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Role of China in Improving the Regional Connectivity and Economic Development in African Union through Program for Infrastructure Development in Africa-Priority Action Plan 1 (PIDA-PAP 1) (2012-2020)

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ABSTRACT

The Programme for Infrastructure Development in Africa (PIDA) is an initiative of the African Union (AU) Commission taken in collaboration with other AU institutions. The NEPAD Planning and Coordinating Agency (NPCA), the United Nations Economic Commission (UNEC) for Africa, and the African Development Bank (AfDB) partnered with the program. PIDA aims to expedite infrastructure development in Africa and overcome the challenges of regional connectivity. It is divided into two Priority Action Plans (PAP) i.e. 'PIDA-PAP1' and 'PIDA-PAP2'. The PIDA-PAP1 (2012-2020) is a strategic framework which ensures fast-track implementation of various projects to address developmental and integrative issues faced by the AU member states which are chiefly related to energy, transboundary water, transportation, and Information and Communication Technology (ICT) sectors. The current study reviews the nature and quantum of Chinese engagements with AU under the PIDA initiative for continental integration by particularly focussing on PAP 1 Program. It qualitatively analyses the relevant literature including official reports and financial documents to critically understand the extensive nature of Chinese involvement in these projects and finds that China is quite keenly involved within the member states of AU to develop inter- and intra-regional connectivity which is apparently intended and would ultimately be helpful to fulfil her own growing economic needs. The study would be helpful

for the scholars, researchers from academia as well as policy-makers and think-tanks working on the China-AU economic relations.

Key Words: Program for Infrastructure Development in Africa, China-African Union Relations, Priority Action Plan 1

1-Introduction

Starting from 2012 and extending till 2020, the Program for Infrastructure Development in Africa-Priority Action Plan (PIDA-PAP) 1 circumscribe 51 programs which are further divided into 433 individual programs covering transport, ICT, energy and water resources available across the AU member states. PIDA basically enables these countries to fulfil demands relating to infrastructure services and increase competitiveness through: -

i. Enhancing efficiencies
ii. Boosting growth
iii. Facilitation of integration into global economy
iv. Improvising the living standards
v. Enhancing intra-African trade

A very precise and accurate capital cost projection regarding implementation of PIDA projects till the year 2040 would be quite difficult and challenging (for present, it exceeds $360 billion) whereas it had cost $68 billion for various PAP projects from 2012-2020 with an average of $7.5 billion per annum (African Union, 2017). 95% of these projects are related to energy and transport (PIDA VPIC, n.d.-k). By extending considerable investments and expertise to improve continental transport and energy infrastructure, China had implemented an extensive economic development program in Africa through PIDA-PAP. Energy and Water, Transport and Infrastructure Development, Information and Communication Technology and Ports are the four key areas categorised by this study to critically examine the true nature of PAP 1. In the following pages, these attributes are detailed and discussed turn by turn.

2-Energy and Water

In Zambia and Zimbabwe, the Batoka Gorge Hydroelectric Power Scheme (BGHES) is introduced to upgrade the hydroelectric power plant in the central portion of the Zambezi River Basin which involves construction of a 2,400 MW plant and dam (The Herald, 2024). It

is a major power project designed to harness the Zambezi River's hydroelectric potential for electricity production (Business Times, 2020). The project is aimed at fostering sustainable, climate-resilient growth and ensuring affordable, reliable energy access for Zambia and Zimbabwe. The BGHES will play a pivotal role in reducing the energy gap in both countries, promoting industrial growth, employment, and regional integration (Volpi, 2024). It is a transformative project that underlies the priority of African Union Development Agency-The New Partnership for Africa's Development-Program for Infrastructure Development for Africa (AUDA-NEPAD-PIDA) scheme with continental and regional support (Gahadza, 2023). This active project provides for a roller-compacted concrete gravity arch dam and radial gated crest-type spillway. Upon completion, it will not only significantly increase regional energy supply but also make substantial contributions to the economies of both states since it would approximately produce 10215 GWH of electricity annually (NS Energy, 2020). The project's financing involves a total cost of $5 billion (Marawanyika, 2024), with $6 million already secured for preparatory activities. The World Bank, a key partner in this project, is actively involved in financing preparation. China has also pledged support for BGHES by providing concessional funding through Exim Bank (Custer et al., 2023; Dreher et al., 2022). In July 2019, a consortium led by Power Construction Corporation of China (Power China) and General Electric (GE) was selected as the contractor for the Batoka Gorge hydropower project (Africa Energy Portal, 2020). However, the retendering of the project would be announced again in April 2025 (Power Technology, 2024c).

The Kaléta Hydropower Plant, a 240 MW hydroelectric facility, was constructed on the Konkouré River in west-central Guinea (Xianming & Rujun, 2015). The project, located approximately 110 KM northeast of Conakry, was financially backed by the Exim Bank of China, which provided an extensive amount of $334.65 million PBC (Preferential Buyer's Credit) loan for project completion (Custer et al., 2023; Dreher et al., 2022). The total project cost was $446 million (Xinhuanet, 2015). The work commenced in April 2012 and was completed in September 2015 (World Bank, 2018). The project's objectives include increasing the availability of clean power to address the region's power deficit and reduce reliance on imported oil and environment damaging hydrocarbon power generation. The project's significant contribution to enhancing regional electric supply (Heng et al., 2019) is a cause for optimism about the future, as it boosts economic development and prosperity in the region.

