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China-Malawi Cooperation: Hope for Malawi's Climate-Resilient Infrastructure

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Abstract:- Infrastructure development has been a crucial component of development in the global South. Any disruptions to infrastructure can negatively impact other aspects of society such as environmental, social, and economic development. Unfortunately, Malawi has suffered from a series of climate change-related natural disasters such as Floods and Tropical cyclones for several consecutive years. These disasters have not only killed many people but also damaged infrastructures such as roads, buildings, railways and bridges. The rehabilitation of such damages is costly and creates unexpected economic pressures on the national economy, eventually disturbing the macroeconomic parameters and worsening the welfare of people. For these reasons, the South-South Cooperation particularly, the China-Malawi Cooperation considers climate-resilient infrastructure as one of the important areas of cooperation. However, there is no empirical evidence to track the progress registered so far. It is against this background that we conducted this review study through a systematic literature search to appreciate if the cooperation is providing any hope to climate resilient infrastructure for Malawi. The study recommends that cooperation provide sufficient discussions and agreements on the type of infrastructure that needs priority, quality standards for climate-resistant infrastructure, and investment in alternative energy sources besides hydro-power. This is crucial for Malawi to have resilient infrastructure that can withstand climate change impacts.

Keywords:- *Sustainable development, Climate-Resilient, Infrastructure, South-South Cooperation, Climate change.*

I. INTRODUCTION

Infrastructure development forms a crucial part of sustainable development as its dividends span across economic, environmental as well as social sectors. Infrastructure development is a reflection of Chinese development experience and has provided an alternate development model for the African continent[1]. [2]Studies examining how physical infrastructure affects inequality and poverty have proved that infrastructure investments help lessen economic inequality and poverty [3]. Boosting resilience is among the most crucial functions of the infrastructure; thus, the infrastructure should have the capacity to bounce back from shocks and do so by transferring that capacity to the social, environmental, and economic pillars of sustainable development.

This paper seeks to uncover the potential of Africa to tackle climate change issues through strategic cooperation with China as a fellow developing country with robust economic and infrastructure progress dubbed "South-South" cooperation. The relationship involves continuous learning from history and experiences of each country and is characterised with mutual respect and "equal treatment" for the development of both countries[17].In case of China-Malawi Cooperation, we begin with a brief overview of climate change as a global public good problem. After understanding the impacts of climate change on Malawi infrastructure and the examination of China-Malawi relationship, we then conclude by giving some recommendations.

II. CLIMATE CHANGE: A GLOBAL PUBLIC GOOD PROBLEM

[4]In this world, the destiny of the humanity is being shaped by the issues that are outside the scope of individual nation's ability to resolve. Living in an interconnected planet, the problems in one nation, affect other countries even in the far off places. [10] Issues like floods, dry spells, COVID-19 pandemic, Tropical Cyclone (i.e. Freddy), financial instability, wars and migration across the continent and water scarcities define global issues[4], and have uncovered the need for global public goods[6].They cause serious implications for livelihoods of every individual and nation regardless of their wealth [5]. Public goods are those goods that are accessible to all ("nonexcludable") and that can be appreciated again and again by anybody without lessening the advantages they convey to others ("nonrival") [6]. Global Public Goods are, therefore, such goods that affect people from all over the world; they give benefits that are accessible internationally and are not confined by national limits, creating a third dimension on top of non-excludability and non-rivalry [7].

Climate change can never be traced to a single country, unlike other public good challenges that are typically manageable at the national level. [7] The concentration of greenhouse gases (GHGs) in the atmosphere is caused by emissions from all sources in all countries. Therefore, climate change is a global public good problem. Climate change significantly impacts all important facets of life,

including those relating to health, education, housing, and socioeconomics. Nearly every year, people from around the world experience the effects of climate change, however, many Africans experience a lot of sufferings, and the climatic threat to the region is very serious. [8] By 2007, Africa was already struggling with the effects of climate change and was very susceptible to its impacts; it is possible for the same area to experience floods and droughts, occasionally with only a few months difference between them, the occurrences which have the potential to result in hunger and create numerous challenges for both economy and society. This growing impact in the continent is affecting the most vulnerable people greatly, and causing food insecurity, displacing people and increasing pressure on water resource among other things[9].The Africa's inability to cope with climate change can be attributed to such factors as poverty, illiteracy and lack of skills, weak institutions, limited infrastructure, lack of technology and information, low levels of primary education and health care, poor access to resources, low management capabilities and armed conflicts[8]. African countries together with their development partners like China should rethink infrastructure investment in terms of climate-resilient if they are to reduce the impact of climate change. [10] An infrastructure is climate resilient if it is prepared for, planned for, constructed, and operated in a manner that adapts to changing climatic conditions, and is able to withstand, adapt to, and quickly recover from disruptions brought on by these climatic conditions; it lowers the risk of disruptions caused by climate change, but it may not completely eliminate it. There is a strong incentive to control emissions in nations with low emissions but high impacts, but little capacity to do so[7], and Malawi is just one of such countries.

