Assessing Climate Change Challenges and Adaptation Strategies in South Asian Countries: A Review

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Abstract: The wide range of environmental consequences caused by climate change highlights the urgent need for global action to mitigate its effects, as it poses a significant threat to forest ecosystems, freshwater systems, and the overall stability of our planet. This review paper addresses the limitations in availability of country-specific documents on climate change in South Asian countries and identifies gaps in addressing climate change challenges. By reviewing secondary literature and utilizing online resources, the paper provides insights into the current status of climate change issues and adaptation strategies in Nepal, India, Bangladesh, Bhutan, Pakistan, Afghanistan, Maldives and Sri Lanka. The paper emphasizes the importance of sustainable practices, community involvement, and adaptive management plans in addressing climate change impacts on forests in these countries. It also highlights the need for international collaborations, research, and monitoring to enhance their capacity to mitigate and adapt to climate change. The research findings are valuable for various stakeholders, including ecologists, geologists, hydrologists, local authorities, and governments, as they can be utilized for climate-sensitive planning, project evaluation, integrating gender perspectives, and further research.

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1. Introduction

Climate change leads to an increase in issues such as drought, flooding, and windstorms, which directly or indirectly impact forest ecosystems. Climatologists suggest that a 3.25°C rise in global temperatures would result in an ecological shift of approximately 500 meters in elevation (Gupta, 2010). This temperature increase also raises air and water temperatures, affecting freshwater, aquatic, and wetland ecosystems and their geological distribution (Poff et al., 2002; Oo., & Thin, 2022). Concerns regarding global climate change encompass rising sea levels, vanishing glaciers, altered precipitation patterns, and overall warming of the planet. The Intergovernmental Panel on Climate Change (Adedeji et al., 2014) predicts that average temperatures could rise by 0.2 degrees Celsius per decade, reaching a 2-degree Celsius increase over pre-industrial levels by 2050. Even a

slight change in climate has significant impacts on terrestrial ecosystems, with a 1-degree Celsius warming affecting more than 10% of all ecosystems. Cold conifer forests, such as the black forest in Germany and the hemlock forest in the Pacific Northwest, are declining and being replaced by temperate and boreal forests. With a 3-degree Celsius increase in global mean temperature (GMT), only 50.1% to 86.9% of ecosystems remain stable (Leemans & Eickhout, 2004). Additionally, since the 1960s, there has been a noticeable increase in ocean heat content above 6,000 feet (2,000 meters), and from 1900 to 2016, the world's surface ocean warmed by approximately 1.3°F (0.7°C) (Hayhoe et al., 2018).

In the South Asian region, climate change is expected to worsen crop yield and growth while increasing the frequency of flooding (Douglas, 2009). In Global South cities, climate change is often viewed as a development priority, emphasizing the heightened exposure to climate

risks and their impact on existing vulnerabilities (Revi et al., 2016; Chu et al., 2017; Ziervogel et al., 2017; Basu and Bazaz, 2018). South Asian countries face specific challenges in climate change adaptation. For example, in the Maldives, the conservation of wetland biodiversity, management of coral reef ecosystems, solid waste management, local understanding of climate change, and project management capacity enhancement are critical (Sovacool, 2012). Sri Lanka is particularly vulnerable to climate change impacts on agriculture, food security, water resources, coastal areas, biodiversity, and human health (Dananjaya, 2017). Bangladesh experiences elevated temperatures and saline stress, leading to the potential death of plant species in plantation and natural forest regions (Rahman, 2012). Nepal's GDP relies heavily on climatically vulnerable sectors like agriculture, water, electricity, and tourism, making it highly susceptible to climate change impacts, including floods, landslides, and resource crises (Dahal, 2010).

