



## CLIMATE ACTION PATHWAY

# LAND USE

### Vision and Summary

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2021

## VISION

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It is 2050, and the full contribution of the land-use sector<sup>1</sup> to the global long-term temperature goal of the Paris Agreement has been attained through conservation, restoration, and improved land management actions in forest, wetland, grassland biomes and agricultural lands as well as in the food and wood supply chain, consumption, diets and waste. Emissions from loss and degradation of remaining **primary forests and other natural terrestrial ecosystems** dropped by at least 70 per cent by 2030 from 2020 levels, becoming a net sink by 2050. This was possible, as private sector and countries mainstreamed deforestation-free investment, and in 2021 pledged to restore 250 million hectares and by 2030 at least 350 million hectares of degraded lands were brought under restoration, including by improving the resilience and productivity of farmland. By 2030 emissions from **agriculture and food systems** were reduced by at least 50 Gt CO<sub>2</sub> eq, thanks to the expansion of regenerative and resilience practices in food and agriculture systems, which played a key role in transforming the sector into carbon negative by 2050. This was possible by adopting net-zero and resilient verifiable commitments, increasing agriculture related Nature-based Solutions technology and innovation, regenerative, climate-smart and agroecological practices as well as through the enhancement of soil carbon sequestration, restoration and measures to improve soil health and avoid degradation. **Finance for nature-based solutions** reached USD 440bn/year by 2030 (WEF, 2020) while also ensuring deforestation-free investment portfolios. Governments led and involved key stakeholders, including private sector, in adequate and effective **cross-sectoral institutional, legal and regulatory frameworks** to implement and promote sustainable and resilient land management, restoration and conservation, providing appropriate government incentives and advancing land-sea integration.

In this 2050 vision sustainable land management is the norm, with adequate action and support for adaptation outcomes, maintaining **habitats for biodiversity and ensuring climate resilience**, particularly for vulnerable populations, and the provision of goods and services from key ecosystems that support water and food security. **Equal land rights** for men and women, indigenous people, local communities and smallholders are recognized and secured across jurisdictions. These played a key role in the reduction of deforestation and land degradation rates as well as upscaling regenerative, climate-smart and agroecological practices. Land-use **monitoring tools** are used by governments, land users and farmers to inform decisions and track whether goals are on target. Fuelwood is a sustainable renewable energy source. **Restoration** supports local economies, ecological integrity and connectivity to ensure carbon sinks are enhanced and secured for the future. Forests and other terrestrial **ecosystems' values are internalized in policy and financial decisions** from the public and private sector, which prioritize and align with the protection and restoration of forests and landscapes, sustainable supply chains as part of the landscapes and terrestrial ecosystems and reforestation. In 2050, **food systems are economically sustainable and profitable**, they have broad-based benefits for society, and have positive or neutral impact on the natural environment. **Forest management** is adapted to climate change and plays its role in mitigation and providing more renewable resources for e.g., building with wood, bioplastics, and from the side streams also bioenergy. Climate smart forestry practices are applied in many countries around the world.

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<sup>1</sup> In terms of geographical locations, inland fisheries and aquaculture should fall inside the scope of the MP Land Use Pathways. However, due to the great similarity of their activities with marine fisheries and aquaculture, the narratives and discussions on aquatic food systems in these MP Ocean Pathways cover inland fisheries and aquaculture.

Agricultural sectors and food systems can sustainably manage current and future stresses, both climatic and non-climatic, while contributing to emission reductions, ensuring sustainable land use, the protection of ecosystems and prosperity for farmers. **Food loss and waste have reduced** to 50% by 2030 and up to 75 per cent by 2050, comparing to 2020, through a set of measures targeting both the supply and demand sides while ensuring that future generations are well-nourished and food-secure. **Consumption has shifted** toward plant-based diets of 50 per cent of the global population by 2050. These measures have been supported with the development and use of technologies for implementation, monitoring and scaling up.

## SYSTEM TRANSFORMATION SUMMARY

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The Agriculture, Forestry and other Land Use (AFOLU) sector represents 20-24% of total GHG emissions generated by agriculture and deforestation, and forest and terrestrial ecosystems loss reinforcing the current biodiversity crisis and decreasing their capacity to adapt to climate change. It is critical to transform the AFOLU sector to maximize its potential contribution to the global mitigation goal as well as being at the centre of adaptive responses, combat desertification and land degradation, and enhancing food security, biodiversity and prosperity for farmers and dependent communities. The goal here to transform the AFOLU sector is two-fold. First, to understand how the system generates incentives for and influences capacities of actors to orient them towards behaviour that leads to a system transformation. Second, to facilitate the emergence of positive feedback loops that generate a self-sustained process of regeneration and performance improvement.

