



The sustainability of developmental programs by the U.S. and China in Sub-Saharan Africa: a comparison of effectiveness

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Abstract

This descriptive comparative qualitative case study examines the sustainability of development programs in Sub-Saharan Africa. We evaluated economic, social, environmental, and institutional development programs from the People's Republic of China (PRC) and the U.S. to Sub-Saharan Africa for sustainable development to fill the research gap on these technique's success and effects on Sub-Saharan Africa. Using purposive sampling, we chose eight Sub-Saharan African countries representing distinct geographies and economies. The College of William & Mary's AID Data-GeoCoded Chinese Official Finance Dataset, China Africa Research Initiative, and USAID's Foreign Aid Explorer provided data. Results revealed a complex view of Sub-Saharan Africa's development policy success. Proposition 1, which claims China's economic tactics exceed those of the U.S., is supported by significant infrastructure investments but presents sustainability problems. Proposition 2, praising the social development initiatives of the U.S., is supported by gains in healthcare and education in other countries. However, context-specific issues persist. Proposition 3 shows that U.S. conservation collaborations have improved environmental preservation. Proposition 4 claims that both countries' institutional development plans fail. The results highlight local government buy-in issues and the need for adaptation. Some of the ideas find support in recent research; however, country and context differences require unique tactics. Development efforts in Sub-Saharan Africa should focus on long-term sustainability, local objectives, and environmental implications. Effective institutional growth requires adaptation and a strong awareness of local governing dynamics, and policymakers, development practitioners, and scholars may gain insight into

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sustainability and development projects in Sub-Saharan Africa from this research. A holistic approach that balances economic, social, environmental, and institutional factors is needed to attain sustainable development goals.

Keywords Sustainable development · International development · U.S. · China · Sub-Saharan Africa · Comparative analysis

Introduction

The issue of development assistance in Sub-Saharan Africa is a complex and ever-evolving subject, attracting considerable attention and resources worldwide. According to the Organisation for Economic Co-operation and Development (OECD), the region received \$52.8 billion in Official Development Assistance (ODA) in 2019, serving a population of 1.2 billion people (OECD 2019a). That amount surpasses the aid received by any other region, including Asia, which, despite having a larger population of 4.1 billion, received only \$48.7 billion in 2017 (OECD 2019a). However, the effectiveness of this aid is a matter of ongoing debate. Rwandan President Paul Kagame, in his address at the 72nd session of the United Nations General Assembly, emphasized the need for the U.N. to be more effective and accountable in its operations. Kagame argued that the U.N. must be transformational rather than just practical and that institutional reform is a continuous process (Kagame 2017, para 6).

Recent work

Githaiga and Kilong'i (2023) examined the connections between foreign capital flow, institutional quality, and human capital development, uncovering the detrimental effects of ODA on human capital development. Their findings are particularly concerning as they suggested that the current aid modalities may hinder rather than foster the region's human capital growth. Similarly, Folarin and Raifu (2023) investigated the relationship between foreign aid and domestic revenue mobilization, highlighting the negative impact of aid on tax revenue in countries with high tax efforts. Folarin and Raifu raised questions about the role of aid in fostering or impeding domestic resource mobilization, a key component of sustainable development. Lau et al. (2022) provided a comparative analysis of ODA's impact on growth in East Asia Pacific and Sub-Saharan Africa, revealing a stark contrast in effectiveness between the two regions. Their findings suggest that while ODA has contributed positively to economic growth in the East Asia Pacific region, it has not had the same effect in Sub-Saharan Africa. This discrepancy emphasizes the need for a tailored approach to aid that considers the unique contexts and challenges of different regions. Mangwanya (2022) evaluated the impacts of foreign aid on low-income countries in Sub-Saharan Africa, discussing the dependency syndrome that arises from high reliance on foreign aid. The study's conclusions point to the necessity of private investments and a shift from aid dependency towards self-sufficiency and sustainable economic growth. These studies reinforce the notion

that development assistance in Sub-Saharan Africa is a complex and nuanced issue, highlighting the need for a critical reassessment of aid strategies with a focus on fostering human capital development, enhancing domestic resource mobilization, and breaking the cycle of dependency to pave the way for sustainable and self-reliant growth.