The Grand Ethiopian Renaissance Dam (GERD), the largest dam in Africa (1800mx155m), is located 700 km on the north-western side of the capital Addis Ababa, along the Blue Nile (Webuild Worldwide, n.d.). Its construction was started in April 2011 (Abtew & Dessu, 2019) which created 12000 jobs. This GERD project is equally vital for the economies of Ethiopia, Sudan, and Egypt. It would save the 40 km area of Sudan from floods and hold the potential to irrigate the 500000 hectares of new agricultural land (Water Technology, n.d.). The project was completed in September 2023 (Xinhua, 2023). China, a major stakeholder in the project, provided a $1.2 billion loan facility for the installation of the dam's transmission lines (Musaraj, 2023). The China Electric Power Equipment and Technology Co., Ltd. (CET) signed the agreement to install the 500 KV Transmission Line for the GERD project (Global Times, 2013). Under this project, the installation of transmission line started in January 2014 and the project was officially completed in August 2017. It was also known as the GERD-Dedesa-Holeta-Akakis (GDHA) 500KV power transmission and transformation project (Custer et al., 2023; Dreher et al., 2022).

The Inga 3 Hydropower Plant project, a beacon of Africa's infrastructure development, aims to generate 11,050 MW of electricity on the Congo River in the Democratic Republic of Congo (DRC). This ambitious initiative involves building a hydropower plant with transmission lines within the DRC and extending across borders, potentially connecting with South Africa, Nigeria, and Angola. The project is aligned with the objectives of NEPAD to enhance power interconnections across Africa, facilitate power trade between Southern African Power Pool (SAPP) and the DRC, and promote economic development in the region. A consortium comprising Fortescue Future Industries (West Australian Company), China Three Gorges (China), AEE Power (Spain), and Sinohydro (China) is developing the project. Presently, AEE Power possesses 25 percent stakes in the project whereas 75 percent stakes belongs to the Chinese companies including China Three Gorges and Sinohydro (Power Technology, 2024a). The Inga 3 dam project having 4500 MW hydroelectric power generation plant will be constructed with financial support from the World Bank. China also negotiated with the US regarding collaboration over the Inga 3 dam project, as reported by the Financial Times (Dyer, 2014). This project is one of the largest projects in the world which requires $80 billion for construction works and can generate 40000 MW of electric power (Richards, 2014). Although agreements have been signed, including a joint development agreement with South Africa, the project has faced delays due to a dispute

between Chinese and Spanish developers regarding managerial procedures to start construction work (Holland, 2019). Despite these challenges, preliminary works are underway, and financial clearing for both generation and transmission lines is expected to progress shortly.

The Sambangalou Hydropower Plant project involves the construction of a gravity dam with a 128 MW capacity and a 3.8 km^3 reservoir on the Gambia River in Senegal, with a portion of the reservoir extending into Guinea (Hydropower & Dams, 2021). This project is part of the Gambia River Basin Organization (OMVG) Energy Project, a transboundary initiative involving Guinea, Guinea-Bissau, Senegal, and the Gambia to fulfil regional energy needs (West African Power Pool, n.d.). The project requires a total investment of $455 million, with preparations costing $23 million. The project construction commenced in 2022 and it will be put into commercial operation by 2026 (ANDRITZ, 2024; Power Technology, 2021b). The PIDA report 2016 mentions that the Exim Bank of China will provide 85% of the total cost of the project (Economic Commission for Africa, 2016).

A significant addition to energy infrastructure development of Tanzania is the 400 KV North East Grid Project which also is financed by the Exim Bank of China. This initiative involves the construction of a 682-kilometer-long transmission line (Power Technology, 2021a) and associated infrastructure, including power stations and substations. In 2016, the Exim Bank committed to finance a massive amount of $695.25 million by facilitating a commercial contract between TANESCO and Tebian Electric Apparatus (TBEA) (Custer et al., 2023; Dreher et al., 2022). Finally, the construction of the project commenced in 2018 which is still under process.

On 26 February 2019, the Sinohydro signed an Engineering, Procurement and Construction (EPC) contract for the construction of the Koukoutamba (ex-Gourbassy) Multi-purpose Dam in Conakry (Guinea). The dam, strategically located in northern Guinea over the confluence of the Bafing and Senegal Rivers, has a designated capacity of 294 MW (Takouleu, 2019). For this project, China provided financial assistance of $812 million by approving a loan facility through Exim Bank (Hydropower & Dams, 2019). The Koukoutamba hydropower project, a significant endeavour, will be the fourth largest plant as developed by the Organization for the Development of the Senegal River (OMVS). Beyond its traditional function of electricity generation, the project serves multiple purposes including water flow

regulation, agricultural development, and navigation enhancement along the Senegal River (Kapital Afrik, 2019). This project is expected to create substantial job opportunities and would provide continuous electricity for the whole city's population of about 140000 individuals (Diallo, 2021). Initially, the project was set to be completed in 4 years, but it is still under construction and expected to become functional in 2027 (Power Technology, 2024b).

In the East African Power Pool (EAPP), the ZTK (Zambia, Tanzania, Kenya) power project, currently under construction, is a transformative initiative that aims to establish a power-sharing network between three states (Ambani, 2024). As a regional power corridor, this project would play a crucial role in electricity production, fostering regional power sharing and development. The construction of double-circuit power transmission lines, spanning over 2300 kilometres, is a key part of the project that will interconnect these three states (Studio Pietrangeli, n.d.). The construction of a ZTK transmission interconnector from Singida (Tanzania) to the city of Namanga, located on the border adjacent to Kenya, is another vital component of this project (Mushi & Kolumbia, 2023). This section, with a length of 414 Km, is part of the broader ZTK project that underlies the PIDA program (African Development Bank, 2015). In October 2016, the esteemed North China Power Engineering Company Ltd. (NCPE) was nominated as the contractor to implement the project (Kiganda, 2016). The project, co-financed by the African Development Bank ($22.4) and the Government of Kenya ($42.9 million), was initially scheduled for completion in 22 months (Kenya Electricity Transmission Company Limited, 2016). Despite some delays, the project has been successfully completed and put into operation in 2022 (PIDA VPIC, n.d.-o).