It is essential to address the drivers of emissions in the sector – such as global trade, production and consumption patterns, regulatory and governance mechanisms and the values and behaviours of society (WEF, 2020). Businesses, governments, finance, technology and civil society have distinct roles to play in the sector’s transformational change. In order to retain carbon pools above and below ground, the conservation of existing critical natural ecosystems and avoidance of further land use change leading to habitat loss and degradation need to be implemented urgently through addressing the driver which will show immediate impacts. Necessary no-deforestation policies in commodity supply chains and enforcement need to be coupled with producer’s shift in approaches and production techniques. Incentives to reduce deforestation and enhance removals need to be sustained through multiple sources of finance. Science-based targets can inform actions taken by the business sector. Concurrently, ecosystem restoration that includes all terrestrial ecosystems and soil needs to be accelerated in order to generate mitigation and adaptation benefits in time to achieve the Paris Agreement. Regenerative land management options will be key to reduce demand for land conversion including sustainable forest management. Nature-based solutions need to be applied not only in forestry and agricultural sectors, but also in urban planning and city and town expansion to reach full mitigation and adaptation potential (William, 2018).

Actions throughout the wood, food and non-food commodity systems will need to scale up to reduce emissions on both the production and consumption side, reduce loss and waste, and transform all supply chains making them transparent and sustainable, including through the creation of circular economy systems and systems for reduced impacts (e.g. in the extractives industries). The potential of soil carbon as a vast carbon sink will have to be understood and leveraged, as well as integrated into carbon pricing.

To transform productive land-use food systems and agricultural sectors, support must be provided to farming, foresters and rural livelihoods to de-risk smallholder farms and value chains as well as to reduce emissions associated with our current diets and generated by food value chains. To achieve this policies, have to be realigned and social movements and innovation towards regeneration have to be enhanced.

For many of these responses Finance is necessary whereby innovative public and private capital investment will play a key role, including through market approaches. The Fourth Industrial Revolution technologies will be central to helping translate the implementation of the land responses at the scale needed, in topics such as resource efficiency, monitoring, natural capital internalization, etc. (WEF, 2020).

Flexible, open access accounting systems that can be used for planning, monitoring and verification for the AFOLU sector need to be established, allowing global use by all stakeholders.

## MILESTONES TOWARDS 2050

	By 2021 ▼	By 2025 ▼	By 2030 ▼	By 2040 ▼
<b>Decision Makers</b>	<ul style="list-style-type: none"> <li>150 million hectares have been brought to restoration.</li> <li>Countries include targets to halt the loss of biodiversity and drastically reduce habitat degradation, in connection with adaptation measures, in their NDCs, COVID-19 recovery programmes, and long term low carbon strategies.</li> <li>Good progress on establishing rules to operationalize ITMOs, and consideration is given for ITMOS from the forest and land use sector (including REDD+).</li> <li>Countries enable policies for transition of agricultural production towards resilient, low carbon, agroecological, regenerative and climate smart practices.</li> <li>The jurisdictional approach to REDD+ and other NbS supports the full climate, environmental and social benefits of NbS; standalone projects are nested or planning how to nest into jurisdictional programs and national implementation in accordance with the Warsaw Framework for REDD+.</li> </ul>	<ul style="list-style-type: none"> <li>End of net deforestation, degradation and conversion, and 50 per cent emission reductions from loss and degradation of natural ecosystems.</li> <li>End subsidies for climate damaging forms of agriculture. Use carbon taxes to disincentivize consumption of climate-damaging food and consumer products.</li> <li>Increase policy measures requiring mandatory corporate disclosure and due diligence of companies operating on forests risks commodity markets.</li> <li>Put in place forest and land-use legislative and governance frameworks in all countries and jurisdictions to promote integrated and sustainable land and forest management.</li> <li>Recognize, respect and protect indigenous peoples' land and natural resources rights and guide land use planning and climate change action under their lead.</li> <li>Market and non-market approaches are functioning under Art. 6 and consideration is given to the trading of high-quality NbS credits including from REDD+.</li> <li>Eliminate perverse fiscal incentives and subsidies to stop ecosystem conversion and increase conservation areas.</li> <li>Advance land-sea/freshwater integration and reduce land-based sources of marine and freshwater pollution.</li> </ul>	<ul style="list-style-type: none"> <li>Protect 30 per cent of natural terrestrial ecosystems by 2030, with incidence in tropical forest and critical ecosystems.</li> <li>350 M hectares have been brought to restoration.</li> <li>End of gross primary forest loss and loss of other terrestrial natural ecosystems including mangroves, peatlands, grasslands and savannas, reducing source emissions by at least 70% from BAU.</li> <li>At the national level, the AFOLU sector developed sustainable pathways and is resilient towards impacts of climate change.</li> <li>Full participation and involvement of Indigenous peoples and local communities in land-related decision-making is the norm.</li> </ul>	<ul style="list-style-type: none"> <li>Land degradation has stopped and sustainable land management is the norm.</li> <li>Emissions from loss of natural ecosystems have dropped by 95 per cent from BAU.</li> <li>Food systems are resilient, sustainable and regenerative.</li> <li>Emissions from agricultural sectors and food systems decreased by 25 per cent compared to BAU.</li> <li>Demonstrable improvements in ecosystems integrity, connectivity and stability are achieved.</li> <li>Rural communities have access to the right technology infrastructure and planning framework to thrive and benefit from new business opportunities and realize their potential for advances in productivity.</li> <li>Indigenous peoples and local communities have access to the right technology infrastructure and monitoring data to govern and protect their territories.</li> </ul>

