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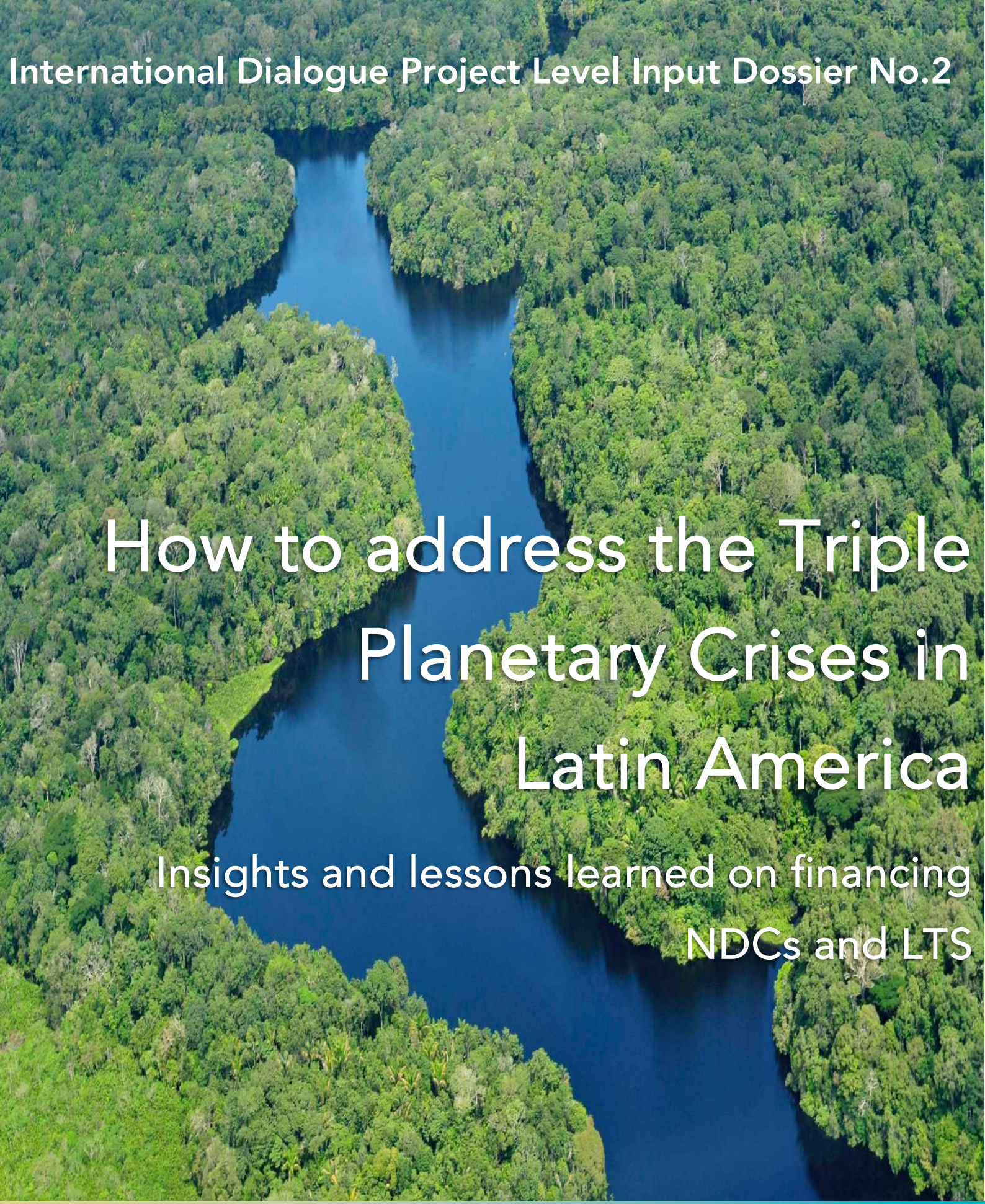

How to address the Triple Planetary Crises in Latin America

Insights and lessons learned on financing NDCs and LTS

August 2023

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DecarBOOST, or by its formal name "Deep Decarbonisation in Latin America: Enabling conditions for Investment in the Transition to a low-carbon society in Latin American countries", is a three-year programme focused on interventions to support Argentina, Brazil and Peru to catalyse their transition to becoming low-carbon societies, promote investments consistent with resilient, low-carbon development, and contribute to the development of the next generation of Nationally Determined Contributions and the global stocktaking process as part of the Paris Agreement ambition mechanism.

DecarBOOST is part of the International Climate Initiative (IKI), which has been located at the German Federal Ministry for Economic Affairs and Climate Action (BMWK) since 2022. The funding programme is implemented jointly with the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the German Federal Foreign Office (AA). BMWK is the entity responsible for the programme. Funding for the programme is gratefully acknowledged.

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Authorship and Review

Authors: Max Horstink, SouthSouthNorth, max@southsouthnorth.org; **Hernan Carlino**, FTDT, hcarl@itdt.edu;
Review: Lukas Kahlen, NewClimate Institute, l.kahlen@newclimate.org

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Methodology

Desk analysis of existing programme outputs
Desk research and analysis
Multiple in-country consultations, semi-structured interviews, and formal stakeholder dialogues conducted by country teams online and in-person
Feedback on the content from country teams and implementing partners

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Preamble

The DecarBOOST programme was executed over three years from March 2020 to February 2023. It aimed to support three Latin American countries—Argentina, Brazil and Peru—in catalysing the transition to a low carbon society and in promoting investments oriented towards, and consistent with, resilient and low carbon development. The objectives of the programme were to provide evidence and proposals to influence policy reform and work to improve the conditions for redirecting financial flows towards low carbon and climate resilient development pathways. Specifically, the programme carried out in-depth sectoral analyses (Argentina and Brazil) and research on Green Economic Recovery options (Peru) to support the public policy reform process, the development of innovative or tailored financial instruments and the creation of investment portfolios to facilitate effective implementation of the Nationally Determined Contribution (NDCs) in line with the objectives of the Paris Agreement.

This is the second of two reports that cover insights from ongoing research undertaken within the DecarBOOST programme. The first edition discussed how the Latin American region is advancing on the governance, policy and institutional fronts, and how these efforts can help secure the basis for continued climate progress (DecarBOOST 2022a). It explored the status of climate planning in the three target countries, and provided preliminary country lessons as well as an outlook for the region based on research and stakeholder dialogue processes undertaken as part of the programme. Governments in the region are strengthening their institutional capacities and are increasingly focusing on mobilising private capital to finance climate-related projects. This includes developing policies and frameworks that enable private sector investment associated with enhancing climate finance. We also assessed the role of Long-Term (Climate) Strategies (LTS), and provided insights on how the region could take advantage of the Glasgow Climate Pact agreements and the associated international voluntary pledges and initiatives launched around COP26 in Glasgow.

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Abbreviations

AFOLU	Agriculture, forestry, and other land use
AML	Metropolitan Area of Lima
BNDES	National Bank for Economic and Social Development (Brazil)
CAF	Corporación Andina de Fomento
CAT	Climate Action Tracker
CBD	Convention on Biological Diversity
CBDR	Common But Differentiated Responsibilities
CE	Circular economy
CEBRI	Brazilian Center for International Relations
CGRi	Circularity Gap Reporting Initiative
CIEL	Center for International Environmental Law
REC	Circular Economy Route
CO_2	Carbon dioxide
CoP	Community of Practice
COP	Council of Parties
COVID-19	Coronavirus disease 2019
CPI	Climate Policy Initiative
DFI	Development Finance Institution
E3G	Third Generation Environmentalism
ECLAC	Economic Commission for Latin America and the Caribbean
FTDT	Fundación Torcuato Di Tella, Argentina
G7	Group of Seven
G20	Group of Twenty
GDP	Gross Domestic Product
GFANZ	Glasgow Financial Alliance for Net Zero

GHG	Greenhouse gas
GBF	Global Biodiversity Framework
GST1	(First) Global Stocktake
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
ILO	International Labour Organization
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPG	International Partners Group
IUCN	International Union for Conservation of Nature
JET IP	Just Energy Transition Investment Plan
JETP	Just Energy Transition Partnership
LAC	Latin America countries
LEDS	Low Carbon Emissions Development Strategy
LTS	Long term (climate) strategy/ies
LULUCF	Land use, land-use change, and forestry
MCTI	Ministry of Science, Technology and Innovation (Brazil)
MDB	Multinational Development Bank
MERESE	Mechanism for Retribution for Ecosystem Services
Mt CO_2 eq.	Million tonnes of carbon dioxide equivalent
NbS	Nature-based systems/solutions
NCI	New Climate Institute
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Co-operation and Development
PCAF	Partnership for Carbon Accounting Financials
PNCP	National Competitiveness and Productivity Policy/Plan (Peru)
SDG	Sustainable Development Goals

SSN	SouthSouthNorth
TNFD	Taskforce on Nature-related Financial Disclosure
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEPFI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
WEF	World Economic Forum
WHO	World Health Organisation
WWF	World Wide Fund for Nature

About the International Dialogue Project Level Input Dossier series

The objective of the International Dialogue Project-Level Input Dossiers is to share key Latin American country (LAC) lessons and insights from the DecarBOOST programme related to financing the enhanced Nationally Determined Contributions and Long-Term Strategies that are in line with Paris Agreement-compatible pathways, and to add value to international dialogues through supporting peer-learning and knowledge exchange among countries in the region, and internationally.

The report incorporates findings from the LAC region and focuses predominantly on Argentina, Brazil, and Peru, the target countries of the DecarBOOST programme. Analysis is mostly conducted for these three countries, but findings from the broader LAC region help to provide context and highlight successes for low- and zero-emissions developments.

The series provide insights from the research undertaken by the DecarBOOST programme on policy development, investment opportunities, and Sector Investment Plans.

This final edition of two reports provides analysis and insights on further opportunities related to climate finance for the LAC region.

1 Introduction

The Intergovernmental Panel on Climate Change (IPCC) Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels suggests that to meet the Paris Agreement's temperature goals, and to avoid the worst climate impacts, the world will need global carbon dioxide (CO_2) emissions to drop by almost half by 2030 and reach net-zero by 2050; and all other greenhouse gas (GHG) emissions by no later than 2070 (IPCC. 2018). Considering the short timeframes, the urgency, the magnitude of the challenge and inadequate progress to date, this requires a radical, low-carbon, systemic transformation of the global economy, and the financial system in particular (UN. 2023a; UNEP. 2022a; IPCC. 2018). The provision of, and access to, climate finance therefore becomes a central cross-cutting issue through all sectors and subsectors of any economy.

The urgent need to address the impacts of climate change, coupled with global commitments and the increasing awareness of the insufficiency of financial resources to address investment needs, has led to a growing recognition of the importance of climate finance among governments and the international climate community. In addition, the last decade or so has seen the climate change mitigation and adaptation processes move gradually from planning to implementation, highlighting the challenges to finance those efforts. Financing countries´ NDCs in the short-, medium- and long-term is a key challenge that needs improved coordination if it is to be mainstreamed in the economies of the developing world. The implementation of the Paris Agreement is not only threatened by a significant finance shortfall but also by knowledge and capacity constraints with respect to climate finance in the financial sector in developing countries (SouthSouthNorth. 2019).

The amount of global climate finance required by 2030 and 2050 to achieve the goals of the Paris Agreement varies depending on the source and the assumptions used. In general, however, the estimates all point to annual investment needs of at least trillions of US dollars (USD). The IPCC estimated that annual supply-side energy-system investments of USD 3.5 trillion *on average* would be required between 2016 and 2050 to keep global warming below 1.5°C above pre-industrial levels, or USD 3.0 trillion for 2°C pathways (IPCC. 2018). The International Energy Agency (IEA) estimated that annual investment in clean energy alone needs to increase to triple to USD 4 trillion by 2030 to achieve net-zero emissions by 2050 (IEA. 2021)[1]. UNEP estimates that annual adaptation flows alone are 5-10 times below developing countries' needs, which will range between USD 160 billion—USD 340 billion by 2030, and USD 315 billion—USD 565 billion by 2050 (UNEP. 2022b).

