NO. 195
NOVEMBER 2021

ADB BRIEFS

KEY POINTS

- The level of climate action needed to meet the goals of the Paris Agreement requires a major transformational change in the way society, economies, and governance function.
- Non-energy sectors—including transport, waste, forestry, agriculture, fisheries, and tourism—are responsible for more than 40% of greenhouse gas (GHG) emissions. Recognizing the potential to reduce GHG emissions and build climate resilience in these sectors, the Asian Development Bank's developing member countries have included them in their nationally determined contributions (NDCs).
- The transformational nature of climate action required to meet NDCs will create opportunities for new industries and businesses, but it could negatively impact society, especially vulnerable groups.
- Integrating the concept of Just Transition into climate policies is therefore paramount to ensure no one is left behind and that the benefits of a low-carbon and climate-resilient future are shared by all. A comprehensive analysis of Just Transition risks needs to be incorporated in the decision-making process for climate action.

ISBN 978-92-9269-111-0 (print)
ISBN 978-92-9269-112-7 (electronic)
ISSN 2071-7202 (print)
ISSN 2218-2675 (electronic)
Publication Stock No. BRF210408-2
DOI: http://dx.doi.org/10.22617/BRF210408-2

Just Transition Beyond the Energy Sector

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INTRODUCTION

This brief examines the potential negative impacts of climate action in non-energy sectors including transport, waste, forestry, agriculture, fisheries, and tourism. It also underlines the social facet of climate action and highlights the need for policymakers to consider these potential impacts in the preparation and implementation of mitigation and adaptation strategies.

The importance of the concept of **Just Transition** is being increasingly recognized amid the global effort to transform economies to mitigate climate change, adapt to its adverse impacts, and increase resilience. Just Transition takes into account the management of potential negative impacts of climate action on people and societies, and ensures that the prosperity brought on by the transition will be enjoyed by all.

Global greenhouse gas (GHG) emissions have risen by at least 50% since 1990,[1] and are expected to keep rising. In 2016, the energy sector made up about 57% of all GHG emissions globally, followed by agriculture, forestry, and land use; transport; industry; and waste.[2] The impacts of climate change are already being felt. According to the latest assessment report by the Intergovernmental Panel on Climate Change (IPCC), "global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO_2) and other GHG emissions occur in the coming decades."[3] As scientific evidence continues to underline the severity of the climate change crisis, a concerted global effort has never been more imperative.

Note: The authors would like to thank—Srinivasan Ancha, Noelle O'Brien, Arghya Sinha Roy, Michiel Van Der Auwera, Ben Graham and Dennis Fenton for their comments and feedback; Janet Arlene Amponin and Hannah Fatima Ebro for their valuable inputs and overall coordination and support; and Anna Liza Cinco, Ken Edward Concepcion and the ADB production team for ensuring the timely publication of this brief.

1 M. Ge, J. Friedrich, and L. Vigna. 2020. *4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors*. World Resources Institute. 6 February.
2 H. Ritchie and M. Roser. 2020. *CO_2 and Greenhouse Gas Emissions*. Energy sector includes electricity and heat, buildings, manufacturing and construction, fugitive emissions, and other fuel combustion.
3 IPCC. 2021. *Climate Change 2021: The Physical Science Basis*.

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In the landmark **Paris Agreement** adopted in 2015, signatory parties agreed to fulfill their role in "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels." Through the design of nationally determined contributions (NDCs), countries have identified the sectors that they aim to transform to achieve this goal. Some countries have also drafted national plans that explore pathways to realize their climate goals. These include long-term low GHG emission development strategies, sectoral mitigation plans, and national adaptation plans, along with a slew of other climate policies.

The level of climate action required to achieve the Paris Agreement goals will constitute a major transformational change of countries' economic systems, in the way industries and supply chains operate, the way energy is produced and used, what people eat, how people manage land and forests, and how cities are designed, among others. Just like in the 1990s when a Just Transition was being demanded for workers in fossil fuel-based industries targeted by environmental policies, countries must now incorporate Just Transition in future climate-conscious policies and decisions pushing for systemic reform to ensure that the needs of workers, communities, and society are considered. Although such radical economic transformations may evoke fears of financial losses and economic hardships, planning for a Just Transition ensures that climate action and economic prosperity do not have to be incompatible.

Countries have come together to acknowledge the importance of a Just Transition through the **Silesia Declaration**, signed by over 50 countries during the 24th session of the Conference of the Parties (COP24) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2018.[4] The Silesia Declaration puts Just Transition in the global policy scene as a geopolitical priority recognizing that "the consideration of the social aspect of the transition towards a low-carbon economy is crucial for gaining social approval for the changes taking place."

"The consideration of the social aspect of the transition towards a low-carbon economy is crucial for gaining social approval for the changes taking place."

– Silesia Declaration, COP24

Just Transition principles are also underscored in the Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development. Just Transition aspects such as human rights, good governance, due participation, gender equality, social equity, decent work and resilience, and climate ambition align with various SDGs: SDG 13 (climate action), SDG 8 (decent work and economic growth), SDG 1 (no poverty), SDG 5 (gender equality), and SDG 10 (reduce inequality).

Just Transition impacts have been widely considered in the energy sector. This brief examines Just Transition impacts in six other sectors—**transport, waste, agriculture, forestry, fisheries, and tourism**—that are prevalent in the NDCs of ADB's developing member countries (DMCs), to advocate for the inclusion of Just Transition impacts in multiple sectors at the core of climate policy development.