Forests play a crucial role in exacerbating or mitigating the effects of anthropogenic climate change through various mechanisms such as albedo, evapotranspiration, and the carbon cycle (Bonan, 2008). Opting for wood products instead of materials with higher greenhouse gas emissions is an efficient choice for reducing carbon emissions through forest management (Lippke et al., 2011; Ximenes et al., 2012). Sustainable forest management not only stores carbon in wood products but also enhances forest productivity and carbon extraction rates from the atmosphere (Kurz et al., 1997; Price et al., 1997). Forests contribute to both climate change mitigation and adaptation (Klein et al., 2005 as cited by Pandey et al., 2016). Community-based forestry approaches that involve local communities in plantation activities are considered effective in addressing climate change-related issues (Pandey et al., 2016). Forests globally sequester billions of tons of CO2 annually, providing significant economic value (Raupach, 2008). Tropical areas hold substantial potential for reducing carbon emissions through deforestation and environmental degradation (Canadell & Raupach, 2008).

To adapt to climate change, various measures are being implemented in different countries. Afghanistan focuses on scientific agricultural methods, developing drought-resistant varieties, cultivating new crops, and promoting migration to suitable regions for small-scale farmers (Omerkhil et al., 2020). In terms of coping strategies, reducing irrigation, adopting water-saving technologies, and implementing water conservation techniques like farm ponds, contour bunds, and mulching rank high (Sarwary et al., 2021). Using alley cropping and nitrogen fixation species such as legumes can also help mitigate the impacts of climate change (De Zoysa & Inoue). Reforestation and afforestation programs in Sri Lanka contribute to carbon sequestration (Udayakumara, 2022). In the Maldives, the "Integrating Climate Change Risks into Resilient Island Planning" (ICCR) program has been initiated (Sovacool, 2012), and the Green Climate Fund was established as an international finance structure to address climate change adaptation and mitigation challenges (Ahmed &

Suphachalasai, 2014). Policy reforms, institutional changes, carbon trading as an economic incentive, gender-sensitive planning, and community-based approaches are essential for climate change mitigation and adaptation (Mainlay & Tan, 2012).

There are limitations in the availability of country-specific documents, project reports, and papers on climate change adoption, challenges, and strategies in online search databases. This review paper aims to address these limitations and identify gaps in addressing climate change issues in South Asian countries. While progress has been made, there are still challenges in effectively tackling climate change in these countries. The paper highlights global issues related to climate change and provides insights into the current status of various countries. The research findings can be valuable for ecologists, geologists, hydrologists, forest technicians, local authorities, governments, and other stakeholders. They can be utilized for climate-sensitive planning, integrating gender perspectives into climate-related issues, project planning and evaluation, and as a basis for further research.

2. Materials and methods

This study relied solely on the review of secondary literature available online. The researchers collaborated through a common network established by the Global Research Institute and Training Center (GRIT). By utilizing online resources and a collaborative network, the researchers aimed to gather relevant information from reputable sources. This approach allowed to access a wide range of scholarly articles, research papers, and reports to analyze the current state of knowledge on the subject. To gather relevant information, the researchers utilized keywords such as "climate change," "impact of climate change," "adaptation measures," "climate change in SAARC countries," and specific country names such as "climate change Afghanistan," "climate change Pakistan," "climate change Bangladesh," "climate change Bhutan," "climate change Sri Lanka," "climate change Nepal," "climate change Maldives," and "climate change India." Additionally, keywords related to forest policy, carbon sequestration, ecosystem services assessment, and the relationship between forests and climate change were included. The researchers conducted searches on various online platforms, including Springer, Google Scholar, Academia, Research Gate, and Science Direct.

The identified literature was organized and stored in separate folders for analysis. The documents were thoroughly examined, and the relevant information was extracted and categorized into different sub-topics. These sub-topics focused on climate change and forest adaptation in Nepal, India, Sri Lanka, Bangladesh, Pakistan, Maldives, Afghanistan, and Bhutan.

