

Enhancing Low Carbon Development for Sustainability

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Enhancing Low Carbon Development for Sustainability

Kariuki Muigua*

Abstract

The paper critically explores the concept of low carbon development as a tool for combating climate change and fostering Sustainable Development. It discusses global, regional and national efforts towards embracing the idea of low carbon development. The paper further examines the promises and drawbacks facing the realization of low carbon development. It also proposes measures towards enhancing low carbon development for sustainability.

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1.0 Introduction

Climate change has emerged as the most pressing global challenge that affects both developed and developing countries in their efforts towards the realization of the Sustainable Development agenda¹. As a result, there have been global calls on governments and all other stakeholders to put in place measures towards responding to the threat of climate change and ensuring that economies are climate resilient². Responding to climate change is one of the fundamental goals under the United Nation's 2030 Agenda for Sustainable Development³. Sustainable Development Goal 13 calls upon countries to take urgent actions towards combating climate change and its impacts⁴.

Responding to climate change involves a two-pronged approach that entails mitigation and adaptation mechanisms⁵. Mitigation involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases (for example, the burning of fossil fuels for electricity, heat, or transport) or enhancing the "sinks" that accumulate and store these gases (such as the oceans, forests, and soil)⁶. Mitigation therefore envisages making the impacts of climate change less severe by preventing or reducing the emission of greenhouse gases (GHG) into the atmosphere⁷. The goal of mitigation is to avoid significant human interference with Earth's climate, "stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened, and to enable

¹ Muigua. K., 'Achieving Sustainable Development, Peace and Environmental Security.' Glenwood Publishers Limited, 2021

² Ibid

³ United Nations General Assembly., 'Transforming Our World: the 2030 Agenda for Sustainable Development.' 21 October 2015, A/RES/70/1.

⁴ Ibid, Sustainable Development Goal 13

⁵ NASA., 'Responding to Climate Change.' Available at [https://climate.nasa.gov/solutions/adaptation-mitigation/#:~:text=Responding%20to%20climate%20change%20involves%20two%20possible%20approaches%3A%20reducing%20and,pipeline%20\(%E2%80%9Cadaptation%E2%80%9D\)](https://climate.nasa.gov/solutions/adaptation-mitigation/#:~:text=Responding%20to%20climate%20change%20involves%20two%20possible%20approaches%3A%20reducing%20and,pipeline%20(%E2%80%9Cadaptation%E2%80%9D)) (Accessed on 07/09/2023)

⁶ Ibid

⁷ European Environment Agency., 'What is the Difference between Adaptation and Mitigation?' Available at [https://www.eea.europa.eu/help/faq/what-is-the-difference-between#:~:text=In%20essence%2C%20adaptation%20can%20be,\(GHG\)%20into%20the%20atmosphere](https://www.eea.europa.eu/help/faq/what-is-the-difference-between#:~:text=In%20essence%2C%20adaptation%20can%20be,(GHG)%20into%20the%20atmosphere) (Accessed on 07/09/2023)

economic development to proceed in a sustainable manner⁸. Adaptation on the other hand means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise⁹. Examples of adaptation measures include large-scale infrastructure changes, such as building defenses to protect against sea-level rise, as well behavioral shifts, such as individuals reducing their food waste¹⁰. The aim of mitigation is to reduce our risks from the harmful effects of climate change such sea-level rise, more intense extreme weather events, or food insecurity¹¹. It also includes making the most of any potential beneficial opportunities associated with climate change for example, longer growing seasons or increased yields in some regions¹².

One of the mitigation mechanism that has been embraced in efforts towards confronting climate change is the idea of low carbon development¹³. The concept of low carbon development which is also expressed using the term Low-Emission Development Strategies (LEDS) also known as low-carbon development strategies, or low-carbon growth plans refers to forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth¹⁴. Low carbon development has also been defined as forward-looking, climate-friendly growth strategies that can highlight a country's priority actions for climate mitigation and adaptation, and a country's role in the global effort against climate change¹⁵. The idea of low-carbon development aims to achieve the goals of reducing greenhouse gas emissions,

⁸ NASA., 'Responding to Climate Change.' Op Cit

⁹ European Environment Agency., 'What is the Difference between Adaptation and Mitigation?' Op Cit

¹⁰ Ibid

¹¹ NASA., 'Responding to Climate Change.' Op Cit

¹² Ibid

¹³ United Nations., 'Low Carbon Development.' Available at <https://sustainabledevelopment.un.org/index.php?menu=1448#:~:text=The%20concept%20of%20low%20carbon,low%2Dcarbon%20growth%20plans> (Accessed on 07/09/2023)

¹⁴ Ibid

¹⁵ United Nations Economic and Social Commission for Asia and the Pacific., 'Low-Carbon Development Plan.' Available at <https://www.unescap.org/sites/default/files/45.%20FS-Low-Carbon-Development-Plan.pdf> (Accessed on 07/09/2023)

exploiting low-carbon energy, and ensuring economic growth¹⁶. It has been observed that LEEDS have attracted interest in the climate negotiations as a soft alternative to voluntary or obligatory GHG emission reduction targets in developing countries¹⁷. Low carbon development focuses on addressing and integrating climate change with development objectives and is therefore a more useful approach for developing countries¹⁸. The idea of low carbon development has been advocated as the inevitable choice to confront climate change and achieve Sustainable Development¹⁹. To effectively reduce greenhouse gas emissions while fostering economic growth, different countries have begun to search for new development paths among which low-carbon development has become a widely advocated one²⁰.

The paper critically explores the concept of low carbon development as a tool for combating climate change and fostering Sustainable Development. It discusses global, regional and national efforts towards embracing the idea of low carbon development. The paper further examines the promises and drawbacks facing the realization of low carbon development. It also proposes measures towards enhancing low carbon development for sustainability.