3-Transport & Infrastructure Development

The Beira-Machipanda (N6) Road Rehabilitation Project (Mozambique), a key driver of economic growth, is strategically designed to increase regional connectivity and economic development (Xinhuanet, 2019c). The 288 Km project, costing $416.5 million, would reduce 3 hours travel time between Beira and Machipanda (Xinhua, 2019). The Exim Bank of China provided financial assistance of $312.4 million in terms of PBC for the construction of the project (Custer et al., 2023; Dreher et al., 2022). The project's construction started in April 2015 by Anhui Foreign Economic Construction Group, Ltd. (AFECC) (China Daily, 2019) which was completed in November 2019.

The Maya-Maya International Airport Project in Brazzaville (Phase-2) was funded by Exim Bank of China with a $72 million loan for project implementation (Custer et al., 2023; Dreher et al., 2022). The Weihai International Economic & Technical Cooperative Co., Ltd (WIETC), a Chinese construction contractor, started working on the project in July 2011. It installed runway equipment, constructed airport hotel as well as aviation club, and completed the project in August 2014.

The N'djili Airport Expansion project in Kinshasa, Democratic Republic of Congo (DRC), involves the upgradation and expansion of N'djili Airport, also known as Kinshasa International Airport. The project aims to upgrade the existing runway and navigation aid system at N'djili Airport. Refurbishing the runway, which is 4,000 meters long and 60 meters wide, is another critical component of the project (Nadalet, 2024). Repairs and improvements to the airport's navigation aid system are also included to enhance safety and efficiency of the air traffic. The Exim Bank provided a $64.3 million PBC for the N'djili Airport Runway Rehabilitation Project (Custer et al., 2023; Dreher et al., 2022). The Sinohydro, a state-owned company of China, implemented the project under an EPC contract. The working on the project commenced in May 2018, and construction activities were completed in November 2021(Albatross, 2021).

The Pointe Noire Port Upgrading project in the Republic of Congo involves the expansion and modernization of the Pointe Noire Port. This expansion includes the construction of new infrastructure and facilities to increase the port activities (China Road and Bridge Corporation, 2016). The Port Management Association of Eastern and Southern Africa (PMAESA), the Port Autonome de Pointe-Noire (PAPN), and the Economic Community of Central African States (CEEAC-ECCAS) are key stakeholders involved in the project (PIDA VPIC, n.d.-l). The China Road and Bridge Corporation (CRBC) signed an agreement with the Congolese Minister of Land and Resource Engineering for the Mineral Port in Pointe Noire in February 2018. This project is also called the Pointe-Noire Port Project. The Exim Bank of China provided the $1.61 billion loan facility for project work. The estimated cost of the project is $2.3 billion. The CRBC is the main contractor firm that will implement the project and will provide the $345 million for construction (Custer et al., 2023; Dreher et al., 2022). The project is situated at a distance of 8 Km (north) from the Old Port of Pointe Noire and

initially has a construction period of 54 months. The current status of the project is not available yet.

The Dar es Salaam-Isaka-Mwanza Standard Gauge Railway (SGR) project in Tanzania significantly enhances the country's railway infrastructure. Spanning over a distance of 1219 kilometres, this high-speed electric standard gauge railway (160 Km/h-120 Km/h) is designed to connect the port of Dar es Salaam to Lake Victoria in Mwanza (Tanzania Railways Corporation, 2022). The project intends to improve transportation efficiency and reduce logistic costs by 15% to 20%. The railway is poised to stimulate sustained industrialization and economic growth in the East African region by providing connectivity to Uganda via Lake Victoria. The project's significant economic benefits include a Net Present Value of $1180.00 million and a Cost-Benefit Ratio of 2.10, suggesting a favourable economic outlook (PIDA VPIC, n.d.-f). The Chinese construction companies have been awarded contracts for various stages of the project. The China Civil Engineering Construction Corporation and the China Railway Construction Co. are developing the SGR Stage 5, which would cover the 249-kilometer stretch extending from the dry port at Isaka to Mwanza (Railway Gazette International, 2022). The work on the project was started in May 2021 and is expected to be completed soon (TanzaniaInvest, 2023). *[Note: for a detailed analysis of similar China's initiatives please go through the study: "Raza, A., & Khan, A. B. (2024). Understanding the Impacts of China's Belt and Road Initiative (BRI) over the Program for Infrastructure Development in Africa (PIDA)(2013-2023). Pakistan Social Sciences Review, 8(2), 758-781. Available at: https://ojs.pssr.org.pk/journal/article/view/690/526]*

The Dar es Salaam New SPM Oil Terminal (cost $266 million), a significant Tanzanias' port infrastructure development project, is being constructed through the collaboration of two esteemed Chinese companies i.e. the China Railway Major Bridge Engineering Group Co., Ltd and Wuhan Engineering Co., Ltd (Shenyoujia, 2024). The contract was awarded in February 2024. The project is currently under construction and will be completed until the end of this year (2024) (Liganga, 2024). This initiative aims to enhance the efficiency of cargo handling at the port, particularly for petroleum and energy products. The terminal, boasting 15 tanks with a total storage capacity of 420,000 cubic meters, is a testament to the capabilities of Chinese partners (Mirondo, 2024). With each tank capable of storing 30,000 cubic meters of petroleum products, the terminal is expected to significantly reduce the time

required for ships to offload their cargo. It was earlier taking an average time of 11 to 12 days which would now be reduced to three to four days which would be a remarkable improvement in terms of efficiency (Shenyoujia, 2024).

