectives (Smith *et al.*, 2013; Roe *et al.*, 2019), and diet change could provide up to 8Gt/CO₂ emission reductions per year, and food waste reduction up to 4.5 Gt/CO₂ reductions per year (Roe *et al.*, 2019). Despite this important role of agricultural demand side policies, they are rarely explored, neither in pathways nor in national or regional policies, and no submitted NDC looks at demand side AFOLU policies (Griscom *et al.*, 2017). The IPCC Special Report on Climate Change and Land (IPCC, 2019) already proposes to structure the

mitigation options for the land sector differentiating production and demand side measures.

Agricultural production is closely associated with food security, job creation and poverty alleviation, which means that environmental objectives (including climate) often take second priority when designing sectoral policies and actions. However, research also show that there are agricultural pathways with synergies among the different objectives.

This is a concern in both developed and developing countries. The EU's *Common Agricultural Policy* (CAP) is a good example: the majority of the budget under the CAP is used as income support to farmers (pillar I), while support to rural development, including to improving the environmental footprint of European agriculture, (pillar II) receives a much smaller part. Understanding and exploiting synergistic solutions with potential socio-economic *and* environmental benefits has so far been a challenge. Hence, it is important to adopt GHG reduction strategies that contribute to rural employment, improving farmers' livelihoods, *and* improving the environmental sustainability of agriculture (in terms of biodiversity, GHG emissions, etc.). Policies must therefore be designed to exploit synergies between agricultural job creation, poverty alleviation among farmers, and GHG emission mitigation. While integrated approaches to agriculture, both regarding the integration of both demand and supply side measures (see the paragraph above) and the integration of environmental and development objectives, are gaining ground internationally. The World Food Summit, organised for the first time in September 2009, and the EU's *Farm to Fork* strategy from 2020, both bear witness to this. Furthermore, the *Koronivia Joint Work on Agriculture* (KJWA), adopted in 2017, which mainstreams agriculture into the UNFCCC processes, emphasizes the importance of agriculture and food security in the climate change agenda and offers a space for policy and expert dialogue between Parties and observers to discuss synergies and trade-offs between adaptation, mitigation and food security across the agricultural sector. However, these insights are still very rarely translated into concrete policies (as illustrated by the disparity between the environmental ambition set in the *Farm to Fork* strategy and the early propositions of the *Common Agricultural Policy* (CAP)).

ADVANCES AND CHALLENGES RELATING TO FORESTRY AND OTHER LAND USE

Even if the overall deforestation rate has fallen over the last decade, about 10 million hectares (approximately the size of Iceland) continue to be converted to agriculture and other land use every year, primarily in the tropics, and some countries have recently experience increases in deforestation rates.

Halting deforestation of carbon-rich and highly biodiverse ecosystems such as tropical forests and peatlands is an essential 'win-win-win' strategy on climate mitigation, adaptation, and biodiversity conservation (land-conversion is the first driver of biodiversity loss globally) (IPCC-IPBES, 2021). For this reason, it has been the focus of numerous national and international initiatives in the past decade (e.g. REDD+², which predates the Paris Agreement, and numerous associated international and bilateral initiatives since 2008 to support developing countries pledging several US billions (Norman and Nakhooda, 2014), and more recently, the launch of the Lowering Emissions by Accelerating Forest finance (LEAF) Coalition, a 10-year public-private initiative launched during the US Climate Summit in April 2021). The global rate of deforestation has reduced over the past decade – going from 12 million hectares of annual forest losses in 2010-2015, to 10 in 2015-2020. However, the net loss of forests globally remains very significant (FAO, 2020b). Deforestation has four key drivers globally, of approximately equal importance: commodity production (soy, beef, palm oil, but also mining, etc.), logging and other forestry practices³, shifting agricultural cultivation⁴ and wildfires (Curtis *et al.*, 2018). In some of the central REDD+ countries, such as Brazil and Colombia, recent trends display a reversal of earlier gains and a renewed increase of deforestation rates. In particular, trends in the Brazilian Amazon are very concerning: after a historic 84% decrease in deforestation rate between 2004 and 2012, Brazil has seen a doubling of defor-

ested areas since 2012. Recent research highlights that the Brazilian Amazon has now gone from being a net sink to a net source of GHG emissions (Qin *et al.*, 2021). This situation raises questions around how effectively reduce deforestation over the long run (Heilmayr *et al.*, 2020). In particular, international initiatives to halt deforestation (e.g. REDD+) have had unclear impacts on deforestation rates themselves, and have not so far mobilised the finance necessary to address the drivers of deforestation and effective protection of forests, despite capacity building investments and pledges for results based payments.

The capacity to monitor, report and verify (MRV) land use changes related to forestry has improved drastically in the last years, as a critical positive result of international capacity building initiatives on the sector and new datasets.

One major advance in the fight against deforestation is the drastic improvements in forestry MRV a multitude of different countries in the last decade. The number of countries in which forest monitoring can be considered good or very good, whether through national forest inventories or remote sensing, has increased drastically between 2005 and 2020. In particular, the explosion and reduced cost to remote sensing of forestry land use changes has enabled many tropical forest countries to drastically improve their forest monitoring (Karimon Nesha *et al.*, 2021). This is notably a direct impact of the international initiative REDD+, which has disbursed a majority of its funding to support capacity building to improve national monitoring capabilities. These improvements in MRV have also been associated with improved forestry governance and policy enforcement (Karimon Nesha *et al.*, 2021). While it is primarily the capacity to detect changes in forest area which has improved, the mapping of forest degradation has also improved (Palahi, 2021). Nonetheless, monitoring forest degradation remain a challenge many countries, including in key tropical forest countries (Lee and Sanz, 2017).

Land-use change due to agricultural commodity supply chains has received growing attention internationally over the past decade as a key lever for further and lasting reductions in deforestation.

² Reducing Emissions from Deforestation and Forest Degradation, sustainable management of forest, conservation and enhancement of carbon stocks

³ Defined as large-scale forestry operations occurring within managed forests and tree plantations with evidence of forest regrowth in subsequent years

⁴ Defined as small- to medium-scale forest and shrubland conversion for agriculture that is later abandon

Agricultural commodity supply chains have been a major area of focus for international and national action over the past decade across various types of private supply-chain governance measures (including commodity roundtables and certification schemes, a growing number of zero-deforestation voluntary company commitments, investor activism, consumer boycotts and campaigns, etc.) with varying degrees of effectiveness in terms of reducing emissions. The Tropical Forest Alliance (TFA) founded in 2010, represents a recent private governance initiative to address zero-deforestation supply chains, or the 2014 UN Forest Declaration that is a common, multi-stakeholder framework for forest action, consolidating various initiatives and objectives that drive forest protection, restoration, and sustainable use. In turn, the UK COP26 Presidency's FACT (Forest, Agriculture and Commodity Trade) Dialogues – a central initiative of its COP26 'Nature' Campaign – has seen 25 producer and consumer countries commit to exchange and collaborate on issues such as smallholder support, transparency and traceability, R&D, and trade and market development, in order to create greater sustainable forest management and ecosystems conservation.⁵

Enhanced national governance and national policies are critical to ensure continuity of efforts to reduce deforestation, with land tenure and law enforcement being of particular importance.

Land reforms ensuring clear tenure rights are critical to create conditions for *lasting* advances on deforestation (as opposed to easily reversible advances). Indigenous Peoples (IPs) and Local Communities are frequently shown to be the best guardians of forests for climate and biodiversity purposes when their tenure rights are respected or recognized (Garnett *et al.*, 2018). However, existing national policy approaches in many countries still do not incorporate this dimension sufficiently. For example, more than one third of the carbon-rich tropical forest land conserved by Indigenous Peoples is not subject to secure tenure rights (Dinerstein *et al.*, 2019). Indeed, in a context where large portions of land is not clearly attributed for example in Brazil, land owners and managers lack

the incentives to protect the forests on their lands, and might be incentivised to deforest land in order to assert their claim to it (Reydon, Fernandes and Telles, 2020). In such situations, even if the central State is pro-active in the fight against deforestation, law enforcement remains an important challenge given the atomization of actors to control. A worst case scenario, in which the state is not taking any action on this objective leads inevitably to a quick rise of deforestation rates, as demonstrated by events since Bolsonaro's election in 2019.

Recent experience shows that halting tropical deforestation requires a combination of public and private governance across (1) a solid national regulatory framework and policy enforcement, (2) detailed monitoring, reporting and verification (MRV), and (3) zero-deforestation agricultural global supply chain efforts (Griscom *et al.*, 2017).

Extensive research demonstrates that, even if precisely attributing the specific role that each policy plays remains challenging, the spectacular impressive reductions in the Brazilian Amazon over 2004-2012 were brought about by this triad of State policies enforcement and regulations, and private governance. These different components taken independently are insufficient to deliver successful outcome given the interplay between them, and they should therefore be considered as the indivisible building blocks of a package for on halting deforestation. Indeed, the success of private governance policy depends on its articulation with strong and well-designed public policies, especially property registries and deforestation MRV (Heilmayr *et al.*, 2020).

GOVERNING THE "GLOBAL CARBON SINK"

The effective management of LULUCF carbon sinks is a critical condition to reach global carbon neutrality. But, despite growing interest and some experiments, the establishment of effective international cooperation approaches, such as international market-based approaches, and governance supporting this objective remains a key challenge in international climate

⁵ FACT Dialogue Statement, (May 2021) <https://www.gov.uk/government/news/joint-statement-on-principles-for-collaboration-under-the-forest-agriculture-and-commodity-trade-fact-dialogue>

policy under the Paris Agreement. More systemic approaches driven by local needs and conservation perspectives of the ecosystems holding the most important carbon sinks combined with the global collaborative efforts, including pooling resources, will offer more effective options while respecting the sovereignty and specific circumstances of individual countries.