III. CLIMATE CHANGE IN MALAWI AND ITS IMPACT ON INFRASTRUCTURE DEVELOPMENT

Malawi is a small landlocked agriculture-dominated country in the South-eastern Africa with a total geographical area of 118,484 km2, 20% of which is Lake Malawi. It is bordered by Zambia to the west, Tanzania to the north and northeast, and Mozambique to the east, south and southwest. According to the previous population census conducted in 2018, Malawi's population was 17, 563, 749 people with an average intercensal growth rate of 2.9 [11], thus, the current population can be estimated at an approximation of 20,000,000 people holding other things constant[11]. Guided by the current Malawi's 2063 Agenda, the nation strives to achieve "an inclusively wealthy and self-reliant nation" by 2063 [12].

[13] Due to rapid population increase, extensive deforestation, and widespread soil erosion, Malawi is particularly vulnerable to the detrimental effects of climate change as it is an agro-based economy. [14] Changing weather patterns due to climate change significantly affect nearly 80% Malawi's population who are dependent on rain-fed agriculture resulting in disastrous food insecurity which in turn reduce country's GDP. Apart from agriculture sector, another developmental sector that significantly impacted by climate change in Malawi is infrastructure.

Recently, cyclones happen to be the most frequent disaster hitting Malawi as a result of climate change. [15] Such cyclones mostly affect the southern region, and the most dangerous cyclone to hit Malawi in the previous 12 months was "Freddy," which made landfall on March 11, 2023 at 2:00 pm local time near Nsanje, one of the District in the southern region and reached wind speeds of up to 172 km/h classified as category 2 according to the widely used Saffir-Simpson classification, and on the open sea, speeds of up to 183 km/h have been recorded (classified as category 3). [3]Flooding resulting from cyclone-induced irregular rainfall considerably damage infrastructures including roads, bridges, houses, health facilities and schools as well as energy (electricity) infrastructures, water and sanitation resources.

Table 1: Recent cyclones that has hit Malawi since 2018

Year	Cyclone Name	Duration	Country part affected
2019	Desmond	January 17 to 22th	Nsanje District (Southern region)
2019	Idai	March 4th to 16th	Southern Region
2019	Kenneth	April 21th to 28th	Mangochi District (Southern Region)
2020/2021	Chalane	December 20th 2020 to January 4th, 2021	Southern Region
2021	Eloise	January 11th to 22th	Southern Region
2021	Guambe	January 11th to 22nd	Southern Region
2021	Iman	March 2nd to 11th	Phalombe District (Southern region)
2022	Ana	January 23rd to 25th	Southern Region
2022	Gombe	March 8th to 14th	Southern Region
2022	Jasimine	April 24th to 28th	Nsanje District (Southern Region)
2023	Freddy	March 2nd to 14th	Southern Region

Source: World weather data https://worldweather.wmo.int/en/

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The 2015 floods, which resulted in substantial losses and hefty recovery costs, exposed vulnerabilities in the transportation sector[14]. [16] In 2019, floods claimed a huge cost in infrastructure sector in terms of damages and losses as shown in Table 1 below. [14] As such overstretched public expenditure budgets are further burdened by the costs of infrastructure maintenance and restoration, and without taking any adaptation measures, Malawi might incur costs of USD 165 million yearly on average only for maintaining its road system.

Table 2: Damage and Loss of 2019 floods in Infrastructure sector (estimated in $)

Infrastructure Sector	Damage(mil $)	Loss (mil $)	Total Effect (mil $)
Transport	36.1	0.87	36.97
Energy-electricity	2.79	0.31	3.1
Water and Sanitation	3.72	2.65	6.37
Water resources	5.05	0	5.05

Source: Government of Malawi-PDNA2019

A. *Displaced people seeking shelter in schools*

B. Bridge washed away

C. Damaged road

D. Houses and powerlines submerged in flooding water

Fig 1: Pictures of damages and losses from flooding (caused by cyclones) (A-D)

IV. SOUTH-SOUTH COOPERATION, SINO-AFRICA COOPERATION

Developing countries experience similar economic, technological, and capacity-related challenges and constraints when implementing policies and measures aimed at achieving low emission and climate resilient development. [17] Through South-South cooperation, nations can get closer to addressing a variety of needs in a focused way; the cooperation offers a great opportunity for developing countries to advance sustainable development pathways in accordance with Paris Agreement, Individual national determined contributions (NDCs) and the Sustainable Developmental Goals of the 2030 Agenda. [18]South-South Cooperation may establish new finance avenues for infrastructure growth and energy transition, allow knowledge transfer, and set up the regional framework for a circular economy.