Meanwhile, these estimated needs stand in stark contrast to current global climate finance flows. Although global climate finance almost doubled in the last decade, the Climate Policy Initiative estimated that total global annual climate finance flows (which includes public, private, and international sources of finance) in 2019/2020 reached USD 653 billion on average, which was 15% higher than in 2017/18 (CPI.

[1] It is important to note that estimates of the required amount of climate finance can vary significantly depending on the assumptions made, such as the level of ambition of climate goals, the pace of technological development, and the level of cooperation and coordination at the international level.

2022), and 43% higher than in 2015/2016. At the same time, the IEA expects clean energy investment to exceed USD 1.4 trillion in 2022 (IEA. 2022). This shows the anticipated finance gap, although varying depending on the source, is large and only tends to be gradually decreasing [2].

CPI data also shows that private sector investment is increasing, but not at the scale and speed necessary for the required transition. The growth rate of private climate finance was slower (4.8%) than that of the public sector (9.1%), even though there is enough excess liquidity in global financial markets with around USD 200 trillion held by investors in 2020 (CPI. 2022).

Equally important as green investment, is the need for divestment from carbon-intensive activities and fossil fuel subsidies. The IEA estimates that, even if annual clean energy investment is currently rising faster than investment in fossil fuels, over USD 1 trillion is going to be invested in unabated fossil fuel supply and power in 2023, of which around 15% will be allocated to coal and the remainder to oil and gas (IEA. 2023a). Furthermore, fossil fuel subsidies analysed in 51 countries worldwide show this type of public support almost doubled to USD 697.2 billion in 2021, from 362.4 USD billion a year earlier, which can be attributed to rising energy prices associated with the recovery of the global economy (OECD. 2022a). To reach the objective of the energy transition by 2050 requires specifically discouraging public budget allocations and private investments related to climate-incompatible activities, by setting goals for the speed of divestment to avoid carbon-lock in, and by rapidly phasing out fossil fuel subsidies.

Lastly, under the Common but Differentiated Responsibilities (CBDR) principle, rich countries are required to provide and mobilise climate finance for climate action in developing countries. As discussed in the first edition of this report series, the provision of international finance to achieve more ambitious mitigation and adaptation objectives remains insufficient both in terms of the commitments made, and the effective disbursement of those promises (DecarBOOST 2022a). The Copenhagen pledges made by wealthy countries in 2009 to deliver USD 100 billion per year to developing countries by 2020 have so far not been met.

1.1 The Triple Planetary Crises

The United Nations Environment Programme (UNEP) recognises that the world faces a triple planetary crisis on climate change, nature and biodiversity loss, as well as regarding pollution and waste (UNEPFI. 2023a). After three decades of climate action and policy development, GHG emissions are still persistently on the rise. Current climate commitments globally are even estimated to lead to around 2.7°C global warming above pre-industrial levels in the most optimistic case (Climate Action Tracker. 2022). A third of the world's land is severely degraded, deforestation continues at an alarming rate, and we are heading towards the 6th mass extinction with up to 1 million species threatened (WEF. 2020a). Plastic litter is rapidly posing a blanket of pollution around the globe, while being expected to double by 2030, thereby presenting one of the greatest risks to the wellbeing of the planet (UNEP. 2021b). More

[2] Estimating the current climate finance flows per year is a complex task as different definitions and methodologies are used by various sources.

than half of the world's gross domestic product (GDP) is put in jeopardy by this loss of nature and biodiversity (WEF. 2020a).

These crises arise from a long history of continuous and unsustainable patterns of overconsumption and overproduction of the human economy, and the associated chemical and waste streams. The three crises are interconnected and reinforce each other, causing further damage to the environment and our health, while exacerbating inequality. Thus, they should be addressed in conjunction, rather than in silos (UNEP. 2021a). To address these interconnected challenges successfully, holistic and collaborative approaches are needed, including in raising the necessary finance.

In this report we assess how and to what extent LAC can take advantage of, and respond to, the triple planetary crises in an integrated manner, and how key global trends related to climate finance may spur decarbonisation and nature protection in the LAC region (Section 3). We share some key insights derived from the DecarBOOST programme research and stakeholder engagement processes in Section 2. Finally in Section 4 an outlook and a number of recommendations are provided for the region, including in light of the ongoing Global Stocktake process and international negotiations at COP28.

2 Financing Current and Enhanced NDCs: Lessons and Insights from the DecarBOOST programme

2.1 Regional setting

The DecarBOOST programme aims to improve the policy framework to support the financing of NDC implementation and LTS in Latin American countries. It is important to note the economic context of the region, affected the policy decision-making and pace of action, finance flows, and investment opportunities that are addressed in this project. LAC is the region with the greatest economic contraction in the world as a result of the COVID-19 pandemic. According to the Economic Commission for Latin America and the Caribbean (ECLAC), more than 2.7 million businesses closed, and more than 44 million people lost their jobs. GDP fell by 7.7% and investment contracted by 20%.

In addition to that economic impact, the region continues to be one of the most unequal in the world. Half of the region's working population is employed in the informal sector which was the most affected during the pandemic. Furthermore, the vulnerability of this population to climate change is expected to increase dramatically. For example, climate impacts such as heat waves are expected to cause 2.5 million job losses by 2030 (Saget, C., Vogt-Schilb, A. and Luu, T. 2020).

The emissions structure of the LAC region is quite different when compared with global emissions. The agriculture, forestry, and other land use (AFOLU) sector plays a major role in the region, whereas energy is the dominant source of GHG emissions at a global level. This is partly due to the power sector having a lower emissions intensity level in the LAC region thanks to vast hydropower resources (now threatened by climate change), and also to the important role of agriculture as the LAC region is one of the main exporters of agricultural commodities globally. In particular, the agroindustry and livestock sectors are major drivers of emissions, contributing to high levels of deforestation in some LAC countries (NewClimate Institute. 2021). While economic pressure to continue high carbon activities continues, it is important to highlight the transition risks associated with these investments, as well as noting the positive impacts of low-carbon development, such as the potential creation of 15 million net jobs by 2030 (NewClimate Institute. 2021).

Despite these challenges, there are also positive signs. Governments in the region are working on their institutional capacities and are increasingly focusing on mobilising private capital to finance climate-related projects. This includes developing policies, strategies, plans, and frameworks that enable private sector investment in climate finance.

The pace could be increased however. As of November 2022, globally over 140 countries had announced or were considering net-zero targets, covering 90% of global emissions (Climate Action Tracker. 2023). In the Latin America region, this includes five countries, namely Argentina, Brazil, Chile, Colombia, and Peru. However, only 62 countries globally have submitted LTS, including four in the LAC region, namely Argentina, Chile, Colombia, and Uruguay. Although they have not (yet) submitted an LTS, Brazil and Peru

have announced net-zero targets, and Peru is currently in the process of developing its LTS. In addition, countries such as Chile, Colombia, and Peru have developed National Climate Finance Strategies that provide the basis for a structured process to financing their NDCs and climate plans.

The DecarBOOST programme supported some of these processes in Argentina, Brazil, and Peru. All three countries have a medium-term climate goal, included in their respective updated NDCs; and in turn, they are working towards a net zero commitment for the year 2050. In the case of Argentina, the programme focused specifically on how to materialise the established net-zero commitment. The following section discusses the results and insights from these processes.

The first edition of the International Dialogue Input Dossier presented an overview of the Status of Climate Planning in the three Latin American target countries (DecarBOOST. 2022a).

2.1.1 Climate finance in Latin America

Zooming in on the LAC region, USD 36 billion of climate finance was spent in the region annually on average over 2019 and 2020, which is around 5.5% of total global climate finance flows. Of the total concentrated in LAC, 53% was raised domestically. Of the total international climate finance provided to the region, 14% was channelled through concessional funding (compared to an average of 16% globally). Concessional finance is an important part of climate finance as it can support developing countries that often face high per capita costs and elevated external indebtedness and therefore struggle to access affordable capital for climate action in a number of ways.

Redirecting investment flows towards climate action is critical for the region to achieve sustainable development over the medium- to long-term. LAC countries need to balance economic development and growth aspirations, equity considerations and poverty alleviation, as well as pressing infrastructure gaps on the one hand, with rising debt levels and finance deficiencies in a context of global economic slowdown, and increased action and risks related to climate change and the Sustainable Development Goals (SDGs) on the other.

At the same time, global macro-economic conditions have not been favourable over the last years, due to the effects of the COVID-19 pandemic and since 2022 the diverse macroeconomic spill-overs associated with the acute geopolitical tensions caused by the war in Ukraine, giving rise to significant economic effects, with impacts on production, trade, investment, inflation, commodity price instability, food prices and security, and fiscal space astringencies. In addition, there are geopolitical strains, related to clashes around technology dominance and global value chains, that increase conflicts in the international arena. These consequences of these circumstances are likely to be prolonged, and the full extent of their effects may not be known for some time.

Moreover, even before this geopolitical poly-crisis started, the world was facing a number of macro-economic aspects that suggested a deteriorating environment for climate finance, especially for middle- and low-income developing countries, including slowing and more unstable GDP growth, escalating capital costs, rising public fiscal costs of mitigation and adapting to rising climate shocks affecting numerous countries, concomitant with increasing scarcity of fiscal resources to address those financial needs of climate action, which negatively impact public indebtedness and country credit ratings, rising

financial and insurance sector credit risks, and stresses arising from the impacts of climate change,[3] as well as the effects of the sharply slowing global macroeconomic growth (IPCC. 2022).

2.2 Results and lessons learned

Between 2020 and 2023, the DecarBOOST programme carried out studies and interventions, and undertook participatory dialogue processes in order to understand the climate finance challenges faced by Argentina, Brazil and Peru in the transition to a low carbon society, to provide evidence thereto, and to propose solutions. In each of the focus countries, interventions centred on the development of policy proposals and financial instruments and mechanisms, designed to overcome the various barriers that currently hinder climate financing, and promote investments consistent with resilient, low-carbon development. Research also aimed to form an understanding of the challenges associated with the international financial system reform in order to comply with the needs of the socio-technical transition to reach net-zero by 2050. These interventions are to be incorporated into the decision-making processes of the countries in order to contribute to the development of the next generation of NDCs and the global stocktaking process as part of the Paris Agreement's ratcheting ambition mechanism.

2.2.1 Sectoral analysis and green economic recovery

The programme carried out in-depth sectoral analysis in Argentina and Brazil, and research on green economic recovery options in Peru, to support the public policy reform process and the development of financial instruments, mechanisms and approaches to advance the effective implementation of the NDCs. The programme has promoted and supported both national and subnational processes, and provided technical contributions to strategic country processes on climate change, including the LTS process and the international negotiation approaches in Argentina, the National Climate Finance Strategy in Peru and a Decarbonisation Strategy in Brazil. In addition, the DecarBOOST programme has developed sector investment plans and investment portfolios containing at least 20 investment opportunities for Argentina, Brazil, and Peru. The DecarBOOST *Series 2022* and *Series 2023* reports provide more detail on key project results and learnings of the programme (DecarBOOST. 2022b; DecarBOOST. 2023)[4].

One of these investment areas is green hydrogen, which is expected to play a key role in future net-zero energy systems, mostly in hard-to-abate sectors where short and mid-term electrification is not viable. Due to its abundant renewable resources, hydrogen has the potential to play a major role in the decarbonisation of the energy mix in the LAC region. To identify the most promising investment opportunities for the region, and specifically for the focus countries Argentina, Brazil and Peru, different

[3] Climate-related disasters around the world are increasing, and in the last year countries in the Global South, from Pakistan to Nigeria, have been particularly hard hit. This has enormous associated costs for vulnerable countries that already face economic challenges.

[4] The programme website https://DecarBOOST.com/en/ provides links to all key publications and project outputs.

hydrogen applications across the value chain were analysed in the DecarBOOST programme (NewClimate Institute. 2023).