	By 2021 ▼	By 2025 ▼	By 2030 ▼	By 2040 ▼
<b>Finance</b>	<ul style="list-style-type: none"> <li>Significantly increase climate finance for the forest and agricultural sectors in order to accelerate implementation of national REDD+ strategies, sustainable land, forestry and agriculture management, climate smart land and forest restoration and national adaptation plans.</li> <li>Reduce financial risks, lower transaction costs, facilitate financial transactions, and enable access to financial services and long-term investment for small-scale farmers and forest landowners.</li> <li>Build deforestation-free supply chains across portfolios.</li> </ul>	<ul style="list-style-type: none"> <li>Forest and other terrestrial ecosystems values are internalized in financial decisions and climate smart forestry pilots are started in many countries</li> <li>Ensure wider access to market information by small-scale farmers and forest landowners to empower them in the marketplace, to add value to their products, and to create new market opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Extensive financial products and improved access to financial mechanisms for sustainable practices and reduction of perverse incentives.</li> <li>Establish clear compliance mechanisms to ensure that investors and lenders do not support unsustainable forest, agriculture and land-use practices or loss of biodiversity.</li> <li>20 per cent of all new houses are built from wood and as part of the full wood chain, bioenergy is produced sustainably</li> <li>Through public-private partnerships develop stronger climate information and early warning systems for use by the agricultural sector and disseminate to small scale farmers and forest owners.</li> </ul>	<ul style="list-style-type: none"> <li>Align financial priorities and investments across sectors with the protection of standing natural forests, reforestation and landscape restoration.</li> </ul>
<b>Private Sector</b> (large scale companies & small farming)	<ul style="list-style-type: none"> <li>Science-based targets and action plans laid out by companies to kick-start massive business transitions to nature-positive models in line with the 1.5 C pathway.</li> <li>Enable access to agricultural inputs (climate-resilient seed, organic fertilizers, training, veterinary services, machinery) for the next season, through extension programmes, digital advisories, or public-private partnerships.</li> </ul>	<ul style="list-style-type: none"> <li>Prioritize ecosystem services in small-scale farming practices.</li> <li>Establish more tripartite frameworks for joint action by farmers and farmer organizations and the private and public sector to increase climate change adaptation and mitigation.</li> </ul>	<ul style="list-style-type: none"> <li>Large scale production/farming companies reach the target of reducing emissions by at least 50 Gt CO<sub>2</sub> eq through agriculture related NbS</li> <li>Wide adoption by companies of supply chain transparency, equity, procurement policies and commodity certification.</li> </ul>	<ul style="list-style-type: none"> <li>Large scale agricultural companies aim to become carbon neutral through NbS.</li> <li>Further development of technology for agricultural production to meet the increasing food demand without jeopardizing ecosystem health and exacerbating risks of climate change.</li> </ul>
<b>Civil Society</b>	<ul style="list-style-type: none"> <li>Raise awareness of food systems and their impacts on and vulnerability to climate change and what actions can be taken in order to minimize these impacts.</li> <li>Raise awareness of healthy and nutritious and sustainable diets.</li> </ul>	<ul style="list-style-type: none"> <li>Support the transformation agenda through awareness raising, policy influencing, education, facilitating partnership, building capacities and increased applied research and knowledge.</li> <li>Support extension services and consolidate close working relations with research institutes to accelerate technology field testing.</li> </ul>	<ul style="list-style-type: none"> <li>Establish local and national training systems dedicated to agroecological small-scale agriculture, small scale agribusiness.</li> </ul>	