The stewardship and protection of certain carbon sinks of global importance is a necessary condition to achieve global carbon neutrality, as demonstrated by the growing interest of countries and private companies for offsetting their emissions with removals and for banking on large-scale CDR (Carbon Dioxide Removal) in coming decades in the context of their net zero strategies. For example, recent research estimates that the voluntary carbon market, currently valued at \$400 million, could value \$10 to \$25 billion in 2030.⁶ Also, the nature, ambition and timing of actions on carbon sinks indirectly defines the efforts required by other countries and sectors towards the global carbon neutrality objective. These acknowledgments, embedded in the paradigm of the Paris Agreement, highlight that protection of carbon sinks cannot be left to the sole responsibility of individual countries, and should be supported by a structured international cooperation. This is even more true since most of the ecosystems holding the most important carbon sinks globally are located in developing countries, such as the Amazon rainforest, the Indonesian peatland, the Congo Basin or Mekong Valley. Hence, international finance can have a key role to play, especially if it helps trigger resources from private or/and public institutions through investments on sustainable projects on the LULUCF sector. The REDD+ initiative has featured experiments along these lines and numerous attempts have been undertaken to reward the protection of existing carbon sinks (i.e. reducing emissions) and the expansion of carbon sinks (i.e. increasing removals) with the ultimate goal of accessing different result based payments schemes, including voluntary carbon market schemes (CORSIA, VERRA, Label bas carbone, etc). There are however major concerns around the environmental integrity of such

⁶ S&P Global, May 2021, "Carbon offsets prove risky business for net zero targets », <https://www.spglobal.com/esg/insights/carbon-offsets-prove-risky-business-for-net-zero-targets>

exchanges, in particular if they are developed at large-scale. Issues include bio-physical constraints such as the difficulty to ascertain the permanence of land-based removals. The market design is also subject to biases given that the demand for offsets would be based on plans and strategies developed independently by countries and companies without taking into account the limited amount of globally available high-quality credits.⁷ Furthermore, there has always been concerns around the methodologies and baselines used to estimate LULUCF removals on voluntary carbon market projects, and a recent analysis by (West *et al.*, 2020) for the Brazilian Amazon concluded that using historical baselines in the projects leads to excess carbon credits for projects when deforestation at the regional level drops below historical averages.

Finally, and most importantly, in the context of a universal agreement such as the Paris Agreement where all countries have emission reductions targets, clear accounting rules must be established to avoid double counting by clarifying whether the removals contribute to the emission reductions of the country financing their protection or of the country under whose geographical jurisdiction the sink falls.

The fundamental difficulty to address these technical and structural challenges of market instruments despite intense efforts by the international community, notably in the context of the difficult negotiations on the Article 6 of the Paris Agreement, indicates that international cooperation on LULUCF carbon sinks may require a more comprehensive and systemic approach. In addition, given the limits of market-based approaches, international initiatives of global cooperation such as REDD+, may have to be rethought in order to address the financial needs of each of the phases of REDD+ (readiness, implementation, rewarding for results) with the most efficient financial instruments, or even to reward efforts as a compensation for conservation (Fletcher *et al.*, 2016) or non-market results base payments schemes (e.g. the REDD+ Results Base Payments GCF Pilot), instead of a pure market-based instrument.

⁷ Ibid.

TRANSVERSAL AFOLU ADVANCES AND CHALLENGES

FINANCE

Recent trends highlight the remaining difficulty to mobilize finance flows at the scale required to support increased climate ambition in AFOLU, as well as the challenges in moving away from environmentally detrimental financial incentives (e.g. subsidies to synthetic fertilisers). Identifying investment projects with positive as well as negative environmental effects, and addressing important uncertainties faced by the sector appears critical to kickstart the required massive redirection of finance flows.

Despite significant mitigation potential, including at apparent low cost, and significant adaptation- and other co-benefits in the sector (CPI, 2019), very little financing is available for the green transformation of AFOLU. In particular, finance from the private sector has so far been a challenge for international efforts both in terms of amount, the source, and the reliability. In particular, while originally expected to be a market-based mechanism, REDD+ has struggled to access private finance and has so far received 90% of its funding from public donors (Angelsen *et al.*, 2017). Altogether, the AFOLU sector received 5.2% of all tracked climate finance during 2017-2018, which, although a significant increase from the 2015-2016 period when the sector received a mere 2.5%, remains far too limited to generate investments able to address domestic and international drivers of land use changes. This situation may be notably caused by the significant uncertainties around mitigation potentials, costs, and permanence of carbon storage, which is a core problem to attract finance (Griscom *et al.*, 2017). Furthermore, the management of uncertainties pose challenges for the efficiency of finance for mitigation, since an excessive emphasis on reducing uncertainties as a sign of good enough carbon credits for markets may lead to focus efforts and finance in the wrong places, e.g. where the risk of deforestation is lower (Aguilar, Funk and Sanz-Sánchez, 2021). There is some hope that the improvements in MRV might unblock more forestry-related international finance, and in

particular, more private finance, given that it improves the capacity of projects to ascertain that paid-for deforestation reductions take place. For example, the recent LEAF initiative launched by Norway, the UK and the US builds on recent advances in forestry MRV to raise 1 billion \$ of public-private finance for reducing deforestation⁸. However, the payments for results through market linked mechanisms are likely not going to be enough to cover the necessary investments for the transformations that are required to lead to sustained and good quality results (e.g. LEAF offers \$10 per tonne of CO₂). Beyond increasing finance for conservation, the OECD also insists on the equal if not greater importance of reforming finance flows that are harmful to biodiversity conservation (OECD, 2019). The World Bank has found that fiscal reforms—such as replacing input or production subsidies with income transfers, or payments for ecosystem services—could play an important role in reducing agricultural pressure on forest clearing (World Bank, 2021).

INTERPLAY WITH OTHER SUSTAINABILITY OBJECTIVES

There is a growing body of knowledge highlighting the interplays between climate and other sustainable development objectives in the AFOLU sector, and integrating these objectives comprehensively must be a core dimension for the international governance and national policymaking of the AFOLU sector.

Key societal- and sustainable development objectives include GHG mitigation, adaptation to climate change, biodiversity preservation, ensuring food security, poverty alleviation and job creation. Notably, science is clear that limiting global warming to ensure a habitable climate and protecting biodiversity are mutually supporting goals, and that the mutual reinforcing of climate change and biodiversity loss means that satisfactorily resolving either issue requires consideration of the other (Deprez *et al.*, 2021). Scientific evidence also highlights the need to assess the consequences of mitigation options in the AFOLU sector against other goals. For example, the IPBES GAR identified that bioenergy/BECCS deployment has by far the largest

⁸ for more information, see this article in [Climate Change News](#), or this article in the [New York Times](#)

negative biodiversity impact of all low-carbon energy sources (IPBES, 2019; CH 6), and warns of heightened local conflict and placing at risk the SDGs that depend on land-based resources (IPBES SPM, 2019).

The interplays between ambitious climate action and other sustainability objectives in the AFOLU sector remains poorly understood. The adoption of more integrated policy frameworks requires more systematic and robust scientific analysis of these interplays.

It is critical that the climate, biodiversity and sustainability scientific communities further develop transformation pathways to reach mid-century net zero emissions in ways that support the preservation of biodiversity, ecosystem integrity, and related planetary boundaries. Indeed, current knowledge on these interplays remains scarce and partial. For example, the scenarios presented in the IPCC SR1.5 report shows that all pathways limiting global warming to 1.5°C requires some land-based CDR, but these analyses do not yet take fully into account the impacts in terms of land-use change, biodiversity loss, food security, and even the feasibility of reaching carbon neutrality if such land-use changes take place. Similarly, the IPCC SR on Climate Change and Land (2019) alerted on the dangers of 'large-scale' deployment of BECCS/bioenergy, namely for food security—noting that by expanding into subsistence agricultural land, a deployment of 11.3 GtCO₂/yr could raise the number of food insecure people by over 150 million (Shukla et. al., 2019). This policy-relevant research agenda would notably mean exploring different options, such as pathways with little to no bioenergy expansion, or decoupling of economic growth with biodiversity loss, etc. (Otero et al., 2020). But it also requires profoundly revisiting the conventional methods used to analyse emission reduction scenarios, to ensure that they capture explicitly the most important aspects related to biodiversity. There are some early examples of modelling, mostly from a biodiversity starting point, that try to better integrate climate and biodiversity objectives, such as Kok et al. (forthcoming) and ID-DRI's "Ten Years for Agroecology in Europe, or TYFA", or who propose exploring more fundamental drivers of change (e.g. economic growth and decoupling (Otero et al., 2020).

The need to address together climate change and other sustainability objectives, notably those related to biodiversity, has entered the political mainstream— with momentum accelerating during the 2021 'climate and biodiversity super-year' in advance of COP15 and COP26. Most of the focus of analysis and international discussions has been on synergies, notably through 'Nature Based Solutions' (NBS). Yet, to reach ambitious climate goals (e.g. mid-century net-zero) while also reaching high goals of biodiversity conservation and ecosystem restoration, there is also a key need to address trade-offs.

The emphasis on NBS is based on the assessment that a series of measures across agriculture, forest conservation and management, and the management of other ecosystems (peatlands, mangroves, etc.) can contribute significantly to ambitious climate objectives – for example Griscom et al. (2017) find that 37% of the mitigation to 2030 to reach the 2°C can be met through 'Natural Climate Solutions' with co-benefits on other ecosystem services. These NBS, and more recently 'Nature Positive' solution, have entered the mainstream climate discussion, as illustrated by the COP26 UK Presidency's 'Nature' campaign, the FACT (Forest, Agriculture and Commodity Trade) dialogues, dedicated discussions in international meetings⁹. However, the design of efficient and actionable climate action in the AFOLU sector requires considering also the trade-offs, since the land sector will increasingly be the key scene of growing tensions between opposing land-uses: food, bioenergy and other land-based mitigation/CDR, and the preservation of biodiversity.

Recent analysis highlighted that limiting the reliance over time on biomass for emission reductions though bioenergy and/or CDR is a key condition to minimize the risks of trade-offs between mitigation and other sustainability goals. It requires notably strengthened global mitigation action in the coming decade and taking into account the systemic and lifecycle effects of AFOLU mitigation measures in carbon neutral pathways.

⁹ eg. President Biden's Leaders' Summit, the Petersburg Dialogue, the HAC for Nature and People, the Leaders' Pledge for Nature, and the G7 Environment Ministers' Communiqué

There is significant policy incitement of bioenergy production (considered carbon neutral under most accounting regimes *in the energy sector*), and its consumption has increased heavily over the last years. This energy features as one of the possible mitigation options to decrease reliance on fossil fuels and, notably, recent research highlights that mitigation pathway all depend on a certain amount of land-based CDR. The amount of CDR varies a lot, between 100 and 1000 Gt of CO₂ emissions removal cumulatively by 2100, depending on the ambition of actions in the short term: the faster we decarbonize now, the more limited CDR from AFOLU we will need in the future. The literature underscores consistently that the reliance on large-scale biomass in mitigation pathways can be a strong concern for a number of reasons. Sustainable thresholds for bioenergy may indeed be quite limited, which raises question marks around mitigation pathways that rely heavily on these solutions. Also, there are also important reasons for scepticism around the sustainability of bioenergy at large scale, given lifecycle analyses indicating that it is not carbon neutral when taking into account emissions from transport etc (Searchinger *et al.*, 2018), given the severe negative impact on biodiversity of current wood biomass burning practices ¹⁰ and given the low efficiency of burning wood biomass and the long carbon cycle of woody biomass. ¹¹ Finally, the higher end of the CDR range, corresponding to less ambitious mitigation action in the coming decade, would require, in the second half of this century, growing biomass on an area larger than Australia, or 1/3 of global agricultural land (Huppmann *et al.*, 2018), placing massive pressure on land use with risks on food provision and threats to today's ecosystem conservation and NBS.

mentation of different solutions. Nevertheless, the mitigation potential of existing supply side technological mitigation options cannot in and of themselves more than halve agricultural emissions (Roe *et al.*, 2019). Agricultural mitigation is further constrained by concerns over trade-offs with food security, farmer incomes, and socio-economic challenges (e.g. access to credit). Further emission reductions require policy and research that adopts systemic approaches to reducing emissions in AFOLU, integrating both demand and supply side measures (see for instance (Aubert, Poux and Schwoob, 2019) for an example of such an integrated and multi-dimensional approach to the sectoral transformation). Key challenges for conservation and expansion of carbon sinks globally are largely socio-economic and politico-institutional, requiring both global collaboration around resources and agricultural commodity trade, as well as clear land tenure regimes and registries, solid national regulatory framework and policy implementation, and robust MRV at the national level. Furthermore, solutions that exploit synergies between mitigation, food security, poverty reduction, biodiversity conservation, and other sustainable development goals will enable overcoming certain barriers to ambitious emission reductions in agriculture and forestry. While there is a growing awareness of the importance of addressing these issues in an integrated and comprehensive manner, concrete policies that take up this task are still rare. An improved understanding of the interlinkages between different objectives and innovative policy approaches are needed to advance on this issue.