Four key investment opportunities for green hydrogen employment were identified for the region:

1. Green steel production
2. Green hydrogen production through electrolysis
3. Green chemicals - methanol and ammonia, as well as fertilisers
4. Heavy-duty mining vehicles in remote locations

At the country level there is a need to develop a very exhaustive country strategy; in the case of Argentina, in particular, there is a strong emphasis in examining and developing the possibilities of expanding an industrial project associated with regional hubs as well as exploring the potential for international trade of hydrogen and its entire value chain.

2.2.2 Participatory dialogue processes

The participatory dialogue processes conducted during the programme have especially been instrumental in developing a common vision for the purpose and direction of the interventions, for outlining and prioritising the scope and breadth of the studies, in providing feedback to the proposals, in identifying low-carbon investment opportunities, plans, projects and tools, and for establishing the initiation of a regional community or practise. Collaborative actions were carried out between 204 specialists from 18 countries in the region to increase knowledge for the transition towards decarbonization and climate resilience. Besides organising continuous national stakeholder dialogues throughout the programme, in 2020, the DecarBOOST programme created a Community of Practice (CoP) in Investments and Climate, a regional space made up of stakeholders from different disciplines, sectors, and levels in mainly Argentina, Brazil and Peru, who work in the climate finance and investments space countries. Key actors included those from civil society, academia, private business, international cooperation, and governments. The purpose of the CoP was to promote collaborative work and inter-learning among the climate and investment communities, thereby increasing awareness of opportunities and actions in the region to strengthen the transition towards decarbonization and climate resilience. As part of the activities, an Annual Investment Forum was held for the duration of the programme.

A key learning point of the programme has been that all of the multidisciplinary, multisectoral and multilevel participatory processes mentioned highlighted the importance of regional cooperation and of diverse perspectives that allow better to understand the country—and actor—specific challenges and distinct approaches that may be taken. For instance, the interaction between the climate community and investment community professionals, the involvement of actors beyond the three countries targeted by the programme, and the coordination at the sub-national level, either with regional governments or with the private and financial sector, significantly supported the articulation and elaboration of proposals and interventions. The programme enhanced the understanding that collaboration at the regional scale is necessary, to improve comprehension of country challenges and synergies, in order to find both common as well as distinct country-specific solutions through this collaboration. This notion is born from the practice, experience and joint efforts of regional cooperation between countries that have similar problems including poverty, inequality, unstable development models, unbalanced societies and high vulnerability, as well as long-term sustainability deficits. Thus, the key learning following from this

experience is that it is critical to capture the intangible impacts of the programme, including the alliances and networks created, the (sub)-national and regional processes followed, the resulting lessons learned, so that they can feed into future processes.

The programme met with political challenges as well. In the federal political context of 2020-2022, it has been difficult in Brazil to move forward with climate action. As such, the DecarBOOST programme chose to support the strengthening of dialogue on decarbonisation within civil society, and regional and local governors, both through the generation of technical inputs and through process design. The new administration introduced in office in 2023 will provide an opportunity to involve the federal government as well and to strengthen the development of a regional perspective over the coming years.

2.2.3 Key lessons and insights

Some key lessons learned from programme implementation include (DecarBOOST. 2023):

- The reform of the financial system will favour the transformation necessary to achieve climate objectives, whether in the direction of mitigation, vulnerability reduction or strengthening the adaptive capacity of societies, natural systems and even assets productive.
- Preserving the integrity of the studies and reports, and the programme ecosystem will strengthen the application and adaptation of methodologies and good practices for replication, shortening processes and generating greater impact in the region.
- The composition of the programme partners from different countries and expertise is key to supporting regional transformations in an articulated and eclectic manner.
- Continuing with the development of financial instruments and risk reduction/transfer mechanisms (with the public sector), is necessary because developing countries do not currently have the conditions for the implementation of their NDCs.
- Strengthening and consolidating the Community of Practice in Investments and Climate will allow the involvement of the financial sector and allies in the Latin American region that implement projects with similar themes or that promote an increase in financing and climate investments.

Much work remains to be done, and the research and participatory processes need to continue and be expanded to other areas. A number of key global trends related to climate finance could be considered in that respect. These are presented in the next section.

3 Global Trends in Climate Finance and How They Affect Latin American Countries

The introduction presented the concept of a triple planetary crisis on climate change, nature and biodiversity loss, and pollution and waste. The 2015 Paris Agreement has provided a framework for action on climate change, the 2022 Kunming-Montreal Global Biodiversity Framework does the same for nature and biodiversity loss. Meanwhile, a global treaty on eliminating plastic pollution is currently under development. However, these have to date been negotiated and developed separately, and governments in general have not been able to put integrated approaches in place to develop policy and spur action.

In this section we discuss how current specific global trends and initiatives could support the process of addressing each of the three planetary crises in the Latin American region, and how these solutions are complementary and mutually reinforcing. We will assess how Latin American countries are responding to the triple crisis, namely with respect to climate finance issues, and provide insights on the way forward.

In the current report we will discuss how the following global trends and initiatives are impacting Latin America, with respect to climate change, nature and biodiversity loss, and pollution and waste.

3.1 Crisis 1: Climate Change

The current pace of addressing climate change, raising ambition, and increasing climate finance still does not align with the established urgency of a rapid transformation of our economies; however, it is gradually picking up, and there are significant trends that are laying the foundation for increased climate finance flows. In this section we discuss two recent trends that may impact climate finance flows in Latin America, namely Just Energy Transition Partnerships (JETPs), and climate litigation.

3.1.1 Just Energy Transition Partnerships

3.1.1.1 What are JETPs?

Climate finance initiatives are increasingly focused on addressing the needs of vulnerable populations and ensuring that climate benefits are distributed equitably. The concept of "just transition" refers to the effort of greening the economy in a way that is as fair, equitable and as inclusive as possible to everyone concerned (UNDP. 2022). Climate finance in support of a Just Transition is likely to be key to a successful low-carbon transition globally, and was explicitly recognised in the Paris Agreement and the 2018 Just Transition Declaration signed by 53 countries at COP24 (IPCC. 2022).

Against that backdrop, the JETP, a nascent climate finance arrangement to support a just transition for the energy sector, has garnered much attention, not least because of its massive scope and potential. It

is expected that, if carried out with care in accordance with country-specific predefined Just Transition principles, these initiatives can play a critical role in supporting developing countries to decarbonise their economies while ensuring social and environmental justice.

JETPs are innovative multilateral funding mechanisms, designed to support the phase out of fossil fuels, especially coal, in emerging economies, as part of a Just Transition. The momentum is there since in 2021 political leaders started to publicly discuss coal phase-out for the first time, with subsequently both the G7 (Financial Times. 2021) and G20 (New York Times. 2021)[5] agreeing to end international unabated thermal coal power generation finance, and the establishment of a global accord to phase down coal at COP26 that same year. Currently, there are a number of JETPs announced or under development, with the most advanced including South Africa, Indonesia and Vietnam. The G7 also announced discussions with coal-dependent India, and Senegal, last year (IISD. 2022).

The first ground-breaking JETP deal was made during COP26 between South Africa as implementing country on the one hand, and the governments of France, Germany, United Kingdom, United States, and the European Union, together constituting the International Partners Group (IPG), on the other. The vision and objectives of the JETP aim to "establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles amongst other interventions to support South Africa's shift towards a low carbon future."

South Africa is one of the most carbon-intensive developing economies in the world, depending on coal for 87% of its electricity (E3G. 2022), and at the same time also one of the most unequal countries in the world, faced with enormous socio-economic development challenges. The agreement provided that the IPG will mobilise an initial USD 8.5 billion between 2023 and 2027, subject to concurrence on an investment framework. Subsequently, a Just Energy Transition Investment Plan (JET IP) was developed over the course of 2022, and published during COP27. The JET IP was developed through a country-owned, country-led engagement process, which involved a series of technical working groups and stakeholder discussions with youth, labour, business, civil society, local government, and faith-based organisations. The JET IP considers how best the initial IPG offer of USD 8.5 billion may be utilised, and aims to leverage a much greater level of resources from both public– and, especially, private-sources, up to USD 98.7 billion (Presidency Republic of South Africa. 2022). Priority areas for the next five years include electricity (phase out of coal), electric vehicles and green hydrogen. The envisioned financing is categorised under infrastructure, planning and implementation capacity, economic diversification and innovation, and just transition interventions such as skills development, social investment and inclusion, aimed at protecting vulnerable workers and communities, especially coal miners, women and youth, who would be affected by the move away from coal.

[5] In 2017, G20 governments still financed at least USD 10 billion in overseas coal projects through their policy and development banks and export credit agencies (Boston University Global Development Policy Center. 2021).

In terms of sourcing finance, the JET IP targets, in addition to the IPG pledge, a wide range of public and private investors including multinational development banks (MDBs), South Africa's development finance institutions (DFIs) and local financial institutions and other private actors. Various funding instruments will be considered including grants, concessional loans, budgetary support, blended finance, thematic bond issuance, and market-related funding instruments including debt, risk-mitigation instruments, venture capital, and equity.

The second country that announced to launch a JETP was Indonesia. The JETP includes an ambitious pathway to reduce power sector emissions, a strategy based on the expansion of renewable energy, and the phase down of coal (UK Government. 2022a), and to shift the programmed power sector emissions peak forward by seven years to 2030, as well as its net-zero goal by 10 years to 2050. A total of USD 20 billion of initial funding has been committed, half of which through the public funds of the IPG, and half by private sector through the Glasgow Financial Alliance for Net Zero (GFANZ) Working Group[6]. Funding instruments include using a mix of grants, concessional loans, market-rate loans, guarantees, and private investments (The White House. 2022). The country is currently working on its Investment Plan which is expected to be published mid-2023.

The third country with which a JETP has been agreed, again through the IPG, is Vietnam, which is one of the 20 countries that are most affected by climate change. The JETP will support Vietnam in delivering an energy transition away from coal, accounting for 60% of the country's carbon emissions, and towards renewables (German Federal Ministry for Economic Cooperation and Development. 2022). The partnership will work to mobilise an initial USD 15.5 billion of finance over the next three to five years, coming from public and private sources. Half of this amount has been committed through the public funds of the IPG together with the Asian Development Bank and the International Finance Corporation, with a commitment to mobilise a matching USD 7.75 billion in private investment from an initial set of private financial institutions coordinated by the GFANZ[7] (UK Government. 2022b). The country is expected to complete its JETP Resource Mobilisation Plan this year.

Table 1 summarises these three case studies.

[6] Including Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG, and Standard Chartered Bank.

[7] Including Bank of America, Citi, Deutsche Bank, HSBC, Macquarie Group, Mizuho Financial Group, MUFG, Prudential PLC, Shinhan Financial Group, SMBC Group, Standard Chartered Bank.

Table 1: Three advanced JETP case studies

	South Africa	Indonesia	Vietnam
Amount committed	USD 8.5 billion	USD 20 billion	USD 15.5 billion
Amount needed	USD 98.7 billion	Unknown	Unknown
Potential sources of finance	Multilateral funds, Development Finance Institutions, private sector	50% public and 50% private. MDBs, and private financial institutions coordinated by the GFANZ, including Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG, and Standard Chartered	Public: IPG together with Asian Development Bank and International Finance Corporation. Private: GFANZ including Bank of America, Citi, Deutsche Bank, HSBC, Macquarie Group, Mizuho Financial Group, MUFG, Prudential PLC, Shinhan Financial Group, SMBC Group, Standard Chartered
Donors	IPG: France, Germany, the United Kingdom, the United States, and the European Union	IPG, co-led by the United States and Japan, and including Canada, Denmark, the European Union, France, Germany, Italy, Norway, United Kingdom	IPG: European Union, United Kingdom, United States, Japan, Germany, France, Italy, Canada, Denmark and Norway
Timeline Investment Plan	5 years	3-5 years	3-5 years
Financial instruments	Grants, concessional loans, budgetary support, blended finance, thematic bond issuance, market-related funding instruments (debt, equity, risk-sharing instruments, venture capital)	Mix of grants, concessional loans, market-rate loans, guarantees, and private investments. USD 1 billion World Bank guarantee (UK government)	Combination of appropriate financial instruments (which should not divert critical development assistance away from existing development funding)
Mitigation targets	Coal phase down; Just Transition interventions, power sector decarbonisation, economic diversification into future energy sectors e.g., EVs and green hydrogen	Coal phase down	Coal phase out
Co-benefits	Skills development, social investment and inclusion	Support economic growth, new skilled jobs, reduced pollution, and a resilient, prosperous future for Indonesians	Programmes of training and retraining, upskilling, job and local value chains creation and other forms of support for workers in the affected sectors and areas
Status	JETP Implementation Plan (JETP IP) developed and published.	JETP Implementation Plan (JETP IP) under construction (expected June 2023)	JETP Resource Mobilisation Plan under construction (expected 2023)

3.1.1.2 JETPs in Latin American countries

The current initiatives largely focus on coal phase-down; however, coal is not a significant source of energy in most Latin American countries (Figure 1). While some Latin American countries have coal reserves, they are generally not large enough to support a significant coal industry, and coal-based power generation is not common in the region compared to other continents.