## PROGRESS

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- The Nature-Based Solutions Coalition co-led by China and New Zealand drew from over 180 proposals to develop a Climate Manifesto at the 2019 Climate Action Summit. The Climate Manifesto acknowledges the important role of nature in climate action and commits to unlocking its full potential in four priority areas.
- The United Nations General Assembly declared 2021–2030 the UN Decade on Ecosystem Restoration, which will offer unparalleled opportunity for more financial support, greater political will from countries, businesses and institutions to combine their efforts, and recognition and interest to restore natural landscapes that will result in job creation, food security and measures to address climate change.
- Countries recognize the potential of the land-use sector in achieving the Paris Agreement: in 2015, 89 per cent of all countries refer to agriculture and/or land use, land-use change and forestry when outlining their mitigation contributions in their nationally determined contributions (NDCs); 98 per cent of the countries that include priority areas for adaptation actions mention land use sectors in their NDCs. Yet, further support is needed for countries to implement these commitments, to upscale the ambition in the second NDCs, and to fully leverage the potential that the land-use sector offers to tackle climate change.
- In September 2020, the Bonn Challenge announced surpassing their first milestone goal, with 74 pledgers from 61 countries, 8 states and 5 associations voluntarily committing to bring over 210 million ha of degraded and deforested lands into restoration.
- Many EU countries started climate smart forestry pilots: adapting, mitigating and creating a resilient forest ecosystem – wood chain.
- Over 340 actors have registered 461 actions on the NAZCA Platform for land-based actions in contribution to the Paris Agreement.
- The UN Food Systems Summit in 2021 is raising global awareness and increasing global commitments that transform food systems to resolve not only hunger, but to reduce diet-related disease and regenerate the planet. The Summit will raise awareness for the need of collective action of all citizens to radically change the way we produce, process, and consume food.
- Since its launch in 2014, the New York Declaration on Forests has been endorsed by 200 endorsers from 41 National Governments, 21 Subnational Governments, 22 organizations from Indigenous People and Local communities, 62 Companies, and 67 Non-governmental organizations.
- Following its adoption in 2017, the Koronivia Joint Work on Agriculture has been a considerable opportunity for countries and observers to exchange views on a variety of topics related to agriculture and climate change, including methods for assessing adaptation, soils, nutrient use, water, livestock, and the socio-economic and food security dimensions of climate change.
- As of April 2021, Costa Rica, Argentina, Colombia, Indonesia, Paraguay, Chile, Ecuador and Brazil have signed REDD+ result-based payments agreements under the GCF for 101.2 Mto CO<sub>2</sub>e.