CONCLUSION

With few exceptions, the remaining challenges for increasing the climate ambition in AFOLU are not technological, in that technical mitigation options exist for many AFOLU emission sources (Searchinger, 2019). Key barriers are instead related to the imple-

¹⁰ Grunwald, M. (March 2021), The 'Green Energy' That Might be Ruining the Planet, Politico <https://www.politico.com/news/magazine/2021/03/26/biomass-carbon-climate-politics-477620>

¹¹ Ibid, and also, Letter Regarding Use of Forests for Bioenergy (2020) <https://www.woodwellclimate.org/letter-regarding-use-of-forests-for-bioenergy/>

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Industrial decarbonization ambition in the post-Paris context

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SUMMARY

The Paris Climate Agreement's objective for net-zero CO₂ emissions shortly after mid-century has completely transformed the climate policy debate for heavy industry. Prior to Paris, the steel, cement, chemicals and other materials sectors were expected to be the last sectors emitting in a -80% reduction world, and much of their emissions were exempted or given free allowances. After Paris, these sectors now have to face both transforming rapidly and paying for any necessary permanent, additive and verifiable negative emissions. This has set off an intense global debate on demand and supply technological options, induced innovation, capital investment needs, policy packages, and potential uprooting of old supply chains to move the most intensive emitting parts of production either where there is geology for carbon capture and storage (CCS) or inexpensive low carbon electricity for electrification. A major shift is needed, from contemporary industrial policy that mainly protects industry to policy strategies that transform. There is a vigorous debate on the key enablers, but a common set of components for a policy framework is emerging: clear policy directionality towards net-zero, knowledge creation and innovation, creating and reshaping markets for sustainable materials, building capacity for governance and change, international coherence, and sensitivity to the focussed cost of sectoral phase outs and the communities where they happen.

INTRODUCTION

Prior to the Paris Agreement (PA) at COP21 in December 2015, heavy industry was largely exempted from most climate change efforts. A 50% chance of maintaining +2°C from pre-industrial temperatures was the usual high-level objective, which most climate modeling of the time showed requiring roughly 80% reduction in emissions by 2050. The integrated assessment models which proved that -80% was possible mainly squeezed the emissions out of electricity production combined with negative emissions, leaving buildings, transport and industry less touched. Heavy industry was considered hard if not impossible to abate, mainly using CCS & bioenergy, and would mostly carry on emitting

as part of the last 20%. The PA's more ambitious 66% chance of 2°C, towards 1.5°C target, requires a smaller carbon budget, however, one consistent with net-zero CO₂ emissions by 2050-'70. Complicating this, existing and planned investments in electricity and heavy industry with current technology would exceed the +1.5°C budget (Tong et al., 2019).

The days of partial reductions for heavy industry, i.e. -40%, -50%, or -80% GHG targets, are over; the PA goal demands that all energy using sectors reach near zero to negative emissions as soon as demand, technology and stock turnover allow. This requires a fundamental transformation in most sectors. Before the ink

was dry on the Paris Agreement, industry participants, system modellers, direct stakeholders, and other interested observers began debating what this meant for industry (Bataille et al., 2018). It reawakened largely dormant interest in several mitigation pathways: circularity through more and better quality recycling; material efficiency; fuel switching to electrification, hydrogen, bioenergy & feedstocks; 90%+ carbon capture and storage, especially the parts of it that had been proven to work with existing technology (e.g. storage of formation gas CO₂ or from methane based hydrogen production); and small and large nuclear for power and heat (Bataille, 2019; Rissman et al., 2020).

THE PHYSICAL PATHWAYS TO NET-ZERO INDUSTRIAL EMISSIONS

Industry emitted 31% of CO₂ from the energy supply and demand system in 2016. Of this, a nominal 9.7% was light industry (manufacturing, food, etc.). Of the “heavy industry” sectors 8% was iron and steel, 6.4% cement & lime, and 5.2% chemicals (Bataille, 2020). The numbers fluctuate each year, but not in fundamental relative size to each other or the rest of the economy. Reducing these emissions will be challenging. First, the standard technologies in use for these sectors are currently highly GHG intense processes for whom low GHG options typically cannot be bought off the shelf, e.g., for making zero emissions primary steel or cement. Lab and pilot level technological options exist, but most are far from fully commercialized. Second, steel, chemicals and potentially clinker are all highly traded, leading to the potential for carbon leakage in a multispeed climate policy world. Finally, unlike coal, oil & gas, steel, cement & chemicals are fundamental to basic development needs for larger buildings, transport and energy infrastructure, and water and sanitation systems.

In terms of demand, several major independent forecasts have shown that while North America and Europe are in their “renovate and replace” phase of demand for concrete, steel and other heavy materials for buildings and infrastructure, and China’s infrastructure demand is tailing off, demand is rising fast in India, Africa and other developing regions, leading to a roughly constant level of global production for these

materials (Bataille, 2020). Even after incorporating rigorous demand management “sufficiency” policies and education (recent IEA analysis shows a 26% drop in cement end-use intensity and 40% drop in steel end-use intensity is possible with transformational supply changes (IEA, 2020, 2019)), the need for key infrastructure (e.g. ports, railways and urban transport) and housing development to reach all the SDGs in Agenda 2030 will contribute to a steady and possibly rising demand for concrete and steel (UN Environment et al., 2018; Wang et al., 2021).

While intense efforts to improve **energy efficiency** have always prevailed because of the large cost component of energy in steel, cement, chemicals and other sectors, while it will continue to be important it will never be enough for net-zero - this requires a transformative change in production. Where there is perhaps more potential is in **material efficiency**; we currently use more than is necessary steel and especially concrete for crafting buildings and infrastructure. Concrete is especially overused because it is so cheap and durable, but we only really need it where we need compressive strength and corrosion resistance. Steel is only needed where we need torsional, shear and tensile strength. New computer aided design tools potentially allow architects and civil engineers to use steel and concrete only where necessary, and to blend in other lower GHG intensity materials where appropriate. For this to happen, however, material intensity with respect to GHGs needs to become not only part of architectural, engineering, and trades education, but be allowed and mandated under building codes. The use of cement in concrete, as well as its production, can also be much less GHG intense. Cement is the glue in concrete, holding together the sand, gravel and small stones that give concrete its strength; better mixed concrete, that more carefully disperses and “packs” the aggregates can be stronger while using less cement. The most emissions intensive part of making cement and concrete is the initial calcination process for making clinker, a cement precursor. Clinker can be safely replaced in cement up to specific levels for given end-uses by both active cementitious material substitutes and passive limestone filler if allowed and encouraged under local building code. But again, education for architects, engineers and trades is necessary. In sum, while demand reduction through sufficiency as well as energy and material efficiency can significant-

ly reduce the challenge, production decarbonization is unavoidable. In the following, working sector by sector, we will identify: the core technical challenges and progress towards production decarbonization; the economic, organisational, institutional and social challenges; enablers to overcome these challenges; and signs of progress.

STEEL

Core challenge

75% of steel production is new primary as opposed to recycled secondary production. Almost all primary production is based on using coal as the iron ore "reductant" (to strip the oxygen off the elemental iron so it can be melted) and heat source. The production facilities are long lived, profit margins are low, and steel is highly traded.

Signs of technical progress

For iron and steel production, several technological pathways for largely eliminating GHG emissions are being considered (Fishedick et al., 2014): more recycling, which is limited by the availability of high quality, uncontaminated scrap; the traditional blast/basic oxygen furnace combined with CCS, perhaps using biocharcoal to reach negative emissions (Fan and Friedmann, 2021); advanced coal based iron reduction & smelting that produces concentrated CO₂, more amenable to CCS; direct iron ore reduction (DRI) using low GHG hydrogen instead of coke followed by an electric arc furnace for smelting (Vogl et al., 2018); and perhaps eventually direct aqueous or molten oxide electrolysis of iron ore to metal, followed by an electric arc furnace run on low GHG electricity. Several regions, including China, are working to increase the amount of recycled steel. The most progress in primary production decarbonization has been made on low GHG hydrogen DRI, using both CCS on syngas (H₂+CO) DRI (a facility has been operating since 2016) and electrolysis based hydrogen DRI (Spanish and Swedish full scale facilities are due to begin operation in 2025 & 2026). At time of writing, there are 10 electrolysis hydrogen DRI plants announced to start before or on 2030, and two CCS DRI plants.¹

¹ <https://www.industrytransition.org/green-steel-tracker/>

Critical economic, organisational, institutional, and social transition barriers & enablers

While most technical progress is being made in Europe under the aegis of its tight overall GHG targets, most new steel demand will be in the developing world, requiring the technology is adopted there much faster than usual. This will require mechanisms for technology sharing and finance.

The proposed EU carbon border adjustment mechanism (CBAM) is controversial. Without strong developed country ambition, which CBAM enables, there will be no effective technology transfer mechanism. But CBAM risks being penurious for developing countries in the early stage of industrialization, when the most steel and concrete is needed. To get around this conundrum, some form of global technology accelerator is needed (Bataille, 2020). It would be fully paid for by the historically GHG culpable, to commercialize needed tech for all. Then pooled, risk diversified enabling finance, again largely enabled by the culpable, is needed to deploy this technology in developing countries.

Signs of organizational, institutional and social transition progress

There has been huge progress in steel decarbonization efforts in the last few years, far more than expected as late as 2017. There have been announcements by several steel firms to reach net-zero by 2050, with a focus on UK & European operations. The Canadian steel association has pledged to net-zero by 2050, and Nucor in the US has now also pledged to dramatically reduce their emissions intensity. HBIS in China has stated it will begin large scale experiment with syngas & CCS and electrolysis hydrogen DRI EAF steel production.