3. Results and discussion

Nepal

Nepal has implemented various practices and policies to mitigate the impacts of climate change on its forests and promote adaptation. These include measures such as reducing carbon emissions, transitioning to renewable energy sources and water-related fuel, implementing improved cultivation methods in agriculture, and promoting agro-forestry and sustainable agricultural systems. The country has also adopted several national initiatives and policies aimed at addressing climate change and protecting the environment. These include the Environment Protection Act (2019), National Climate Change Policy (2019), Climate Resilient Planning and Budgeting Guideline (2019), Disaster Risk Reduction and Management Act (2017) and Regulation (2019), GESI and Climate Change Strategy and Action Plan (2019), National Adaptation Programme of Action (NAPA), National Reducing Emissions from Deforestation and Forest Degradation (REDD+) Strategy (2018), and various sectoral policies related to forestry, energy, industry, transport, and agriculture. Additionally, Nepal has developed institutional ties with agricultural organizations and non-governmental organizations to promote the adoption of technology and enhance resilience.

In terms of forest management, Nepal exhibits variations in the distribution and quality of community forests across different regions. The hilly and mountainous areas have fewer community forests compared to the terai region. However, community-managed forests in upstream districts tend to have more forest cover and better quality compared to downstream areas. This shift in the formation of natural assets, including forests, farmland, and drainage, has positive impacts on the overall ecosystem (Niraula et al., 2016). Collaborative efforts between agricultural organizations, non-governmental organizations, and local communities play a crucial role in fostering the adoption of technology and sustainable practices. By combining traditional knowledge with technological advancements, these coalitions facilitate the acceptance and implementation of technology among farmers (Chhetri et al., 2012). Majority of people in Nepal rely on medicinal plants for their treatment from the ancient times (Giri, Ojha, Subedi, Rana, Bhandari, and Khanal, 2023).

Furthermore, studies have shown that community forest programs in Nepal demonstrate higher levels of biological diversity compared to non-community forest project plots. These programs are particularly effective in mountainous and hilly regions, whereas their effectiveness in the terai is relatively lower (Luitel et al., 2018). This highlights the importance of considering the specific ecological contexts and social dynamics of different regions when implementing forest management strategies and community-based initiatives.

India

Plantation forests offer a significant potential for mitigating greenhouse gas emissions and enhancing carbon sequestration. Although data on the diversity and composition of major forest types in the Garhwali Himalayas have been collected, some areas still lack information on carbon stock density within the forests (Chandra M et al., 2010). Terrestrial ecosystems play a vital role in capturing carbon dioxide from the atmosphere. Through the process of photosynthesis, plants absorb carbon dioxide and transfer it to animals through the food chain. Upon the death of an animal, bacterial activity in the organic matter leads to its decomposition and conversion into soil organic material (Ramachandran et al., 2007).

Among various forest types, tropical forests are particularly productive. The carbon sequestration capacity of a forest depends on factors such as its age and type (LA et al., 2000). It is essential to consider these factors when assessing the potential of a forest ecosystem to act as a carbon sink and contribute to climate change mitigation.

India's forests are vulnerable to the impacts of climate change. Rising temperatures, changes in precipitation patterns, and increased frequency of extreme weather events pose significant challenges to forest ecosystems. These changes can disrupt the natural balance of forest communities, affect species composition and distribution, and lead to forest degradation and loss. Additionally, climate change can exacerbate existing pressures on forests, such as deforestation, land-use change, and unsustainable resource extraction practices.

To adapt to these challenges, various options are available. Forest management strategies can focus on promoting forest resilience and enhancing adaptive capacity. This includes adopting sustainable practices such as agro-forestry, reforestation, and afforestation to restore degraded areas and increase forest cover. Maintaining and conserving biodiversity within forests is crucial as it enhances their resilience to climate change impacts.

Furthermore, incorporating climate change considerations into forest policy and planning is essential. This involves developing adaptive management plans that account for the projected impacts of climate change and integrate measures to mitigate these impacts. It is crucial to engage local communities, indigenous peoples, and other stakeholders in decision-making processes and empower them to participate in forest conservation and management efforts.

Investing in research and monitoring is also crucial for understanding the specific impacts of climate change on different forest types and ecosystems in India. This knowledge can inform evidence-based decision-making and guide the implementation of effective adaptation strategies. Additionally, promoting international collaborations and sharing best practices can further enhance India's capacity to address the impacts of climate change on its forests.