The analysis for each of the six sectors follows a three-part structure. First, **Sector Outlook** provides a brief overview of the sector's current situation. Second, **Sector Actions for Mitigation and Adaptation** illustrates prevailing climate actions that have been implemented or envisioned in the sector. Finally, **Just Transition Impacts** consider the potential negative impacts in the implementation of those actions.[5]

TRANSPORT

Sector Outlook

Developing countries in Asia are expected to contribute the most to the accelerated growth of emissions from the transport sector. By 2030, Asia is expected to emit 31% of the CO_2 released by the transport sector worldwide.[6] Many countries have started to transform this sector, introducing ways to reduce dependence on fossil fuels, and thus reduce GHG emissions. Such decarbonization efforts are expected to affect the job landscape of the sector, and the lives of people that rely on transport systems.

Sector Actions for Mitigation and Adaptation

- Countries' NDCs focus on supporting modal shifts (e.g., from road to rail) including for freight, improving public transport systems, supporting the penetration of motors with higher fuel efficiency, the use of alternative fuels, and promoting electric vehicles.
- Promotion of public transport revolves around the construction of mass transport systems and infrastructure, extending and improving efficiency of transportation modes, including bus and ferry networks.
- Energy-efficient transport is proposed to be achieved by introducing stricter efficiency standards, banning the import of older vehicles, using alternative fuels, and promoting the retirement of old vehicles.

4 COP24. 2018. *Solidarity and Just Transition: Silesia Declaration*.
5 Though also worth considering, opportunities presented by climate action, as well as negative impacts from climate change itself, are not extensively explored in this brief.
6 ADB. ADB's Work in Sustainable Transport.

Box 1: Inclusive Consultation and Dialogue

The participation of all members of society in the Just Transition planning and implementation is imperative. Both social participation and stakeholders' consultation are critical aspects of a well-designed Just Transition. Stakeholders include workers, unions, employers, industry representatives, academia, environmental groups, national and local governments, non-unionized and informal workers, along with civil society, communities, indigenous groups, migrants, and the landless.

Equally important to involving the correct stakeholders are the processes, information provided to participants, and periodicity of the consultations. These will decrease the risk of social conflict. There are two concepts to consider when planning the consultation processes:

- Procedural justice includes fairness the decisions related to inclusion and exclusion of individuals and groups in the consultation processes and access to fair information. It also includes ensuring proper public participation in policy development and decision making.
- Recognition considers whose interests and values are recognized and taken into account.[a] This accepts that "there are cultural and institutional processes and legacies that have explicitly or implicitly given individuals, communities, or social groups unequal recognition."[b]

Together, these two concepts focus not only on who is engaged in the process but also how they are engaged.

An institutional setting for social dialogue and participation is critical to promote successful dialogue and cooperation. This may include the following:

- Incorporation of Just Transition in the agenda of relevant tripartite councils and boards.
- Formation of working groups or subcommittees to ensure proper attention is paid to monitor progress.
- Creation of adequate participatory platforms across society to listen to all and engage players across a broad spectrum.
- Provision to those affected by the transition of resources and the ability to participate in the design and implementation of the response to the challenges of the transition.

[a] Center for Strategic and International Studies and Climate Investment Funds. 2020. *Just Transition Concepts and Relevance for Climate Action*.
[b] Steve Williams and Andréanne Doyon. 2018. *Just Systemic Change: Justice and System Transitions. Submitted to the 9th International Sustainability Transitions Conference.*
Source: Asian Development Bank.

- Increasing the share of passenger electric vehicles—especially for two- and three-wheelers[7]—and developing the charging support network have been proposed in some NDCs. Globally, it is expected that passenger electric vehicles will represent approximately 60% of sales and 30% of the fleet by 2040.[8] Subsidies on private electric vehicles[9] and electrification of buses and commercial vehicles is expected to accelerate.
- A carbon tax on fossil fuels (e.g., diesel and gasoline), which leads to an increase in fuel price, can disincentivize the use of private vehicles.
- Local governments may enact partial bans on cars in some parts of cities to discourage driving and reduce local GHG emissions, and introduce policy responses such as congestion charging or incentives.[10]
- Other relevant actions include promoting nonmotorized transport (e.g., walking, biking), and behavioral changes (e.g., working from home, virtual meetings, remote studying), which imply less commute and fewer trips.
- Transport infrastructure is also being made more climate resilient. For example, road levels have been raised and sealed to deal with overtopping associated with sea level rises. Ports have also been made more robust and resilient to wave action, as well as having the capability to be raised in response to rising sea levels.[11]

Just Transition Impacts

- The production of electric vehicles is vastly different from that of internal combustion engine (ICE) vehicles. As electric vehicles have a simpler design and fewer parts, employment needs in manufacturing and assembly may shrink. The assembly of an all-electric engine takes only about 3.7 hours, compared to 6.2 hours for a conventional ICE.[12] Electric vehicles also have fewer maintenance needs, and this may also have further impact on employment (footnote 11). Fewer parts and less maintenance will also affect the supply chain of the automotive industry.
- The phaseout of traditional fossil fuel-intensive public transport may threaten the livelihoods of formal and informal workers who have relied on these for a living. If the phase-out occurs before the introduction of more sustainable vehicles, drivers who are unable to adapt financially will find themselves stranded.

7 B. Fabian. 2021. GFEI paving the way for electric mobility in South-East Asia. *Global Fuel Economy Initiative*. 8 February.
8 BloombergNEF.2021. *Electric Vehicle Outlook 2021*. New York.
9 International Energy Agency. 2021. *Global EV Outlook 2021*. Paris.
10 M. Shepherd. 2020. Decarbonizing transport: a just transition? *Oxera*. 30 June.
11 ADB. 2013. *Climate Change and Transport*. Manila.
12 P.A. Einstein. 2019. Electric vehicles pose 'real risk' for autoworkers, with fewer parts — and jobs — required. *NBC News*. 3 October.

Box 2: Considering Gender Impacts and Opportunities of Transition Actions

Gender equality must be a central component of Just Transition. Beyond assessing gender impacts, Just Transition should become an opportunity to empower women and increase their role in society.