¹⁶ Yuan. H, Zhou. P, & Zhou. D., 'What is Low-Carbon Development? A Conceptual Analysis.' *Energy Procedia*, 5 (2011) 1706-1712

¹⁷ ¹⁷ United Nations., 'Low Carbon Development.' Op Cit

¹⁸ Ibid

¹⁹ Xin. X, Yuding. W, & Jianzhong. W., 'The Problems and Strategies of the Low Carbon Economy Development.' *Energy Procedia* 5 (2011) 1831-1836

²⁰ Yuan. H, Zhou. P, & Zhou. D., 'What is Low-Carbon Development? A Conceptual Analysis.' Op Cit

2.0 Legal Framework on Low Carbon Development

The concept of low carbon development has its roots in the *United Nations Framework Convention on Climate Change (UNFCCC)*²¹ adopted in 1992. The objective of the UNFCCC is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system²². According to the UNFCCC, such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner²³. The UNFCCC further provides that policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each party and should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change²⁴. The UNFCCC therefore envisions low carbon development through states pursuing economic development while integrating climate change mitigation and adaptation measures in their national development programmes. It further stipulates several commitments by state parties which are vital in realizing low carbon development such as promoting and cooperating in the development; application and diffusion, including transfer, of technologies; practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases; promoting sustainable management, and promoting and cooperating in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases; cooperating in preparing for adaptation to the impacts of climate change and taking climate change considerations into account, to the extent feasible, in relevant social, economic and environmental policies and actions; and employing appropriate methods, for example impact assessments towards confronting climate change²⁵. Achieving the commitments

²¹ United Nations Framework Convention on Climate Change, United Nations, 1992., Available at <https://unfccc.int/resource/docs/convkp/conveng.pdf> (Accessed on 07/09/2023)

²² Ibid, Article 2

²³ Ibid

²⁴ Ibid, Article 3 (4)

²⁵ Ibid, Article 4

stipulated under the UNFCCC is vital in enhancing low carbon development at the global level.

Fostering low carbon development was also a major point of concern under the *Kyoto Protocol*²⁶ to the UNFCCC which sought to operationalize the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases emissions in accordance with agreed individual targets²⁷. The Protocol required these countries to implement measures and policies geared towards low carbon development by achieving their emission limitation and reduction commitments²⁸. These measures include enhancement of energy efficiency; promotion of sustainable forms of agriculture in light of climate change considerations; research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies and cooperation between states to enhance the individual and combined effectiveness of their policies and measures adopted towards confronting climate change²⁹. The Kyoto Protocol also required member states to formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change³⁰.

Among the salient provisions of the Kyoto Protocol geared towards fostering low carbon development is the idea of clean development mechanisms³¹. According to the Protocol, the purpose of a clean development mechanism is to assist parties in achieving Sustainable Development and in contributing to the ultimate objective of the UNFCCC by achieving compliance with their quantified emission limitation and reduction

²⁶ United Nations Framework Convention on Climate Change., 'Kyoto Protocol to the United Nations Framework Convention on Climate Change.' Available at <https://unfccc.int/resource/docs/convkp/kpeng.pdf> (Accessed on 07/09/2023)

²⁷ Ibid

²⁸ Ibid, Article 2

²⁹ Ibid

³⁰ Ibid, Article 10 (a)

³¹ Ibid, Article 12

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commitments³². The Clean Development Mechanism(CDM) was aimed at enabling parties to benefit from project activities resulting in certified emission reductions and using the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments³³. The Clean Development Mechanism set out under the Kyoto Protocol was vital in enhancing low carbon development by stimulating Sustainable Development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets³⁴. The Kyoto Protocol established the first global, environmental investment and credit scheme of its kind, providing a standardized instrument for offsetting emissions, known as certified emission reductions³⁵. The Kyoto Protocol was vital in fostering low carbon development at the global level until the adoption of the Paris Agreement³⁶.

The *Paris Agreement*³⁷ was adopted to strengthen the global response to the threat of climate change, in the context of Sustainable Development and efforts to eradicate poverty³⁸. It seeks to achieve this goal through measures such as 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, recognizing that this would significantly reduce the risks and impacts of climate change; increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production and making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development³⁹. A key provision of

³² Ibid, Article 12 (2)

³³ Ibid, Article 12 (3)

³⁴ United Nations Framework Convention on Climate Change., 'The Kyoto Protocol Mechanisms.' Available at https://cdm.unfccc.int/about/cdm_kpm.pdf (Accessed on 07/09/2023)

³⁵ Ibid

³⁶ Ibid

³⁷ United Nations Framework Convention on Climate Change., 'Paris Agreement.' Available at https://unfccc.int/sites/default/files/english_paris_agreement.pdf (Accessed on 07/09/2023)

³⁸ Ibid, Article 2 (1)

³⁹ Ibid

the Paris Agreement aimed at fostering low carbon development is the requirement of state parties to communicate and maintain successive Nationally Determined Contributions (NDCs) that they intend to achieve⁴⁰. The Paris Agreement further requires parties to pursue domestic mitigation measures, with the aim of achieving the objectives of such NDCs⁴¹. Nationally Determined Contributions envisaged under the Paris Agreement are vital in combating climate change and unleashing national actions and investments towards a low carbon and sustainable future⁴². States through their NDCs have set out ambitious targets towards reducing greenhouse gas emissions through measures such as investments in renewable energy, adopting sustainable agricultural practices and fostering green transport and infrastructure⁴³. The Paris Agreement is therefore of utmost importance in enhancing low carbon development.

At the regional level, the *East African Community Climate Change Policy*⁴⁴ recognizes the adverse impacts of climate change as a major challenge to socio-economic development globally. The Policy is aimed at contributing to Sustainable Development in the East African Community region through harmonized and coordinated regional strategies, programmes and actions to respond to climate change⁴⁵. It further seeks to address the adverse impacts of climate change in the region and harness any potential opportunities posed by climate change in the context of the principle of Sustainable Development⁴⁶. The Policy also seeks to support the integration of climate change into regional development processes and planning including disaster risk management and gender development among other targets⁴⁷. Towards fostering low carbon development in the region, the

⁴⁰ Ibid, Article 4 (2)

⁴¹ Ibid

⁴² Fragkos, P et al., 'Energy System Impacts and Policy Implications of the European Intended Nationally Determined Contribution and Low-Carbon Pathway to 2050.' *Energy Policy* 100 (2017) 216-226

⁴³ Ibid

⁴⁴ East African Community., 'East African Community Climate Change Policy.' Available at <https://www.eac.int/environment/climate-change/eac-climate-change-policy-framework> (Accessed on 07/09/2023)

⁴⁵ Ibid

⁴⁶ Ibid

⁴⁷ Ibid

Policy emphasizes the importance of mainstreaming climate change adaptation and mitigation into national and regional development plans, taking a sectoral approach, with an emphasis on key socio-economic sectors and sub-sectors adversely impacted by climate change and with potential opportunities to contribute to mitigation efforts and Sustainable Development of the East African region⁴⁸. These sectors include, but are not limited to: water resources, agriculture and food security (crop, livestock, fisheries production), energy, biodiversity and ecosystem services (forests, wildlife, wetlands, coastal and marine ecosystems), land use and soil protection, human health, tourism, industry, transport and infrastructure, disaster risk management, gender and community development, education, training and research and development⁴⁹.