On June 1st 2021 there was a Clean Energy Ministerial agreement (United Nations Industrial Development Organization (UNIDO), 2021) to jointly pursue steel and cement decarbonization, the first time steel and cement decarbonization has seen this level of political commitment.

In terms of carbon pricing policy, the EU has announced it will impose a partial CBAM for steel, cement and aluminum in January 2023, fully phased in

by 2026. In terms of lead market creation, Volvo and Daimler Benz have agreed to contract with SSAB and H₂ Steel for green steel (Daimler-Benz., 2021; Green Car Congress, 2021) and Salzgitter AG will start allocating existing low GHG EAF steel making to Mercedes Benz this year.

Where progress is missing is a clear direction for how steel decarbonization technology will be transferred to developing nations, and how the extra costs will be justified and paid for until low GHG technologies cost less than standard high GHG technologies.

CEMENT & CONCRETE

Core challenge

Concrete is the most widely used material in human civilisation. The sand, gravel and stones in concrete are held together with cement, of which calcium oxide is a key constituent. CaO is made by heating limestone (CaCO₃), and CO₂ is released – this represents ~60% of all cement and concrete emissions. The other 40% come mainly from heat for the limestone calcination and then clinker baking, where CaO is combined with mainly iron and aluminum silicates.

Signs of technical progress

As mentioned previously, clinker can be safely replaced in cement up to specific levels for given end-uses (most up to 50%) by both active cementitious material substitutes and passive limestone filler (Habert et al., 2020; UN Environment et al., 2018).

While there are some long term potential replacements for Portland cement, it will be decades before they are available in any amount. CCS will be required for the Portland cement limestone calcination process CO₂ emissions, and progress is ongoing. There are several multi-company projects to master key technologies: 90-95% capture CCS at the Heidelberg Lehigh plant in Edmonton; the LEILAC process gas CSS kiln retrofit project in Belgium (Hills et al., 2017); and the Brevik CCS project in Norway.

For the heat requirements, mixes of biomass or hydrogen-based fuels may be useful for decarbonization. There is also a project linked to LEILAC to electrically heat the calcination kiln.

Critical economic, organisational, institutional, and social transition barriers & enablers.

CCS technology needs to be proven for at least process gases, and it will be helpful if it can be used for all heat needs. As with steel, this production decarbonization technology must be made available globally, with the necessary finance and incentives for its adoption – CCS does not add value to cement products, it only adds capital and energy costs. Alternative heat sources must be trialed and their use proven for where CCS cannot be used for the entire flue gas stream.

Material efficiency efforts will be complicated, as they encourage less use of cement and concrete. This may or may not be welcome by construction companies, but will not be welcomed by cement companies unless they are compensated somehow. The business model of cement, in conjunction with construction regulation, must be adapted to level the playing field for all cement firms, possibly through building design regulations, which are hard if not impossible to enforce in developing countries.

Signs of organizational, institutional, and social transition progress

On the negative side, unlike steel, very few global cement companies have announced net-zero goals. On the positive side, as with steel, a Clean Energy Ministerial agreement was announced in June 2021, likely to be followed by green procurement commitments at COP 26. Again like steel, the EU has announced a partial CBAM for steel, cement and aluminum in 2023, fully phased in by 2026.

There is virtually no movement towards decarbonizing cement production in developing country contexts.

CHEMICALS

Core challenge

Chemicals demand, and especially for plastics, is growing rapidly globally. Ammonia fertilizers, usually made from methane for its hydrogen and as an energy source, are currently critical to global food production. Most chemicals are composed of primarily carbon, nitrogen, hydrogen and oxygen. The chemicals indus-

try, with over 20,000 products produced using 7-8 main feedstocks (hydrogen, carbon monoxide, methane, methanol, ethylene, benzene, toluene, xylene) is currently designed to use coal, crude oil and methane as the primary feedstocks. Production facilities are long lived, profit margins are low, and feedstocks are highly traded.

Signs of technical progress

Plastics recycling e.g., for ethylene products, and deposit and return systems to encourage this, are a first key step to reducing chemical emissions. Regional progress in this varies from very high rates of recycling to none, but the global average is only about 5%. In the chemicals industry, alternative heat sources, low GHG hydrogen (either from low fugitive methane based production with CCS or electrolysis using low GHG electricity), electrocatalytic processes, and net-zero or negative carbon feedstocks (e.g., incorporating forestry or pulp and paper biomass or carbon from direct air capture) are key to reducing the sector's emissions (Bataille, 2020; Rissman et al., 2020). The pulp and paper industry, for example, can contribute biogenic carbon feedstock for chemicals and negative emissions through CCS.

Critical economic, organisational, institutional, and social transition barriers & enablers.

A key barrier organization and institutional barrier to decarbonizing chemical production emissions is that carbon is the key "construction material", or lattice upon which most chemicals are built. The industry has argued vociferously that even though most chemicals get combusted to atmosphere as waste if not fuel, that they are not responsible, instead the end emitter is – this matches with standard GHG accounting practices. A key institutional principle needs to be applied somehow that all carbon that leaves the ground and becomes a net emission to atmosphere must be accounted for, and be eliminated or offset using additive, verifiable and permanent offsets.

Chemical feedstocks are also highly traded, without certification of their highly varying production GHG intensity – most of the basic feedstocks are made

from coal, crude oil, natural gas liquids or methane. Methane in turn can be fossil or biogenically sourced commercially today. The long run goal is to recycle chemical feedstock carbon or source it biogenically or from direct air capture.

Signs of organizational, institutional, and social transition progress

Plastics recycling is almost non-existent globally, and is probably the fastest way to reduce large amounts of GHG emissions from the chemicals sector. Ammonia has been made with electrolysis based hydrogen in the past, and could be again in relatively short order if enough clean electricity can be purchased. Otherwise low GHG chemical production decarbonization is at a very early stage. BASF, the largest German chemical company, is actively considering electrification and green hydrogen options in cooperation with the RWE (BASF, 2021).

LIGHT INDUSTRY

Core challenge

Light industry, whose emissions mainly come from combustible gases and heating oil, mainly requires electricity, steam and small amounts of heat in various ranges from 50-1000°C. The relative cost of coal (very low), natural gas (low) and electricity (high) in most regions and the noncentrality of energy costs to most light industry operations are the biggest challenges.

Signs of technical progress

Light industrial energy needs are mostly highly electrifiable today, directly or with heat pumps. Local solar or biomass is also useful on a site-specific basis. Direct electric methods to produce low grade heat and steam through industrial heat pumps (possibly farming from waste heat sharing systems) and electrothermal heating for higher heat needs have been considered (Lechtenböhrer et al., 2016; Madeddu et al., 2020). Low GHG hydrogen and bioenergy can be used for process heat above 150°C, but it is expensive and limited by local demand and supply of hydrogen and bioenergy.

Critical economic, organisational, institutional, and social transition barriers & enablers.

Most small and medium sized firms are focussed not on their energy cost but sales and production of their product, and will simply use the cheapest and most reliable energy form that meets their needs. Electrification through heat pumps is capital intense, and while fully commercialized, knowledge of it is at a fairly low state. Information programs that suit the industry, lifetime cost education, and targeted low interest loans would help alleviate some of the key challenges.

Signs of organizational, institutional, and social transition progress

While options like industrial heat pumps and solar heating systems are becoming more commonly available, there is little or no progress beyond carbon pricing systems (which struggle against the electricity gas spread, i.e. the carbon price would need to be very high to induce a switch) to address decarbonization of these sectors.

In summary, there is no one magical, simple solution (such as demand management, energy efficiency or material efficiency, or carbon capture and storage (CCS)). In each and every sector there is a fundamental technological challenge that must be faced for which one has to dig into the details of each sub-sector to identify the solutions.

POSSIBLE POLICY PACKAGE COMPONENTS

Thinking in terms of transformation, rather than the historic mode of pricing and protection (which is a necessary but insufficient condition for transforming heavy industry), the following **key enablers of ambition** emerge from the physical pathways above

The first most important element is **national governments and the global community need to demonstrate ironclad policy directionality towards net-zero. Decarbonization is very risky and costly for industry (producing decarbonized materials will cost more for the foreseeable future), and it needs to be sure the world is serious before it will act.** Arguably, there's been lots

of progress with this. All the above, combined with regional climate policy pressures such as the EU commitment to net-zero and the Green Deal, including an EU general industrial strategy (European Commission, 2020a) and hydrogen strategy (European Commission, 2020b), has led to regional and global firm and sector commitments to net-zero in the various industrial sectors. Most of these commitments, given the very real risks of long-term industrial investments, come with requests for financial help and demands for competitiveness protection, such as from border carbon adjustments (BCAs). While simple in conception, BCAs beyond very simple, undifferentiated bulk products will be very difficult to implement practically, and if applied clumsily could have adverse legal, political and climate effects. Ascertaining the GHG intensity of individual products is a nascent organisational and logistic science that needs development. This calls for more nuanced, subtle and staged policy packages to enable the transformation

Basic materials industries are so far relatively sheltered from climate mitigation. Given the Paris Agreement goals, new climate and industrial policies are necessary for transforming the basic materials industries.

A gradual end to industrial process emission exemptions & free allowances is needed, combined with competitiveness protections. While full material carbon pricing will eventually be needed, gradually rising maximum GHG intensity standards for simpler (easier to measure in terms of GHG intensity) and then more complex products, designed to weed out the most emitting foreign and domestic supply (with compensation and transition support) could help send short term signals to industry until stronger carbon pricing is possible. Given the long-lived nature of industrial facilities, just applying simple carbon pricing and border carbon protections will likely slowly boil these industries alive inside the carbon pricing bubble, imposing broader costs on the economy given the need for steel, cement, chemicals etc. in a low carbon economy. A transformative approach is needed. Zero emissions require profound technology and organizational changes across whole material value chains, from primary production to reduced demand, recycling and end-of-life of metals, cement, plastics, and other materials. Complementary solutions relying on technological, organizational, and behavioral change must be pursued in parallel and throughout whole

value chains. **This requires clear, full supply chain lifecycle emissions accounting rules that take account of current differences in GHG intensity** (e.g. primary steel can vary from 0.7 to 3.0 tonnes CO₂ per tonne made with existing commercial technologies). While there are many possible GHG efficiencies in current technologies, **to reach near zero emissions new technologies are required** (e.g., electrification, hydrogen and post combustion carbon capture and storage). This requires multistage support, from research and development through piloting and early commercialization. Arguably, enough R&D has been done to mostly decarbonize most heavy industry – what is required is intensive early commercialization support so that all new facilities are near zero emissions by the early 2030s (International Energy Agency (IEA), 2021). For this to happen, **following research and development, we need lead or niche markets for low GHG commodities (creating and shaping markets) to allow steel companies to invest in the first 10-20 plants to fully commercialize low GHG steel technology**, i.e., via government green procurement or private buyers' clubs. This will allow firms to build experience with the new technologies and supply chains in a less risky environment. These could include financially supported lead markets through public procurement and private buyers' clubs actualised through contracts for difference (Sartor and Bataille, 2019) for low GHG production. Volvo and Daimler Benz have already committed to absorbing early green steel production from Sweden. Given existing GHG intensity differences, and the potential for new supply sources, we need **trade policy with flexibility to allow reformulation of supply chains to minimize the costs of decarbonization**. In the long run, it is quite feasible that the supply chains for currently intense products will separate into pieces, with the most GHG intensive parts (e.g. clinker and iron ore reduction) being done in regions with ample CCS geology or potential for clean electricity production, e.g. from wind & solar. For this to happen efficiently and equitably, however, **international trade rules and regulations will need to be revisited**, including common GHG intensity measurement rules and a "level playing field" for all parties, which could have material implications for the Paris Climate Agreement's Article 6 negotiations.