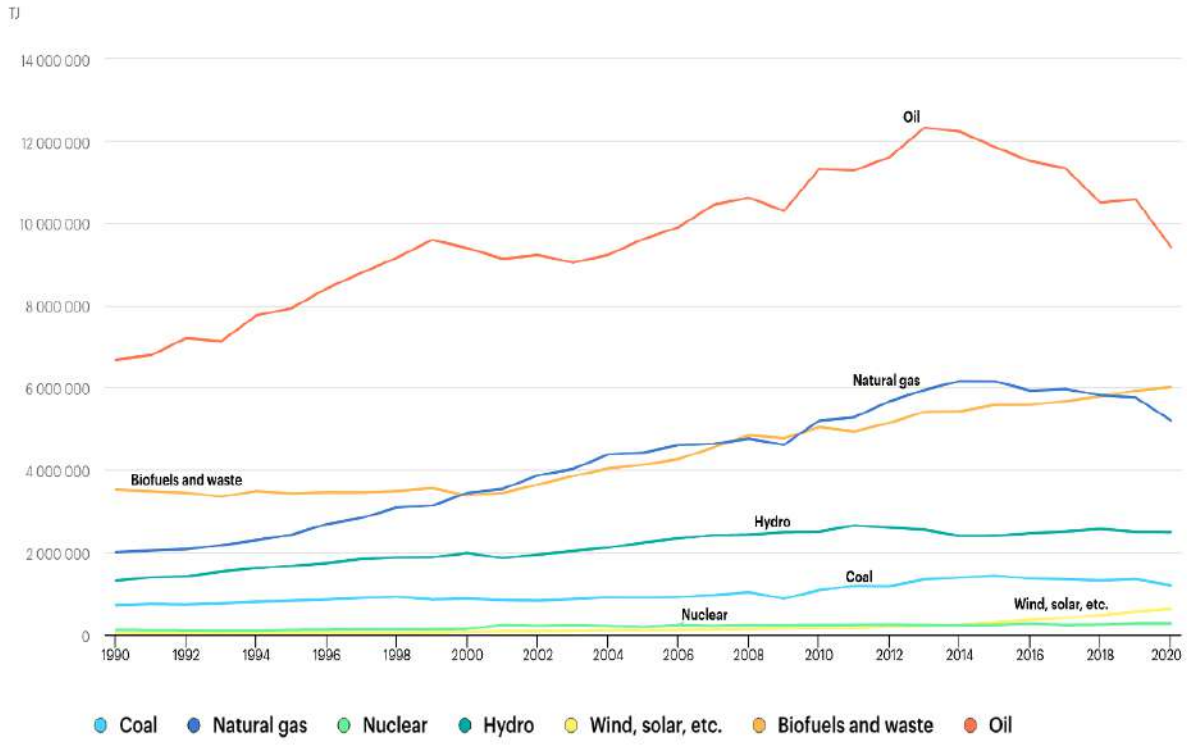

Figure 1: Total energy supply by source, Central & South America 1990-2020
Source: IEA. 2023b.

There are some exceptions to this. For example, Chile relies on coal for a significant portion of its electricity generation, with coal accounting for over 30% of the country's total electricity production in 2019. Colombia and Brazil also have coal reserves, but oil and natural gas are the dominant fossil-fuel-based primary energy sources (Figure 2).

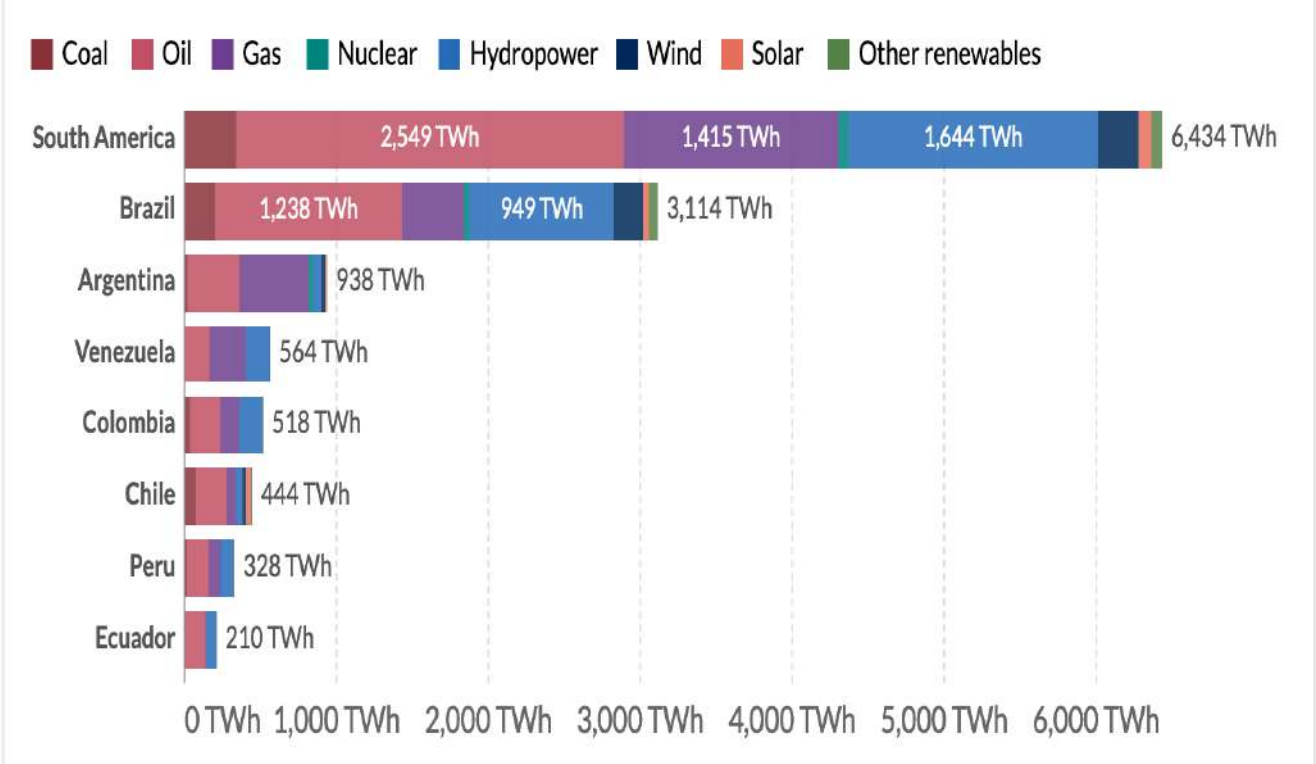

Figure 2: Primary energy use by source for Latin American countries in 2021
Source: Our World in Data. 2023.

Venezuela and Brazil are major producers of oil and natural gas, with the petroleum industry accounting for a significant portion of the country's economy. Argentina is a significant producer of oil and natural gas, with the energy sector playing an important role in the country's economy. Colombia is also a significant producer of oil. Meanwhile, Ecuador is a small oil producer, but oil exports are a major source of revenue for the country. JETPs would therefore more likely focus on the oil and natural gas phase out in Latin American countries, rather than coal.

With regard to per capita primary energy, fossil-fuel consumption is most dominant in Chile, Argentina and Venezuela, and to a lesser extent Brazil (Figure 3), while Brazil and Argentina are most significant in absolute terms (Figure 2).

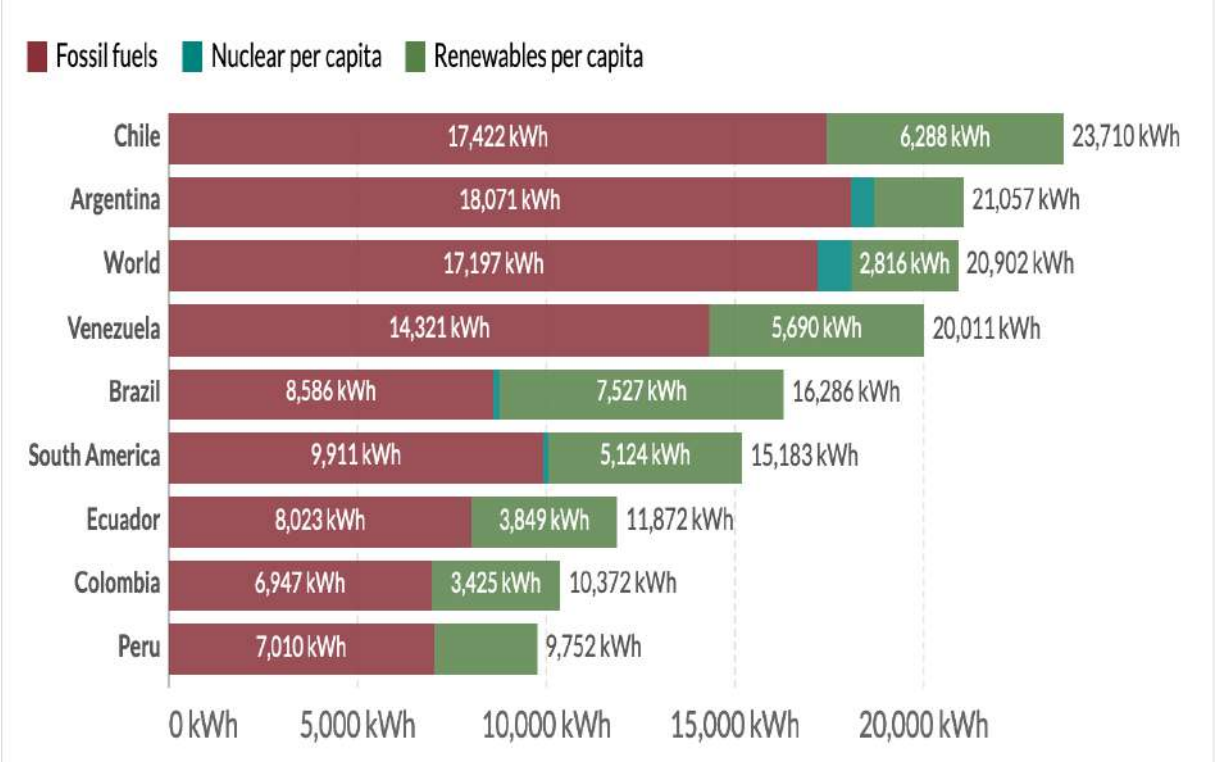

Figure 3: 2021 per capita energy from fossil fuels, nuclear, and renewables in Latin American countries compared to regional and world averages

Source: Our World in Data. 2023.

Meanwhile, Chile, Argentina and Venezuela would be top candidates for power sector decarbonisation based on their per capita fossil-fuel-based electricity generation (Figure 4).