The Policy also acknowledges that climate change mitigation presents an opportunity for East Africa to benefit from project activities that result in Certified Emission Reductions (CERs) under the CDM as provided for under the *Kyoto Protocol* to the UNFCCC or under similar provisions of any other future agreement⁵⁰. It further acknowledges that CDM can foster Sustainable Development in the region while at the same time contributing to the ultimate objective of the UNFCCC which is to reduce greenhouse gas emissions and further assisting the region in securing funding of certified project activities within the sectors with significant mitigation such as energy, forestry, agriculture, waste management and transport⁵¹. In addition, the Policy urges East African countries to exploit opportunities in Reducing Emissions from Deforestation and Forest Degradation (REDD) and REDD+ through a suite of relevant policies for conservation and sustainable management of forests and enhancement of forest carbon stocks⁵². The Policy is vital in enhancing low carbon development in the East African region since it recognizes the critical need for the development of climate change adaptation and mitigation strategies to secure economic growth, social development and environmental

⁴⁸ Ibid, Part 3.0

⁴⁹ Ibid

⁵⁰ Ibid, Part 3.2

⁵¹ Ibid

⁵² Ibid

sustainability of the region⁵³. Actualizing this Policy is crucial in enhancing low carbon development in the region.

Enhancing low carbon development is also a pertinent objective under the climate change agenda in Kenya as envisioned under the *Climate Change Act*⁵⁴. The Act seeks to provide for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development among other purposes⁵⁵. The Act has since been amended by the *Climate Change (Amendment) Act*⁵⁶, 2023 in order to enhance climate change mitigation and adaptation measures in Kenya. The Amendment Act introduces the idea of carbon trading in Kenya and defines a carbon market as a mechanism that enables and allows public and private entities to transfer and transact emission reduction units, mitigation outcomes or offsets generated through carbon initiatives, programmes and projects subject to compliance of national and international laws⁵⁷. It also introduces the idea of carbon offset which refers to a reduction or removal of emissions of carbon dioxide or other greenhouse gases made in order to compensate for emissions made elsewhere⁵⁸. The Amended Act further requires national and county governments to provide guidance in the development and implementation of carbon markets and nonmarket approaches in compliance with international obligations⁵⁹.

Part IV A of the Amended Act provides the framework for the regulation of carbon markets in Kenya⁶⁰. It requires the state to formulate a policy direction on carbon markets which should prescribe carbon reduction credits that aim to reduce emissions from current sources through projects, removal or sequestration credits that take carbon dioxide out of the atmosphere and either use or store it via afforestation, reforestation,

⁵³ Ibid

⁵⁴ Climate Change Act., No. 11 of 2016., Government Printer, Nairobi

⁵⁵ Ibid

⁵⁶ Climate Change (Amendment) Act, 2023

⁵⁷ Ibid, S 2

⁵⁸ Ibid

⁵⁹ Ibid, S 3

⁶⁰ Ibid, Part IV A

nature-based solutions or technology-based removal and technologies and projects towards this end⁶¹. The Act requires the trade in carbon markets in Kenya to ensure that transactions in carbon trading aim towards a reduction of greenhouse gas emissions as per the prescribed carbon standards⁶². The Act envisions the participation in carbon markets through bilateral or multilateral trading agreement, trading with private entities and voluntary carbon markets⁶³. Towards this end, the Act gives the Cabinet Secretary in charge of the Ministry of Environment, Climate Change and Forestry power to enter into a bilateral or multilateral agreement with another state party to trade carbon for emission reductions and removals⁶⁴. In pursuance of the principles of Sustainable Development, the Act requires every carbon trading project authorized to undergo an Environmental and Social Impact Assessment in accordance Environmental Management and Coordination Act, 1999⁶⁵. It also requires every carbon project undertaken pursuant to the Act to take into consideration and aim to improve the economic, social and cultural wellbeing of the community around the project⁶⁶.

The amended Climate Change Act is an important milestone in fostering low carbon development in Kenya by providing the legal framework for carbon trading. Although the Climate Change Act, 2016 was intended to enhance national response to climate change and provided mechanisms and measures to achieve low carbon climate-resilient development, it did not envisage the concept of carbon trading⁶⁷. The Amended Act has the potential to facilitate the effective implementation of carbon markets and trading making it possible for Kenya to engage a broader range of stakeholders and

⁶¹ Ibid, S 23 A

⁶² Ibid, S 23 B

⁶³ Ibid, S 23 C (1)

⁶⁴ Ibid, S 23 C (2)

⁶⁵ Ibid, S 23 D (1)

⁶⁶ Ibid, S 23 E (7)

⁶⁷ Section 3 of the Climate Change Act, 2016 stipulates mechanisms and measures to enhance climate change resilience and low carbon development for the Sustainable Development of Kenya. However, it does not embrace the idea of carbon trading

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support its emissions reduction goals⁶⁸. It has been pointed out that if well designed, carbon markets can be an effective, credible and transparent tool for helping to achieve low-cost emissions reductions in ways that mobilize private sector actors, attract investment, and encourage international cooperation⁶⁹. A price on carbon makes clean energy more profitable, allows energy efficiency to earn a greater return, makes low-carbon products more competitive, and values the carbon stored in forests⁷⁰. The amended Climate Change Act can therefore usher in an era of low carbon development in Kenya by incorporating carbon markets and participation in them as a way to enhance national response to climate change.