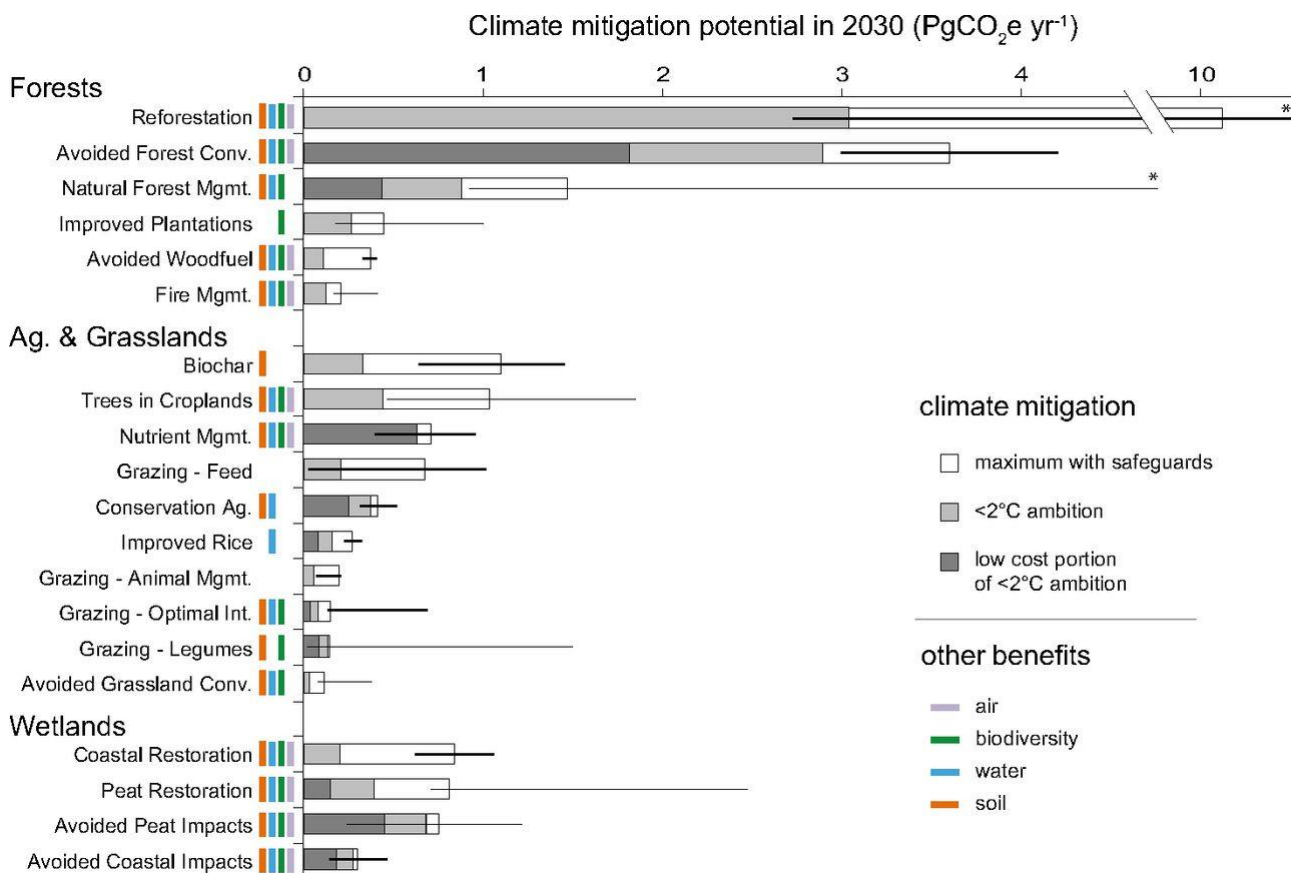
- Results in terms of emission reductions from REDD+ so far reach close to 8 billion tons of CO<sub>2</sub>e/year as reported to the UNFCCC REDD+ Platform.
- The Forest Carbon Partnership Facility (FCPF) has reached a major milestone of signing contracts (ERPAS) to generate emission reductions from REDD+ programs. As of April 2021, a total of 13 countries (Chile, Costa Rica, Côte d'Ivoire, Democratic Republic of Congo, Fiji, Ghana, Indonesia, Laos PDR, Madagascar, Mozambique, Nepal, Vietnam, Republic of Congo) have signed ERPAs with the World Bank for a total contract value of over USD 640 million.
- The Council of the International Civil Aviation Organization (ICAO) — the United Nations agency that sets standards for global aviation - approved jurisdictional tropical forest protection programmes for airlines' use in accounting for their emissions in ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).
- The Lowering Emissions by Accelerating Forest Finance (LEAF) Coalition was launched. It is an ambitious new public-private initiative designed to accelerate climate action by providing results-based finance to countries committed to protecting their tropical and subtropical forests. This initiative aims to mobilize at least USD 1 billion in financing, kicking off what is expected to become one of the largest ever public-private efforts to help protect tropical forests, to the benefit of billions of people depending on them, and to support sustainable development. Initial participation is from the governments of Norway, the United Kingdom, the United States, and nine leading companies including Amazon, Nestlé, and Unilever.