Bangladesh

Bangladesh has implemented measures to protect and restore coastal green areas as a means of safeguarding against tropical cyclones, as mangroves play a crucial role in shielding non-mangrove tree species from these natural disasters (Chow et al., 2019). Following the breakdown of centrally controlled forest regimes, participatory resource management approaches have been adopted. Participatory forest management (PFM) is essential for the sustainable

management of forest resources, considering social, economic, environmental, and ecological factors (Nash et al., 2020). In Bangladesh, the Payment for Ecosystem Services (PSE) system has been implemented to benefit the local disadvantaged populations. Mangrove caretakers may receive compensation for providing services such as supporting fisheries, mitigating hurricanes and floods, and sequestering carbon (Razzaque et al., 2017).

Bangladesh's forests face significant challenges due to climate change impacts. Rising sea levels, increased salinity intrusion, and extreme weather events pose threats to coastal mangrove forests. These changes can disrupt the ecological balance, alter species composition, and lead to habitat degradation and loss. Furthermore, deforestation, illegal logging, and unsustainable resource extraction practices exacerbate the vulnerability of forests in the country.

To adapt to these challenges, Bangladesh has pursued various options. The conservation and restoration of mangrove forests are crucial for enhancing coastal resilience. This includes reforestation efforts, promoting sustainable mangrove management practices, and raising awareness among local communities about the importance of mangroves for coastal protection.

The implementation of participatory forest management approaches, such as PFM, is vital for sustainable forest resource utilization. Involving local communities in decision-making processes and empowering them to take part in forest conservation efforts can enhance the effectiveness and long-term success of forest management initiatives.

The Payment for Ecosystem Services (PSE) system in Bangladesh provides economic incentives for mangrove caretakers. By recognizing and rewarding the ecosystem services provided by mangroves, such as fisheries support, storm and flood mitigation, and carbon sequestration, the PSE system promotes the sustainable management and conservation of mangrove forests.

Strengthening institutional capacities, improving monitoring and enforcement mechanisms, and enhancing scientific research and knowledge exchange are crucial for effective climate change adaptation in Bangladesh's forests. International collaborations and partnerships can provide additional support in terms of technical expertise, financial resources, and best practices for forest conservation and management.

Bhutan

In Bhutan, local and regional district disaster management teams have been established to address the impacts of climate change. Efforts are being made to enhance early warning systems and implement measures to mitigate the risks associated with glacial lake outburst floods (Sovacool et al., 2012). Bhutan has developed a comprehensive range of adaptation programs, including a disaster management plan, weather forecasting systems, landslide management, flood prevention, and community-based forest fire management and prevention initiatives.

To tackle climate change, Bhutan has also implemented advanced land use management techniques. These include tree planting on farmland, soil conservation practices such

as mulching and zero tillage, organic manure application, terrace fields, contour planting, laser land leveling, increasing the height of field bunds, and rainwater storage for irrigation during the dry season. Additionally, Bhutan has adopted strategies such as rotational cropping systems, changing crop types and varieties, adjusting sowing and harvesting practices, intercropping, and exploring non-livelihood options (Saddique et al., 2022).

Raising public awareness about the impacts of greenhouse gas emissions is crucial, and technical solutions should be coupled with responsible forest management practices. Afforestation emerges as a viable strategy for achieving emission reductions. However, Bhutan should also consider potential unintended consequences that may arise from ambitious hydropower projects and forest protection initiatives (Yank et al., 2018).

To ensure effective protection and monitoring of resources, as well as to enhance governance and clarify rights to resources, it is essential to identify, quantify, and value natural ecosystems at both local and national levels. This can be achieved by assessing the need for prioritizing protection, improving resource governance, and enhancing the understanding of the value of natural ecosystems (Wangchuk et al., 2021).

Pakistan

According to studies conducted in Gilgit-Baltistan, sustainable forest management can be influenced by three key variables: cultural, strategic, and environmental factors (Ali et al., 2021). In Swat, Pakistan, habitat destruction is occurring due to a lack of effective enforcement of laws and regulations, mismanagement, and other contributing factors (Pellegrini et al., 2011).