The Uvira-Bukavu Road upgradation project is located within the Democratic Republic of Congo. This project establishes a crucial link in the Central Corridor, spanning over 140 Km and connecting key lakes and ports (PIDA VPIC, 2018). Its upgradation will foster smoother movement of goods and people across borders, particularly between Tanzania, the DRC, Burundi, and Rwanda. The Route Nationale 5 (RN5) Construction and Modernization Project includes a section of Bukavu-Nyangezi-Kamanyola-Uvira, which consists of a length of 55.5 km. This Sino-Congolese Project was included in Phase-I and funded by Exim Bank with a significant amount of $13 million for construction work. The project involved revamping and constructing of a strategically important road segment which linked Bukavu (town) and Uvira (town) in Northern Kivu (province) of DR Congo. The Sinohydro-14 and the CIMA International were the contractors which completed the project. The project contract was allotted in April 2015 and successfully completed in April 2018. Noteworthy, the Exim Bank of China provided another loan of $5 million for Phase-I (Custer et al., 2023; Dreher et al., 2022).

The Modjo dry port expansion project in Ethiopia marks a significant milestone to modernize the logistics sector and enhance connectivity between the Ethiopian hinterland and the ports in neighbouring Djibouti. The ground-breaking ceremony for the project was held in June 2021 which was attended by senior Ethiopian government officials and representatives from the World Bank (Xinhuanet, 2021). Led by the China Civil Engineering Construction Corporation (CCECC), the $110 million expansion project (funded by the World Bank) aims to construct six warehouses, improve road and pavement infrastructure, and develop various operating facilities (Walta Media and Communication Corporate S.C., 2022). With the commitment of both Ethiopian and Chinese stakeholders, including the CCECC, the project is expected to be completed in November 2024 (Bogale, 2021).

The Kinshasa-Ilebo Railway Project is a major priority project designed by the New Partnership for Africa's Development (NEPAD). In DR Congo, an agreement between China and the government of DR Congo was signed in September 2007 to finance the rail project which includes installation of 870 Km long line over the river port of Ilebo and Kinshasa.

Initially, China agreed to provide $5 billion for the project (Railway Gazette International, 2007). The project also includes the rehabilitation of the 1067mm gauge line, which connects Sakania and Lubumbashi (Katanga) with Ilebo and links with Kinshasa and Matadi (PIDA VPIC, 2019). The Chinese Government provided another $10 million loan to Société Nationale de Chemin de Fer du Congo (SNCC) for the procurement of 20 new locomotives (Custer et al., 2023; Dreher et al., 2022).

In March 2022, the Kenya National Highway Authority signed a contract with China Road and Bridge Corporation (CRBC) for the construction of the Garissa-Isiolo (Kenya) Road Project (China Road and Bridge Corporation, 2022). This project, a crucial component of the LAPSSET Corridor, holds a significant place as it aligns with Kenya's Vision 2030 (Elumelu, n.d.). The project is 160 Km in length and it would have to be completed in 18 months but it faced delays, and up till February 2024, merely three percent of the work on the project had been done (Oduor, 2024). The expected time for its completion is now the year 2025 (Elumelu, n.d.).

The Zambian President Michael Sata inaugurated the Kitwe-Chingola Road Construction project in November 2013 (Virtual Expo Group, n.d.). This project is situated in a copper-enriched region in northern Zambia. The contract to complete the project was assigned to the Sinohydro Bureau 11 Co., Ltd. (Kang'ereha, 2018). The project was characterized by a 2-way, 4-lane road spreading over a distance of 45.5 Km in length. The estimated project cost was $105 million, and the timeline initially set for its completion was about 2 years (Virtual Expo Group, n.d.). The Zambian government funded the whole project (Lusakatimes, 2012). The project was completed around 90% until the spread of COVID-19 pandemic (Gladys, 2020).

The Kampala-Kibuye Busega-Mpigi Expressway Road Project (35 Km) features a 4-lane road which underlies with the initiatives of PIDA (PIDA VPIC, n.d.-h). The contract was first awarded to the China Communications Construction Company (CCCC) in June 2016 and was initially planned to be completed in 2021 (New Vision, n.d.). As the CCCC already engaged in the construction of the Entebbe–Kampala Expressway, it was overburdened with new contracts hence delaying the newly awarded project which is now expected to be completed in 2025 (Adams Kesiime & Ssenkabirwa, 2022). The project is designed to interlink

Kampala and Mpigi and will reduce traffic congestion and contribute to economic development.

The Dongo Kundu Bypass, a key component of regional integration, was proposed thirty years ago as an alternative route along Likoni Ferry to create a link with the southern coast (Andeso, 2018). The Southern Bypass, also known as Dongo Kundu Bypass, aims to connect three corridors: Mombasa-Nairobi Highway, Mombasa-Lunga Lunga Highway, and Mombasa-Malindi Highway (Kenya News Agency, 2021). The project is further split into three phases; Phase I was launched in 2015 and completed in 2018 with a cost of 39 billion Shilling (Andeso, 2018). This portion is connected to the second container terminal and the Mombasa-Nairobi highway (The Keny Monitor, 2015). In June 2018, President Kenyatta inaugurated the marvel Mombasa Southern Bypass Phase-I (10 Km), a pivotal transport link that facilitates trade and transportation (Bi Ali, 2018). The China Civil Engineering Construction Company (CCECC) constructed Phase-I (Mwaklo, 2015). The completion of the project within the due timeline was a praiseworthy achievement that signifies the CCECC's commitment to regional integration.