Sobtafo (2021), writing on the effectiveness of ODA in Africa's health sector, raised concerns about the continent's poor performance on several development indicators despite substantial aid investments. Olubiyi et al. (2023) explored the relationship between workplace inequalities and business effectiveness, shedding light on sustainable development's social and economic dimensions. Baev and Rakhimov (2023) conducted a quantitative analysis of U.S. and PRC aid to Sub-Saharan Africa, revealing that while U.S. aid influences the voting behavior of African countries in the U.N. General Assembly, aid from China does not have a significant impact. Githaiga and Kilong'i (2023) examined the relationship between foreign capital flow, institutional quality, and human capital development in Sub-Saharan Africa. They found that ODA had a negative and significant effect on human capital development. These works highlight the challenges faced by Sub-Saharan Africa in the realm of development assistance and collectively paint a complex picture of the efficacy of development assistance in Sub-Saharan Africa while further supporting the need for continued exploration in this area.

Sustainability and development

The region has had a complicated history with loans from public international organizations like the International Monetary Fund (IMF) and the World Bank, as well as countries like China. The debt crisis of the 1990s led to the Multilateral Debt Relief Initiative (MDRI), which resulted in debt forgiveness for 19 African countries. However, scholars have argued that this could encourage weak African governments to over-borrow, hindering economic growth (Coulibaly et al. 2019). Sustainable development, as defined in the Brundtland Report (1987), aims to meet the needs of the present without compromising future generations (p. 37). The United Nations' Sustainable Development Knowledge Platform further elaborates on this by identifying economic, social, environmental development, and inclusive institutions as the four pillars of sustainable development (Keeble 1988). While Sub-Saharan Africa receives significant development assistance, the effectiveness of this aid in fostering sustainable development remains a contentious issue. The complexities range from governance and accountability to social inequality and economic growth, which require a multi-dimensional approach for a more sustainable future.

In the context of this study, sustainability refers to the ability of developmental programs to have a lasting and positive impact on the socioeconomic and environmental conditions of Sub-Saharan African countries. Sustainable development encompasses a layered approach that not only addresses immediate challenges but also considers long-term consequences, ensuring that the benefits of development endure for future generations. Sustainable development encompasses economic growth, social well-being, environmental preservation, and promoting inclusive

and equitable societies. In this context, development programs are initiatives undertaken by external actors, such as the United States and China, to support the economic and social advancement of Sub-Saharan African nations. These programs encompass a wide array of activities, including infrastructure projects, healthcare interventions, education initiatives, and economic collaborations, to enhance the well-being of the recipient countries.

Research gaps

Several research gaps became evident concerning international development, particularly in Sub-Saharan Africa, propelling the impetus for this study. These notable research gaps encompass limited comparative analysis and a lack of longitudinal and local perspectives. Researchers have predominantly examined the development programs of either the United States or China in isolation (e.g. Martuscelli 2020; Gwandu 2022; Byamugisha and Dubosse 2023; Sempungu et al. 2023), resulting in a dearth of comprehensive comparative analyses. By failing to scrutinize both nations' approaches within the same geographic expanse, previous studies have precluded a detailed and granular understanding of these programs' relative efficacy and sustainability. Much extant research has confined itself to providing mere snapshots of development initiatives in African regions and their immediate outcomes. Regrettably, few researchers have undertaken a longitudinal analysis to trace the evolution of development programs over time and discern their enduring impacts (e.g. Meinck et al. 2021; Vyas et al. 2023), thus leaving a considerable void in our comprehension of the developmental trajectory. Finally, the level of local engagement and partnership in the context of development programs remains a relatively uncharted territory within the scholarly domain but has received some recent attention (e.g. Atisa et al. 2020; Naanyu et al. 2023; Otlhogile and Shirley 2023). While the imperative of local ownership and collaboration for ensuring the sustainability of development endeavors in African nations is acknowledged in recent work (e.g. Vu et al. 2022; McCarthy et al. 2023; Vyas et al. 2023), this critical aspect has not received commensurate attention in the literature as a holistic or comparative concept.