Existing inequalities, if left unchecked, can be exacerbated not only by the effects of climate change itself, but also by shortsighted climate policy. Women are often involved in the lower-paid, less-qualified activities of the sectors analyzed, which puts them at risk of being overlooked by climate policy. They may also be unfairly affected by changes to family dynamics. Women are already typically expected to carry out unpaid care and domestic work, with women in Asia and the Pacific spending up to 11 times more time on unpaid care work than men.[a] Women will most likely assume the entirety of these responsibilities if they lose their jobs. At the same time, impacts on men's jobs may trigger domestic instability, heightened tensions, and increased domestic violence.

Women have also been found to lack representation in the decision-making process. For example, in agriculture, due to cultural norms, women farmers tend to feel discouraged from participating in community planning despite making up a significant portion of the agricultural labor force. Thus, their concerns tend not to be heard when designing policies.

In the development of Just Transition policies, the gender dimension of climate change and the transition toward a low-carbon, climate-resilient economy must be highlighted. Women's engagement in the consultation processes is essential.

Countries should consider incorporating a gender impact analysis in any mitigation and adaptation policy and sectoral plan. While gender impact assessments have become common in adaptation planning, it has not fully been integrated in climate mitigation planning.

Beyond minimizing potential impacts, Just Transition should focus on the opportunities it can promote, including:

- Incorporation of gender representatives in tripartite consultative groups.
- Empowering women through skills and workforce development to incease their access to new jobs and career development plans.
- Promotion of women enrollment in science, technology, engineering, and mathematics programs.
- Elimination of gender pay gaps.
- Support for women entrepreneurship and women-led businesses.
- Prioritization of new businesses and industries that allow for a greater participation of women.
- Prioritization of infrastructure and technologies that contribute to women's safety and increased access to markets and resources.

[a] I. van Wees. 2019. Reducing gender gaps in Asia and Pacific essential to realizing region's potential. Manila: ADB. 27 September.

Source: Asian Development Bank

- The expected decline in commuting due to remote working, distance learning, and virtual meetings may have detrimental effects on local economies, as was observed during the coronavirus disease (COVID-19) crisis.[13] This may affect eateries and shops around offices and universities that grew to depend on the steady stream of workers and students.
- Higher fuel prices from carbon taxes and higher vehicle costs from stricter fuel efficiency and vehicle standards may disproportionately impact lower-income workers and families who tend to drive less-efficient vehicles. High fuel and vehicle efficiency standards, including introduction of electric vehicles, may lead to a significant reduction of less-efficient vehicles, which are usually cheaper, in the market.
- Individual well-being may also be at risk. For example, a vehicle ban in some urban areas can neglect the needs of individuals who depend on private vehicles for mobility, such as those with accessibility issues and the elderly. Likewise, access to public transport may become challenging if informal modes of transport are phased out without appropriate consideration of intermodal connectivity.
- If women are left with few options for mobility, the increased use of public transportation may pose safety concerns, including a potential rise in sexual harassment incidents.[14]

WASTE

Sector Outlook

As the fourth largest GHG emitter globally, the waste sector holds a lot of potential for transformation toward becoming a net-zero sector (footnote 1). Each step of waste management—waste storage, collection, transfer and/or transport, recycling, treatment,

[13] A. Tappe. 2021. Why remote work is a big problem for the economy. *CNN*. 2 August.

[14] ADB. 2015. *Policy Brief: A Safe Public Transportation Enviroment for Women and Girls*. Manila.

and disposal—generates GHGs.[15] As the population growth in developing countries accelerate, so will the waste generated, putting a strain on waste management and effective GHG emission mitigation. From 1970 to 2017, Asia and the Pacific accounted for 53% of the total global urban population, with the region's total urban population potentially increasing from 1.8 billion in 2017 to almost 3 billion in 2050.[16] In rural areas, unregulated dumping of waste is still practiced.

The problem of waste is even more serious in small island developing states (SIDS). On average, a person in SIDS generates 2.3 kilograms (kg) of municipal solid waste (MSW) per day, which is 48% higher than the global average. SIDS in the Pacific have an even higher average of 3.09 kg MSW per person per day.[17] Additionally, with land-use constraints, treating MSW can be very challenging.

Overall, Asia is expected to produce as much as 1.5 billion tons of MSW by 2030, further increasing to almost 2 billion tons by 2050 (footnote 17). Although proper waste management services are employed in developed countries, people in developing countries where such services are not as present often resort to open dumping of waste, leading to groundwater contamination, respiratory diseases, and excess GHG emissions, among other issues.[18] In terms of employment, underdeveloped waste management systems in developing countries are also prone to rely on informal workers in municipal waste collection, sorting, and recycling.[19]

Sector Actions for Mitigation and Adaptation

Some sector actions mentioned in NDCs of DMCs look to improve waste management systems to capture landfill gas either to be utilized as energy or to be flared. Others aim to employ new technologies and methods that may include aerobic composters, anaerobic digesters, incineration, and co-combustion.

- Waste management systems are at risk due to extreme weather events. A rise in sea levels and flooding events may affect critical infrastructure and lead to overflow of waste. This may force local governments to relocate disposal sites far from vulnerable areas and allocating additional resource for securing infrastructure. The capacity of landfill leachate collection systems for heavy rainfall events could also be increased.[20]
- Mitigation can be reached through the transformation of the current economic model from linear to circular. In a linear economy, "resources are extracted, transformed into products, used, and finally discarded," while in a circular economy, resources are considered finite and are being reused, repaired, remanufactured, shared, and recycled (footnote 19). This will reduce waste generation—and the corresponding GHG emissions.