The second phase, once completed, will decongest the traffic on Likoni Ferry and bring about significant socio-economic growth in the southern coast region. The China Civil Engineering is working on the construction of 17.7 Km which is expected to be completed during 2024 (Ochieng, 2022). This phase, characterized by a dual carriageway, included the construction of an interchange over the Likoni-Lunga Lunga highway, and two bridges erecting one at Mwache (660 m) and the second at Mteza (1440 m) (Freight Logistics, 2021). Phase-II is a transformative road project that not only reduces the snarls-ups but also equally contributes to industrial development and increases the efficiency of the Mombasa port. The game changer Southern Bypass Phase-II and Phase-III were launched in October 2018 with an estimated cost of 30 billion Shilling (Bi Ali, 2018). In October 2018, the work on two bridges, 600 meters, and 1440 meters long, including 660 meters viaduct and Mwache-Mtewza dual carriageway stretched over 9 Km, were expected to be completed in 48 months with a cost of 24 billion Shilling (Barasa & Murathe, 2020). The Japanese International Aid Corporation (JICA) is financing the project (Freight Logistics, 2021). Both Phase-I and II were awarded to CCECC, and the Japanese Consortium Fujita Corporation and Mitsubishi Corporation constructed Phase-III (Ochieng, 2022).

The completion of the Nairobi Southern Bypass Upgrading project marks a significant milestone in Kenya's efforts to alleviate traffic congestion in its capital city (Nation, 2020). Spanning over 29 Km, this upgradation, executed by the China Road and Bridge Corporation (CRBC), enhances the capacity of the Nairobi Southern Bypass road (Xinhua Silk Road Information Service, 2016). A faster, more efficient route relieves pressure on critical arteries like Mombasa Road and the A104 National Highway to Uganda. This project, funded through PBC valued $176.5 million from the Exim Bank of China, commenced in June 2012 and concluded on November 1, 2016 (Custer et al., 2023; Dreher et al., 2022). With a designated speed of 100 km/h and a two-way, four-lane configuration, the upgraded bypass offers improved connectivity and smoother traffic flow, benefitting both residents and businesses along its route (China Daily, 2021; Xinhua Silk Road Information Service, 2016). Its completion signifies a boost to Nairobi's transportation infrastructure and underscores the positive impact of international cooperation in fostering economic development (Fontana, 2016).

In July 2015, the president of the Republic of Congo, Mr. Sassou, inaugurated the Ouesso-Mambili road in Sangha (Mvouanzi, 2015). This road has a diverse range of benefits which included traffic improvement and national and regional socio-economic gains. Despite tough weather conditions and a challenging environment, Chinese and Congolese engineers completed the 199-kilometer-long road project with great enthusiasm (Moses et al., 2023). The China Road and Bridge Corporation (CRBC) started working on the project in May 2012 (Mvouanzi, 2015). This project was actually part of the 5-year development plan implemented from 1982 to 1986 by the Republic of Congo, but due to financial issues, it remained halted for a long time. The Exim Bank provided an extensive amount of $234 million for implementation of the project (Moses et al., 2023). After the completion of Mambili-Ouesso Road project, the connectivity and accessibility in the Republic of Congo has been improved which, in turn, fostered economic development and regional integration.

On March 22, 2022, the Nigerian President Muhammadu Buhari inaugurated the newly built international terminal at Murtala Muhammed International Airport in Lagos, marking a significant milestone in the modernization of Nigeria's aviation sector (Xinhua, 2022). The Chinese-assisted project, designed to accommodate 14-million passengers annually and generate 3,000 direct and indirect jobs, symbolizes a new era of safety, security, and comfort

in the Nigerian aviation industry (Eze, 2022b). This state-of-the-art facility, equipped with modern amenities, including check-in counters, immigration desks, and security screening points, underscores the importance of infrastructure development in fostering China-Nigeria cooperation (Odutola, 2022). The construction of the project was started by the China Civil Engineering Construction Corporation (CCECC) in 2015 (Daily Asset, 2020; Olander, 2021). China supported the project and provided combined financial assistance of $500 million in terms of a PBC to various Airport Terminal Expansion Projects, including Lagos, Kano, Port Harcourt, and Abuja (Custer et al., 2023; Dreher et al., 2022). China paid an additional $150 million to cover the variation in remedial measures against structural deficiencies as well as expanded facilities (Eze, 2022a). As mentioned above, the Murtala Muhammed International Airport upgradation was part of that financial package. The Nigerian Government co-financed the project, contributing $100 million to these upgradation projects (Custer et al., 2023; Dreher et al., 2022). As China continues to prioritize infrastructure investment to drive economic growth, the completion of the Murtala Muhammed International Airport terminal stands as a testament to China-African Union efforts in advancing the Nigerian aviation industry and enhancing continental as well as intercontinental connectivity.

4-Information and Communication Technology (ICT)

The Abuja-Yaoundé Fibre-optic Link project in Cameroon is part of the PIDA-Information Communication Technology Terrestrial Broadband Connectivity program. It is a significant project to create digital connectivity between Nigeria and Cameroon as well as enhance ICT infrastructural integration in the ECOWAS (The Economic Community of West African States) region (PIDA VPIC, n.d.-b). China, a key player in African continental integration, is deeply involved in this project. China provides financial assistance and undertakes ICT projects, such as the Abuja-Yaoundé Fibre Link Project. Her involvement is prominent, particularly in the financing and execution of the project. The Cameroon Fibre Optic Transmission Backbone Project was completed in three phases. In the 1st phase of the project which was launched in 2009, the Exim Bank of China provided PBC loan valued $52.05 million. In this phase, groundwork was completed in 2011 to lay down the fibre optic cable. In the second Phase (Phase-II), the work to lay down the fibre optic cable of about 3200 Km was finished in the northern region, particularly in Maroua (Cameroon). This phase was started in 2011, and the expansion of the fibre optic cable network in the remaining part of the north region was completed in 2013. Similarly, the third phase (Phase-III) started in

February 2015, in which a fibre optic cable of about 3950 Km was laid. At the end of Phase III, a fibre optic cable of a total length of 12000 Km was laid in Cameroon. The Exim Bank of China provided $91.6 million for project work, which was completed in 2017 (Custer et al., 2023; Dreher et al., 2022). Nonetheless, the government aims to extend the fibre optic cable network to about 20000 Km to achieve coverage in the whole of Cameroon. As the project progresses, it is expected to yield substantial benefits for both Nigeria and Cameroon, including improved connectivity, enhanced communication networks, and increased access to digital services, thereby contributing to socio-economic development in the region.