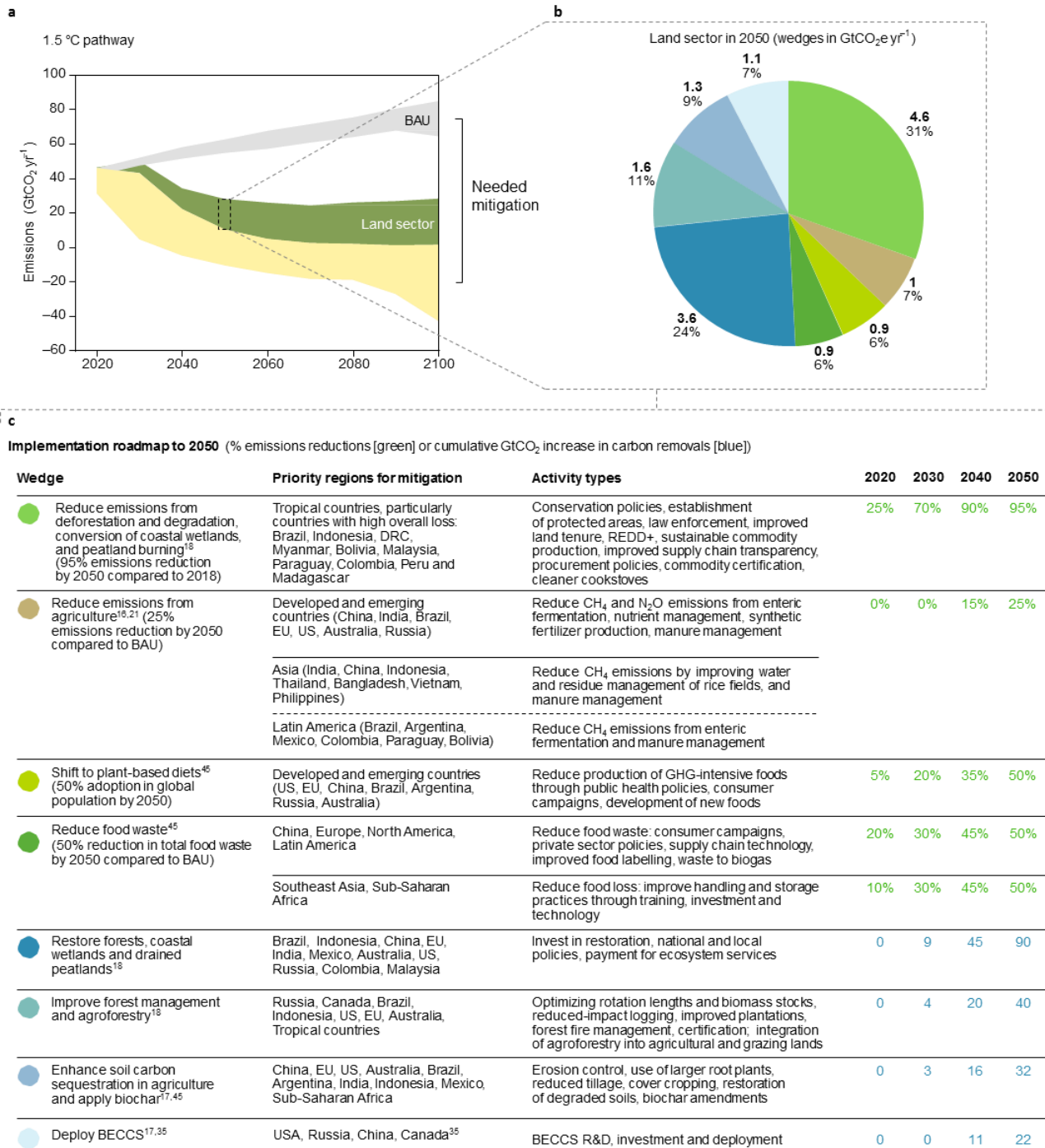
## FACTS & FIGURES

The first figure shows the climate change mitigation potential of 20 land-based pathways within conservation, restoration, and/or improved land management that increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural lands. The analysis argues that these responses can provide over a maximum of one-third of the cost-effective climate mitigation needed between 2016 and 2030 to stabilize warming to below 2 °C.