Just Transition Impacts

- Transforming the economy from linear to circular will involve a massive shift in the economic model. While jobs are expected to be created during this transition, jobs are also expected to be eliminated, substituted, transformed, and redefined, including in the waste sector. As the waste industry shifts from GHG emission-heavy operations, such as landfilling and incineration, to more sustainable practices such as recycling, workers will be expected to make the same shifts. Relevant skills may need to be learned through retraining for these workers (footnote 20).
- As developing countries begin to implement more comprehensive waste management systems, informal workers who were once vital to waste collection, sorting, recycling, and other waste management activities run the risk of being marginalized. Integration of informal workers, such as waste collectors, in new waste management systems should be considered to safeguard their source of income.
- Waste pickers, who, in addition to earning income from the retrieval and subsequent sale of materials in landfills, also relied on these landfills for subsistence, may lose a crucial source of livelihood if waste management systems are improved and prohibit their access to these sites. Social support systems must be implemented to provide them access to jobs that can support a more sustainable and healthier lifestyle.
- As women who work in waste management are typically employed in the informal sector,[21] failure to incorporate informal workers into formal waste management employment may impact them more severely.
- Cooperation between municipal governments and waste workers' organizations is encouraged to identify relevant skills and build workers' capacity to transition to more advanced waste management systems.
- Relocation of disposal sites may expose new communities to health hazards and may divert employment opportunities from one community to another.

AGRICULTURE

Sector Outlook

In their NDCs, DMCs have acknowledged the role of agriculture in their countries' overall GHG emissions and have therefore included plans to mitigate GHG emissions in this sector. Agriculture contributes significantly to global GHG emissions, making up 17% of GHG emissions from all sectors in 2018. Regionally, the Asia and Pacific region releases more GHG from

15 G.A. Kristanto and W. Koven. 2019. Estimating greenhouse gas emissions from municipal solid waste management in Depok, Indonesia. *City and Environment Interactions*. Volume 4. pp. 100027.
16 ADB Institute. 2020. Solid Waste Management in Developing Asia: Prioritizing Waste Separation. *ADB Institute Policy Brief*. No. 2020-7. November. Tokyo.
17 United Nations Environment Programme. 2019. *Small Island Developing States Waste Management Outlook*. Nairobi.
18 World Bank. 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Washington, DC.
19 P. Schröder. 2020. *Promoting a just transition to an inclusive circular economy*.
20 C40 Cities Climate Leadership Group. 2020. *Reducing climate change impacts on waste systems*. June.
21 GA Circular. 2019. *The Role of Gender in Waste Management*. Singapore.

Box 3: Small Island Developing States

Small Island Developing States (SIDS) have contributed minimally to greenhouse gas emissions, but they are among the most vulnerable countries to the adverse effects of climate change. Seven SIDS can be found in the top 10 countries most at-risk, as reported by World Risk Report, with four located in the Pacific.[a]

SIDS need special considerations when identifying Just Transition actions to potential impacts. The need for relocation of workers and their families due to job losses from diminished or discontinued operations in the island may imply migration to a different country. In addition to the impact on individuals and their families, this can have negative consequences on the cultural heritage and societal organization of their homeland.

The Asian Development Bank's developing member countries in the Pacific have proposed several actions in their nationally determined contributions for the transition to a less resource-intensive, more climate-resilient economy. Opportunities relate to sustainable tourism, agriculture, fisheries, and forestry, among others. As climate impact models reveal the most vulnerable areas and regions, governments must make informed decisions about where resources will be best spent. If models show that some areas will most likely suffer severe irreversible damage due to climate change, governments may need to prioritize less vulnerable regions to ensure that resources spent are allocated on long-lasting initiatives and projects. Such decisions may require transitional support actions for affected workers and families.

[a] Bündnis Entwicklung Hilft. 2020. *WorldRiskReport 2020*. The four Pacific countries in the top ten at-risk SIDS in Asia and the Pacific, in order, are Vanuatu, Tonga, Solomon Islands, and Papua New Guinea.

Source: Asian Development Bank.

agriculture than any other region,[22] also leading in GHG emissions from livestock alone.[23] Thus, much effort has been placed on incorporating mitigating actions from this sector in DMCs' NDCs.

At the same time, however, agriculture is also highly vulnerable to the adverse effects of climate change, as extreme weather events have the potential to affect yields and severely impact the livelihoods of farmers in the region. Increases in temperatures, shifts in precipitation patterns, and increased frequencies and intensities of extreme weather events are just some of the climate change-induced extreme weather events foreseen to impact the agricultural landscape.[24] Furthermore, climate change can contribute to changes in the quantity and quality of land, soil, and water resources.[25] For example, a rise in sea levels can lead to the salinization of soil and well waters, affecting agriculture especially in Pacific island countries.[26] To ensure food security and stability in the sector and in the employment of farmers, adaptation measures must also be taken.

Sector Actions for Mitigation and Adaptation

- To address both mitigation and adaptation actions in agriculture, farmers are diversifying their operations to include either more climate-friendly activities or activities that are resilient to more frequent and more severe weather events that will be triggered by climate change. For example, farmers are starting to grow new climate-resilient rice varieties tolerant to drought, flooding, extreme temperatures, salinity, and poor soil quality.[27] In some Pacific island countries, cabbage has been introduced to supplement traditionally grown taro,[28] while in other countries, farmers are opting for ducks instead of chickens, due to ducks' higher resilience.[29] Mixed crop-livestock systems can also be adopted to improve efficiency without an exorbitant strain on resources.
- New techniques are also being employed to keep up with environmental stresses that render traditional farming techniques inadequate. For example, farmers in Pacific island countries are now learning to use new techniques to plant taro in drier areas, despite taro having been traditionally grown in swampy areas, which are now drying.
- Reduction of herd sizes, especially of cows, goats, and sheep, has also been called for to reduce methane emissions, aiming for an optimal stocking rate where productivity is highest.[30] More efficient feeding regimes have also been found to mitigate emissions.[31]