Addressing the research gap and rationale

This study endeavors to bridge these research gaps by embarking on a comprehensive and comparative analysis of development programs from the U.S. and China in Sub-Saharan Africa. The potential to yield invaluable insights into the effectiveness and sustainability of development initiatives within the region underpinned the study. Considering the research mentioned above gaps and the contours of our study, we posited the following research question and propositions:

Specification of research questions and propositions

(RQ1) Which strategies are most effective in achieving sustainable development in Sub-Saharan Africa?

In response to that question, we presented and assessed the extent of the validity of the following four propositions.

Proposition 1: economic development strategies

The economic development strategies used by China in Sub-Saharan Africa are more effective than those employed by the United States in achieving sustainable development goals.

Proposition 2: social development strategies

The social development strategies of the United States in Sub-Saharan Africa are more effective than those used by China in achieving sustainable development goals.

Proposition 3: environmental development strategies

The environmental development strategies used by the United States in Sub-Saharan Africa are more effective than those employed by China in achieving sustainable development goals.

Proposition 4: institutional development strategies

Neither the institutional development strategies used by the United States or China in Sub-Saharan Africa effectively achieve sustainable development goals.¹

Proposition summary

We addressed economic, social, environmental, and institutional development strategies from the U.S. and China to achieve development in Sub-Saharan Africa for sustainability. In this study, the researchers aspired to contribute to a scholarly landscape characterized by a more profound and nuanced comprehension of the sustainability underpinning development programs in Sub-Saharan Africa. Through the redressal of the identified research gaps, our endeavors aim to proffer discerning perspectives for the benefit of policymakers, practitioners, and scholars engaged in international development. We hope that this study will catalyze the formulation of more efficacious and sustainable paradigms for development in the region.

Research limitations and delimitations

Many factors affect development and project sustainability (e.g., pandemics, environmental change, social unrest, military conflict) and could affect development projects. Therefore, researching the effect of one project on regional, national, or

¹Note: For the fourth proposition, sustainable is defined as more than 50% of the institutional development indicators deemed sustainable by the U.S. or China.

local development indicators is outside of the scope of this study and may limit the generalizability of the content. Additionally, a delimitation included the intentions of the U.S., China, or other development donors in Sub-Saharan Africa, which lie beyond the purpose of this research. We highlighted examples of when a development project or strategy is detrimental to a recipient nation's relation with nearby countries, its ecosystem, or is predatory.

Literature review

Epistemology

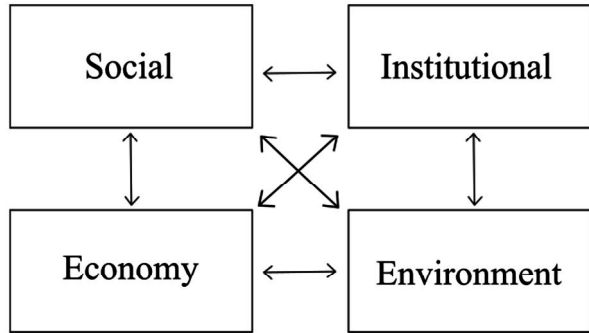
We used constructivism as the theory of knowledge in this study. Smith et al. (2016) stated that “[c]onstructivists embrace an intersubjective ontology, emphasizing norms, social agents and structures, and the mutual constitution of identity” (193). According to Smith et al., constructivists contend that there is no single objective reality. However, a social dimension of international relations demonstrates the importance of norms, rules, and language at the international level. Norms, rules, and language also affect states and their behavior at the state and local levels. Constructivism is often used interchangeably with interpretivism and assumes that reality is socially constructed (Merriam and Tisdell 2015). Wendt (1987) expanded on this by stating that shared ideas and not material forces determine the structures of human association (e.g., relations). Wendt also asserted that these shared ideas construct the identities and interests of actors. We followed that tradition and assumed that if norms, social agents, and structures exist, they affect the relationships between states in the international system. As there are structures that cause some states to be wealthier and more advanced than others, those structures also create the desire for these wealthy states to provide development assistance to states that are not as wealthy or as advanced.