Pakistan is highly vulnerable to the impacts of climate change due to its economic dependence on climate-sensitive industries like agriculture and forestry, as well as the threat of flooding to its densely populated floodplains. Advanced countries are attributed to be responsible for these consequences (Farooq et al., 2005).

The National Climate Change Policy (NCCP) of 2012 aims to foster collaboration among sectors and organizations to build resilience effectively. By encouraging cooperation among various adaptation initiatives at the national, sub-national, and local levels, the NCCP aims to enhance institutional flexibility. To ensure national food, energy, and water security, the NCCP proposes several adaptation measures at different administrative levels. It is observed that public spending on climate change is driven more by sector-specific policies rather than the national climate change policy. As a living document with no fixed timeframe, the NCCP is designed to be adaptable, emphasizing the need to respond to new findings and concerns related to climate change. While the policy emphasizes national-level implementation of adaptation measures and cooperation with provinces, it has limited capacity for local and global adaptation. However, the policy exhibits strong reflexivity as it aligns well with other state actions and policies in the energy, water, and food sectors (Vij et al., 2017).

Afghanistan

Afghanistan's forests play a crucial role in supporting the livelihoods of its population, as the country's slow industrialization has led to a reliance on the local ecosystem. These forests, along with landforms and water resources, not only sustain life but also provide economic benefits by safeguarding agricultural soil and water resources (Najmuddin et al., 2022). Forest plantations like Shah Fold and Banyan are particularly important for protecting against natural disasters and meeting the increasing demand for fuelwood (Gourami et al., 2021).

The majority of Afghans rely on wood as a fuel source, which poses challenges due to its low-carbon conversion. Generating hydroelectricity is a potential solution to mitigate this challenge (Fahimi et al., 2021). Afghanistan has experienced extreme weather events in recent years, leading to increased poverty rates. While long-term solutions include expanding the irrigation network for intensive agriculture, immediate actions have involved humanitarian aid provided by the United Nations to address food shortages. Adaptation measures have primarily focused on modifying crop cultivation practices, such as employing scientific methods to increase productivity, cultivating drought-resistant crop varieties, introducing new crops, and seeking government assistance for crop cultivation (Kochhar & Knippenberg, 2023).

In several provinces, including Bamiyan, Diakundi, Balkh, Badakhshan, and Kabul, the National Environmental Protection Agency (NEPA) and the United Nations Environment Programme (UNEP) have implemented the first climate change adaptation project. This project, funded by the Least Developed Countries Fund (LDCF) under the Global Environment Facility (GEF), aimed to enhance farmers' adaptive capacity through initiatives focused on water use efficiency and community-based watershed management. Various interventions, including the National Solidarity Program of the Ministry of Rural Rehabilitation and Development/World Bank and climate change-related projects of the World Food Program, have prioritized sectors requiring support for adaptation. Immediate attention is needed for water management, as recurrent droughts threaten water resources essential for agricultural production. Community-based watershed management is a priority area identified by the National Adaptation Programme of Action (NAPA) (Jawid & Khadjavi, 2019).

Srilanka

Sri Lanka is facing carbon sequestration challenges as a result of the conversion of marshlands into aquaculture farms. While this activity generates income, it is not beneficial for the country's long-term development (Bournazel et al., 2015). Mangroves play a significant role in sequestering atmospheric carbon and controlling the overall amount of organic CO_2 in the atmosphere. The organic carbon stored in the soil, accumulated through flood-borne organic material from the surrounding areas, helps mitigate the impacts of climate change (Perera et al., 2019). The practice of agroforestry has a positive impact on biodiversity by reducing the reliance on conservation areas, increasing richness within agricultural systems, and

promoting the growth of tree species (De Zoysa et al., 2014).