Enhancing low carbon development in Kenya is also a priority under the *Energy Act*⁷¹ and the *National Climate Change Action Plan*⁷² (NCCAP) 2023-2027. The Energy Act requires the state to take measures towards harnessing opportunities offered under CDM and other mechanisms including, but not limited to, carbon credit trading to promote the development and exploitation of renewable energy sources⁷³. The NCCAP seeks to enhance low carbon development through measures such as developing carbon market frameworks for climate change adaptation and mitigation programs and providing incentives for investments in carbon markets and developing and operationalizing ecosystem and carbon benefit sharing framework⁷⁴. The NCCAP outlines key priority climate action areas, with adaptation and mitigation actions across policy and regulatory environments; capacity building; knowledge management; technology and innovation;

⁶⁸ Kipkemoi. F., 'Key Highlights of Amended Climate Change Act.' Available at <https://www.the-star.co.ke/news/realtime/2023-09-01-key-highlights-of-amended-climate-change-act/> (Accessed on 07/09/2023)

⁶⁹ Natural Justice., 'Kenya's Climate Change Bill: Paving the Way for Sustainable Development and Carbon Markets.' Available at <https://naturaljustice.org/kenyas-climate-change-bill-paving-the-way-for-sustainable-development-and-carbon-markets/> (Accessed on 07/09/2023)

⁷⁰ Ibid

⁷¹ Energy Act., No. 1 of 2019, Government Printer, Nairobi

⁷² Ministry of Environment, Climate Change and Forestry., 'Draft Strategic Plan: 2023-2027' Available at <https://www.environment.go.ke/wp-content/uploads/2023/05/MoECCF-Strategic-Plan-Draft-07.05.2023-updated.pdf> (Accessed on 07/09/2023)

⁷³ Energy Act, S 75 (2) (g)

⁷⁴ Ministry of Environment, Climate Change and Forestry., 'Draft Strategic Plan: 2023-2027' Op Cit

climate finance; and monitoring; reporting and verification⁷⁵. Kenya has therefore adopted an ambitious plan towards enhancing low carbon development. Enhancing low carbon development in Kenya is necessary in meeting the country's NDC target of a 32% reduction in greenhouse gas emissions by 2030⁷⁶.

From the foregoing, it is evident that there are global, regional and national efforts towards enhancing low carbon development for sustainability.

3.0 Enhancing Low Carbon Development for Sustainability: Promises and Drawbacks

Enhancing low carbon development has become a global concern in light of the persisting threat of climate change. The COP 27 cover decision known as the *Sharm El-Sheikh Implementation Plan*⁷⁷ highlights that a global transformation to a low-carbon economy is expected to require investments of at least USD 4 trillion to USD 6 trillion a year⁷⁸. It points out that the world needs USD 4 trillion per year needs to be invested in renewable energy up until 2030 to be able to reach net zero emissions by 2050, and that, furthermore, a global transformation to a low-carbon economy is expected to require investment of at least USD 4–6 trillion per year⁷⁹.

Various techniques and approaches have been adopted towards fostering the idea of low carbon development. These include carbon offsets which have become a popular tool in global efforts to mitigate climate change⁸⁰. Carbon offset programs work by offering regulated polluters the opportunity to increase their own emissions if they subsidize

⁷⁵ Ibid

⁷⁶ NDC Partnership., 'Kenya Unveils Comprehensive Legal Framework to Accelerate Climate Action.' Available at <https://ndcpartnership.org/news/kenya-unveils-comprehensive-legal-framework-accelerate-climate-actio> (Accessed on 07/09/2023)

⁷⁷ United Nations Framework Convention on Climate Change., 'Decision -/CP.27: Sharm El-Sheikh Implementation Plan.' Available at <https://unfccc.int/documents/624444> (Accessed on 08/09/2023)

⁷⁸ Ibid

⁷⁹ Ibid

⁸⁰ Calel. R, 'Do Carbon Offsets Offset Carbon?' Available at <https://cep.lse.ac.uk/pubs/download/dp1808.pdf> (Accessed on 08/09/2023)

equivalent emission reductions in unregulated markets⁸¹. Carbon offsets allow emission reductions in one location to compensate for emissions made elsewhere⁸². They create flexible mechanisms for states, companies, organizations, and individuals to purchase carbon credits when their direct emission reductions are too costly or difficult to implement⁸³. These mechanisms were institutionalized at the global level through the Kyoto Protocol through its flexible mechanisms, including the CDM⁸⁴. Carbon offsets have since been embraced as a technique to enhance low carbon development⁸⁵.

The world's largest carbon offset program, the CDM has supported more than USD 90 billion of renewable energy investments in developing countries, equivalent to 13% of their total renewable energy investments⁸⁶. The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO₂⁸⁷. These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol⁸⁸. It has been observed that the CDM mechanism stimulates Sustainable

⁸¹ Ibid

⁸² Andonova, L., & Sun, Y., 'Private Governance in Developing Countries: Drivers of Voluntary Carbon Offset Programs.' Available at https://d1wqtxts1xzle7.cloudfront.net/81071680/glep_a_00496-libre.pdf?1645352500=&response-content-disposition=inline%3B+filename%3DPrivate_Governance_in_Developing_Countries.pdf&Expires=1694170071&Signature=Acp6vkhp64d5t9RD97FC5hc6lin0n4bIABB4pFgANsbO1nEGWXXh4TTvnWNC09BbBz5HAn~XJENfkHFyLu12V-gfCZq5-x9LMbqCe7wRFutQFLsRoSC8dChKGIDcGwzx-5AG9mkhYaEkHwfV9a4FGCSkLSBj-wI3ZdIJBA1N~XVIIpY8UO75deHZOLY2TTG~A~arO~eRbGMF-MOI7efIT2R4tZCYtPwE29wNW4APrdvpmompl~jbpEvA08CsOFq2oqAEv-OXWKUpN6W4f3mYJJ0WzM02vGv1kBMcx3jnn~AGCYnuHQI9RwQXSYruaf6fQXiaMLDgv2oH6TnM1xEN~Q_&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA (Accessed on 08/09/2023)

⁸³ Ibid

⁸⁴ Kyoto Protocol, Article 12

⁸⁵ Andonova, L., & Sun, Y., 'Private Governance in Developing Countries: Drivers of Voluntary Carbon Offset Programs.' Op Cit

⁸⁶ Calel, R., 'Do Carbon Offsets Offset Carbon?' Op Cit

⁸⁷ United Nations Framework Convention on Climate Change., 'What is the Clean Development Mechanism?.'