Further, disparate structures can explain why one state's development method differs from another's. Reus-Smit (1997) postured states install systems to allow for collective action, and those fundamental institutions are generic structural elements of international societies that can vary from one society of states to another. Further, these fundamental (social) institutions inform the identity of these actors, shape state behavior, and “inform the interests that motivate state action” (Reus-Smit 1997, p. 561). Most of this research focused on the pillars of sustainable development provided by the United Nations (Fig. 1).

Defining sustainable development

The World Commission on Environment and Development's Brundtland Report defined sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland et al. 1987, p. 37). The Brundtland definition emphasized needs, specifically those in developing countries, as a critical concept. Additionally, as these needs are socially and culturally determined, worldwide sustainable

Fig. 1 U.N. pillars of sustainable development



consumption is now viewed as something all countries must aspire to (Baker 2012). Consumption is an environmental consideration that previously had not been considered within this context. Daly (1990) stated that the Brundtland definition “has made a great contribution by emphasizing the importance of sustainable development and, in effect, forcing it to the top of the agenda of the United Nations and the multilateral development banks” (p. 1). Sneddon et al. (2006) suggested that 20 years after developing this definition, it still serves as a guiding institutional principle and remains relevant despite new challenges confronting the international system. Baker (2012) explained that the term allows for interdependence in competing focus areas, noting that with the popularization of the Brundtland concept of sustainable development, environmental quality and economic development have become interdependent and mutually reinforcing. Thus, the mainstream debate has shifted from its earlier concern with whether environment and development are compatible objectives to a new preoccupation with achieving environmentally sustainable forms of development. Governments and international organizations have misinterpreted this definition or used the term toward their own goals. Lempert and Nguyen (2011) explained that international non-governmental organizations (NGOs) perceive sustainable development as poverty reduction and increased productivity. International development agencies define a program as sustainable if the activity can continue once the money from the agency stops. Finally, country governments have redefined sustainable government as the continuation of short-term profits without measuring long-term balance or the continuity of people, communities, or environments.

There are myriad definitions of sustainable development, which has led to much scholarly debate. Pearce et al. (1989) defined sustainable development as the creation of a social and economic system that maintains goal attainment. Thereby, development could include an increase in income and educational standards, improving the health sector, and advancing the overall quality of life. Pearce and Atkinson (1993) added that the development costs did not advance to future generations. If cost transfers to future generations, states should attempt to compensate for these costs. Holdgate (1993) stated that “development is about realizing resource potential. Sustainable development of renewable natural resources implies respecting limits to the development process, even though these limits are

adjustable by technology. The sustainability of technology may be judged by whether it increases production” (para. 9). The similarity of all these definitions is that improvements must arise. Increases in rights, income, and education are notable examples.

Additionally, minimizing the effects on the environment also is of concern across the board. The effective management of resources is of concern across all definitions. Further, understanding that one should be concerned about the cost to future generations is touched on in the Pearce and Brundtland definitions.