The second figure shows pathways in the land use to achieve the 1.5 °C goal by 2050, divided by eight wedges and twenty-four activity types. For each wedge, regions and activity types are highlighted based on bottom-up mitigation potentials and a political feasibility analysis. Countries shown in the table are countries with the highest global AFOLU emissions and the ones with the highest mitigation potential in the land sector from carbon removals, reduced land-use change, reduced enteric fermentation, diet shifts, food waste reduction (consumption and production). Achieving this scenario could result in about 30 per cent of global mitigation. For the full explanation, sources and methods please refer to the original publications (links below).



**Figure 1:** (From the original publication) “Figure 1. Climate mitigation potential of 20 natural pathways. We estimate maximum climate mitigation potential with safeguards for reference year 2030. Light gray portions of bars represent cost-effective mitigation levels assuming a global ambition to hold warming to <2 °C (<100 USD MgCO<sub>2</sub>e<sup>-1</sup> y<sup>-1</sup>). Dark gray portions of bars indicate low cost (<10 USD MgCO<sub>2</sub>e<sup>-1</sup> y<sup>-1</sup>) portions of <2 °C levels. Wider error bars indicate empirical estimates of 95% confidence intervals, while narrower error bars indicate estimates derived from expert elicitation. Ecosystem service benefits linked with each pathway are indicated by colored bars for biodiversity, water (filtration and flood control), soil (enrichment), and air (filtration). Asterisks indicate truncated error bars. See SI Appendix, Tables S1, S2, S4, and S5 for detailed findings and sources.” Griscom, Bronson W.; Adams, Justin; Ellis, Peter W.; Houghton, Richard A.; Lomax, Guy; Miteva, Daniela A. et al. (2017): Natural climate solutions. In Proceedings of the National Academy of Science 114 (44), p. 11645. DOI:10.1=1073/pnas.1710465114



**Fig. 6 | Land-sector roadmap for 2050.** **a**, The land sector makes up 21–30% interquartile range (median 25%, approximately 14 GtCO<sub>2</sub>e yr<sup>-1</sup>) of the total mitigation in 2050 in modelled 1.5°C pathways (data from Fig. 2c). In the bottom-up assessment, the median mitigation potential of the land sector is about 15 GtCO<sub>2</sub>e yr<sup>-1</sup> in 2020–2050, or about 30% of total mitigation needed. **b**, The needed mitigation is translated into eight priority land-based measures (wedges), combining the 24 land-based activities from the bottom-up assessment, and based on an analysis of co-benefits and risks, feasibility and sustainability to deliver mitigation of about 15 GtCO<sub>2</sub>e yr<sup>-1</sup> by 2050 (detailed in Supplementary Tables 5 and 6). The green wedges represent emission reduction measures (7.4 GtCO<sub>2</sub>e yr<sup>-1</sup>), and the blue wedges represent carbon removal measures (7.6 GtCO<sub>2</sub>e yr<sup>-1</sup>). Each wedge is individually accounted for with the intent of avoiding double-counting (Supplementary Information Section 14). **c**, The implementation roadmap to 2050 details each wedge and related priority regions, activity types and implementation trajectories in per cent for emission reduction activities and cumulative GtCO<sub>2</sub>e for carbon removal activities starting in 2020. The baseline and trajectory numbers in 2050 are based on the source used for each wedge (Supplementary Table 5). The 2020–2050 trajectories were developed through a political feasibility assessment combined with an expert assessment weighing trade-offs. A additional details on priority regions and trajectories are provided in Supplementary Information Sections 13 and 14.

Figure 2: Roe, S., Streck, C., Obersteiner, M., Frank, S., Griscom, B., Drouet, L., Fricko, O., Gusti, M., Harris, N., Hasegawa, T., Hausfather, Z., Havlik, P., House, J., Nabuurs, G. J., Popp, A., Sánchez, M.J.S., Sanderman, J., Smith, P., Stehfest, E. and Lawrence, D. 2019. Contributions of Land Sector to 1.5°C World. In: Nature Climate change [online] <https://www.nature.com/articles/s41558-019-0591-9>