The Bamako-Algiers Fibre-optic Link project in Algeria and Mali is another significant investment in ICT infrastructure. It aims to revolutionize regional and continental communication networks, enhancing connectivity and telecommunications capabilities. The project, supported by a $52.66 million Government Concessional Loan (GCL) from Exim Bank, is a testament to the commitment to this cause (Custer et al., 2023; Dreher et al., 2022). The project involves several key components, including the establishment of a fibre optic network in Bamako and the connection of approximately thirty public administration sites and communities with various applications such as video surveillance, telepresence, and IP telephony. The project also entails laying 942 km of fibre optic cable along two segments: one from Gao to the Algerian border and another from Gao to the Nigerian border (PIDA VPIC, n.d.-c). The Huawei Technologies Co., Ltd. is responsible for implementing the project, which was officially launched on November 21, 2011, in Gao. The completion of the project is still pending being dependent on a follow-up project financed by Exim Bank called the National Broadband Network Project. The objectives of this project include improving telecommunications infrastructure, facilitating connectivity, and enhancing communication capabilities in Algeria and Mali. It aims to support economic development, promote digital inclusion, and foster regional cooperation in the ICT sector by modernizing fibre optic networks and deploying advanced telecommunications systems.

The Brazzaville-Bangui Fibre-optic Link project in the Congo establishes a digital connection between the Republic of Congo and Central African Republic (CAR) (PIDA VPIC, n.d.-c). The part of the project concluded in two phases. In Phase I, two loans were issued by China for the completion of projects, such as $70 million in 2008 and $10 million in 2012. In 2017, a loan for Phase II valued $62.64 million was provided by the Exim Bank of China to Congo.

In fact, the Phase-II National Telecommunication Coverage Project is linked with the PIDA project Brazzaville-Bangui Fibre-optic Link (Congo section). This knitting of fibre optic cable network is about three thousand meters in length as part of Phase-I and II. The fibre optic cable (backbone) network interconnects various cities such as Pointe Noire, Makossa, and Dolisie, then continues to Brazzaville, Oyo, and Ouesso. Several fibre optic cable segments branching off the backbone network extended connectivity to more areas. Contractors such as Alcatel-Lucent Shanghai Bell Co., Ltd., Huawei Technologies Co., Ltd., and China Machinery Engineering Corporation (CMEC) were responsible for implementation of the project. The Phase-I of the project started in August 2010 which interconnected a segment of 510 Km between Pointe Noire and Brazzaville. The other portion of the backbone project extending from Brazzaville to Owando (510 Km) and further extending up to Ouesso city, was completed in February 2024 (Custer et al., 2023; Dreher et al., 2022). This significant project is of immense vitality in telecommunication infrastructure and connectivity, which lead towards regional integration by facilitating communication and trade, and socio-economic development by creating job opportunities and improving access to information.

Another project ‘Ndjamena-Khartoum Fibre-optic Link (Sudan section)’ connects the two neighbouring states of Chad and Sudan through an integrated digital network (PIDA VPIC, n.d.-j). The Exim Bank of China provided a loan of $38.6 million for the project (Custer et al., 2023; Dreher et al., 2022). The work to lay down the fibre optic cable, which spanned over 1480 Km (Guangdong Cable Factory Co Ltd., 2020), commenced in June 2014. Notably, the main cable was laid down within a remarkably short period of about six months. The project was awarded to Huawei Technologies (a Chinese firm). Despite facing delays due to severe weather and a sudden downfall in global oil prices, the project was successfully completed in November 2018. The project's significant contribution to the digital economy and socio-economic development at the regional level is a promising sign for the future of the region.

The project “Burkina Faso-Benin-Niger Fibre-optic Link project (Niger Section)” is of much importance in digital connectivity through modern fibre optic high-speed cables between the neighbouring states of Burkina-Faso, Benin and Niger (PIDA VPIC, n.d.-e). An agreement for a loan facility was signed between China and Niger in December 2013. Following the

agreement, the Exim Bank issued the GCL valued $112.07 to Niger Government in January 2014. The China International Telecommunication Construction Corporation started work by laying down the 2275 Km fibre optic cable in June 2015 (Custer et al., 2023; Dreher et al., 2022). The project was divided into three parts: Niamey–Tillabéry (1st), Zinder–Diffa (2nd), and Agadez–Tahoua (3rd). The project featured the most advanced characteristics as the broadband coverage increased from fifty-four percent to seventy-two percent. The completion was registered in 2017, though it was handed over to the government in May 2018 (Custer et al., 2023; Dreher et al., 2022). It is a project that holds the potential to promote economic development as well as regional uniformity in the ECOWAS region.