Some scholars questioned the utility of the Brundtland Commission’s definition. Mebratu (1998), for example, offered that most definitions of sustainable development are vague and focus on elements within development and thus fail to capture a holistic definition of sustainable development. Emas (2015) agreed with Mebratu and offered that the concept integrated environmental policies with development strategies. She also contended that there does not need to be a decision by state leaders between advancing economic development and environmental sustainability. Hopwood et al. (2005) shared Emas’ belief that there is a mixing of economic development with other sectors. However, Hopwood et al. argued further that the definition of sustainable development is the marriage of environmental issues with socioeconomic issues. Lele (1991), on the other hand, asserted that the all-encompassing nature of the Brundtland Commission definition contains significant weaknesses, such as “an incomplete perception of poverty challenges and environmental degradation” (p. 616) and the role of economic growth within sustainable development. These weaknesses lead to inadequate policymaking for leaders who use this definition as a starting point. Although there are several development and economic growth theories, there is no theory complementing the definition of sustainable development. As there is no roadmap to sustainable development, policymakers and leaders have difficulty operationalizing development fairly for both the donor and the recipient. Banerjee (2003) elaborated on this when he stated:

The Brundtland definition is not a definition; it is a slogan, and slogans, however pretty, do not make theory. As several authors have pointed out, Brundtland’s definition does not elaborate on the notion of human needs and wants ([as referenced in] Kirkby et al. 1995; Redclift, 1987), and the concern for future generations is also problematic in its operationalization. (p. 152)

Banerjee (2003) added to this sentiment when he stated, “It is ironic to the point of absurdity that the poorer countries of the world have to be ‘austere’ in their development while the richer nations continue to enjoy standards of living that are dependent on the ‘austerity’ measures of the poorer nations. Simply put, who is sustaining whose development?” (p. 157).

Methods

Case study design

The choice of a descriptive comparative qualitative case study methodological design for this research was deliberate and carefully considered. We chose this approach for several compelling reasons that align with the research objectives and the nature of the study. Firstly, using a qualitative case study method allows for an in-depth exploration of complex phenomena within their real-life contexts. Given the complex nature of development programs in Sub-Saharan Africa, it was crucial to examine the specifics of each case to unravel the intricacies, challenges, and successes associated with both U.S. and PRC initiatives. By employing a qualitative method, we gained access to context-specific data that can provide valuable insights into the dynamics under examination. Secondly, the comparative aspect of the case study design is instrumental in achieving the research goals. By selecting eight Sub-Saharan African countries, each with its unique socioeconomic, political, and cultural characteristics, we created a diverse and representative sample that allowed for meaningful comparisons. This approach enabled us to discern patterns, variations, and disparities in the implementation and impact of U.S. and PRC development programs across different contexts.

Sampling

Purposive sampling was employed to select the case study countries due to practical considerations. While researchers often prefer random sampling, it may not always be feasible or appropriate in international development programs. Purposive sampling allowed us to access relevant data and case studies for the selected countries more efficiently, facilitating a comprehensive examination of a diverse range of experiences within the constraints of the study. We chose the sources of information for the case studies to ensure data accuracy and relevance. Using datasets such as the College of William and Mary's AID Data-GeoCoded Chinese Official Finance Dataset, the China Africa Research Initiative's data on the PRC's Foreign Aid, and USAID's Foreign Aid Explorer provided a robust foundation of empirical data for the analysis. These sources are reputable and widely recognized within the field of international development research, enhancing the credibility of the study's findings. The intent to capture a diverse spectrum of Sub-Saharan African nations guided the case study selection. These countries represent regions, economies, and developmental challenges, ensuring the research encompasses various experiences and contexts.

Descriptive analytical framework

Incorporating descriptive statistics into the research design provides additional context and quantitative data that complement the qualitative insights. The triangulation of data sources enhanced the comprehensiveness of the analysis, allowing for