[22] Food and Agriculture Organization (FAO). 2020. *Emissions due to agriculture: Global, regional and country trends 2000–2018*. Rome.
[23] P.J. Gerber et al. 2013. *Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*. Rome, Italy: FAO.
[24] Environmental Protection Agency. *Climate Impacts on Agriculture and Food Supply*.
[25] FAO. 2007. Adaptation to climate change in agriculture, forestry and fisheries: Perspective, framework and priorities. *FAOSTAT Analytical Brief*. Rome.
[26] Ohio State University. 2018. Climate change, rising sea levels a threat to farmers in Bangladesh: Salty soil drives changes in agriculture, migration, study finds. *ScienceDaily*. 23 October.
[27] International Rice Research Institute. *Climate change - ready rice* (accessed 28 September 2021).
[28] International Labour Organization (ILO). 2019. *Future of Work for Climate Resilience in the Pacific Islands*. Fiji.
[29] S. Savage. 2019. To Survive in a Wetter World, Raise Ducks, not Chickens. *The Atlantic*. 13 July.
[30] M. Daalder. 2021. Climate report sets up fight over herd sizes. *Newsroom*. 3 February.
[31] M.D. March et al. 2021. Effect of Nutritional Variation and LCA Methodology on the Carbon Footprint of Milk Production From Holstein Friesian Dairy Cows. *Frontiers in Sustainable Food Systems*. 5. pp. 119.

- New technologies are also being developed and produced to aid in both mitigation and adaptation efforts in agriculture. This includes higher efficiency pumps for irrigation, solar water pumps, and new irrigation techniques. Seeds have also been bred to minimize the need for tillage, reducing fuel consumption in the farm, while others have been bred to tolerate stresses such as droughts, salinity, pests, and diseases.[32] Feed technology is also being improved to increase the nutritional value of feeds given to livestock.
- Other technologies to promote low-impact farming may involve high-tech approaches that rely on digital technologies. Drones have also been considered to carry out some of the work required in a farm, reducing the need for intensive manual labor that can save farmers a lot of time from working outside under increasingly extreme weather conditions.[33]

Just Transition Impacts

- Coastal farming impacted by severe climate events may lead to the need for moving agriculture inland, and even agriculture-dependent communities. Land tenure and land ownership may lead to negative impacts for farmers if no good, accessible land is available.
- The diversification of farm operations and products will require farmers to develop different knowledge or skills, requiring reskilling and retraining. Such programs, coupled with appropriate policy, will be required to give farmers sufficient comfort level to invest their time, effort, and money into these new operations. The same can be expected of new techniques farmers need to adopt.
- The use of new, advanced technologies in agriculture, though promising, may be limited to wealthy farmers. Meanwhile, smaller farms with lesser capacities may be left without these upgrades and may suffer financially in the long run with lower productivity levels and exposure to climate impacts. Gender can also be a factor, as fewer women may be able to gain access to these technologies (footnote 33). As a result, farms that are unable to afford expensive technology and convert their operations to involve more sustainable methods may appear unattractive to potential partners, buyers, and the market.
- Jobs may also be affected through the incorporation of advanced technology that employ automation. Although this may keep farmers from prolonged exposure to extreme weather conditions, big farming establishments may no longer find the need to employ many people, thus reducing employment opportunities.

FORESTRY

Sector Outlook

Forests have a dual role when it comes to climate change mitigation, acting both as a source and a sink for CO_2. In Asia and the Pacific, biomass burning on forest land is the leading source of GHG emissions from forests, followed by deforestation, and is heavily carried out in Southeast Asia.[34] On the other hand, through sustainable forest management, cropland, and afforestation efforts, countries can take advantage of forests and harness their potential as carbon sinks while delivering other biodiversity benefits (footnote 34). Globally, forests have been estimated to be a net carbon sink, absorbing about 7.6 gigatonnes of CO_2 per year.[35] With analyses of NDC commitments in the Asia and Pacific region showing a potential of 160% increase in land-based carbon sinks by 2030 if fully implemented, the region can further push the role of forests as carbon sinks worldwide.[36]

In addition to their role in climate change mitigation, forests are also important contributors to climate resilience by helping regulate hydrological cycle, lowering temperatures, and increasing storm resilience. Local and indigenous communities also rely on them. The loss of biodiversity and overall environmental damage that would result from the destruction of forests can disproportionately affect vulnerable local communities. Risks to their survival are compounded with risks to their identity as many of these communities have rich cultural ties to the forests in which they have lived for generations. Climate actions regarding forests must consider these issues to ensure a Just Transition approach.

Sector Actions for Mitigation and Adaptation

- As increasing forest cover is key to harnessing the potential of forests to act as carbon sinks, several DMCs have cited afforestation and deforestation efforts in their NDCs. However, maintaining existing forestry assets is also key through the restriction of deforestation activities, considered one of the largest contributors to GHG emissions in forests. In some countries, bans on logging have been imposed, while in others, moratoria have been set on the issuance of new permits to clear forests.[37]
- Several countries in the Asia and Pacific region have recognized in their NDCs the need for forests to be managed sustainably. This ensures that the activities carried out in the forest bring social, environmental, and economic benefits. Some countries are looking to incorporate social forestry programs as one type of forest management initiative to directly involve the local and indigenous communities that have relied on these resources. Such programs would have both the health of the forest and the welfare of the people in mind, and will use best practices and local wisdom that have been developed by these indigenous communities.

[32] J.R. Muhumuza. 2018. Agricultural technology can help curtail climate change. *Alliance for Science*. 25 April.
[33] ActionAid. 2019. *Principles for a Just Transition in Agriculture*.
[34] FAO. 2019. *Asia-Pacific Forestry Commission*. Twenty-Eighth Session. Incheon, Republic of Korea, 17–21 June.
[35] N.L. Harris et al. 2021. Global maps of twenty-first century forest carbon fluxes. *Nature Climate Change*. 11. pp. 234–240.
[36] FAO. 2019. *Forests as Climate Solutions in the Asia-Pacific Region through NDC Commitments*. 12 August.
[37] *Reuters*. 2019. Indonesia president makes moratorium on forest clearance permanent. 8 August.