The Chinese-funded project Dar es Salaam-Kampala Fibre-optic Link in Tanzania, covering the 10674 Km fibre optic cable network, is another monumental undertaking. This project, linked with the Tanzania National Fibre Optic Backbone Project (Phase II), was designed to establish connectivity between sea cables passing the neighbouring states which included Kenya, Uganda, Rwanda, Malawi, Burundi, and Zambia. The Exim Bank of China provided the GCL valued $144.02 million for the execution of the project (Custer et al., 2023; Dreher et al., 2022). The project, launched in August 2010 and completed in October 2015, is a testament to the scale and ambition of the parties involved. Another Tanzanian digital network project financed by China was the Dar es Salaam-Bujumbura Fibre-optic Link. This project, integrated with Tanzania National Fibre Optic Backbone Project Phase-III, was funded by the Exim Bank with a substantial amount of $105.78 million (Custer et al., 2023; Dreher et al., 2022). It upgraded the current fibre optic network and established the connectivity between Burundi and Tanzania and other neighbouring states as well. The work commenced in June 2015 and was completed in September 2016. As part of the ICT Terrestrial Broadband Connectivity program, it has been administered by the Tanzania National ICT Broadband Backbone (NICTBB) (PIDA VPIC, n.d.-m). These projects, with their monumental scale, have significantly contributed to regional connectivity and economic development in East Africa.

5-Ports

The successful completion of the Dar es Salaam New Container Terminal Project, a significant milestone, was made possible by the collective efforts of all stakeholders. This project involves the construction of two berths (13 &14) with a dredging access facility

(PIDA VPIC, n.d.-g). This $421 million project was launched by President Magufuli in July 2017. It was funded by the World Bank ($345 million), the UK Government ($12 million), and the Government of Tanzania ($63 million) (Global Construction Review, 2017). The China Harbour Engineering Construction Company (CHEC) was the contractor that implemented the project (Xinhuanet, 2020). The project was completed in 2023, increasing the port handling capacity to meet future demand and boost regional trade.

The petroleum terminal facility at Mombasa Port had reached its saturation point which demanded a new terminal to de-saturate and ensure smooth functioning. This led to the launch of the Mombasa Port New Petroleum Facility project, a significant investment that promises substantial economic benefits. The project, aimed to construct a build-operate-transfer (BOT) terminal to handle the extra liquid in bulk quantity, was essential to support the manufacturing and mineral sector in the region (PIDA VPIC, n.d.-i). The Kenya Ports Authority planned and funded an Oil Terminal in Kipevu valued $353 million. The China Communications Construction Company started the construction of 770-meter-long jetty project in 2018 and completed it in 2022 (Antieno, 2022; Reuters, 2018). The Foreign Minister of China, Mr. Wang Yi and Kenyan President Uhuru Kenyatta visited the New Terminal a few weeks earlier before completion. The latter expressed his confidence in the project's potential to increase revenue and prevent demurrage, which is valued $18 million (ChinaDaily, 2022). Mr. Wang highlighted the project as evidence of China-Africa's sincere friendship. He added that China, in collaboration with African states, had completed 100000 Km of roads, 10000 Km of railways, 1000 bridges, and 100 ports in the continent, and additionally a large number of hospitals, schools, and other construction projects have also been completed so far (ChinaDaily, 2022). With the completion of this project, the port's handling capacity increased from 100,000 to 200,000 deadweight tons of petroleum products (Rogers, 2022).

The geostrategic location of Namibian coast provides direct access to principal shipping routes and attracting global trade as Walvis Bay is situated on this coast which is a crucial gateway for foreign trade (Namport, 2018). Walvis Bay is the largest commercial port in Namibia, with an approximate annual receipt of 3,000 vessels and handling of five million-tons of cargo (Ship Technology, 2019). To accommodate a higher quantity of cargo, the Namibian Port Authority (Namport) planned the port’s expansion with the construction of a

new container terminal (PIDA VPIC, n.d.-n). In light of this, the Walvis Bay Port New Container Terminal Project was designed to increase the port's efficiency. The construction of a new container terminal at Walvis Bay enhanced the port's handling capacity from 350,000 TEUs to 837,000 TEUs annually (Xinhuanet, 2019a). In February 2007, the Chinese Premier Hu Jintao pledged to provide $100 million through the Exim Bank in terms of PBC loan for port expansion. However, the Namibian Ministry of Finance, instead of using Chinese offer, opted for the African Development Bank (AfDB) loan of $300 million (Custer et al., 2023; Dreher et al., 2022). The project began in 2014, and the China Harbour Engineering Co. (CHEC) was the contractor responsible for its implementation (Belt and Road portal, 2019). In August 2019, the new container terminal became fully operational, as reported by the AfDB in September 2020 (African Development Bank, 2020).

The Abidjan Port, located in the West African region, is the largest natural deep-water harbour. It serves as a crucial marine gateway for landlocked countries such as Mali and Niger. The Côte d'Ivoire government launched an upgradation project to enhance the port's capacity and efficiency. For this, the Exim Bank funded the 'Upgrading of the Abidjan Port (Côte d'Ivoire)' Project (PIDA VPIC, n.d.-a) with a significant PBC loan facility worth $ 878.26 million (Custer et al., 2023; Dreher et al., 2022). The total project cost was about $1.12 billion, with a four-year fixed contract duration (Masons, 2015). The project aimed to transform Côte d'Ivoire's economy by doubling the port capacity, thereby opening up new economic opportunities for the region (China Daily, 2016). The port authorities proposed a new container terminal for port extension. The second container terminal, constructed by China Harbour Engineering Company (CHEC), opened for operation in December 2022 (Belt and Road Portal, 2022). The construction work included different project segments, such as three container berths, a cargo berth for general handling, a RORO berth, and shipping channels (Dredging Today, 2020). The extension of the Vridi Canal linking Abidjan to the Atlantic Ocean was also part of the project (Ship Technology, 2020). The project started in October 2015, with an initial end date set for 2021. The RORO terminal construction work and the Vridi Canal expansion were finalized in 2018 and 2019, respectively. The second container terminal was commissioned by CHEC (a subsidiary of China Communication Construction Company (CCCC)), with the terminal constructed by the CCCC and the work ended in December 2022 (Si, 2020). The multilateral collaboration on the project reinforces Abidjan's status as a regional hub port, facilitating trade and fostering economic cooperation

among neighbouring countries. The project exemplifies the cooperation in infrastructure development among China, Côte d'Ivoire, and the African Union (AU).