a more robust interpretation of the findings. In this research, bar charts facilitated a comparative analysis of the developmental programs and foreign aid initiatives undertaken by the United States and China across eight selected Sub-Saharan African countries. Bar charts are an effective visual tool for presenting categorical data and depicting the frequencies or proportions of different categories. One of the fundamental aspects of this research was to categorize and compare the nature and impact of developmental programs and foreign aid efforts carried out by the United States and China in Sub-Saharan Africa. To achieve this, a categorical representation of the data was essential. Bar charts display discrete categories, allowing for clear differentiation between various aspects of foreign aid and development, such as infrastructure projects, healthcare initiatives, educational programs, and environmental sustainability projects. The comparative analysis was a central objective of this research, aimed at discerning disparities and similarities in the approaches of the United States and China toward Sub-Saharan African development. Bar charts enabled an at-a-glance comparison of the two nations' contributions, highlighting areas of emphasis and identifying trends. By visually depicting the distribution of aid and development projects across the selected countries, we visualized the strategic priorities of each donor. Sub-Saharan Africa is a diverse region comprising countries with varying socioeconomic conditions and developmental needs. The research focused on four distinct regions within Sub-Saharan Africa to capture the nuances of development assistance. Bar charts were instrumental in presenting regional trends, showcasing how the United States and China allocated resources and efforts across West Africa, East Africa, Central Africa, and Southern Africa. Additionally, the charts allowed for in-depth analysis at the country level, revealing specific patterns and preferences within each nation. Bar charts were also useful in tracking the progress of foreign aid and development programs over time. By visualizing data from multiple years, we assessed the evolution of aid initiatives and their impact on Sub-Saharan African countries. Trends in funding allocation and project implementation were readily apparent, enabling a comprehensive understanding of the sustained efforts or fluctuations in aid provision.

Dataset assembly

We assessed Washington's and Beijing's projects for social, economic, institutional, and environmental sustainability. Seven projects were chosen for each donor from 2000–2014 via purposive sampling for each recipient country. We compared each project's purpose to the United Nations Sustainable Development Indicators to determine indicator appropriateness. We used literature on the development approaches from the U.S. and China to Sub-Saharan Africa (previously conducted secondary research in the forms of books, peer-reviewed academic journal articles, and reports produced by governments, inter-governmental organizations, and non-governmental organizations, and news reports, especially within the countries in question), and information from data compilations to ensure triangulation.

The data regarding China's development in Sub-Saharan Africa came from the College of William and Mary's AidData (2000–2014). This data set aided in analyzing the effects of individual projects on the distribution of spatial economic

activity within countries in Sub-Saharan Africa. The compilation includes PRC government-financed development assistance projects in 138 countries and non-concessional official financing. Data regarding U.S. development assistance in Sub-Saharan Africa came from USAID's Foreign Aid Explorer. This data helped us to explore the multi-dimensional picture of U.S. foreign assistance through an interactive website. Although the website focused on development assistance worldwide, we gleaned information for the specific countries included in this study during the period under consideration. We retrieved information on USAID projects from the Development Experience Clearinghouse, an online repository for documents regarding U.S. development projects.

Case study selection

We chose countries in the East, West, Central (also known as Middle), and Southern regions of sub-Saharan Africa to present an accurate picture of development in Africa. The *richer*, *medium*, or *poorer* determination was decided based on the country's nominal GDP, an indicator of national wealth. Researchers have shown that countries with a higher GDP have better economic, institutional, social, and environmental development when compared to countries with a lower GDP (Rodrik et al. 2004; Bénassy-Quéré et al. 2007). For this research, we considered any country with a nominal GDP between 100,000 and more as *wealthy*, 99,999–12,000 was considered *medium*, and less than 12,000 was considered *poor*. Each selected country was then a separate case study. The selected case study countries included Sierra Leone, Nigeria, Gabon, Ethiopia, Sudan, Botswana, the Democratic Republic of the Congo, and the Republic of the Congo (Table 1).