It's far from good enough to decarbonize basic materials production in the developed world. Most new steel demand will be in the developing world, requiring the technology is adopted their much faster than usual. This means **we will require mechanisms for technology sharing while maintaining innovation**. Developing nations in particular may need educational, logistic and financial support adopting initially more expensive low carbon technologies.

In particular, finance, due to risk, is structurally more expensive in developing countries, i.e., the weighted cost of capital is higher for the same project. Some mechanism for pooling these risks to allow portfolio diversification and allow developed country finance rates to apply for a climate related project to proceed are needed. The risk premia will be lower with each successive successful project. Developed country enabling finance to "leverage" private market finance will likely be required. Finally, **some long lived, non-retrofitable facilities will need to be shut down, which in some cases will have large impacts on local and regional economies and communities**. Regions and communities will need help exploring options, aid for worker re-education, and in some cases early retirement funds will be required for labourers. Amongst others, these 'just transition' strategies should be reflected in nations' long-term strategies and Nationally Determined Contributions under the Paris Agreement.

THE UPSHOT

Industrial decarbonization is technically possible, and would not cost the greater economy much (less than 1-2% for most materials for most final end uses), but because heavy industry, unlike transport, buildings and electricity, tends to be highly traded and is currently very GHG intense it poses strong investment and carbon leakage risks in a multispeed climate policy world. This has been largely ignored in global climate negotiations to date. We must also build global, national and sectoral capacity for governance and change in this sector; this is broad component that stretches from teaching all key stakeholders about the need for netzero to identifying the key emissions intense components and use structured research, development and fast commercialization policies (e.g.,

government procurement and private buyers clubs/ contracts) to build economies of scale and bring the key technologies to market. Regulations and carbon pricing can then be used to enable their uptake. In

summary, heavy industry decarbonization will need to take center stage in future international climate policy and negotiations.

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The transition to zero-emission transport

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CONTEXT

Transport is one of the most interconnected and cross-cutting development areas. It has profound impacts on all facets of sustainable development - social, environmental, and economic - with 'multiplier effects' that go well beyond the scale of development and financial investment. Enabling more sustainable, low carbon development pathways for transport and mobility is therefore necessary to achieving more sustainable development overall, including implementing the Sustainable Development Goals outlined in the 2030 Agenda for Sustainable Development. The COVID-19 pandemic has highlighted how critical transport is to a functioning society - from enabling access to jobs and essential services such as healthcare and education, to delivering food and other goods, and supporting overall equitable economic development. For example, sustainable, low carbon transport increases equitable access to jobs and other socio-economic opportunities for people of all ages, genders,

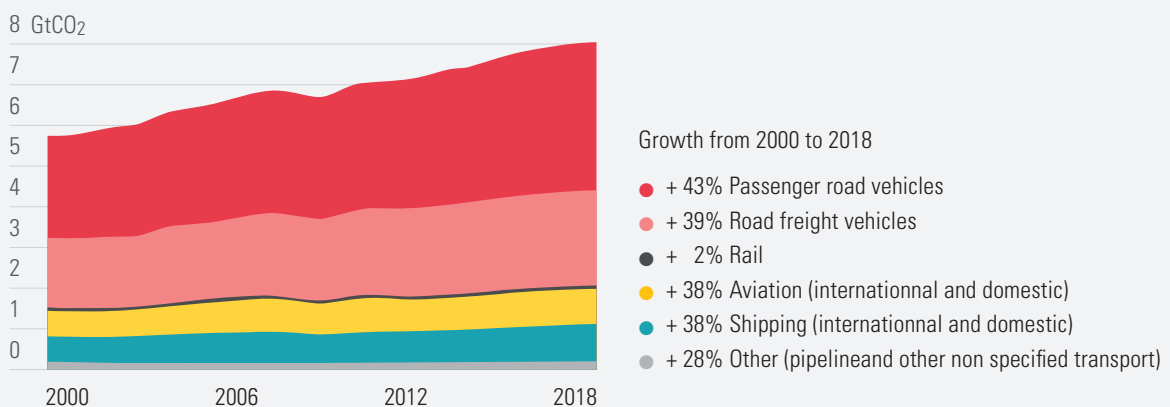
and abilities. It powers a just transition to green jobs in a circular economy and employs millions of people in urban and rural areas. It reduces air pollution from transport, improving air quality and providing significant benefits to public health. It reduces congestion, fuel imports and infrastructure costs. And sustainable, low carbon transport is essential to reach global carbon neutrality by mid-century compatible with the 1.5 degree celsius goal of the Paris Agreement.

Yet, while transport is essential to a thriving society, the current paradigm - in which transport is primarily powered by fossil fuels - is coming at a dire cost to people and our planet. The transport sector is now the fastest-growing source of emissions from fuel combustion in the world, and was the second largest source of CO₂ emissions after the power sector in 2019 (Crippa et al., 2020). Annual emissions from transport grew continuously from 5.7 Gt CO₂ in 2000 to around 8 Gt CO₂ in 2018 (IEA, 2019), representing 24% of global en-

Figure 1. Global Transport CO₂ Emission Trends by Mode: 2000-2018.

Rising global demand for mobility and goods has led to a rapid growth in transport emissions from 2000-2018. For more information on the major trends and drivers leading to this growth, see:

[SLOCAT Transport and Climate Change Global Status Report - 2nd edition](#)



ergy-related emissions and 14% of global greenhouse gases emissions in 2018 (IEA, 2020).

Given the concerning global trends in the growth of transport CO₂ emissions, ambitious targets to decarbonise the sector and associated action strategies must be set as a matter of urgency. However, thus far, these ambitions have fallen short in countries' Nationally Determined Contributions (NDCs). As of May 2021, only 15% of updated NDC submissions (representing 7 countries and the EU-27, out of 54 total submissions) had set transport mitigation targets (GIZ and SLOCAT, 2021).

To keep global temperature rise well below 2°C and towards 1.5°C, economies must reach carbon neutrality as soon as possible (and by mid-century at the latest). According to the Intergovernmental Panel on Climate Change (IPCC), this will require “rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings)”, “unprecedented in terms of scale” and “imply deep emissions reductions in all sectors” (IPCC, 2018). This will require the transport sector to approach absolute zero emissions by 2050, which cannot be achieved without structural and systemic transformations (Rogelj et al., 2018) which go beyond, for example, relying on carbon offsets to compensate for emissions. The sustainable decarbonization of the sector is possible, through a combination of scaling up existing solutions and taking a more comprehensive approach to reaching carbon neutrality.

Chapter objectives

The objective of this chapter is to contribute to a balanced assessment of current progress and challenges of approaching absolute zero transport emissions by 2050 to better understand what it will take for the sector to achieve the goals of the Paris Agreement. While the targets and plans set in countries' Nationally-Determined Contributions (NDCs) reveal current levels of ambition, they do not paint a complete picture of the global trends and developments which are both leading to and helping mitigate the transport sector's impact on the climate.

This chapter assesses some of these current trends to help identify the structural transformations which will be necessary to reach carbon neutrality. It starts by assessing the implementation of four key sectoral

transformations before outlining a list of enabling conditions which are believed to be critical to the success of the overall sustainable decarbonization of the transport sector.

ASSESSING THE IMPLEMENTATION OF FOUR KEY SECTORAL TRANSFORMATIONS

Four key areas have been identified in which structural transformations are necessary to sustainably approach absolute zero transport emissions from the transport sector by 2050. Some of these transformations are already under way but will need to be greatly accelerated. Each area includes details on progress, remaining challenges, and proposed solutions. The four areas identified include:

- 1. (Re)developing metropolitan areas to be less car-dependent**
- 2. Revamping supply chains towards more local and circular production and consumption systems**
- 3. Transitioning from fossil-fuel powered to zero-emission road vehicles**
- 4. Employing a multifaceted approach to reduce emissions from aviation**

1. (Re)developing metropolitan areas to be less car-dependent

Cities and their metropolitan areas are currently facing numerous challenges caused by car-oriented mobility systems, such as air pollution, CO₂ emissions, congestion, and traffic crashes and current development patterns in cities are characterised by uncontrolled urban sprawl. These challenges have helped evoke a global movement in which cities are adapting the built environment and related social, transport and land-use policies to reduce travel distances and encourage the use of active and collective mobility for daily activities and deliveries. To achieve this, some cities are beginning to redesign and adapt their built environment to include multiple compact centres in which citizens are able to access most of their daily needs (housing, employment, shopping, health care, schools and leisure) within a limited radius, where walking, biking or public

transport are the most efficient modes of transport in terms of time and cost (Ewing and Cervero, 2010). This transformation of urban environments has been gaining popularity through the “15-minute city” concept, based on residents’ ability to meet the majority of their daily needs within a 15-minute (walk/cycle/public transport) trip from their home. The concept was first popularised by Mayor Anne Hidalgo of Paris and has been adapted and implemented in a number of cities around the world.

For example, several European cities, such as Barcelona, Spain, have incorporated superblock systems made up of neighbourhoods of several blocks, where traffic is restricted to major roads around the periphery of the superblock, opening up entire groups of streets to pedestrians and cyclists. These developments, which are cheap and reversible, are designed to create more open space for citizens to meet, talk and carry-out daily activities (C40 Cities Climate Leadership Group and C40 Knowledge Hub, 2020; Nanda, 2019). Paris, France is achieving 15-minute cities by turning over 70% of on-street car parking space to other uses, including bicycle paths on every street and bridge. The concept is also relevant for less dense cities, such as Houston, Texas, which has proposed a Walkable Places ordinance to create six distinct central business districts aligned with 15-minute city principles, with the aim of reducing commuter traffic across the city. Chengdu, China also has plans to move towards a more polycentric development approach by creating a smaller, distinct satellite city in its outskirts, where essential goods and services will be within a 15-minute walk of the pedestrianised center and connected to current urban centers via mass transport (C40 Cities Climate Leadership Group and C40 Knowledge Hub, 2020).