<https://cdm.unfccc.int/about/index.html#:~:text=The%20CDM%20allows%20emission%2Dreduction,targets%20under%20the%20Kyoto%20Protocol> (Accessed on 08/09/2023)

⁸⁸ Ibid

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Development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets⁸⁹.

The United Nations has also developed a Carbon Offset Platform, an e-commerce platform where a company, an organization or a regular citizen can purchase units (carbon credits) to compensate greenhouse gas emissions or towards supporting climate action⁹⁰. The platform features UNFCCC certified projects that reduce, avoid or remove greenhouse gas emissions from the atmosphere⁹¹. The projects are majorly implemented in developing countries and are rewarded with Certified Emission Reductions (CERs), a type of carbon offset measured in tonnes of CO₂ equivalent⁹². The CERs are available for everyone to purchase to offset emissions or in support of the projects⁹³. This platform has aided low carbon development in developing countries through investments in renewable sources of energy such as wind power, hydro power, natural gas and biomass based renewable energy⁹⁴. Carbon offsets are therefore very essential in enhancing low carbon development. In addition to emission reductions, they also support Sustainable Development in the communities where environmentally friendly projects are implemented, ensuring job creation and continuity, health improvements and many more co-benefits⁹⁵.

The idea of emissions trading has also been adopted as a mechanism for enhancing low carbon development as envisaged under the Kyoto Protocol⁹⁶. According to the UNFCCC, emissions trading allows countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries that are

⁸⁹ Ibid

⁹⁰ United Nations Framework Convention on Climate Change., 'United Nations Carbon Offset Platform.' Available at <https://unfccc.int/climate-action/united-nations-carbon-offset-platform> (Accessed on 08/09/2023)

⁹¹ Ibid

⁹² Ibid

⁹³ Ibid

⁹⁴ Ibid

⁹⁵ Ibid

⁹⁶ Kyoto Protocol, Article 17

over their targets through carbon markets⁹⁷. It has been pointed out that emissions or carbon trading is a vital instrument in reducing greenhouse gases and enhancing the global fight against climate change⁹⁸. Carbon trading works by getting companies and other entities to pay for every ton of CO₂ emitted into the atmosphere⁹⁹. This can be achieved through a carbon tax, which is a fixed price that must be paid for every ton of CO₂ emitted and a 'trade and cap' system which is a concept that caps an organisation's total emissions, and allows it to trade any excess allocation¹⁰⁰. The UNFCCC opines that emissions trading schemes may be established as climate policy instruments at the national level and the regional level whereby governments set emissions obligations to be reached by the participating entities¹⁰¹. Countries such as the United States of America (USA) have unveiled voluntary carbon trading market schemes with the aim of boosting private investment in clean energy projects in developing countries¹⁰². At the regional level, the African Carbon Markets Initiative (ACMI) has been developed in order to unlock the potential of voluntary carbon markets for financing Africa's energy, climate and development goals¹⁰³. The ACMI was inaugurated at COP 27 and aims to support the growth of carbon credit production and create jobs in Africa¹⁰⁴. This idea has been introduced in Kenya under the amended *Climate Change Act* which introduces carbon markets as a mechanism that enables and allows public and private entities to transfer and transact emission reduction units, mitigation outcomes or offsets generated through carbon initiatives, programmes and projects subject to compliance of national and

⁹⁷ United Nations Framework Convention on Climate Change., 'Emissions Trading.' Available at <https://unfccc.int/process/the-kyoto-protocol/mechanisms/emissions-trading> (Accessed on 08/09/2023)

⁹⁸ Channel News Asia., 'CNA Explains: What is Carbon Trading and How Does it Work?.' Available at <https://www.channelnewsasia.com/sustainability/cna-explains-carbon-trading-tax-climate-change-global-warming-3424796> (Accessed on 08/09/2023)

⁹⁹ Ibid

¹⁰⁰ Ibid

¹⁰¹ United Nations Framework Convention on Climate Change., 'Emissions Trading.' Op Cit

¹⁰² Milman. O, & Lakhani. N., 'US Introduces New Carbon Trading Scheme to Boost Investment in Developing Countries.' Available at <https://www.theguardian.com/environment/2022/nov/09/cop27-us-carbon-trading-scheme> (Accessed on 08/09/2023)

¹⁰³ Sustainable Energy for All., 'Africa Carbon Markets Initiative (ACMI).' Available at <https://www.seforall.org/our-work/initiatives-projects/ACMI> (Accessed on 08/09/2023)

¹⁰⁴ Ibid

international laws¹⁰⁵. Giving effect to the provisions of the Act on emissions trading will enhance low carbon development in Kenya. Carbon markets are therefore vital in enhancing low carbon development. Carbon markets offer an incredible opportunity to unlock billions for the climate finance needs of African economies while expanding energy access, creating jobs, protecting biodiversity, and driving climate action¹⁰⁶. It is thus imperative to embrace carbon markets in Africa for low carbon development.