Box 4: A Just Transition Road Map

Just Transition planning requirements and early funding needs can be a barrier for implementation.

Initial planning should focus on defining responsibilities and authorities related to Just Transition, and identifying relevant stakeholders and groups to involve in consultations (with special attention to the involvement of indigenous groups, women, youth, and disadvantage groups)—designing the most adequate consultation processes for each case.

Funding frameworks often underestimate the need to allocate upfront funds for Just Transition activities. Some considerations from the start of the process include the following:

- Support for the development of a road map for implementation and the design of a Just Transition policy and institutional framework.
- Research activities and data collection, modeling, and analysis at the sectoral level to support impact assessment processes and the identification of new opportunities.
- Initiation of consultation processes with stakeholders and society.

Source: Asian Development Bank.

- Reduced-impact techniques can be utilized to fell and extract trees from forests. Such techniques reduce collateral damage to other trees in the area. These would also reduce erosion, waste, and carbon emissions associated with traditional logging techniques.
- Afforestation, avoided deforestation, and sustainable forest management are also proposed as adaptation measures in NDCs, given their contribution to increasing climate resiliency.
- The REDD+ (reducing emissions from deforestation and forest degradation) mechanism that was developed by the parties to the UNFCCC has been referred to in some NDCs. Through this mechanism, countries are financially incentivized not only to address deforestation and forest degradation, but also to push for conservation, sustainable management, and enhancement of forest carbon stocks.

Just Transition Impacts

- Although the preservation of forests through the banning of logging and deforestation appears to be an intuitive solution to increase the positive impact of forests on climate change, poor implementation can lead to unfavorable results. Since the clearing of forests are normally conducted to give way to economic opportunities such as the sale of timber or the use of land, many people rely on the jobs provided not only by the logging activities themselves but also those downstream. Decisions to ban logging can lead to job losses and diminished revenues, which may further affect the capability of affected workers to support themselves.[38]
- Though generally frowned upon, illegal logging is a source of income for some people. Better forest management may increase patrolling and prevent illegal logging, but it may also negatively impact those who have relied on these activities for their livelihood. Therefore, such initiatives must address even illegal activities by providing loggers with viable legal options to sustain themselves and those they support.
- Banning deforestation will also have implications on the survival of individuals and communities that rely on harvesting firewood to keep themselves warm for the season.[39] If this method of surviving harsh winters in some DMCs is taken away, citizens must be provided with alternative, affordable, climate-conscious ways to do so.
- Countries that do not have social forestry programs that push for the involvement of indigenous people in sustainable forest management run the risk of neglecting the needs of these communities. Well-intentioned, environmentally friendly forest initiatives may end up causing harm if indigenous communities are not actively involved in the decision-making process. Failing to include them in governance may lead to oversights not only in the effectiveness of planned actions but also in their sensitivity to the indigenous people's welfare and cultural heritage.[40]

FISHERIES

Sector Outlook

The vast amount of coastline found in Asia and the Pacific lends to the significance of fisheries in local economies throughout the region. Although food security and the gross domestic product (GDP) of some countries are more reliant on the fisheries sector than others, it is undeniable it is a source of food and income for many people in the region. Several Pacific island countries, for example, depend heavily on income generated from the export of products from capture fisheries and aquaculture,[41] and are a significant source of fish for the global market. Thirty-four percent of the world's tuna catch comes from the waters of exclusive economic zones in the Pacific.[42]

Like agriculture, the adverse effects of climate change threaten the future of fisheries. For example, ocean acidification and an increase in sea surface temperatures can contribute to the degradation of coral reef ecosystems and affect populations of fish and marine invertebrates.[43] Marine ecosystems are expected to move geographically, generally toward the pole, due to climate change, taking "traditional" species from some areas and replacing them

[38] P. Durst and T. Enters. 2017. *Contemplating the impacts and effectiveness of logging bans*. UN-REDD Programme. 31 March.
[39] FAO. 2019. *State of Forests of the Caucasus and Central Asia*. New York and Geneva.
[40] A. Wong. 2020. Malaysia's Indigenous people question timber sustainability. *Al Jazeera*. 30 October.
[41] UNEP. 2016. GEO-6 Regional Assessment for Asia and the Pacific. Nairobi.
[42] ILO. 2019. *Future of Work for Climate Resilience in the Pacific Islands*. Fiji.
[43] Government of Fiji, World Bank, and Global Facility for Disaster Reduction and Recovery. 2017. *Fiji 2017: Climate Vulnerability Assessment - Making Fiji Climate Resilient*. Washington, DC.

Box 5: Human Capital and Skills Development

The transition to a low-carbon and climate-resilient economy can be a net creator of jobs. As many as 24 million new jobs are expected to be created by 2030 worldwide if the right policies are implemented, with most regions expected to experience net job creation.[a] Nevertheless, there will be winners and losers in the process.

The transition planning should ensure that affected workers are compensated and eventually prepared for new jobs.

Compensation is needed for retrenched workers who may not be able to enter the job market again. Their age, level of education, or skill compatibility with the alternative opportunities may create barriers that keep them out of the workforce. Also, new opportunities may arise in a different location or time after the affected industry activity ends, which can affect the ability of workers to transition.

Beyond retrenched workers employed by affected industries, indirect workers can also be impacted by lower industrial activities in the region they operate. Specially challenging is the case of informal sector workers affected.

Direct and indirect workers in agriculture, forestry, waste, tourism, and transport sectors may need to be equipped with new skills for adapting their work practices to the new, more sustainable opportunities. Training and reskilling programs are then key in facilitating their transition. Informal workers need to be considered, analyzing options for their incorporation to the formal sector, providing them with an alternative way of living, or for planning specific social support measures.