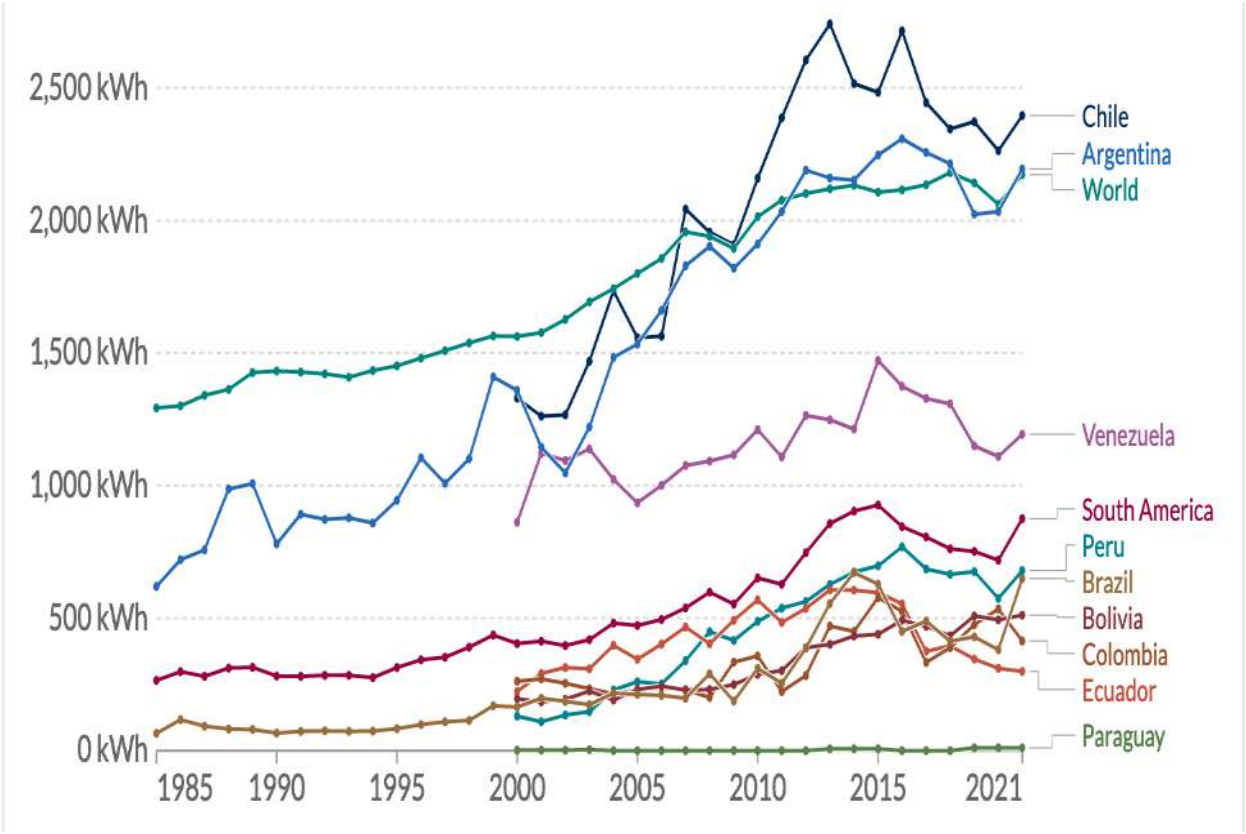

Figure 4: 2021 per capita electricity generation from fossil fuels (sum of coal, oil, and natural gas) in LAC compared to regional and world averages
Source: Our World in Data. 2023.

3.1.1.3 JETPs: opportunities for Latin America

So, what can we learn from the JETP process with respect to closing the climate finance gap in Latin America? Firstly, the advantage of these Partnerships is that these are multilateral large-scale cooperation agreements between a limited group of public and private actors, which have specific goals and can potentially mobilise relatively large funds in short time frames (at least that is the idea). The extent of cooperation could be very powerful as it would be realised through public alliances such as the IPG, and private alliances such as GFANZ, and in the three examples presented earlier in Table 1 specific public and private partners per JETP are already announced. Timelines to mobilise the (initial) target funds are envisioned to be expeditious with three—five years on average (Table 1). A range of financial instruments are currently envisioned (Table 1), including significant guarantees up to USD 1 billion. However, it would be important to avoid diverting critical development assistance away from existing development funding.

At the same time, considering the history of promises around climate finance it would remain to be seen that timelines are kept, and funds are provided. Nevertheless, the partnerships and mandates presented so far are very concrete and the Partners can as such not afford to lose face.

Latin American countries have abundant renewable energy resource potential, such as wind, solar, and hydroelectric power, that can support a transition to a low-carbon economy. JETPs can play a crucial role in supporting these countries to decarbonise their economies while—critical for this region—ensuring social and environmental justice. JETPs could be an important way to decarbonise Latin American power sectors, diversify the economies into future energy sectors, including electric vehicles and green hydrogen, supported by country-specific just transition interventions.

While JETP mechanisms could play a critical role in supporting LAC countries to decarbonise their economies in specific cases and would most likely aim to focus on the oil and natural gas phase out in the region, it should be noted that a JETP is a multilateral funding mechanism that depends essentially on autonomous non-structural agreements and on the decision-making processes of a group of countries and institutions. At present there are no organised channels to access funds within these mechanisms in a systemic manner, thus limiting in practice the extent to which JETPs may contribute to the required global or regional transformation. Therefore, these mechanisms would only be able to complement and not replace the essential financial system structural reform.

3.1.2 Climate litigation

The urgency and the pace of climate action are hotly debated topics. Climate change is a direct threat to the basic human rights of millions of people, and climate-related disasters around the world are increasing with countries in the Global South being particularly hard hit. This has enormous associated costs for vulnerable countries that already face dire economic challenges of different nature.

As years of advocacy, lobbying and public demonstrations did not seem to speed up the process, concerned stakeholders are turning to litigation more and more. Climate change litigation, or simply climate litigation, is an increasingly common and accessible area of environmental law (Agarwal. 2022). It has become an emerging trend, with the number of lawsuits doubling globally since 2015 to hold both governments and corporations accountable for their impact and historical contributions to the problem of climate change (Setzer and Higham. 2022). Since 2015, there has been a trend in the use of human rights arguments in climate lawsuits (Peel and Osofsky. 2018). Overall, more than 2,000 cases have been brought against governments and companies worldwide, and about a quarter of those cases were filed between 2020 and 2022 (Setzer and Higham. 2022).

Most of the climate litigation cases have been recorded in the Global North (of which over 70% are in the USA, Figure 5). However, more and more cases are being filed in the Global South, with at least 88 cases identified, of which the majority (at least 47) in LAC (Figure 6).

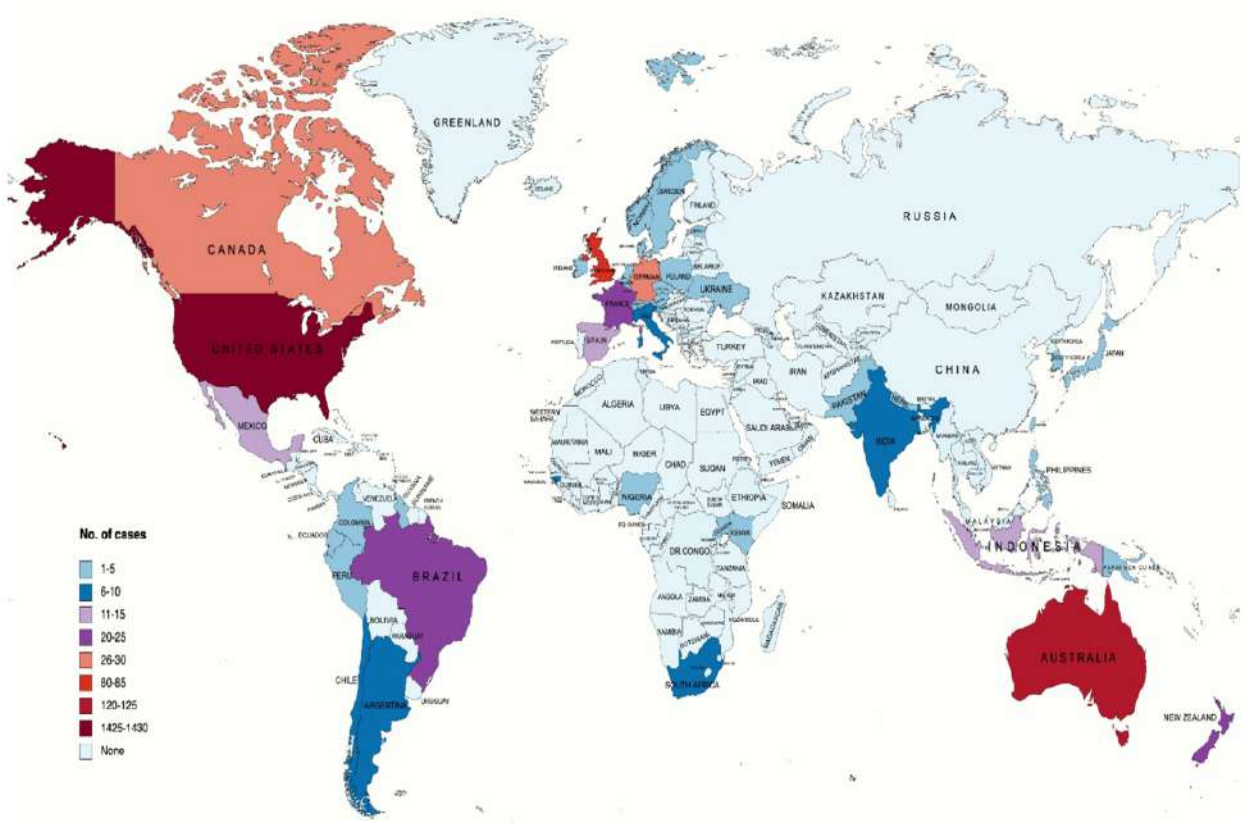

Figure 5: Climate litigation cases filed before national tribunals, per jurisdiction (to 31 May 2022)
Cases filed before international and regional bodies are not included.
Source: Setzer and Higham. 2022.

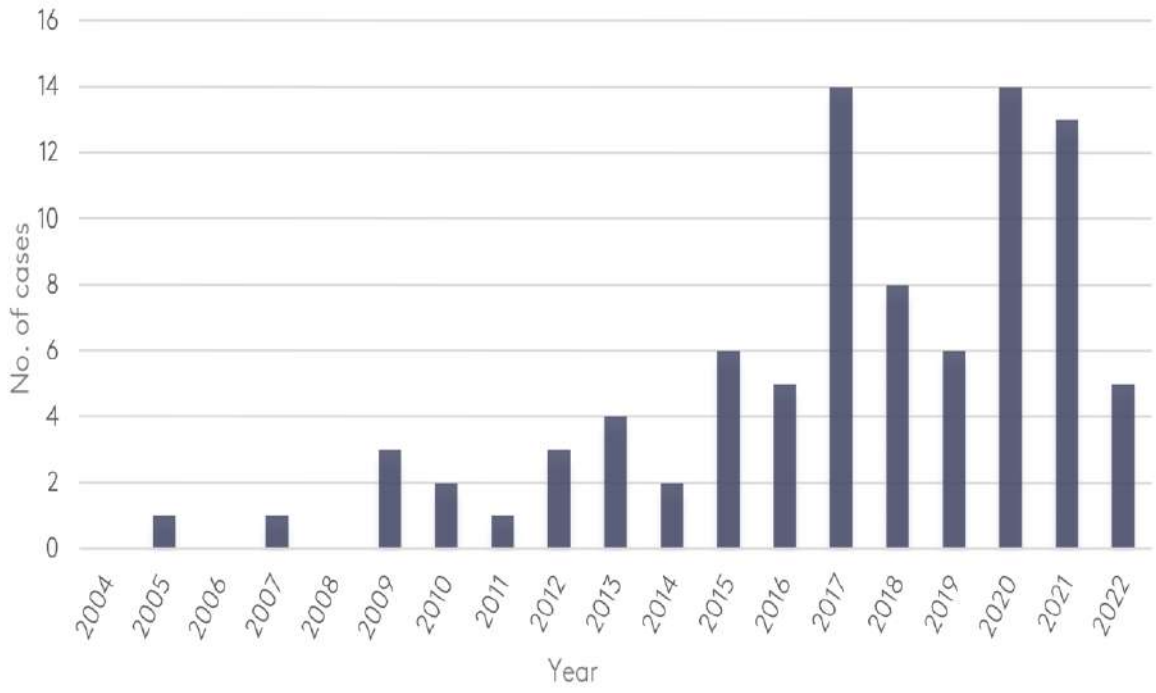

Figure 6: Number of climate litigation cases in the Global South over time (to 31 May 2022)
Source: Setzer and Higham. 2022.