In addition, fostering green growth through initiatives such as low carbon infrastructure, smart agricultural practices and sustainable cities is essential in enhancing low carbon development¹⁰⁷. It has been asserted that approximately 79% of global greenhouse gas emissions come from infrastructure construction and operations such as power plants, buildings, and transport¹⁰⁸. In order to curb this situation while maintaining infrastructure as a priority sector for climate action, and national growth in general, climate experts have argued that governments need to radically rethink how infrastructure is planned, delivered and managed in order to make it suitable for a low-emission and resilient future¹⁰⁹. Low-carbon infrastructure development is therefore necessary in enhancing low carbon development since it generates fewer carbon emissions than traditional infrastructure and helps build resilience in vulnerable countries while protecting against exposure to extreme climate change events¹¹⁰. Low

¹⁰⁵ Climate Change (Amendment) Act, 2023, S 2

¹⁰⁶ Climate Champions., 'Africa Carbon Markets Initiative Launched to Dramatically Expand Africa's Participation in Voluntary Carbon Market.' Available at https://climatechampions.unfccc.int/africa-carbon-markets-initiative/?gclid=CjwKCAjwjOunBhB4EiwA94JWsJZ_t3NzOZhvgrVH50425NnhonFqhjUleIc_hKi8OzOKEaq4xFBFwBoC6tIQAvD_BwE (Accessed on 08/09/2023)

¹⁰⁷ Xin. X, Yuding. W, & Jianzhong. W., 'The Problems and Strategies of the Low Carbon Economy Development.' Op Cit

¹⁰⁸ Brickstone., 'Low-Carbon Infrastructure in Curbing Climate Change.' Available at <https://brickstone.africa/low-carbon-infrastructure-in-climate-change/#:~:text=Urban%20transport%20projects%2C%20such%20as,emissions%20compared%20to%20ofossil%20fuels> (Accessed on 08/09/2023)

¹⁰⁹ Ibid

¹¹⁰ Kennedy. C, Ibrahim. N, & Hoornweg. D., 'Low-Carbon Infrastructure Strategies for Cities.' Available at https://www.researchgate.net/profile/Nadine-Ibrahim-2/publication/262954714_Low-carbon_infrastructure_strategies_for_cities/links/5705559e08ae13eb88b9644e/Low-carbon-infrastructure-strategies-for-cities.pdf (Accessed on 08/09/2023)

carbon infrastructure projects such as railway infrastructure, urban transport projects, such as Metros and Light Rail projects which reduce car usage and renewable energy projects including solar, wind, and hydropower are therefore crucial in enhancing low carbon development¹¹¹. In addition, cities are increasingly adopting Low Carbon City Development Programmes which stipulate a framework and set of comprehensive requirements to help in planning, implementation, monitoring, and accounting for low carbon investments and climate change mitigation actions across all sectors¹¹². Further, climate smart agriculture is vital in enhancing the resilience of the agriculture sector, promoting food security while curbing greenhouse gas emissions¹¹³. Climate smart agriculture is an integrated approach to managing landscapes including cropland, livestock, forests and fisheries that addresses the interlinked challenges of food security and accelerating climate change¹¹⁴. Embracing climate smart agricultural practices can therefore accelerate low carbon development.

Finally, climate finance has also been embraced as a strategy to enhance low carbon development. Climate finance refers to local and global financing of public and private investment that seeks to support mitigation of and adaptation to climate change¹¹⁵. It has also been defined as finance for activities aimed at mitigating or adapting to the impacts of climate change¹¹⁶. Climate finance is vital in climate change mitigation and adaptation by accelerating clean energy transitions and building resilience in the most vulnerable

¹¹¹ Ibid

¹¹² The World Bank., 'Rio de Janeiro Low-Carbon City Development Program.' Available at <https://www.worldbank.org/en/topic/urbandevelopment/publication/rio-low-carbon-city-program> (Accessed on 08/09/2023)

¹¹³ The World Bank., 'Climate-Smart Agriculture.' Available at <https://www.worldbank.org/en/topic/climate-smart-agriculture> (Accessed on 08/09/2023)

¹¹⁴ Ibid

¹¹⁵ Hong. H., Karolyi. G. A., & Scheinkman. J.A., 'Climate Finance.' *Review of Financial Studies*, Volume 33, Issue 3 (2020)

¹¹⁶ The London School of Economics and Political Science., 'What is Climate Finance?' Available at <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-climate-finance-and-where-will-it-comefrom/> (Accessed on 08/09/2023)

countries¹¹⁷. The UNFCCC acknowledges the importance of climate finance and seek to mobilise USD 100 billion in climate finance per year to support developing countries¹¹⁸. At COP27, a breakthrough agreement was reached to provide loss and damage funding for vulnerable countries hit hard by floods, droughts and other climate disasters¹¹⁹. This decision has been lauded as historic since it recognizes the need for finance to respond to loss and damage associated with the severe consequences of climate change¹²⁰. It has also been argued that creation of the Loss and Damage Fund will have a positive impact on the adoption of the carbon market as an addition avenue for climate finance¹²¹. Climate finance is therefore an essential tool of enhancing low carbon development.

From the foregoing discussion, it can be deduced that there has been progress towards enhancing low carbon development. However, despite the efficacy of low carbon development in enhancing sustainability, there are several drawbacks hindering its practice. In the field of carbon trading, it has been pointed out that major polluters might relocate across borders to more lenient jurisdictions in a move known as carbon leakage¹²². Carbon leakage has resulted in companies moving emissions-intensive operations abroad to escape regulation impeding many, perhaps most, mitigation policy options given the perceived risk of these shifting to jurisdictions with weaker climate

¹¹⁷ Hill. A., & Babin. M 'Why Climate Finance is Critical for Accelerating Global Action.' Available at <https://www.cfr.org/in-brief/why-climate-finance-critical-accelerating-global-action> (Accessed on 08/09/2023)

¹¹⁸ United Nations Framework Convention on Climate Change., 'Introduction to Climate Finance.' Available at https://unfccc.int/topics/introduction-to-climatefinance?gclid=EAIaIQobChMI18L91LDRgAMVAlpoCR2_kQzJEAAYAiAAEgI4cfD_BwE (Accessed on 08/09/2023)

¹¹⁹ United Nations Framework Convention on Climate Change., 'Decision -/CP.27 -/CMA.4: Funding Arrangements for Responding to Loss and Damage Associated with the Adverse Effects of Climate Change, Including a Focus on Addressing Loss and Damage.' Available at https://unfccc.int/sites/default/files/resource/cma4_auv_8f.pdf (Accessed on 08/09/2023)

¹²⁰ United Nations Framework Convention on Climate Change., 'Five Key Takeaways from COP 27.' Available at https://unfccc.int/process-andmeetings/conferences/sharm-el-sheikh-climate-change-conference-november-2022/five-key-takeawaysfrom-cop27?gclid=EAIaIQobChMI-5_C16jRgAMVDzAGAB11kw6NEAAYASAAEgL_QfD_BwE (Accessed on 08/09/2023)