This shift in spatial organisation and development is particularly relevant for cities in the Global South, where today, more than half of urban residents must travel 60 minutes or more to access jobs and services (Venter et al., 2019). The Global South is also experiencing the fastest growth in urban development, so this shift in the conceptualisation of urban and transport planning can be helpful in avoiding car-oriented transport development patterns. It also does not cost more than car-oriented development, and can lead to long-term savings for cities, who will be able to avoid some of the costs associated with congestion,

air pollution, and maintaining more extensive transport infrastructure.

The current COVID-19 pandemic has highlighted the often inequitable use of public space between cars and pedestrians and cyclists. It has also offered opportunities for cities to rapidly implement short-term measures which are consistent with a long-term transformation towards less car-dependency. For example, in 2020, more than 194 cities across the world launched open streets programmes (prioritising pedestrians and cyclists over cars) and in Europe (Combs, 2020), cities quickly built 1,500 kilometres of bicycle lanes, allocating EUR 1.7 billion (USD 2 billion) towards the promotion of cycling (European Cyclists’ Federation, 2020).

Ongoing challenges and proposed solutions:

1.a. Urban and spatial planning, transport planning, economic development, and social services are not designed and implemented in unison.

Transport planning traditionally focuses on the operation, provision, and management of transport infrastructure and services. However, transforming metropolitan areas to be less oriented around the use of cars requires an articulated and systemic long-term approach which includes socio-economic and land-use policies (See *Enabling condition 1 - Adopt a comprehensive and long-term strategy towards transport decarbonization which includes a focus on the underlying drivers of transport demand*).

Land-use planning and local financial incentives and regulations play a key role in enabling the shift towards less car-oriented development. These policies and regulations can help enable a diversification of activities (residential, commercial, places of employment and leisure, etc.) to exist in the same spatial radius. It is important that these policies take into account the diverse needs of different households and businesses, developing measures to make these activities affordable and accessible for all. This requires targeted social and economic policies such as developing relevant housing regulations to avoid unwanted relocation of low-income households or local financial incentives to facilitate the development of specific jobs and economic activities (Braeuninger et al., 2012).

Sustainable Urban Mobility Plans (SUMPs) are a tool that can help support this more systematic and integrated planning approach. SUMPs are strategic plans designed to satisfy the mobility needs of people and

businesses in cities and their surroundings for a better quality of life. SUMP's build on existing planning practices and take due consideration of integration, participation, and evaluation principles. SUMP's are based on the following principles: plan for sustainable mobility in the "functional urban area"; cooperate across institutional boundaries; involve citizens and stakeholders; assess current and future performance; define a long-term vision and a clear implementation plan; develop all transport modes in an integrated manner; arrange for monitoring and evaluation; and assure quality.

MobiliseYourCity has developed a SUMP toolkit to provide support to cities in the various phases of SUMP development and implementation. The EU also has developed a set of guidelines for defining and implementing SUMP's (Changing Transport, 2021; Rupprecht Consult, 2019) which can complement transport emission reduction strategies in NDCs.

1.b. Local competencies and resources are often insufficient to design and implement integrated planning.

Cities must have both the financial and human capacity to plan in a more integrated manner, which requires higher levels of communication and coordination between different city departments. Many major cities and economic centers have this financial capacity and should reallocate funding and restructure workflows towards more integration between transport planning, urban planning, and economic development. However, for many less economically-developed cities, including many mid-sized cities, national governments play an important role in allocating sufficient financing and human and technical resources to local governments to support more sustainable long-term planning. In large part, these resources exist today, but are being used on more carbon-intensive and less sustainable city organisation and modes of transport (See *Enabling condition 3 - Redirect international and national financing away from fossil fuels and towards more sustainable, low carbon transport options*).

Training is also needed to build human resource capacity for this more integrated approach to planning mobility in metropolitan areas. Capacity development activities for those working on urban and transport planning and economic development will be required and can support the use of existing tools, such as SUMP's.

2. Revamping supply chains towards more local and circular production and consumption ecosystems

Freight accounts for an estimated 40% of emissions from transport (2018) (SLOCAT, 2021), and current projections show global freight demand tripling by 2050 (ITF, 2019). With technological solutions such as zero-emission vessels, aircraft, and long-distance trucks still far from maturity, the revamping of global supply chains to support net zero development objectives must receive greater attention. This means moving towards a more local and circular production and consumption system -- from long and complex to shorter and simpler supply chains; the development of a less resource-intensive sharing economy combined with a reduce, reuse, and recycle production strategy; and focusing shipment and stock management strategies on ensuring efficiency by aggregating deliveries (which at times may require a delay in shipment times). This structural and systemic reorganisation could reduce unnecessary transport distances, facilitate the use of intermodal systems and shorter-haul electric trucks and cargo bikes in cities, and contribute to the transition towards a carbon neutral freight and logistics sector.

Companies, especially shippers and freight forwarders, are on the front line of this transformation. Momentum is growing, as 2020 saw increasing corporate commitments to supply chain sustainability following growing public pressure for companies to demonstrate greater environmental stewardship and social responsibility (Bateman et al., 2021). For example, Unilever has set a target to achieve carbon neutrality by 2039, which includes reaching zero emissions from transport in their product supply chains (Unilever, 2021).

The COVID-19 pandemic has also reinforced the need to increase supply chain resiliency, highlighting a number of structural economic transformations, such as the relocation of essential manufacturing activities closer to markets, which could accelerate progress towards more long-term equitable and carbon neutral supply chains. However, in order for this transformation to occur at scale, it will need to involve the multitude of stakeholders who impact supply chains -- including producers, distributors, and consumers.

Ongoing challenges and proposed solutions:

2.a. Most companies do not have clear long-term and systematic decarbonization strategies which look beyond improving business-as-usual operations.

Of the companies that have committed to carbon neutrality by mid-century, few have outlined the full set of structural and systemic transformations necessary to reach their vision. Most focus on improving the environmental impact of current business-as-usual (BAU) operations while necessary structural transformations, such as the reorganisation of supply chains, receive less attention. However, carbon neutrality by mid-century is currently not achievable by simply improving BAU operations and shifting towards more local and circular production and consumption is one of the key components of reducing global carbon emissions. This transformation will require profound changes in companies' business models, with significant impacts on their use of freight and logistics services.

Companies must therefore go beyond measuring and reporting CO₂ emissions, and focus on developing comprehensive and systematic strategies to reorient their business models towards carbon neutrality. Once companies have identified these strategies and pathways, it is important that they work closely with governments to ensure relevant policies and regulations are aligned with the changes necessary to reach carbon neutrality (*See Enabling condition 2 - Ensure the active engagement and effective cooperation of a broad range of stakeholders in transport decarbonization*).

2.b. Most companies are not providing transparent information on the carbon footprints of their supply chains.

The visibility and traceability of each component of a supply chain (from the procurement of raw materials, to where and how they are assembled, stocked, distributed, consumed, and disposed of) is essential for setting, implementing, and monitoring environmental and social goals. This information can help to identify the types of interventions and where along the supply chain they should be implemented in order to progress towards carbon neutrality.

Several companies have developed transparent and accessible tools to track the social and environmental impacts of the different components of their supply

chain. For example, for each of their products, Guerlain, a French cosmetics company, provides information on the location and environmental impact of the product's raw materials, packaging, production, transport, points of sale and recycling (Bee Respect: Guerlain, n.d.). These types of tools help respond to a growing demand from consumers and shareholders for more information on the environmental footprint of products to help inform their purchasing and investment decisions. Companies should therefore strive to provide this information for each step of their supply chains, and include the carbon footprint (and ideally, how it was calculated) on product labels. This is a critical first step to help identify concrete actions and build momentum towards achieving carbon neutral supply chains.

2.c. Production and transport costs do not reflect social and environmental externalities.

Because the true environmental and social costs of the production and distribution of goods are not reflected in their prices at a global level, there has been a large outsourcing of production to countries with less stringent social and environmental regulations, leading to longer travel distances to distribute goods (with higher associated emissions), and making local markets less competitive.

Production costs are an important driver for site location and the reorganisation of supply chains, especially for labour-intensive industries (Comerford and Spano, 2010) with limited margins. As companies have outsourced their production to countries with looser emissions constraints to reduce costs, this has led to carbon leakages and higher emissions along the supply chain. In order to implement more sustainable global development and ensure producer and consumer responsibility over the social and environmental impact of goods, countries or regions should consider developing importation tariffs and mechanisms which take into account these externalities and simultaneously support stronger standards in producing countries. For example, in efforts to avoid carbon leakages and take into account the full climate impact of goods, the European Union is currently proposing a Carbon Border Adjustment Mechanism (CBAM). The CBAM could apply to imports of goods at the price of carbon determined by the EU Emission Trading System through the system of auctions. Importers would either be charged on the basis of a default value or based on the actual emissions embedded in the imports (European Commission, 2020).

The cost of transport is another key driver in the organisation and operation of supply chains. Today, the price of transport does not reflect all of the social and environmental costs associated with its use, such as costs related to air pollution, crashes, GHG emissions, etc. (See *Enabling condition 3*). This has led to issues such as the recent expediting of delivery times in many markets. Because the environmental costs associated with reducing shipment times are largely not reflected in prices, consumers have been demanding faster delivery times in recent years. In order to make deliveries more efficient from an environmental perspective, the true costs of expedited deliveries must be more properly reflected in the price of goods.

3. Transitioning from fossil-fuel powered to zero-emission road vehicles

The transport sector remains 97% powered by fossil fuels and is the least diversified of all energy end-use sectors (IEA, 2018). Road transport is the biggest driver of global transport emissions, and is the most common mode of transport, fulfilling 78% of total transport demand (IEA, 2016). Within road transport, passenger vehicles account for approximately 60% of all energy consumption (2017) (IEA, 2021). The challenges of decarbonising road transport vary significantly between countries and regions. For example, second-hand vehicles are often exported from the Global North to countries in Africa, Central Asia, and Latin America. These vehicles are usually less efficient, have lower emission standards and lead to higher levels of pollution (UNEP, 2020). In North America and Europe, buyers' preferences are moving towards larger and larger vehicles, namely sport utility vehicles (SUVs), which were the second largest source of new CO₂ emissions globally between 2010 and 2018, after the power industry (Cozzi and Pretropoulos, 2019). The transition towards zero-emission road vehicles is an essential element in reaching carbon neutrality in the transport sector by mid-century, and electric technologies are seen as playing a major role in supporting this transition. Advances in battery technologies are currently reshaping the landscape, as plunging battery prices are making electric vehicles more affordable for many users, especially in the Global South. Lithium-ion battery pack prices have decreased 36% over the last five years, reaching 137\$/kWh on average in 2020 with

projections for further decreases to 62\$/kWh by 2030 (BloombergNEF, 2020). More-affordable batteries are facilitating the rapid scale-up of electric bicycles in Europe, North America, and South Asia, and of electric bus fleets in countries such as China, Chile, and Colombia. In addition, it is anticipated that internal combustion engine and battery-electric cars with approximately 250 kilometres of autonomy could reach price parity by 2025 (Lutsey and Nicholas, 2019).