We selected sustainability indicators via purposive sampling, closely aligned them with the United Nations Sustainable Development Indicators and the U.N. 2030 Agenda for Sustainable Development, and separated them by pillar (Appendix). The goals were from the same source and were identical to the U.N. Sustainable Development Goals. The projects were selected via purposive sampling and separated by the appropriate pillar for both the United States and China for each country. We assigned development indicators by comparing the project purpose to the United Nations Sustainable Development Indicators and the U.N. 2030 Agenda for Sustainable Development to determine if a project was sustainable. Projects that

Table 1 Selected cases, GNI per capita, and ranking

Country	Region	GNI per capita	Classification
Sierra Leone	West Africa	\$550	Low income
Nigeria	West Africa	\$2880	Lower middle income
DROC	Central Africa	\$460	Low income
Congo	Central Africa	\$2410	Lower middle income
Gabon	Central Africa	\$7970	Upper middle income
Ethiopia	East Africa	\$600	Low income
Sudan	East Africa	\$1980	Lower middle income
Botswana	South Africa	\$6050	Upper middle income

fit into multiple pillars comprised each pillar. Upon reviewing the activity results from reports, data compilations, and news reports, we determined the assigned indicator's sustainability using a deductive reasoning approach via modus ponens. In that tradition, we asked the following questions during the evaluation process:

- (1) Are the indicators comparable to the purpose of the activity?
- (2) At the end of the project, was the indicator met?
- (3) Was the project completed?

There were situations where there was not enough information to determine if an indicator was met or not. In such situations, we excluded the project from the study. Once the project evaluation concluded, we organized the sustainability information by the case (i.e., country), sustainable development pillar (e.g., economic, institutional, environmental, social), and indicator. Where possible, we present descriptive statistics to reveal patterns within the data.

Findings

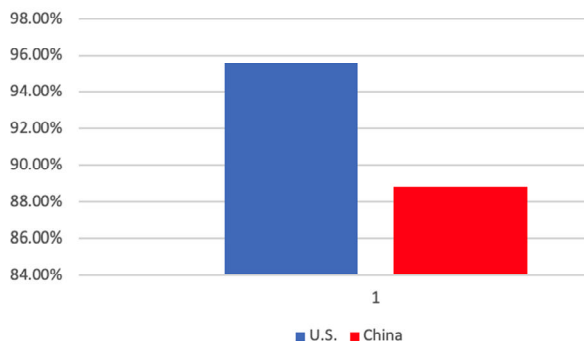
Overall sustainability

U.S. projects in Sub-Saharan Africa were more sustainable overall. When we considered the indicators for all eight case study countries, U.S. projects were 95.57% sustainable. Beijing's projects were 88.80% sustainable (Fig. 2). These findings challenge research that suggests that Beijing's development projects are not sustainable.

Sustainability comparison by case (country): U.S. vs. China

In Nigeria, Sudan, and Botswana, the United States achieved 100% sustainability (Fig. 3). This score means that all the indicators in the 21 projects for these cases were deemed sustainable. This sustainability score is interesting, as Nigeria and Sudan were countries where the United States did not have a substantial trading or diplomatic relationship. The finding signals that in countries such as Sudan, where

Fig. 2 Overall sustainability comparison (U.S. versus China)



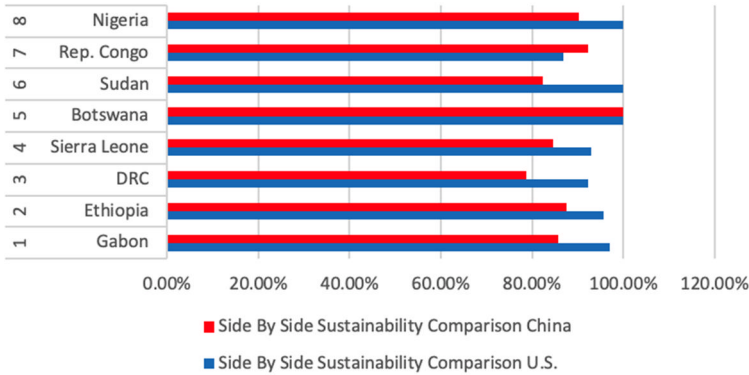


Fig. 3 Sustainability comparison by case study (U.S. versus China)

the United States does not have a competitive trading relationship (or at least did not before the sanction removal), it can still foster a positive relationship through development assistance.