¹²¹ Climate Trade., 'Top 5 Carbon Market Developments at COP 27.' Available at <https://climatetrade.com/top-5-carbon-market-developments-at-cop27/> (Accessed on 08/09/2023)

¹²² Channel News Asia., 'CNA Explains: What is Carbon Trading and How Does it Work?.' Op Cit

policies¹²³. Carbon markets have also been accused of resulting in minimal emissions reductions while burnishing the green reputations of large companies¹²⁴. Consequently, it has been asserted that the idea of carbon offsetting allows polluters to keep polluting instead of reducing greenhouse gas emissions¹²⁵. In addition, transparency concerns have been raised in relation to carbon markets¹²⁶. It has been argued that carbon trading focus could encourage dubious carbon accounting and offsetting practices¹²⁷. There is also the risk of double counting in unregulated voluntary carbon market because they do not fall under jurisdiction of the UNFCCC¹²⁸.

Further, another pertinent concern is the potential of human rights violation since such schemes often involve forests and agricultural land where indigenous and pastoral communities have lived sustainably resulting in widespread reports of land grabs and higher food prices linked to carbon markets in some countries¹²⁹. It has been argued that carbon markets have historically failed to fulfil climate goals and often profoundly harm communities and undermine human rights¹³⁰. Carbon markets have been associated with challenges such as exploitation, inequalities and perverse speculations and financial bubbles¹³¹. There is need to effectively implement carbon markets in order to enhance their role in low carbon development.

¹²³ Grubb, M., 'Carbon Leakage, Consumption, and Trade.' *Annual Review of Environment and Resources.*, 2022. 47:753–95

¹²⁴ Milman. O, & Lakhani. N., 'US Introduces New Carbon Trading Scheme to Boost Investment in Developing Countries.' Op Cit

¹²⁵ Ibid

¹²⁶ Luhn. A., 'COP27 Boosts Carbon Trading and 'Non-Market' Conservation: But Can they Save Forests?' Available at <https://news.mongabay.com/2022/11/cop27-boosts-carbon-trading-and-non-market-conservation-but-can-they-save-forests/> (Accessed on 09/09/2023)

¹²⁷ Ibid

¹²⁸ Crook. J., 'Was COP 27 the Beginning of the End for Corporate Offsetting?' Available at <https://carbonmarketwatch.org/2022/12/07/was-cop27-the-beginning-of-the-end-for-corporate-offsetting/> (Accessed on 09/09/2023)

¹²⁹ Milman. O, & Lakhani. N., 'US Introduces New Carbon Trading Scheme to Boost Investment in Developing Countries.' Op Cit

¹³⁰ Michaelowa. A., 'Failures of Global Carbon Markets and CDM?.' Available at <https://www.tandfonline.com/doi/pdf/10.3763/cpol.2010.0688> (Accessed on 09/09/2023)

¹³¹ Ibid

Finally, fostering low carbon development in most countries has been hindered by challenges such as economic barriers, infrastructural and operational challenges, lack of proper policy mechanisms and market barriers¹³². There is need to address these challenges in order to enhance low carbon development.

4.0 Way Forward

In order to enhance low carbon development, it is vital for countries to fulfill their obligations as stipulated under the international climate change framework including the UNFCCC and the Paris Agreement¹³³. The *Paris Agreement* seeks to confront climate change by 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 levels¹³⁴. The United Nations observes that in order to keep global warming to no more than 1.5°C – as called for in the Paris Agreement – emissions need to be reduced by 45% by 2030 and reach net zero by 2050¹³⁵. It is therefore important for countries to significantly strengthen their Nationally Determined Contributions (NDCs) and take bold, immediate steps towards reducing emissions in order to realize low carbon development and confront climate change¹³⁶.

Further, there is need to establish an international carbon market in order to allow countries to offset their emissions with credits based on greenhouse gas-reducing projects

¹³² Luthra. K et al., 'Analysing the Adoption Barriers of Low-Carbon Operations: A Step Forward for Achieving Net-Zero Emissions.' Available at <https://repository.derby.ac.uk/item/9vz84/analysing-the-adoption-barriers-of-low-carbon-operations-a-step-forward-for-achieving-net-zero-emissions#:~:text=The%20results%20also%20show%20that,and%20achieving%20net%2Dzero%20emissions> (Accessed on 09/09/2023)

¹³³ United Nations., 'For a Livable Climate: Net-Zero Commitments Must be Backed by Credible Action,' Available at <https://www.un.org/en/climatechange/net-zero-coalition> (Accessed on 09/09/2023)

¹³⁴ Paris Agreement, Article 2 (1)

¹³⁵ United Nations., 'For a Livable Climate: Net-Zero Commitments Must be Backed by Credible Action,'

Op Cit

¹³⁶ Ibid

elsewhere as envisaged under the Paris Agreement¹³⁷. The Paris Agreement envisages the development of carbon markets through internationally transferred mitigation outcomes and voluntary cooperation between countries among other measures¹³⁸. It is imperative to fulfill these provisions in order to develop carbon markets as tools of low carbon development. The outcome of COP 27 was vital in enhancing carbon markets through initiatives such as the establishment of the Loss and Damage Fund and development of the African Carbon Markets Initiative¹³⁹. There is need to further these efforts through appropriate global and regional initiatives including COP 28 in order to strengthen the role of carbon markets in enhancing sustainability¹⁴⁰.

It is also imperative for countries to embrace carbon market initiatives including emissions trading as climate policy instrument at the national level¹⁴¹. There has been progress towards realizing this goal in Kenya through the enactment of the *Climate Change (Amendment) Act* which introduces carbon markets as a mechanism that enables and allows public and private entities to transfer and transact emission reduction units, mitigation outcomes or offsets generated through carbon initiatives, programmes and projects subject to compliance of national and international laws¹⁴². Global and regional cooperation in this sector is also vital in enhancing low carbon development¹⁴³.