Table 2 provides a brief cross-section of recent climate litigation cases that have been initiated in Latin American countries (with Mexico added for additional reference):

Table 2: Selection of climate cases in LAC, 2018—2022

Country	Year	Overview
Columbia	2018	25 young people filed a lawsuit against the Colombian government, alleging that it had failed to take adequate measures to combat climate change. The lawsuit argued that the government's inaction on climate change violated the youth's constitutional rights to life, health, food, and water. The Supreme Court ruled in favour of the plaintiffs and has told the government it must take urgent action to protect its Amazon rainforest and stem rising deforestation (Reuters. 2018).
Brazil	2020	Four political parties, along with environmental NGOs, filed a lawsuit before the Federal Supreme Court of Brazil, challenging the Federal government's purported lack of action to adopt administrative measures concerning the Amazon Fund. The claim made by the plaintiffs is that despite the availability of resources and pending projects awaiting technical analysis, the fund has not granted approval to any project since 2019 to avoid deforestation in the fight against climate change and loss of biodiversity. Two years later, in November 2022, the Supreme Court ruled that the federal government must reactivate the Amazon Fund, and needs to comply within 60 days (Agência Brasil. 2022)
Brazil	2022	The Brazilian NGO Conectas Direitos Humanos took Brazil's national development bank (BNDES) and its investment arm BNDESPar to court to force the bank to develop a greenhouse gas emissions reduction plan to guide their investments. This is allegedly the first ever civil climate action against a national development bank, the potential consequences of which could have a substantial impact on broader climate finance (The Guardian. 2023).
Peru	2018	A group of farmers filed a lawsuit against the German energy company RWE, alleging that its greenhouse gas emissions contributed to the melting of glaciers in the Andes, which threatened their livelihoods. The court sent judges to Peru last year to determine the level of damage. The case was dismissed by a German court but is currently under appeal (The Guardian. 2023).
Mexico	2021	A group of young people filed a lawsuit against the Mexican government to force them to focus on climate change in the discussion of the Electricity Industry Law, arguing that the planned reform to the Law approved in 2021 is unconstitutional since it revokes the energy transition and the right to a healthy environment. The lawsuit argued that the government's inaction on climate change violated their constitutional rights to life, health, and a healthy environment. The case is ongoing (Forbes. 2022).

These examples demonstrate a growing trend of climate litigation in Latin American countries, as citizens and organisations seek to hold both governments and corporations accountable for their actions on climate change. Historically, the majority of climate lawsuits had been dismissed or impeded in

procedural arguments. But as the previous examples show, cases are starting to become successful, arguably as a result of yearly increasing scientific evidence and growing public awareness around climate change, but moreover owing to the fact that the 2015 Paris Agreement provides ground to hold governments accountable as they are gradually putting their commitments into law. In recent years, important precedents have been set globally. IPCC Working Group III acknowledged the role of litigation in affecting "the outcome and ambition of climate governance" in 2022 (Setzer and Higham. 2022). Climate litigation as such is becoming an instrument used to enforce or enhance climate commitments made by governments, and to hold corporations responsible for the damage they cause.

A number of successful cases are setting precedents for future litigation. In 2019, after seven years of proceedings in court, the Dutch Supreme Court made a historic ruling: in the State of the Netherlands v. Urgenda Foundation case, the Dutch government by 2020 must reduce their greenhouse gas emissions by at least 25% from 1990 levels. The case had been filed in 2013 by the Urgenda Foundation, and the initial lower court ruling in 2015 was upheld in 2019 by the Supreme Court after appeals. This ruling set the stage for similar cases around the globe. Lawsuits were subsequently won in Australia, Indonesia, Germany, Belgium, and Ireland (Wikipedia. 2023; The Guardian. 2023). Governments in Latin America will need to reckon with this trend which may progressively impact future cases in the region.

Successful lawsuits were also filed against the carbon-intensive practices of multinational companies. In another landmark case, environmental organisation Milieudefensie won a case against Shell in 2021 that forces the oil company by 2030 to reduce its emissions by 45% compared to 2019. The case was based on the argument that, similar to the Dutch government, Shell has responsibility to ensure the well-being of citizens, bound by both the country's civil code and the European Convention on Human Rights, which safeguards the right to life (Economist. 2023).

In Poland, ClientEarth, an environmental organisation won a case against Enea, a Polish energy company, that stopped them from building one-gigawatt coal-fired power station north of Warsaw. The argument was not focused on the impact the plant would have on climate change, but rather that the company was not acting in the shareholders' best interests, since the investment was destined to become a stranded asset, and as such posed an irresponsible financial risk on the shareholders (Economist. 2023).

In February 2023, an environmental law charity initiated legal action against Shell's Board of Directors, alleging their failure to expedite the transition away from fossil fuels, consequently putting the company at risk. This case represents an unprecedented attempt to establish personal accountability for corporate directors for their failure to adequately prepare for the energy transition. The case was dismissed in May 2023; however, the legal process continues (ClientEarth. 2023).

3.1.2.1 Impact and future trends

These successful cases, and the arguments presented, are setting important precedents and spurring new concepts for future litigation, showing that successful cases can make an impact. After the ruling of the Supreme Court in the State of the Netherlands v. Urgenda Foundation, the Dutch government increased the pace of implementation of measures to fulfil the emissions target, passing a new climate plan, and ordering the shutdown of a coal power plant four years earlier than planned.

With the increasing quantity and variety of climate lawsuits, multinational companies are increasingly considering climate litigation to pose a material risk on their operations (Economist. 2023). Besides large fossil-fuel companies, this also applies to the financial sector, the Network for Greening the Financial System, a group of 114 central banks and financial regulators, concluded that the risk of litigation should be factored into a company's credit risk, not only due to the expenses incurred in legal fees and the potential compensation to be awarded to the plaintiffs, but moreover because of the potential reputational costs.

Even if cases are unsuccessful, a positive climate impact can be observed, as these cases raise awareness about climate change and put the topic on the political agenda of governments and organisations, providing a whole new dimension to climate responsibility. Furthermore, the trend may help to raise awareness in the corporate sector associated with the emerging risks of the legal process, including its impact on public opinion and stakeholders, and the eventual monetary impacts resulting from successful lawsuits.

3.2 Crisis 2: Loss of Biodiversity and Nature

3.2.1 Introduction

Extensive research indicates that the presence and preservation of biodiversity play a crucial role in safeguarding human health, livelihoods and economies (IPBES. 2021; WHO. 2020; UNEP. 2020; WEF. 2020b). However, there is a dramatic global decline in biodiversity, which encompasses the diminishing diversity within species, between species, and across ecosystems, at a rate unprecedented in human history. Human activities have been responsible for the alarming loss of 83% of wild mammal populations and approximately half of all plant species, and for putting nearly 1 million species at risk of extinction, which lead to the World Economic Forum's 2020 Global Risks Report placing the depletion of biodiversity and the subsequent collapse of ecosystems as one of the top five risks facing our planet (WEF. 2020b; WEF. 2020c).

The emergencies of biodiversity loss and climate change are intricately intertwined, and should thus be addressed jointly (WEF. 2021). This process has only been initiated recently in 2021, with a joint workshop between the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), where the two separate intergovernmental bodies collaborated to explore the synergies and trade-offs between climate and biodiversity (IPBES and IPCC. 2021). The report stresses that either crisis can only be solved in conjunction with the other. This is the realm of Nature-based Solutions (NbS), which refers to interventions that integrate measures to reduce emissions with those that foster – and not in any way violate – the flourishing of natural ecosystems and human well-being.

NbS may have the potential to provide around 30% of global climate mitigation required by 2030 to meet the 1.5°C target in the Paris Agreement (IUCN. 2022), and could create 20 million new jobs (ILO, UNEP and IUCN. 2022). Meanwhile, in spite of the relevance of AFOLU emissions and the significance of agricultural systems in providing a diversity of key inputs to national economies, in the years 2017–2018 only 3% of global climate finance was directed towards AFOLU and natural resource management (UNEP and IUCN. 2021), signifying an important gap in prioritisation of finance flows.

3.2.2 Nature-based solutions (NbS)

3.2.2.1 NbS, business and finance

Over the past few years, there has been a growing recognition among financial institutions, investors, and the private sector in general about the risks and opportunities associated with biodiversity loss. This is driven by the notion of both financial risk as well as business opportunities, investor and stakeholder pressure, and increasing regulations. The fall in biodiversity threatens not only the environment, but also the global economy, the economic value of approximately USD 44 trillion of economic value relies to a significant extent on nature and the services it provides (WEF. 2020b).

Importantly, in December 2022 a landmark international treaty was achieved at the 15th Conference of the Parties (COP15) to the United Nations Convention on Biological Diversity (CBD), adopting the Kunming-Montreal Global Biodiversity Framework (GBF) which aims to halt and reverse biodiversity loss by 2030. Similar to the Paris Agreement on climate change, this accord sets a mandate for the public and private sector to implement policies and actions to sustainably manage biodiversity, and align financial flows accordingly. Over 150 financial institutions had called for an ambitious agreement during the negotiations, indicating the interest and support from the financial sector (UNEPFI. 2022).

As a part of this process the private sector would need to set up systems for risk management and to measure and disclose both their dependencies on nature and the potential impacts on their business caused by biodiversity loss. The GBF framework sets a target for the 196 signatory countries to promote and facilitate such monitoring and evaluation for businesses (UNEPFI. 2023b). A process to provide guidelines to this extent and to integrate nature into decision making had been started in 2021 through the private sector Taskforce on Nature-related Financial Disclosure (TNFD. 2023).

Even though there is an increasing focus on the issue of nature loss, there is still a lack of comprehensive understanding regarding its material significance and overall implications for businesses and value creation and the specific measures that the private sector can adopt to tackle this challenge. This is however changing, it is expected there is a vast range of investment opportunities for both the public and private sectors, with the aim of supporting projects that are specifically designed to restore biodiversity on Earth through what is called NbS (WEF. 2023). Investing in NbS can create revenue streams through a range of activities across sectors such as reforestation projects, habitat restoration, sustainable agriculture, eco-tourism, bioprospecting and bioeconomy, payments for ecosystem services, green bonds, bioarchitecture, and sustainable urban development solutions.

Similar to the implementation of the Paris Agreement, many challenges and risks remain before governments and the private sector will be able to make meaningful contributions to nature and biodiversity loss and to shift global financial flows away from activities that have a negative impact on nature and channel them towards those that have a positive impact on nature. However, the momentum seems to be there to pursue this agenda due to increased awareness among the public and private sectors, in particular asset owners.

3.2.2.2 Latin America NbS

Latin America is one of the richest regions in the world with respect to biological diversity. It houses 40% of the world's biodiversity while it comprises 12% of the total surface area of arable land (CAF. 2018). The Amazon region in South America, the world's largest tropical rainforest, holds immense importance in terms of biodiversity. It is considered one of the most biologically diverse regions on Earth, harbouring an extraordinary array of plant and animal species. The Amazon rainforest alone is home to approximately 10% of the world's known species.

At the same time, deforestation has caused the region to lose at least 17% of original rainforest cover, and an additional 17% are degraded. Moreover, Latin America as a whole has seen the largest regional decline in the relative population abundance of animal species across the planet between 1970 and 2018, reaching 96% versus the global average of 69% (WWF. 2022).

At the same time, vast extensions of mangroves and wetlands and unique ecosystems throughout the entire region of LAC have been degraded or lost through the systematic expansion of industrialised agriculture, in particular and soy and cattle expansion, the displacement of forests and the expansion and telecoupling of commodity frontiers trough international trade.

Consequently, governments in Latin America have been implementing policies, regulatory frameworks and initiatives around NbS and biodiversity to address these aggravating trends.