The Sri Lankan government has developed a National Climate Change Adaptation Strategy for the period 2011-2016, focusing on a five-part strategy framework. This framework includes integrating climate change adaptation (CCA) into national planning and development, creating climate-resilient human settlements, reducing the impact of climate change on food security, enhancing the climate resilience of major economic sectors like travel, transportation, and energy, and safeguarding biodiversity and natural resources from the effects of climate change. However, interviews suggest that the implementation of CCA measures is still in the early stages, with a primary focus on policy development (Sterrett, 2011).

Maldives

The Maldives faces significant challenges in terms of limited groundwater resources and energy availability. However, the country has unique opportunities for sustainable energy development. When water management and renewable energy generation are combined, rural coral reefs can thrive and emit less CO_2. Mangroves and seagrasses not only contribute to the mitigation of anthropogenically produced CO_2 emissions but also absorb carbon from the soil, thus addressing global climate change. Among different types of forests, mangroves have shown the highest carbon sequestration capacity, which is crucial for biodiversity protection and shoreline stability (Agardy et al., 2017).

The ICCR (Intergovernmental Coral Reef Conservation and Rehabilitation) has made efforts to overcome various challenges by focusing on "soft" measures instead of "hard" adaptation strategies. By emphasizing coral propagation, beach nourishment, and mangrove afforestation, the ICCR aims to enhance the resilience of infrastructure and ecosystems. This approach ensures the use of a diverse range of technologies and activities to address climate change impacts, rather than a one-size-fits-all approach. The ICCR strengthens institutional resilience by providing education to government stakeholders, collecting climate change data, and supporting pilot projects. It also incorporates local knowledge of island topography and engages indigenous communities in climate planning, raising awareness of climate threats and suitable actions to improve community resilience (Sovacool, 2012).

The formulation of adaptation policies in the Maldives has been a crucial step, with the National Adaptation Programme of Action (NAPA) playing a significant role. The NAPA integrates various levels of intervention, including policies, institutional activities, awareness campaigns, and the management of local systems. Additionally, in the case of the Maldives, the climate change adaptation (CCA) paradigm has been closely linked with risk reduction strategies. This has led to the adoption of the term CCA(M), which stands for Climate Change Adaptation and Mitigation, recognizing the importance of addressing both adaptation and mitigation efforts. The shift from the mitigation paradigm to adaptation and more recently to resilience reflects

international agendas and the evolving understanding of climate change challenges (Sovacool, 2012).
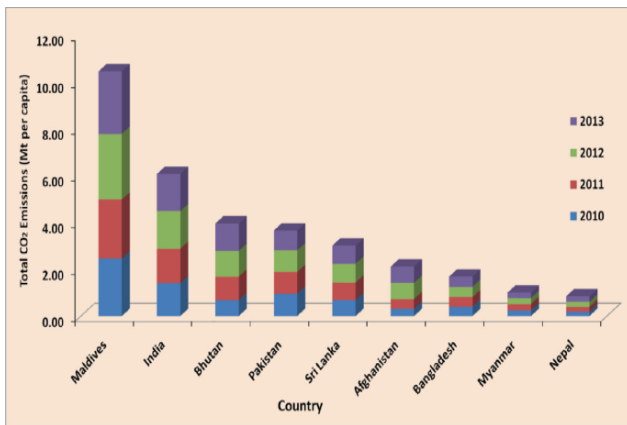

Figure 1: Total CO$_2$ per capita in South Asian countries (Goel, 2021)

4. Discussion

Forest management practices have a significant influence on the effectiveness of boreal forests as carbon sinks and in reducing greenhouse gas emissions from landscapes (Kortelainen et al., 2006; Juutinen et al., 2009). Efficient wastewater treatment and land use policies are crucial in reducing nutrient loads and enhancing carbon sequestration while decreasing greenhouse gas emissions in boreal landscapes (Vanhala et al., 2016). Forests play multiple environmental and conservational roles, including regulating climate and physical conditions, protecting water supply, maintaining soil fertility, and conserving biodiversity (Jusoff & Taha, 2008). The involvement of indigenous peoples is crucial for the success of climate change policies and initiatives (ILO, 2016).