## LAND USE CLIMATE ACTION TABLES – STRUCTURE

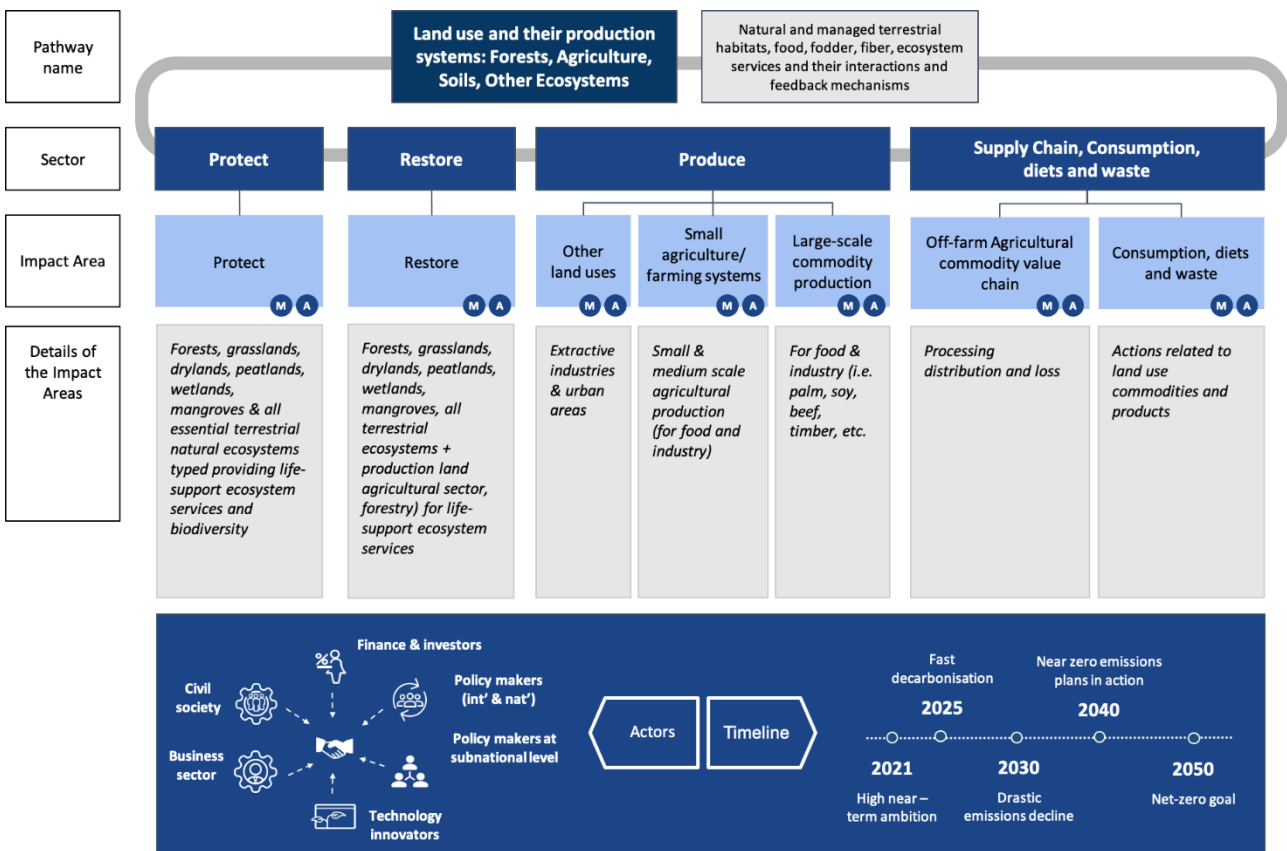
The AFOLU sector is a major contributor to climate change, contributing with about 24 per cent of the anthropogenic greenhouse gas (GHG) emissions including through loss and degradation of forests and other ecosystems. At the same time, broader natural ecosystems and agro-sylvo pastoral systems are in the front line of defence against climate extremes and weather variabilities, providing disaster risk reduction and adaptation for enhancing the resilience of livelihoods for food security and nutrition; it provides key solutions to achieve the goals of the Paris Agreement. The Land Use Action Tables aims to address the complex nature of land use sectors and its interrelations and interactions.

The Land Use Action Tables are structured into four sub-sectors that correspond to classification of the IPCC Special Report on Climate Change and Land (IPCC, 2019):

- Protect;
- Restore;
- Produce; and
- Supply chain consumption, diets and waste.

Overall, seven impact areas addressing adaptation, resilience and mitigation actions were identified under the four sub-sectors, listing actions for each of the key groups of actors or levers to achieve by 2021, 2025, 2030 and 2040.

The diagram below provides additional details on the content of each impact area. Impact areas under sub-sectors i) and ii) are straightforward, while sub-sectors iii) and iv) are divided in a number of impact areas given that actions are distinct depending on the area’s focus.



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