Under the new administration, Brazil recently announced a new plan to expand protection of the Amazon, reduce deforestation and mitigate climate change through a set of eight decrees (Government of Brazil. 2023). To implement this efficiently, analysis from the DecarBOOST programme highlights current low enforcement of the Forest Code and its deforestation restrictions and compensation requirements will have to be reversed in order to reduce the annual deforestation rate and to foster forest restoration with native species. Law enforcement and strengthening of command-and-control strategies are essential policy instruments to achieve these goals (La Rovere et al. 2022).

In Peru the government developed policies around "payment for ecosystem services" that aims to protect and restore ecosystems, enhance the provision of ecosystem services, and promote sustainable land use practices, including NbS. The Mechanism for Retribution for Ecosystem Services (MERESE) was introduced in 2016 and seeks to implement, through voluntary agreements, actions for the conservation, recovery and sustainable use of the natural infrastructure where ecosystem services are produced, such as water provision, in quality and quantity, are financed and implemented (Government of Peru. 2017). The 2019 National Competitiveness and Productivity Policy (PNCP) aims to create capacities and instruments for the management of the enhancement of natural resources and ecosystem services. Finally, the *Urban Biodiversity and Ecosystem Services Strategy* that was developed last year is a roadmap to 2050 that seeks to guide actions related to the conservation, restoration and sustainable use of urban ecosystems and biodiversity, the enhancement of ecosystem services and the naturalisation of the city in the Metropolitan Area of Lima (AML), made up of the provinces of Lima and Callao (Government of Peru. 2022).

In Argentina, the Forestry and Industrial Forestry Strategic Plan 2030 proposes to increase the planted forest area to 2 million hectares, attract 7 billion dollars in investments that would allow the industrialization of different regions of the country, generate 187 thousand quality jobs, and value native forests by expanding sustainable management and recognition of the ecosystem services they provide to communities (FTDT, 2022).

These kinds of policies may form a basis for action through NbS, however the key challenge remains to move from the policy-level to on-the-ground implementation, and this needs to go hand in hand with climate financing, private sector engagement strategies and redefining the prevailing structure of incentives, in order to efficiently mobilise public and private finance and build up a project portfolio.

3.3 Crisis 3: Pollution and Waste

3.3.1 Introduction

Climate change could be perceived by people as a perhaps intangible problem since the impacts of climate change manifest gradually and are observed largely over extended periods, and it can be challenging to attribute specific weather events or localised phenomena solely to climate change without conducting the necessary rigorous scientific analysis.

Meanwhile the effects of the current plastic pollution crisis, even before considering the effects on ecosystems and human health, present immediate and noticeable consequences. As a result of unsustainable production and consumption patterns, and inadequate waste management, plastic waste can now be found almost anywhere in nature, water bodies, and urban areas, and images of animals entangled in plastic debris or ingested by it are familiar to most of us. The visual side of plastic pollution therefore provides a sense of urgency. However, climate science, policies, and action are generally much more advanced than the equivalent for the plastic pollution challenge, which over the last few years has only started to build momentum. Scientific research specific to the full impacts of plastic pollution is only still emerging. The urgency of climate action has been embraced by many countries, leading to the development of climate policies and commitments. In comparison, plastic pollution, while gaining recognition, has not yet reached the same level of public and political mobilisation. Moreover, climate change mitigation and adaptation efforts have attracted relatively significant financial resources, including international funding mechanisms and climate finance initiatives. While some funding is available for plastic pollution initiatives, the scale and level of support are generally not as extensive.

Nevertheless, due to mass global littering, single-use plastics have created an enormous environmental, economic, and social problem, as they make their way through our waterways to the ocean, breaking down into microplastics that are affecting animal life, water ways, ecosystems, food chains, drinking water, and ultimately human health. Annually, more than 400 million tons of plastic are manufactured globally, with approximately one-third of it being single-use packaging. Of that, the equivalent of over 2,000 garbage trucks filled with plastic waste is littered into our streets, oceans, rivers, and lakes on a daily basis (UN. 2023b). Moreover, plastic pollution is expected to double by 2030 (UNEP. 2021b), and triple by 2050 (WEF. 2022).

Moreover, there are also substantial implications for the global economy. The U.S. alone spends about USD 11.5 billion annually cleaning up litter (Lisa. 2021). UNEP estimates that in 2018 the economic costs of marine plastic pollution, including its effects on tourism, fisheries, aquaculture, and clean-up efforts, ranged between USD 6—19 billion on a global scale. By 2040, the financial risk for the private sector could reach USD 100 billion per year if governments enforce regulations that necessitate companies to bear the costs of waste management (UNEP. 2021b), a process that has already started in the European Union. Whereas the estimated value of the global plastic market in 2020 reached USD 580 billion, the monetary value of losses of marine natural capital is projected to be as high as USD 2,500 billion per annum (UNEP. 2021b).

However, apart from the before-mentioned pressing adverse environmental and economic effects, the plastic pollution challenge also presents a climate impact. Greenhouse gases are emitted at each stage of the plastic lifecycle, from fossil fuel extraction and transport, plastic refining and manufacturing, waste management including recycling and incineration, as well as the degradation of plastic litter on land, waterways and oceans (CIEL. 2019). Plastic packaging for various commercial products including food is often made from a range of petrochemical products. The utilisation of petrochemical feedstock currently represents 12% of global oil demand, and this proportion is projected to rise due to the growing demand for plastics, fertilisers, and similar goods (IEA. 2018). The production of plastics alone is associated with 6% of global coal electricity (Cabernard. 2022), and 4—8% of global oil consumption, of which the latter could increase to 20% by 2050 following current consumption trends (WEF. 2022). Plastic refining is among the most greenhouse-gas-intensive and fastest growing industries in the manufacturing sector. In 2019, the production and incineration of plastic produced more than 850 million metric tons of greenhouse gases, which is equivalent to the emissions from 189 five-hundred-megawatt coal-fired power plants (CIEL. 2019). If the current trajectory of plastic production and usage continues, it is projected that by 2030, emissions from plastics could reach 1.34 gigatons annually, equivalent to the emissions from over 295 new 500-megawatt coal-fired power plants (CIEL. 2019). These figures do not take into account the emissions associated with plastic degradation, for which little data exists to date (CIEL. 2019).

This shows the complex multi-faceted challenge that plastic pollution presents, and how climate, nature loss and pollution are interlinked, and need to be considered in conjunction to a greater extent than is the case at present.

3.3.2 International agreement on plastic pollution

To begin to address the problem, 175 United Nations (UN) Member States agreed in March 2022 to develop a legally-binding international agreement on plastic pollution by the end of 2024 that will address the entire life cycle of plastics, from design to production and disposal (UN. 2022). Five meetings have been planned in that period to negotiate the accord. Countries with varying interests are currently debating the scope and ambition needed (i.e., recycling and improved waste management versus phase-out of single-use plastics) with the general aim to end plastic pollution by the year 2040.

A key underlying factor of pollution, which is also deeply interconnected with the issues of both climate change and biodiversity loss, is the unsustainable use of natural resources in our production and consumption models (UNEPFI. 2023a). Our current economic system can be characterised as an economy

that follows a linear flow of resources, i.e., raw materials are extracted from nature, processed into products, consumed, and ultimately discarded as waste after their useful life. It has become very clear that this system will not be sustainable over the long term.

The majority of countries in the LAC region have started to take action by passing laws addressed at reducing, prohibiting, or eliminating single-use plastics (UNEP. 2023a).

3.3.3 Circular economy approaches

A key approach to addressing the triple planetary crisis encompassing climate change, nature loss, and pollution, is to transition from this linear system to a more resource-efficient and circular economy (UNEPFI. 2023a). The transformation to a circular economy focuses on decoupling economic activity from resource use, by minimising waste and eliminating pollution, by reusing and recycling products and materials, and by regenerating natural systems (Ellen MacArthur Foundation. 2023). The circular economy (CE) approach can form a basis for action on climate change, biodiversity loss, and pollution, and as such support achieving the objectives as set in the Paris Climate Agreement, the Kunming-Montreal Global Biodiversity Framework, and the upcoming international agreement on plastic pollution, as well as the SDGs. At present, material extraction and use represent 70% of global GHG emissions. Therefore, to achieve net-zero emissions by 2050, to stop marine and landscape pollution, and to halt biodiversity loss, we need to incorporate a CE approach in our policy frameworks and plans, including the NDCs. It is estimated that applying circular economy strategies to just four key industrial materials (cement, steel, plastic and aluminium), global GHG emissions could be reduced by 40% in 2050 (Ellen MacArthur Foundation. 2021).

Over the past decade, the concepts and principles of the circular economy have received increasing attention in both the public and private sector, with focus on studies on its potential effects and benefits, and design of new policies and business models.

Governments around the world are starting to develop plans and implement policies. The European Commission has taken the lead in incorporating the CE approach as a key element in its framework policy, the European Green Deal, and developing an action plan around the theme.

Nevertheless, the 2023 Circularity Gap Report reports that the global economy is now only just 7.2% circular, and driven by rising material extraction has gradually decreased from 9.1% since 2018. This implies that over 90% of materials used in society are either wasted, lost, or unavailable for reuse (CGRi. 2023). Moreover, studies highlight that the global society is rapidly depleting the Earth's natural resources (UNDP. 2023).

3.3.4 Circular economy in LAC

The circular economy is also on the agenda of most Latin American countries. In this section we assess to which extent governments are taking action. Table 2 provides an overview of Latin American country efforts with respect to CE, and whether these are included in their NDCs or LTS submissions.

As of May 2023, half of the South American countries [8] have included circular economy considerations in their NDCs under the Paris Agreement, compared to only 27% of NDCs globally (Table 2). Others have not specified this objective in their NDCs, but are considering or working on CE approaches. At the same time, only a quarter of countries have included the CE approach in their LTS (Table 2).

Chile is a leader in this field in the region. Chile's NDC includes commitments to promote sustainable production and consumption patterns, implement a CE approach in key sectors, and develop waste management systems that prioritise recycling and waste reduction. The importance of an integrated and synergistic approach is highlighted with respect to circular economy, land use, land use change and forestry (LULUCF) and oceans, as well as climate mitigation and adaptation. In July 2021, the Ministry of the Environment published the *Roadmap for a Circular Chile* with seven ambitious goals set for 2030 and 2040. 118 concrete steps have been envisioned to achieve them, which fall into four general lines of action, including Circular Innovation, Circular Culture, Circular Regulation, and Circular Territory (Ellen MacArthur Foundation. 2022). Chile also published its National Strategy for Organic Waste and approved laws on extended producer responsibility, banning plastic bags and regulating single-use plastics, further supporting their circular economy goal (OECD. 2022b).

Colombia's NDC emphasises the transition to a circular economy through measures such as promoting sustainable consumption and production, implementing waste management strategies, and developing sustainable agriculture practices. Colombia published a *National Circular Economy Strategy* in 2019. The circular economy is recognized as a key tool in the mitigation of GHG emissions in all economic sectors.

Argentina's NDC also emphasises the importance of a circular economy in achieving its climate goals, particularly in the waste management sector. The importance of a Just Transition and equity in that regard are specifically highlighted.

Neither Peru nor Brazil's NDCs specifically mentioned CE approaches; however, both countries are advancing on this theme, which started by publishing circular economy roadmaps.

In Brazil, the Circular Economy Route (REC) was developed in the Ministry of Integration and Regional Development in 2019. Following that, the Brazilian Center for International Relations (CEBRI) published a study based on the Circular Economy experiences of the European Union, China and Chile in December 2020. The roadmap envisions the creation of sustainable alternatives for the management and productive disposal of waste, and to promote productive inclusion and regional development based on its economic use. By the end of 2020, two regional initiatives had been structured, the Cerrado Circular (Integrated Development Region Brasília- Federal District) and the Paraíba Circular. Both formed management committees and created portfolios of projects, with two projects currently underway.

[8] The Caribbean and dependencies and constituent entities are excluded from this analysis.

Given Brazil´s experience in the bioeconomy, the Ministry of Science, Technology and Innovation (MCTI) Bioeconomy Productive Chains program includes the promotion of circularity in the production chain in its selection criteria, and evaluates topics such as the promotion of circular business models.