Low carbon development can also be achieved by countries 'greening' their economies¹⁴⁴. The concept of 'greening' economies has become a pertinent concern in global politics in the wake of challenges facing the planet including the threat of climate change¹⁴⁵. The

¹³⁷ Nasralla. S, & Abnett. K., 'U.N. Carbon Market Talks to Drag Beyond COP27 as Deals Elusive.' Available at <https://www.reuters.com/business/cop/un-carbon-market-talks-drag-beyond-cop27-deals-elusive-2022-11-17/> (Accessed on 09/09/2023)

¹³⁸ Paris Agreement, Article 6

¹³⁹ United Nations Framework Convention on Climate Change., 'Five Key Takeaways from COP 27.' Op Cit

¹⁴⁰ Climate Trade., 'Top 5 Carbon Market Developments at COP 27.' Op Cit

¹⁴¹ United Nations Framework Convention on Climate Change., 'Emissions Trading.' Op Cit

¹⁴² Climate Change (Amendment) Act, 2023, S 2

¹⁴³ United Nations Framework Convention on Climate Change., 'Emissions Trading.' Op Cit

¹⁴⁴ Bergius. M., 'Towards a Green Modernization Development Discourse: The New Green Revolution in Africa.' *Journal of Political Ecology*, 2019

¹⁴⁵ Ibid

idea of 'green economy' is a policy focus that emphasizes environmentally sustainable economic progress to foster low-carbon, socially inclusive development¹⁴⁶. Countries should therefore embrace the idea of green economies through measures such as embracing renewable sources of energy including solar, wind and hydropower, adopting climate smart agricultural techniques, fostering sustainable cities and infrastructure and adoption of sustainable waste management techniques¹⁴⁷. It is also vital for countries to embrace the concept of REDD+, or Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, as a mechanism for sustainable management of forests¹⁴⁸. Forests absorb vast amounts of carbon dioxide and can be a source of greenhouse gas emissions when destroyed or damaged¹⁴⁹. REDD + can enhance low carbon development through sustainable management of forests and the conservation and enhancement of forest carbon stocks¹⁵⁰.

Finally, it is essential for countries to unlock climate finance as an essential tool of confronting climate change and enhancing low carbon development¹⁵¹. Climate finance is vital in climate change mitigation and adaptation by accelerating clean energy transitions and building resilience in the most vulnerable countries¹⁵². The outcome of COP 27 , the *Sharm El-Sheikh Implementation Plan*,¹⁵³ highlights the world needs USD 4 trillion per year needs to be invested in renewable energy up until 2030 to be able to reach net zero emissions by 2050, and that, furthermore, a global transformation to a low-carbon

¹⁴⁶ United Nations Economic and Social Commission for Asia and the Pacific., 'Green Growth Uptake in Asia-Pacific Region.' Available at https://unece.org/fileadmin/DAM/env/cep/CEP20/ppp/Item10_b_ESCAP_GreenGrowthUptake_esm.pdf (Accessed on 09/09/2023)

¹⁴⁷ Muigua. K., 'Actualizing Africa's Green Dream.' Available at <http://kmco.co.ke/wp-content/uploads/2023/07/Actualizing-Africas-Green-Dream.pdf> (Accessed on 09/09/2023)

¹⁴⁸ Luhn. A., 'COP27 Boosts Carbon Trading and 'Non-Market' Conservation: But Can they Save Forests?' Op Cit

¹⁴⁹ United Nations Framework Convention on Climate Change., 'What is REDD+?' Available at <https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd> (Accessed on 09/09/2023)

¹⁵⁰ Ibid

¹⁵¹ Muigua. K., 'Unlocking Climate Finance for Development.' Available at <http://kmco.co.ke/wp-content/uploads/2023/08/Unlocking-Climate-Finance-for-Development.pdf> (Accessed on 09/09/2023)

¹⁵² Hill. A., & Babin. M 'Why Climate Finance is Critical for Accelerating Global Action.' Op Cit

¹⁵³ Sharm El-Sheikh Implementation Plan.' Op Cit

economy is expected to require investment of at least USD 4–6 trillion per year¹⁵⁴. It is therefore imperative for countries to identify and mobilize effective and appropriate financing for climate action in order to enhance their resilience and effectively confront climate change¹⁵⁵.

These measures are integral in enhancing low carbon development for sustainability.

5.0 Conclusion

The idea of low carbon development has been advocated as the inevitable choice to confront climate change and achieve Sustainable Development¹⁵⁶. The need for low carbon development has been recognized at the global, regional and national levels with various efforts being undertaken towards realizing this ideal¹⁵⁷. Despite progress being made towards realizing carbon development, concerns such as economic barriers, infrastructural and operational challenges, lack of proper policy mechanisms and market barriers are hindering its effective realization¹⁵⁸. Low carbon development can be realized through mechanisms such as countries fulfilling their obligations as stipulated under the international climate change framework including the UNFCCC and the Paris Agreement, establishing an international carbon market, countries embracing carbon market initiatives including emissions trading as climate policy instrument at the national level, greening of economies and accelerating climate finance¹⁵⁹. Enhancing low carbon development for sustainability is an achievable mandatory objective in light of the Sustainable Development agenda.

¹⁵⁴ Ibid

¹⁵⁵ United Nations Framework Convention on Climate Change., 'Climate Finance Access and Mobilization Strategy for The Least Developed Countries In Asia: 2022-2030.' Available at https://unfccc.int/sites/default/files/resource/UNFCCC_NBF_SD_AsianLDCA_final.pdf (Accessed on 09/09/2023)

¹⁵⁶ Xin. X, Yuding. W, & Jianzhong. W., 'The Problems and Strategies of the Low Carbon Economy Development.' Op Cit

¹⁵⁷ Yuan. H, Zhou. P, & Zhou. D., 'What is Low-Carbon Development? A Conceptual Analysis.' Op Cit

¹⁵⁸ Luthra. K et al., 'Analysing the Adoption Barriers of Low-Carbon Operations: A Step Forward for Achieving Net-Zero Emissions.' Op Cit

¹⁵⁹ Yuan. H, Zhou. P, & Zhou. D., 'What is Low-Carbon Development? A Conceptual Analysis.' Op Cit

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