New and more sustainable industrial practices and new business models also affect future professionals. Governments, industry representatives, and academia need to cooperate to ensure university curriculum and professional training are aligned with future demands. Furthermore, students need to have access to information on future job demands that may be different to what is currently demanded in the job market and may not be fully aligned with their families' and communities' immediate preferences.

[a] International Labour Organization. 2018. 24 Million Jobs to Open Up in the Green Economy.

Source: Asian Development Bank.

with new ones that local fishers may not be familiar with.[44] At the same time, unsustainable fishing practices may lead to the destruction of fish habitats and the depletion of fish stocks in the ocean. As Asia and the Pacific looks to adapt to the negative impact of climate change and adopt more sustainable fishing practices, workers must be properly equipped to make the appropriate changes to their livelihoods.

Sector Actions for Mitigation and Adaptation

- Fisheries have implemented spatial and temporal closures to protect the stock and allow the affected species by extreme events brought on by climate change to repopulate. If such extreme events can be anticipated through proper and sufficient monitoring systems, these closures can be implemented in time before fishery stocks suffer from potentially irreversible damage due to climate changed-induced conditions (footnote 44).
- The relocation of landing and processing practices has also been considered to address environmental changes induced by climate change. Since the survivability of certain animals depends on the conditions of where they are landed, finding alternative landing locations that provide suitable conditions is important. For example, the mortality of rock lobsters has been observed to increase with warmer waters and freshwater (footnote 44), so fishers must relocate their landing to areas with cooler waters and where there has not been heavy rain.
- As fish species themselves relocate due to shifts in ocean conditions, fishers must likewise change their fishing locations. As these stray farther from established landing and processing facilities, new ones must be built closer to new fishing areas.
- While a rise in ocean temperatures may displace some sensitive fish species from established fishing areas to more favorable conditions, it may also bring in new fish species that now find the new ocean conditions in these areas more suitable. This brings an opportunity for fishing communities to capitalize on this new species not only to fill in gaps in sources of income but also to assist in ecological efforts to curb the population of these invasive species, in the case where they severely disrupt existing habitats and populations of remaining high-value species. With a wider range of fish to sell, the total income earned by vessels and fishing communities can become less sensitive to fluctuations in fish stock and catch rates (footnote 44).
- While most actions are focused on adaptation, countries are also analyzing how to reduce the carbon footprint of fisheries value chains.

Just Transition Impacts

- Closures of fisheries can trigger a cascade of job loss, starting from the fishers themselves, through processers, to vendors. Alternative jobs must be provided to compensate.
- Relocation of facilities can have a major impact on jobs where landing and processing practices were traditionally carried out.

[44] FAO. 2021. Adaptive management of fisheries in response to climate change. *FAO Fisheries and Aquaculture Technical Paper. No. 667*. Rome.

If new landing and processing locations are established too far from the original location, then people that are unable to travel or relocate and may be left unemployed. Although these would create new opportunities in the new location for local communities, the options and opportunities left for those in the old location must be considered, especially for women, who are heavily involved in pre- and post-harvesting activities, including processing.[45]

- Shifts in target fish species may involve major changes in practices that fishers have been accustomed to, especially if sustainable operations are to be implemented to ensure the longevity of the new practice. Various species may move into open waters where there is no regulation on catches. Lastly, as with relocation, vessels may need to be repurposed, if not completely replaced, to adapt to these new operations, incurring costs on local communities (footnote 44).
- Smaller local fisheries may be more vulnerable to the challenges to be presented by the relocation of fishing locations and landing and processing facilities. Though larger fishing companies may absorb the costs of making longer trips, informal fishers may not have such funds available and may thus be disproportionately affected by these changes.
- From a health standpoint, the introduction of new species to an area that has never hosted such animals can present biotoxins, viruses, and diseases that can affect local communities in the new location.

Box 6: ADB and Other Multilateral Development Banks' Commitment Toward a Just Transition

The Asian Development Bank (ADB) is currently developing multiple mechanisms for coordination and engagement around Just Transition. Many of the aspects of Just Transition are aligned with the vision under ADB Strategy 2030 of "achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific," and are linked with various operational priorities under Strategy 2030.[a]

ADB and other multilateral development banks (MDBs), in their joint high-level statement released during the 2019 United Nations Climate Action Summit, committed to "continue working with national development banks and other financial institutions, to develop, by COP26, financing and policy strategies supporting a Just Transition that promotes economic diversification and inclusion."[b] On 29 October 2021, the MDBs released a joint statement outlining their commitment to five High-Level Principles that will help guide MDB support for a Just Transition and ensure consistency, credibility, and transparency in their efforts.[c]

[a] ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.
[b] ADB. 2019. *High Level MDB Statement*. Manila.
[c] ADB. 2021. *ADB Joins MDBs to Support Just Transition Toward Net-Zero Economies*. News release. 29 October.

Source: Asian Development Bank.

TOURISM

Sector Outlook

Spanning a vast area and hosting a myriad of diverse cultures and landscapes, the Asia and Pacific region has attracted tourists from all over the world. In 2019, the region made up 30% of global international tourism receipts, with international tourist arrivals making up 25% of the global total, both second only to Europe.[46] However, the significance of tourism in economies varies. Although some popular destinations in the region receive a greater number of tourists, the revenue generated by the fewer tourists attracted by less popular destinations in smaller countries contribute substantially to these countries' GDP. Many Pacific island countries, for example, rely heavily on tourism for income.[47] Instability in tourism trends may thus have a larger impact not just on the sector itself but also on the whole country. A major disturbance in the tourism industry was already observed when the COVID-19 crisis led to governments closing their borders and limiting travel, causing the tourism industry all over the world to suffer. Worldwide, an estimated $2 trillion in global GDP was lost due to this decline in international tourism.[48]

Climate change will be a significant driver of changes in the tourism industry in Asia and the Pacific, including resettlement of dependent communities, as it has the potential to cause major disturbances on local ecosystems on which many tourism industries in the region thrive. Threats include rising sea temperatures, ocean acidification, coral bleaching, water shortages, and heavy rainfall events.[49] Countries have thus recognized the need for adaptation strategies to keep the tourism industry alive, as well as a few mitigation actions such as energy efficiency and distributed renewables. Furthermore, countries recognize the overall need to address other sustainability issues in the industry, such as excessive waste, food wastage, and water demand.