In Peru, the National Competitiveness and Productivity Plan (PNCP) that was put in place in 2018, included an objective to promote CE in the country's economic activities. This provided the basis for future policies and implementation on CE in the country. The advances in the circular economy are reflected through the Clean Production Agreements, which were established on a voluntary basis between the Ministry of the Environment and various private companies committed to environmental conservation (Government of Peru. 2021). In July 2021, the 'Peruvian Pact for a Circular Economy', was established. The Pact refers to a commitment of various national public and private actors to promote the transition towards a circular economy and is currently in the development phase. Through it, the Peruvian Platform for a Circular Economy will be established (Circle Economy. 2021).

Colombia published its National Circular Economy Strategy in 2019, which establishes concrete lines of action, as well as indicators and goals, for the implementation of the circular economy in the country (Gobierno de la Republica de Colombia. 2019).

In Uruguay, the Comprehensive Waste Management Law was approved in 2019, which promotes the circular economy. The waste and agriculture sectors are specifically mentioned with respect to CE approaches. The NDC mentions the objective to develop a National Circular Economy Strategy that will provide the framework and enabling conditions to create new opportunities for climate change mitigation in the future (Government of Uruguay. 2022).

Guyana published its Low Carbon Emissions Development Strategy (LEDS) in July 2022, which introduces the measure of creating a circular economy to fight climate change. The strategy announces that a National Circular Economy Strategy will be developed by 2023, and presents seven lines of action (Government of Guyana. 2022).

Table 3: Overview of LAC country action on CE approaches, and inclusion or omission in NDCs and LTS
Source: Author´s analysis

Country	Government is implementing or considering a circular economy approach	Circular economy approach included in NDCs	Circular economy approach included in LTS
Argentina	Yes. The importance of a Just Transition and equity are specifically highlighted.	Included	Not Included
Bolivia	Unknown. Some international cooperation organisations are supporting CE projects including a focus on green businesses and MSW in La Paz.	Not Included	No LTS submitted
Brazil	Yes	Not Included	No LTS submitted

Chile	In July 2021, the Ministry of the Environment published the Roadmap for a Circular Chile with seven ambitious goals set for 2030 and 2040. 118 concrete steps have been envisioned to achieve them, which fall into four general lines of action, including Circular Innovation, Circular Culture, Circular Regulation, and Circular Territory (Ellen MacArthur Foundation, 2022). Chile also published its National Strategy for Organic Waste and approved laws on extended producer responsibility, banning plastic bags and regulating single-use plastics, further supporting their circular economy goal.	Included	Included
Colombia	Yes, National Circular Economy Strategy approved (2019)	Included	Included
Ecuador	Yes. NDC Waste sector line of action: Promote inclusive campaigns to raise awareness among the population and industry in the management of solid and liquid waste, towards a circular economy.	Included	No LTS submitted
Guyana	Yes. Guyana published its Low Carbon Development Strategy (LEDS) in July 2022, which introduces the measure of creating a circular economy to fight climate change. The strategy announces that a National Circular Economy Strategy will be developed by 2023, and presents seven lines of action.	Not Included	No LTS submitted
Paraguay	Yes. NDC claims circular economy implemented on an industrial scale.	Included	No LTS submitted
Peru	Yes. Peru has taken progressive and continuous steps aimed at generating policies and promoting frameworks for the transition to a CE (‘Pacto Peruano por una Economía Circular; decreto Feb 2020: Hoja de Ruta hacia una Economía Circular en el Sector Industria').	Not Included	No LTS submitted
Suriname	No.	Not Included	No LTS submitted
Uruguay	Yes. The Comprehensive Waste Management Law was approved in 2019, which promotes the circular economy. They are now working on a National Circular Economy Strategy.	Included	Included
Venezuela	No.	Not Included	No LTS submitted
Mexico	Yes. Focus on industry and waste sector. Planning to develop a National Circular Economy (Strategy Estrategia Nacional de Economía Circular)	Included	Not Included

3.3.5 Conclusions pollution and circular economy

The countries that included CE approaches in their NDCs or LTS, predominantly build a narrative around waste sector policies. Climate change, nature loss, and pollution cross-cutting objectives or approaches are not included in this narrative. Including such considerations could be an opportunity for the next NDC update due in 2025, as integrated approaches would reinforce and strengthen the response to the triple planetary crises as well as the SDG goals, and avoid conflicting policies that operate in parallel.

Some countries such as Peru and Brazil have started considering and implementing plans and policies on CE, however have not yet included those in their NDCs or LTS. In the next NDC updates these should be included. Currently, there exists a large finance gap for the transition towards circular production and consumption models (UNEP. 2023b). Considering the financial challenges of implementing CE approaches, finance considerations should be included in National Financial Strategies that are aligned with NDCs and LTS, and the financial and private sectors should be engaged to support the development of financial instruments and policies. Similar to its planned NDC updates, Chile's financial strategy on climate change is due to be updated every five years, providing opportunities to include new climate and pollution action approaches.

The design of the circular economy models will be fundamental and needs to include equity, and social inclusion considerations. The current lack of a social justice component has led to the introduction by researchers of the term *circular society* as an alternative (Calisto Friant. 2020).

However, the circular economy theory is also subject to criticism by researchers, highlighting the superficial and unorganised research agenda, unclear theoretical grounds, and the structural obstacles its implementation faces (Corvellec, Stowell and Johansson, 2021; Korhonen. 2018). Nevertheless, regardless of any potential flaws, society should proceed designing and implementing a circular economy, since the linear economy is no longer an option. Rather, as with any transition, these potential flaws should be addressed through rigorous scientific research, stakeholder consultation, and trial and error.

The transition of changing production and consumption patterns has many synergies with financial system reform, and should be addressed in conjunction, not in parallel. Section 4 further discusses these synergies.

4 Way Forward in the LAC Region

We introduced the triple planetary crisis on climate change, nature and biodiversity loss, pollution and waste as a central theme in this report, and suggested an integrated and holistic approach for Latin American countries to address them, including on finance.

This includes finding alternatives for the unsustainable patterns of overconsumption and overproduction of the current linear economic system, and the associated chemical and waste streams. As the three crises are interconnected and reinforcing each other, so should be the solutions to be put in place. Finance therefore becomes a central cross-cutting issue through all sectors and subsectors of any economy. We need to rethink not only how we consume and offer products, but also how we invest and provide finance. Traditional financial mechanisms are focused on short-term profit maximisation that promote and maintain linear economy business models, and fail to include externalities in market prices. They also often fail to provide sufficient capital for low-carbon projects, and lack financial inclusion for individuals, indigenous communities, and small and medium enterprises.

In order to ensure a sustainable and equitable economy and redirect capital flows towards low-carbon and circular economy projects, the financial system will need to be reformed. That is a global challenge which needs to be addressed at international, regional, and national levels. The objectives of the Paris Agreement to reach net-zero emissions by 2050, require a radical low-carbon systemic transformation of the global economy, which should be considered in conjunction with biodiversity and pollution challenges. This involves transforming the linear economy, as well as the existing international financial system. Mitigation measures should include CE approaches as well as NbS to simultaneously tackle climate change and the SDGs.

An integrated approach will ensure efficiency in both policy and finance, as well as the incorporation of national and regional development considerations including social equity, just transition and the achievement of the SDGs.

The United Nations Development Programme (UNDP) observes an emerging trend in updated NDCs of including integrated climate solutions, such as NbS, CE approaches, and integrated water resource management (UNDP. 2021). On par with well aligned climate policy packages, such cross-cutting systemic approaches, while more complex to manage and implement, have the potential of upscaling and enhancing the ability to proactively anticipate cross-sectoral impacts (UNDP. 2021), as well as avoiding conflicting or merely uncoordinated policies that operate in parallel to each other.

Given the failures of, and the socio-economic impacts associated with the current linear economic system, the CE approach can be expected to replace it globally over time. The question is at which pace, and under which design. It will be an opportunity for Latin American societies to include equity, social inclusion, and just transition principles in the design of their circular economies, for which the term *circular society* is preferred by some researchers (Calisto Friant. 2020). This would need to go hand in hand with financial system reform.

Circular economy approaches should be a basis for action on climate change, biodiversity loss, and pollution. They are key to addressing the triple planetary crises and transform the economies. Low-carbon

and circular economy policies are complementary and mutually reinforcing. A smartly designed CE approach would be a key climate mitigation measure as well as address the pollution and biodiversity loss challenges. Thus, it will be key for governments in Latin America to incorporate these approaches in climate and waste policies.

This should be done in collaboration with the private sector, since new business models play a crucial role in enabling the shift from linear to circular processes. Policies, mechanisms and strategies need to be developed to allow for companies, and especially SME´s, to access finance to transition from linear to circular business models.

In the first edition of this Dossier series, we recommended that national NDC and LTS processes should be aligned with national finance processes or strategies. They should in addition combine CE approaches and considerations of financial sector reform. Strategic climate documents such as Long-term low GHG emission strategies, Nationally Determined Contributions, National Climate Strategies, should be aligned with National Biodiversity Strategies, National Waste Strategies, and Natural Resource Management Strategies, in particular on water, which calls for inter-ministerial coordination.

From the finance perspective it will be key to develop and periodically iterate National Climate Finance Strategies in order to implement such a complex holistic approach properly. Countries in Latin America such as Colombia, Chile, and Peru have developed National Climate Finance Strategies that provide the basis for financing their NDCs. It is recommended to have them revised to include all the cross-cutting considerations mentioned in this report. Chile plans to update both its NDC and its National Climate Finance Strategy every five years. Chile already pursues an integrated approach in their NDC that encompasses the role of oceans, circular economy, forests, peat bogs and ecosystems, as well as places a social focus on a fair transition and sustainable development (Government of Chile. 2021). Other countries in the region should follow suit.

The Global Stocktake (GST) process is a periodic facilitative dialogue among Parties. The first stocktake (GST1) started in 2022 and will conclude at COP28 in 2023, and is an important process to inform the next NDC cycles, as well as national climate action and policy development. The technical discussions held last year and this year highlighted the need for systemic transformation and included a focus on integrated and holistic approaches. So far, the first two technical discussions have included the need for integrated policies, as well as inclusion and equity considerations in climate action (UNFCCC. 2023). However, it would be important these discussions more specifically focus on integrated approaches that address the triple planetary crises, thus including mitigation, NbS, and CE approaches, as well as consider financial reform in conjunction, as argued in this report. The next NDC cycle is due in 2025 and provides an opportunity to include more holistic cross-cutting systemic approaches.

As discussed in this report, JETPs could play a significant role in supporting Latin-American countries to decarbonise their economies while ensuring social and environmental justice. However, while JETPs are innovative multilateral funding mechanisms designed to support the phase out of fossil fuels, similar climate finance vehicles could be designed around the CE approaches and Nature-based Solutions, being particularly appropriate for Latin America considering the global role it plays with respect to bioeconomy and biodiversity. Due to its vast endowment of natural resources and extraordinary biological diversity, NbS are particularly relevant for the LAC region, and will be an important part of LAC

countries' NDCs and LTS, in response to both climate change and loss of biodiversity. It will be a key challenge to finance the land-use related action required, in order to balance the preservation of the Amazon on the one hand, and the region's dependency on—and export of—natural-resource intensive products. It will require both international and private sector financing. Instigating the discussion around innovative finance mechanisms could be an opportunity for Latin-American countries in the setting of the GST1 and the Standing Committee on Finance before and during COP28.

However, no matter the extent of the ongoing mitigation and adaptation efforts and associated enabling conditions, without appropriate action on reforming the international financial system in order to allow the necessary shift of trillions of dollars to developing countries in a planned, efficient, predictable and just manner, the overall objectives of a net-zero global economy may become out of reach.

The DecarBOOST programme supported the public policy reform process and the development of sector investment plans, investment portfolios, financial instruments and mechanisms, and other approaches to advance the effective implementation and financing of the next generations of NDCs and LTS' of LAC countries. The participatory dialogue processes conducted during the programme have been instrumental, especially in developing a common vision for the purpose and direction of the interventions. These processes need to continue and would provide an opportunity to include the integrated approaches recommended in this report, as well as further consideration of the key integrated climate solutions presented.

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