Developing nations' voices in international climate negotiations and discussions can be amplified through cooperation and adoption of common positions; they, together, can track, monitor, and assess their institutional, technical, and financial capacity-building requirements, ensuring that developed nations fulfil their climate funding commitments fully and timely[18]. [3]South-South Cooperation is seen to be good pathway towards fighting against climate change especially in Africa, China and other

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developing countries hence it is to be deepened; the heads of delegates of PRC, African countries and African Union(AU) declared a decision to establish China-Africa partnership of strategic cooperation of the new era for fighting against climate change [19].

Dating back to 1950s, China had been in strong ties with African countries, [20]which expanded both economically and politically post to Cold War and got formalized via Forum on China-Africa Cooperation (FOCAC) in 2000. Among other things, the cooperation brought such hopes to African countries as synergetic, reciprocally beneficial economic relations; and knowledge and technology transfers and diffusion through joint ventures and other formation.

[21] The major component of China-Africa relationship has been Chinese infrastructure financing which increased from around $500 million in 2001 to $14 billion in 2011; mainly allocated to power and transport sectors as well as water and sanitation. Chinese Infrastructure financing is also major component in President Xi's Belt and Road Initiative (BRI) (formerly One Belt one Road (OBOR)) declared in 2013 with much focus on such infrastructure projects high-speed railway, power generation, telecommunications in OBOR countries [22].

V. CHINA-MALAWI COOPERATION AND INFRASTRUCTURE DEVELOPMENT

Under the umbrella of South-South Cooperation, China has made cooperation with most African countries including Malawi. [23] Through Forum on China-Africa Cooperation (FOCAC), both China and Africa have proved the importance of the cooperation mainly in terms of trade, poverty reduction and economic development as well as geopolitical support. China's support of African nations through the "win-win" principle increased agricultural output and productivity [24]. [25] Infrastructure development has been and still is the Chinese developmental aid to Africa. Chinese companies through Chinese soft loans put up infrastructure in African countries.

Since the establishment of Malawi-China cooperation, China has been engaged in a number of infrastructure projects under grants and concessional loans arrangements; [26]the parliament building, Bingu international convention center (BICC), Malawi University of Science and Technology (MUST), roads (Chitipa-Karonga road), stadium and a hotel have all been funded and constructed by China[26]. Like a number of African countries, Malawi has recently also signed a Memorandum of Understanding (MoU) with China on the Belt and Road Initiative (BRI) cooperation. [27] In the signed MoU, the key infrastructure projects listed include the Lilongwe Water program worth 67.7million US dollars concessional loan, the construction of dual carriage way in Lilongwe worth 50million US dollars grant and a 15 million US dollars grant for the construction of 5 community technical schools in the country.

VI. CONCLUSION

Infrastructure forms an essential component for sustainable economic development. Developmental pillars including the economic, social, and environmental ones are affected when infrastructure development is disrupted. Climate change is a global public good challenge causing a significant number of global public issues. Like many developing countries, Malawi extremely suffers from the effects of the climate change, and one of the sectors that are significantly and immediately impacted is the infrastructure sector.

South-South Cooperation is a potential platform for tackling such global issues as climate change especially in global south. Like in other African countries, Malawi's infrastructure sector has benefitted from the country's relationship with China, and there is great potential of continued infrastructure development. With China's commitment to climate change action, China-Malawi cooperation is the prospect of climate-resilient infrastructure in Malawi; unless the infrastructures are climate-resilient, Malawi will not ably adapt to climate change and will continually suffer from its effects; high food insecurity, economic shocks, and high poverty levels. However, there is a need of proper discussions and agreements between Malawi and China on a number of areas;

Firstly, the kind of infrastructure that should be given top priority in light of the effects of climate change. For instance, nearly every year Malawi is hit by cyclones that is associated with erratic rainfalls hence floods, therefore, among other things considering construction of strong dykes in the cyclone hit and flood prone areas would reduce the impacts. Roads and building infrastructures should not be the only parts of the deal.

Secondly, the quality standard of the infrastructures should be emphasized in the projects' agreement incorporating climate resilience aspect. Almost every year, roads, bridges, and other buildings are damaged. This places a significant burden on the government and development partners in terms of maintenance costs.

Thirdly, energy (electricity) sector is largely affected by the climate change. Malawi highly depends on the hydro-power which is very vulnerable to climate change. The levels of water are low and the power generation machines do not produce enough when it is too hot (dry). The flooding that occurs when cyclones strike also forces power plants to shut down. The malfunctioning and shutting down of power plants (particularly during cyclones or droughts) reduces the supply of electricity, which is already inadequate to meet demand causing continuous load shedding. Accordingly, the collaboration ought to consider putting resources into such other possible alternative energy as solar-based, geothermal, coal and wind.

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