The Port of Lomé is a crucial deep-water port that handles the shipment of the Western and Central African regions and is pivotal for Niger, Burkina Faso and Mali serving as a gateway for these landlocked states, including the north Nigerian Region (Terminal Investment Limited, n.d.). In 2022, it was the fourth largest African port in terms of container traffic and was ranked 96th worldwide (WazoPlus, 2023). The "Upgrading of the Lome Port (Togo) Project" was started by the Lomé Container Terminal Co., Ltd. (LCT) in January 2014 and opened for operation in March 2023 (WazoPlus, 2023). The LCT is a Togolese firm established to implement the project, co-owned in equal partnership between Global Terminal Limited (GTL) and China Merchants Holdings (International) Company Limited (CMHI) by a fifty-fifty joint venture (International Finance Corporation, 2013). The estimated cost for upgradation of the Lomé Port project was $442 million (Custer et al., 2023; Dreher et al., 2022). The China Development Bank (CDB), provided a $57.36 million loan to complete the work (Custer et al., 2023; Dreher et al., 2022). The construction of the container terminal involved 3-berths covering a 1050-meter coastline with a 16.6-meter depth expanded over the 53-hectare area (Haruna, 2023).

The Tema Port is the largest port located on the eastern coast of Ghana. The port is a leading competitor in the West African maritime region (Construction World, 2022). It covered 3.9 million square meters with a vast anchor range of about 1.5 Km-4 Km (Ship Technology, 2017). The port handles ninety percent of trade in Ghana and international cargo shipments (de Boer et al., 2019). Since its expansion was inevitable to meet the growing commercial needs hence the 'Tema Port Expansion Project' was started in October 2016 (Port Technology, 2016). China supported this project through substantial financial assistance. The Bank of China contributed $272.77 million as part of the $667 million syndicated loan for port expansion (Custer et al., 2023; Dreher et al., 2022). However, the total estimated project cost was $1.5 billion (Lawer, 2019; Meridian Port Services, 2015). The project aimed to increase the efficiency, operational capacity, and cargo handling capacity to meet the growing trade activities by extending port infrastructure (Ship Technology, 2017). A quay (1.4 Km) along with a draft (16 meters) for four container berths and a break-water (4 Km) were the main components of the upgradation plan of Tema Port (AECOM, n.d.). The construction

work of the port was officially completed and launched for operation in April 2020 (APM Terminals, 2020). The esteemed China Harbour Engineering Company and AECOM were the contractors of the project (African Review, 2019). Praiseworthy, the project ended within the stipulated time—the significant expansion of Tema Port brought substantial financial and trade benefits for Ghana and the region (Xinhuanet, 2019b).

The Beira Port is situated along Bella City and intersects the south-west side of the Mozambique channel. It is the 2nd largest port in Mozambique, consisting of 11 berths and covering a length of 1994 meters over the Pungue River (Nanjing Deers Industrial Co., n.d.). It is a transit port vital for Malawi, Zambia, and Zimbabwe (Club of Mozambique, 2017). The Beira Port Dredging project awarded a 2-year contract to the China Road and Bridge Corporation (CRBC) in November 2018 (China Road and Bridge Corporation, 2018). With a total dredging amount of approximately 3 million cubic meters, the project aimed to alleviate siltation in the port's entry and exit channels, enabling larger ships to access the port. The project targeted dredging in the area of a 40 Km entrance channel to the port of Beira (PIDA VPIC, n.d.-d). The project's regular maintenance includes taking care of the six areas of Beira Port. The European Development Fund (EDF) financed the project. As of 2022, the Mozambican Beira Port’s maintenance dredging was ongoing (Nanjing Deers Industrial Co., 2022). The current update on the project is yet to be available. The successful completion of this endeavour will enhance the port's capacity and efficiency. Further, it will contribute to regional economic development by facilitating increased maritime trade and transportation activities. The project signifies the entry of CRBC into the field of port dredging in Mozambique, further solidifying international cooperation and infrastructure development efforts in the region.

6-Conclusion

The Programme for Infrastructure Development in Africa (PIDA) has successfully accelerated the advancement in African continental integrative infrastructure particularly under the banner of PAP 1 extending from 2012 to 2020. The foregoing review of various projects in all the above-mentioned four sectors—energy, ICT sector, transport, and transboundary water—reveals that the region has experienced significant development under the said plan. Several mega projects had been completed in this timeframe particularly because of the highly professional approach employed by the multinational companies and

banks with leading contribution from China. In fact, the implementation report of PAP 1 issued by PIDA itself admitted that the China's contribution to continental and regional development is very high as compared to all other actors involved in the activities. Whatever might be the objectives and consequences of this overwhelming Chinese contribution to the regional development, it is praiseworthy that this excessive involvement and effort by China resulted in an increased access to the electricity, communication, connectivity and socio-economic progress by majority of the inhabitants of the region. It would, in turn, cause a massive rise in the literacy late, per capita income of this marginalised region and proliferation of an overall wealthier environment because of the promotion of intra-African trade and investments. The improvised electricity production has also resolved issued like water shortages, low agricultural production. China in fact had persistently been engaged with the AU and its adherence to achieving continental integration through infrastructure development projects is evident from the quantum of her investment and efforts with reference to PAP 1. These projects which are actually aligned with AU's Agenda 2063 demonstrate the extensively deep-rooted nature of China-AU nexus which ultimately would excel in AU's efficacy by mitigating economic marginalization, social exclusion and creating employment opportunities and economic advancement. In sum, the China's leading contribution has enabled Africa to become a global hub for economic and commercial activities.

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