Sector Actions for Mitigation and Adaptation

- Efforts to increase energy efficiency in the tourism sector have been included in a few NDCs. Actions include upgrading lighting, cooling, and refrigerants in air conditioning.[50] Such mitigation activities can also support local employment.
- Renewable energy has been considered to replace oil products that have traditionally been the source of energy supply in

[45] World Wide Fund for Nature. 2012. *Fisheries Management & Gender*.
[46] World Tourism Organization (UNWTO). 2020. *International Tourism Highlights: 2020 Edition*. Calculated by authors based on information.
[47] J. Connell. 2020. Blue Ocean Tourism in Asia and the Pacific: Trends and Directions Before the Coronavirus Crisis. *ADBI Working Paper Series*. No. 1204. Tokyo: Asian Development Bank Institute.
[48] UNWTO. 2020. *Impact Assessment of the COVID-19 Outbreak on International Tourism*. Updated.
[49] F. Wolf et al. 2021. Influences of Climate Change on Tourism Development in Small Pacific Island States. *Sustainability*. 13 (8). p. 4223.
[50] D. Said, K. Youssef, and H. Waheed. 2017. Energy efficiency opportunities in hotels. *Renewable Energy and Sustainable Development*. 3 (1). pp. 99–103.

islands, including in the tourism industry. Technologies such as solar water heating, solar air conditioning, sea water air conditioning, and solar photovoltaic systems have been explored as alternatives.[51]

- The adoption of ecotourism has been offered as a way to address the environmental demands of traditional tourism.[52] Ecotourism also aims to bring business and income opportunities to local, typically rural, communities where it is established.
- Nature-based solutions have been widely considered in making the tourism industry more climate-resilient. The degradation of ecosystems, such as coral reefs and mangrove forests, due to climate change and unsustainable human activity, has led to a decline in attractiveness of the tourist sites where they exist and may need rehabilitation.
- In addition to their touristic appeal, coral reefs and mangrove forests provide protection against waves and storm surges, mitigate floods, and prevent coastal erosion. Their destruction can lead to heightened vulnerability of the area. More investments in nature-based solutions can also lead to the preservation of these resources, while also preparing them for an expected increase in demand for experiences in nature.[53]

Just Transition Impacts

- If tourism companies restructure their operations and decide to relocate to seek more environmentally robust areas, employment opportunities will be taken away from local communities. Coastal communities and SIDS that rely almost entirely on the tourism industry will be hit hard, as alternative jobs may be scarce. Though some may be able to relocate with the company, those that held employment that required lower qualifications and may have less capacity to uproot themselves will become more vulnerable.
- Despite the good that ecotourism companies hope to bring to the region where they are established, there are still risks in their operations. Although they aim to preserve the local environment, the presence of tourists always poses a risk to the disruption of wildlife. This can be exacerbated by a growth in popularity and in tourist arrivals, which can strain resources and cause the local environments to suffer.
- This popularity can also attract other companies and developers, which may establish businesses that compete with local ones, driving up prices and making it more difficult for residents to afford basic goods.
- Due to the concentration of women in these lower-level jobs in the tourism industry, such as retail, hospitality, and cleaning, women may become disproportionately affected by companies deciding to transfer their operations.[54]
- Developments built to accommodate a growing influx of tourists may also displace indigenous communities and other locals.[55] If unchecked, ecotourism can end up being detrimental to those it has pledged to uplift and protect.
- When considering the current demographics of the tourism work force—which consists greatly of women, youths, people with a lower educational level, and migrants—disruptions to the sector can disproportionately impact vulnerable communities, furthering existing inequalities in the overall workforce.[56]

CONCLUSION

As countries all over the world mobilize to carry out climate actions in their NDCs to fulfill the Paris Agreement goals, governments must become more aware of the implications these actions may have on people and communities. Mitigation and adaptation actions in different sectors can have both positive and negative impacts on people's livelihoods, health, and overall quality of life. The development of a Just Transition approach can guide policymakers in identifying potential impacts and finding ways to minimize unfavorable outcomes.

While the non-energy sectors discussed—transport, waste, agriculture, forestry, fisheries, and tourism—present opportunities for climate action and sustainable development, there is still room for Just Transition. These sectors have the potential to create green jobs and new sustainable businesses, but careful assessments must be made to ensure that the projected benefits of their transition to a green economy can be distributed to everyone. This can be done through the formalization of workers in the informal sector, the empowerment of women, and the inclusion of minorities and disadvantaged groups, among others. Just Transition assessments must be made following specific guidelines to equip policymakers with the information about what climate actions are most viable—not only from a financial and technical standpoint but also from a social standpoint. Only when a climate strategy considers a Just Transition should it be put into action.

[51] International Renewable Energy Agency. 2014. *Renewable Energy Opportunities for Island Tourism*. Abu Dhabi.
[52] The International Ecotourism Society. 2015. *TIES Announces Ecotourism Principles Revision*. 7 January.
[53] UNWTO. 2021. *Recommendations for the Transition to a Green Travel and Tourism Economy*. Madrid.
[54] UNWTO. 2019. *Global Report on Women in Tourism – Second Edition*. Madrid.
[55] B. Swanston. 2018. Positive & Negative Effects of Ecotourism. *USA Today*. 24 April.
[56] Z. Rahimić , K. Črnjar, and V. Čikeš. 2019. Seasonal Employment in Tourism Organizations as a Challenge for Human Resource Management. *Tourism in Southern and Eastern Europe*. Vol. 5. pp. 607–620.

About the Asian Development Bank
ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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