These developments have helped lead to a global movement to end the production of internal combustion engines (ICEs). At least 19 countries, 11 cities and regions, and a number of automobile manufacturers have announced ICE phase-out commitments, with many targeting the year 2030 or 2035 (SLOCAT, 2020). For example, in November 2020, the government of the Canadian province of Québec announced plans to end the sale of new light-duty ICE vehicles by 2035 as part of its "2030 Plan for a Green Economy." The plan states that by 2035, 100% of new motor vehicle sales will be electric (or another form of zero-emission vehicle), and the sale of new fossil fuel-powered vehicles will be prohibited (Wappelhort, 2021). This year (2021), the automobile manufacturer General Motors also pledged to stop making gasoline-powered passenger cars, vans, and sport utility vehicles by 2035. The company has committed to investing USD 27 billion in electric vehicles and associated products between 2020 and 2025, including refurbishing factories and investing in battery production. As part of its plan, General Motors will manufacture roughly 30 different types of electric vehicles, and by 2025, 40% of the company's U.S. models will be battery-powered electric vehicles. It has also pledged to make its factories and other facilities carbon neutral by 2040 (Mufson, 2021).

On top of this technological progress, national fuel economy and emission standards for light- and heavy-duty vehicles have been increasing in numbers and ambition since 2015. For example, 30 countries have actively improved fuel economy-related policies since 2018, and nearly 80% of all light-duty vehicles sold as of 2017 are subject to such regulations (Yang and Bandivadekar, 2017; IEA, 2019). Local governments are also taking measures to restrict the use of cars in cities. Several cities have introduced low-emission zones (LEZs), which are specific areas within cities where access by some polluting vehicles is restricted

or banned. LEZs have proven to reduce vehicle emissions and yield measurable benefits in air quality. For example, in November 2018, Madrid, Spain implemented a LEZ, and within a month of its launch it had led to a 38% decrease in nitrogen dioxide concentrations and a 14% decrease in CO₂ emissions (Nelsen, 2019). The LEZ has also helped to avoid an estimated 3,000 premature deaths annually (Porter, 2018). LEZs should be combined with relevant urban and land-use policies and offer a greater focus on shared fleets in order to avoid simply leading to cleaner congestion (See Transformation 1: Re-developing metropolitan areas to be less car-dependent).

Ongoing challenges and proposed solutions:

3.a. Fuel economy and emission standards are still not ambitious enough to support the shift to zero-emission fleets.

While fuel economy and emissions standards for road vehicles are steadily improving, they are still not sufficient to drive the level of innovation necessary to drastically decarbonise the sector. In many countries, standards only enable a reduction of fossil-fuel consumption per vehicle, which is often offset by an overall increase in demand. Improved national fuel economy and emission standards for new vehicles are critical, and these regulations should be better aligned at the global level. Other policies can also support this shift, such as limiting imports of polluting second-hand vehicles to the Global South. This is seen in recent commitments from 18 countries in Africa, Asia, and Latin America (UNEP, 2020). Zimbabwe, for example, has recently banned the importation of vehicles more than ten years old (Xinhua, 2021).

3.b. The transition to zero-emission road vehicles could be delayed if governments don't provide targeted support to those most impacted by the transition.

Strategies to transition to zero-emission fleets require the inclusion of all stakeholders central to the process, including the automobile industry, service operators, and vehicle users. For example, depending on the relative importance and technological choices of the national automobile industry, the transition to electric vehicles could represent a direct threat to their current activities. National plans to support the de-

velopment of electric vehicles and their components should therefore be developed in close cooperation with the automobile industry to identify effective regulatory and financial incentives to shift production. Another example concerns the transition of paratransit or "informal transport" fleets, including mini-buses and vans in rapidly urbanising cities throughout Africa, Asia and Latin America. Paratransit is a major global supplier of transport, but operations often rely on privately owned, second-hand vehicles for hire, which can result in highly-polluting and poorly maintained vehicles. Governments should work in cooperation with vehicle owners to establish adapted regulations and incentives to address the renewal of fleets while ensuring that these vital mobility services continue to be provided for a large segment of the global population (SLOCAT, 2021).

Finally, citizens need transport to access essential goods, activities, and services, and in many countries, low-income households rely on the use of older fossil-fuel powered private vehicles. Pricing reforms and incentives to support citizens to transition to lower-emission vehicles must therefore be developed carefully, with a deep understanding of how these policies will affect different socio-economic classes living in locations where collective transport may or may not be accessible. This will be essential to avoid mass social protests, such as those that occurred in Ecuador in 2019, when the government attempted to quickly remove subsidies on fossil fuels (Monahan, 2019). One of the main challenges to pricing reform is ensuring that viable alternatives are in place which are financially accessible to citizens and companies. Countries must focus on developing these alternatives and structure stakeholder dialogues to identify the best solutions (See *Enabling condition 2 – Ensure the active engagement and effective cooperation of a broad range of stakeholders in transport decarbonization*).

3.c. Technical challenges remain for the future of zero-emission long-distance trips.

Battery-electric vehicles using the most commercialised lithium-ion battery technologies currently face limitations in terms of weight and battery capacity, and charging infrastructure is not yet well-developed in most countries. As a result, long-distance trips remain a technological challenge for electric vehicles.

Currently, the most popular alternatives to fossil fuel powered vehicles for long-distance trips are hybrid vehicles (gasoline and electric) or internal combustion engines powered by liquid or gaseous biofuels. However, biofuel development is not a viable or sustainable long-term solution for road transport, as it creates additional challenges and pressures on the agriculture, forestry, and land-use sectors, in direct competition with objectives to protect biodiversity and ensure global food security (Deprez et al., 2019). Other fuel technologies for long-distance use are under development in the first stages of commercialisation, such as hydrogen-powered vehicles. The development of hydrogen production and distribution from non-fossil fuel energy, however, remains a key challenge which requires additional research and investment.

In addition to these “fuel shift” solutions, reducing the length of both freight and passenger trips and incentivising modal shifts in long-distance travel towards shared and collective mobility and mass-freight will also be key to reaching zero emissions in the transport sector.

4. Employing a multifaceted approach to reduce emissions from aviation

In the past decade, a surge in global demand for air travel and the rapid movement of goods has led to double-digit growth in aviation emissions (Topham, 2019). Aviation currently emits an estimated one 1 gigatonne of CO₂ emissions annually, and is one of the fastest-growing and most difficult transport modes to decarbonise from a technological standpoint (IEA, 2020). Implementation of effective strategies to reduce aviation emissions will therefore be critical to achieving zero emissions in the transport sector in the coming decades.

Some technological progress has been made to reduce energy consumption in aviation (IEA, 2020), but it has not been sufficient to counter an overall increase in demand. Challenges remain as advanced low-carbon fuel technologies are not yet mature enough to be developed at scale and alternative low-carbon engine technologies for aircraft are complex and virtually nonexistent.

At the international level, targets were adopted in 2009 by the International Air Transport Association

(IATA) - a trade association of the world’s airlines, to mitigate CO₂ emissions from aviation including a cap on net CO₂ emissions from 2020 (carbon-neutral growth) and a reduction in net aviation CO₂ emissions of 50% by 2050, relative to 2005 levels (IATA, n.d.; A4A, 2021). In 2016, the International Civil Aviation Organization (ICAO), an intergovernmental organisation, adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to support this target. CORSIA is a market-based mechanism in which airlines will have to buy emissions reduction offsets from other sectors if they are not able to reduce their own emissions above 2020 levels (ICAO, 2021).

In addition, a number of major airlines have adopted new policies towards decarbonization in recent years for both national and international trips. For example, in early 2020, US airline Delta committed USD 1 billion over 10 years to mitigate emissions through strategies such as fleet renewal, biofuels and carbon offsets, although it later reduced its offset targets due to the impacts of the COVID-19 pandemic. Starting in November 2019, UK carrier easyJet pledged to purchase carbon offsets to equal the fuel used on all flights in its network (Kollmeyer, 2019). The same year, Lufthansa and Swiss International Air Lines began offering passengers the option to reduce their carbon footprints by selecting sustainable aviation fuel when booking flights (Holger, 2019).

However, it is important to note that there are significant risks associated with an over-reliance on carbon offsets in aviation decarbonization strategies. As carbon offsets do not amount to real emission reductions from aviation, relying on such mechanisms will not support reaching carbon neutrality by mid-century, as highlighted by many non-governmental organisations (Timperley, 2019). The potential environmental benefits of offsets are limited and will not be sufficient if each sector depends on them to achieve carbon neutrality.

Civil society movements have also emerged in recent years as a reaction to the failure of current measures to achieve meaningful emission reductions. For example, in Sweden, the “flygskam” (Swedish for “flight-shame”) movement led to seven consecutive months of reductions in the number of air travel passengers, resulting in a 4% annual decrease in Swedish air travel in 2019 (Hervey-Bathurst, 2019).

Ongoing challenges and proposed solutions:

4.a. International transport emissions are not accounted for in national emission reporting, resulting in insufficient ambition to decarbonise aviation.

Although aviation emission reduction targets have been set at the international level, in order for meaningful progress to be made towards their achievement, governments must adopt the same (or more ambitious) targets at the national level. This can serve to both raise global ambition to decarbonise aviation and ensure that policies and actions are being implemented at the national level that are consistent with global targets.

To help ensure that national governments are adopting ambitious aviation decarbonization targets, international aviation emissions should be calculated as part of countries' national GHG inventories. For example, in 2019, the United Kingdom decided to include international aviation emissions in their whole-economy net-zero target for 2050, which will help support the implementation of international targets through direct national actions (Lord Deben, 2019).

4.b. Current technical solutions are not sufficient to keep up with growing demand.

The aviation sector faces several substantial technological barriers to decarbonization. First, the high initial investment costs for aircraft as well as their long life spans (roughly 40 years) pose significant challenges for fleet renewal. As electric mobility has limited potential in aviation except for light, small, and short-distance aircraft, most current developments and investments are related to biofuels, while existing engines continue to be powered by liquid fossil fuels. ICAO estimates that the need for liquid fuels could reach 400 million tonnes by 2050 (compared to 160 million tonnes in 2015), if demand stays on its current growth trajectory (ICAO, n.d.). In this scenario, sustainable aviation fuels (SAFs) will play an important role in meeting this demand for liquid fuels. SAFs should be made of advanced biofuels from agriculture and forestry residues, organic waste or non-food and non-feed energy crops to limit the impact on biodiversity and other essential land use for agriculture and human settlement (IRENA, 2016).