Ecosystem changes caused by climate change can lead to the release of carbon into the atmosphere, exacerbating global warming (Canadell et al., 2004). The sensitivity of ecosystems to climate change has significant implications for the climate system (Sonwa et al., 2012). Deforestation and degradation, primarily occurring in tropical regions, contribute to approximately 20% of global carbon emissions (Köhl et al., 2010).

The IPCC's Fifth Assessment Report identifies 14 barriers to adaptation, categorized into knowledge and awareness, social and cultural, physical and biological, human resources, government and institutional, and economic and finance (Jawid & Khadjavi, 2019). Inadequate infrastructure and a lack of investment in climate-resilient infrastructure pose challenges to adaptation in cities worldwide, along with urban disparity and discriminatory urban planning (Singh et al., 2021).

The governance of climate change and sustainable development must be coordinated to achieve sustainable development (Karki et al., 2022). Climate change impacts are particularly severe in developing nations, which are the most vulnerable and least capable of adapting (Karki

et al., 2022). The adaptive capacity and vulnerability theory support the achievement of SDG 13, especially in developing nations like Bangladesh (Haque & Jahid, 2021). To effectively adapt to climate change, countries can benefit from replicating strategies such as developing infrastructure, enhancing institutional capacity, and promoting societal awareness (Malatesta & Schmidt Di Friedberg, 2017). The third goal among the 17 Sustainable Development Goals (SDGs), which focuses on ensuring healthy lives and well-being for all, places significant importance on health and is supported by 13 targets (Dhimal et al., 2017). Additionally, SDG 13, known as Climate Action, prioritizes activities related to climate adaptation and mitigation (Hinz et al., 2020).

Countries vary in their progress in implementing climate policies, with some regions being more dedicated to decarbonization than others (Haque & Jahid, 2021). Bhutan, as a least developed nation, has committed to achieving carbon neutrality to limit global temperature increase (Haque & Jahid, 2021). In India, various adaptation measures, including afforestation, reforestation, agroforestry, and community-based forest management, are being implemented to address climate change (Singh et al., 2021). In Bangladesh, local interactions based on traditional knowledge and adaptation practices are being integrated into site-specific climate risk strategies (Baas & Ramasamy, 2008).

In conclusion, each country of South Asia faces unique challenges and opportunities in adapting to climate change impacts on their forests. Efforts to reduce carbon emissions, enhance forest resilience, and foster sustainable practices are underway. Collaboration, research, capacity building, and international cooperation play essential roles in addressing climate change and promoting sustainable forest management.

5. Conclusion

The impacts of climate change on South Asian forests are evident, with rising temperatures, changes in precipitation patterns, and increased frequency of extreme weather events posing significant challenges to forest ecosystems. However, the countries in the region have implemented various measures and policies to mitigate these impacts and promote adaptation. Nepal has focused on reducing carbon emissions, transitioning to renewable energy sources, and implementing sustainable agricultural practices. India recognizes the potential of plantation forests for carbon sequestration and emphasizes the importance of considering forest type and age when assessing carbon sequestration capacity. Bangladesh has implemented participatory forest management approaches and the Payment for Ecosystem Services system to protect and restore mangrove forests. Bhutan has established disaster management teams and implemented advanced land use management techniques to enhance resilience. Pakistan has developed the National Climate Change Policy and implemented adaptation measures at different administrative levels. Afghanistan has focused on

sustainable forest management, water management, and community-based initiatives. Sri Lanka has developed a National Climate Change Adaptation Strategy, while the Maldives has prioritized sustainable energy development and coral reef conservation.

To strengthen forest management in South Asia and mitigate the impacts of climate change, it is crucial for countries in the region to promote sustainable practices like agro-forestry, reforestation, and afforestation. By restoring degraded areas and increasing forest cover, they can enhance the resilience of forests. Conservation and restoration of biodiversity within forests should be prioritized to ensure their adaptability to climate change. South Asian countries should also actively engage in international cooperation, sharing knowledge, experiences, and lessons learned to address climate change impacts on forests globally. Through these actions, South Asian countries can enhance the resilience of their forests and contribute to global climate change mitigation efforts.

Acknowledgements

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