Growing demand for aviation will require unprecedented capital investments in advanced liquid biofuel

production infrastructure and could lead to consequences continue to incentivise and accelerate investments in this area.

It is important to note that the advancement of the use of SAFs can reduce but not eliminate airline emissions. Indeed, beyond the emissions emitted from SAF production, flying contributes to the radiative forcing of climate, and could therefore have a two to three times higher climate impact (Lee et al., 2009; Lee et al., 2021; Bannon, 2018; Ritchie, 2020).

4.c. Current incentives to manage aviation demand and support the shift towards alternative transport modes have not been sufficiently developed and integrated.

Managing demand for aviation is a crucial and under-addressed topic. One way to help manage demand is by better integrating the socio-environmental costs of aviation into travel prices (See *Enabling condition 3*). The challenge is to integrate these prices in a fair way which does not result in increasing inequalities. Europe is leading the way in raising airline taxes to help manage demand. The EU's Green Deal, for example, creates a set of coordinated airline taxes that signal clear incentives to avoid unequal application of tax policies across national and corporate borders and in 2020, a consultation was launched to test the waters for a pan-European tax on jet fuel (European Commission, 2019; European Commission, 2002). Other pricing reforms have been taken in recent years. For example, in 2020, France introduced an aviation "eco tax" ranging from EUR 1.50-18 (USD 1.8-22) per ticket (FCC Aviation, 2019; Brandler, 2021). The parliament of Switzerland also approved a tax in 2020 on all departing flights, ranging from USD 33-133, depending on the class of travel and distance of the flight (Le News, 2020).

In addition, the development of transport alternatives for continental trips such as high-speed rail is necessary to shift demand and reduce emissions from aviation. Collaborative planning between aviation and rail systems (including high-speed and overnight rail services) can help drive the use of these more energy-efficient modes for shorter trips and help meet greenhouse gas reduction targets. For example, in 2020, Sweden proposed launching sleeper train services to Belgium and Germany to reduce dependence on aviation and minimise travel impacts (Duxbury, 2020), and in France, revenues from the country's eco-tax on flights will be

spent on boosting domestic train services. Additional investments in rail infrastructure coupled with incentives to shift demand from short- and medium-haul aviation activity are still widely needed.

ENABLING CONDITIONS FOR THE TRANSFORMATION TOWARDS ZERO-EMISSION TRANSPORT

To enable the comprehensive and structural changes required to transform the transport sector and put it on a pathway towards carbon neutrality, the overall approach to decarbonization will need to be more focused on understanding and influencing transport demand, finding effective ways to involve the broad range of stakeholders who influence travel behaviour and policies, and redirecting financing away from fossil fuels and towards more sustainable, low carbon options.

Enabling condition 1 - Adopt a comprehensive and long-term strategy towards transport decarbonization which includes a focus on the underlying drivers of transport demand

Transport decarbonization measures are often categorised into three different types: *avoid* (avoiding and reducing unnecessary transport demand), *shift* (shifting to less carbon-intensive transport modes) and *improve* (improving vehicle and fuel efficiency) (GIZ, 2019).

The current discourse on transport decarbonization focuses largely on *improve* measures, such as improving fuel economy and electrifying vehicles. This is apparent in the transport content of countries' Nationally Determined Contributions (NDCs). Most countries focus strongly on *improve* measures (52% of all measures), with *shift* and *avoid* measures account for 38% and 10% of all transport measures in NDCs (SLOCAT, 2020).

While *improve* measures are an important component of transport decarbonization, they are simply not sufficient to reach the goals of the Paris Agreement or 2030 Agenda for Sustainable Development. This reveals that countries need to develop more comprehensive and long-term strategies (LTS) by 2050 to ensure that short-term actions and NDC objectives are consistent with reaching carbon neutrality and socio-economic development goals by mid-century.

Such approaches will therefore facilitate the integration of more long-term and systemic *avoid* and *shift* measures, which could contribute to 40-60% reductions in total transport emissions (Bergk et al., 2016). To make more progress on *avoid* and *shift* measures, it is important for policymakers to understand that the demand for transport is a derived demand, meaning that people and companies use transport in order to access other goods, services or markets - and don't use transport services for their own sake. This understanding highlights the importance of a number of decisions and underlying determinants that influence transport demand, but which are not often considered within the scope of transport planning. These include supply chain and service models, socio-economic characteristics of households, urban and rural land use and development patterns, internet access, pricing and other fiscal decisions for example, that can all have a substantial impact on transport demand and behaviour, and consequently on modal choices and technology uptake (Briand et al., 2018). For example, if a government is trying to implement a modal *shift* from private car use to public transport, the strategy should not rely only on infrastructure and service development. It should also integrate targeted actions aimed towards specific household categories, distinguished by income or location, and specific types of trips, distinguished by purpose, distance or time.

To accelerate progress, transport decarbonization strategies should therefore adopt comprehensive and long-term perspectives to go beyond *improve* measures and focus more on *avoid* and *shift* measures which consider on the above determinants of travel demand and behavior (Briand and Waisman, 2019).

Enabling condition 2 – Ensure the active engagement and effective cooperation of a broad range of stakeholders in transport decarbonization

First, there is a clear need to reinforce the high-level political engagement of governments towards transport decarbonization. The design and implementation of the comprehensive policy packages needed for transport deep decarbonization requires strengthening the coordination between environment and transport ministries, which still often work in silos at the national level. Also, the enhancement of international coop-

eration on transport decarbonization requires stronger engagement of transport ministers in international climate processes. This would facilitate the sharing of best practices, the pooling of resources to accelerate innovation and the alignment of actions by different countries, which are all widely acknowledged as key enablers for ambitious climate action.

However, the transformation of transport is not limited to the actions of ministries and must include the participation of a large number of stakeholders from different sectors and segments of society -- far beyond the governments, planners, engineers, and companies who are traditionally seen as having the largest impact on transport. For example, as mentioned in Enabling condition 1, mobility patterns, which are key drivers of transport emissions, depend largely on the spatial organisation of human activities, which in turn result from decisions of multiple actors, including employers, schools, retailers, local businesses, entertainment venues, and medical facilities (among many others). Therefore, at the national level, those leading transport decarbonization efforts should review the structure of decision-making processes to ensure that the active engagement and effective cooperation of this diverse set of stakeholders. In parallel, at the global level, multi-stakeholder, which bring together national transport and climate ministers, international companies, scientists, and non-governmental organisations, among others, should be further developed to better align actions towards transport decarbonization. Some initiatives, such as the Transport Decarbonization Alliance (TDA), which brings together cities, countries, and companies working to achieve a net-zero emission mobility system by 2050, are helping to build capacity by sharing best practices and cooperation by developing articulated action plans. More initiatives like this will be needed to help accelerate action.

Enabling condition 3 – Redirect international and national financing away from fossil fuels and towards more sustainable, low carbon transport

Achieving low carbon transport pathways will require substantial investments on the order of USD 2.7 trillion per year through 2030, with 60-70% of these investments in emerging economies (OECD, 2017). These resources already exist today but are neither

distributed fairly among countries nor directed towards sectoral transformations compatible with carbon neutrality. For example, two-thirds of infrastructure investments from the 50 largest economies (USD 586 billion) went to support road transport infrastructure, such as highways, in 2015 (Oxford Economics, 2017). While the development of highway infrastructure is not necessarily incompatible with achieving carbon neutrality, most of these investments are not being made as part of comprehensive strategies to reduce transport emissions, and are in fact leading to increases in emissions. COVID-19 recovery spending is also not supporting decarbonization of the sector. Only around a third of all transport investments in COVID-19 recovery packages are going to support clean transport, with the majority going to fossil fuel-focused investments (Climate Action Tracker, 2020).

In addition, current economic incentives, such as fossil fuel subsidies, since the Paris Agreement was adopted in 2015, G20 member countries have spent more than USD 3.3 trillion in subsidies for coal, oil, gas, and fossil-fuel power (BloombergNEF, 2021). With more efficient fuel prices, the IMF estimates that 28% of global CO₂ emissions and 46% of air pollution deaths could be avoided annually, increasing tax revenues by 3.8% and adding economic benefits worth 1.7% of global GDP (Coady et al., 2019).

The use of fossil fuel-powered road vehicles, for example, requires significant infrastructure investments and results in road crashes, air pollution, and congestion, which costs society billions of dollars. In the European Union, for example, it is estimated that private road freight operators only pay for 26% of the total costs associated with their operation (Schroten et al., 2019). Efforts should therefore be made to better integrate the cost of these externalities in user fees, this could be done using measures such as road tolls, parking fees, and congestion pricing. For example, the London congestion charge discourages some drivers from entering London - but the massive revenue stream it has generated has enabled the transformation of public transport services and urban space for the benefit of all (C40 Cities Climate Leadership Group, 2019). These types of measures will be critical to redirecting investments towards more sustainable, low carbon transport.

With such large investment needs, national and international transport stakeholders should work together to better align financial flows with actions and investments identified in long-term low-emission and resilient development pathways (OECD et al., 2018). Such pathways could be a useful tool to structure intersectoral dialogues around transport decarbon-

ization (Waisman et al., 2021). For example, at the international level, climate and transport dialogues (as discussed in *Enabling condition 2*) could focus on the development of international and regional transport pathways compatible with carbon neutrality, with the aim of redirecting international financial flows towards the achievement of these pathways.

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The DDP is an initiative of the Institute for Sustainable Development and International Relations (IDDRI). It aims to demonstrate how countries can transform their economies by 2050 to achieve global net zero emissions and national development priorities, consistently with the Paris Agreement.. The DDP initiative is a collaboration of leading research teams currently covering 36 countries. It originated as the Deep Decarbonization Pathways Project (DDPP), which analysed the deep decarbonization of energy systems in 16 countries prior to COP21 (deepdecarbonization.org). Analyses are carried out at the national scale, by national research teams. These analyses adopt a long-term time horizon to 2050 to reveal the necessary short-term conditions and actions to reach carbon neutrality in national contexts. They help governments and non-state actors make choices and contribute to in-country expertise and international scientific knowledge. The aim is to help governments and non-state actors make choices that put economies and societies on track to reach a carbon neutral world by the second half of the century. Finally, national research teams openly share their methods, modelling tools, data and the results of their analyses to share knowledge between partners in a very collaborative manner and to facilitate engagement with sectoral experts and decision-makers.

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The Institute for Sustainable Development and International Relations (IDDRI) is an independent, not-for-profit policy research institute based in Paris. Its objective is to identify the conditions and propose tools to put sustainable development at the heart of international relations and public and private policies. IDDRI is also a multi-stakeholder dialogue platform and supports stakeholders in global governance debates on the major issues of common interest, such as actions to mitigate climate change, protect biodiversity, strengthen food security, and to manage urbanisation. The institute also participates in work to build development trajectories that are compatible with national priorities and the sustainable development goals.

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