Both the United States and China should focus on how to improve their development in countries where their sustainability scores are low. This advice would include Sierra Leone, DRC, Ethiopia, and Sudan for China and the DRC and the Republic of the Congo for the United States. Further research would need to determine if both countries experienced the same challenges to development assistance in these countries. The fact that both China and the United States in the DRC had challenges begs the question of a lack of an enabling environment that would foster development there.

Unsustainability comparison by pillar: U.S. vs. China

The United States had five unsustainable social development indicators out of 239 indicators; this score reflects a 98% social development sustainability (Fig. 4). Only

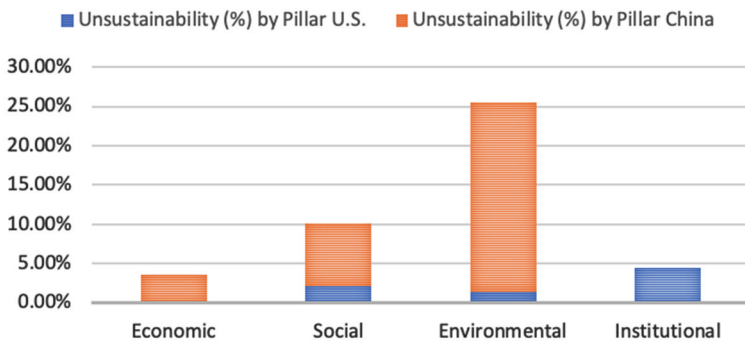


Fig. 4 Unsustainability comparison by pillar (U.S. versus China)

one environmental and none of the economic indicators were deemed unsustainable. Five of the 113 indicators under the institutional pillar were deemed unsustainable. This finding reflects an unsustainability of 4.42% for the institutional pillar.

Although the United States (specifically USAID) is adept in development, this data indicates that Washington should make a concerted effort to improve its performance under the institutional development pillar. This advice will serve the United States well in improving the sustainability of its projects. Although the United States does not do many economic development projects, no economic development indicators were deemed unsustainable. This finding indicates the U.S. could be competitive with China in this development pillar if they chose to do so.

Thirteen of the 362 economic development indicators were unsustainable, reflecting sustainability of 96.41%. As most of the projects that China attempts in Sub-Saharan Africa are economic development projects, this would reflect that what China is doing is doing well. Four of the 50 social development indicators were deemed unsustainable. Two of the institutional development indicators were deemed unsustainable. This finding reflects 92% and 100% sustainability for the social and institutional development pillars, respectively.² Environmental sustainability is of some concern. Fourteen of the 58 indicators were deemed unsustainable, or 24.14%. This finding indicates that nearly one in four indicators are unsustainable in this development pillar. Environmental sustainability is where China should focus its energy on improving its development practices (Table 2).

All the indicators were counted for all development projects in each of the eight case study countries, respectively. When comparing the individual projects to the indicators specified in the methodology section of this paper, China had more indicators for Ethiopia, the Democratic Republic of Congo, the Republic of Congo, and Nigeria (except for the Republic of the Congo, China was not more sustainable in these countries; see Fig. 3). The sustainability comparison for these countries is as follows: Ethiopia (95.65% versus 87.50), the Democratic Republic of

Table 2 Number of indicators comparison U.S. and China

Country	Number of indicators (U.S.)	Number of indicators (China)
Gabon	33	28
Ethiopia	23	32
Democratic Republic of Congo	26	33
Sierra Leone	28	26
Botswana	24	27
Sudan	39	34
Republic of Congo	38	39
Nigeria	30	31

²China's institutional sustainability percentage is not conclusive, as China had only two institutional development indicators.

Congo (92.31% versus 78.79%), the Republic of Congo (86.84% versus 92.31%), and Nigeria (100% versus 90.32%), for the U.S. and China, respectively. Although China's projects are larger and more complex (i.e., more indicators), the projects from the United States to these countries were more sustainable except for the Republic of Congo. It is also worth noting that the Republic of the Congo was the only country where China's development assistance was more sustainable than that of the United States.

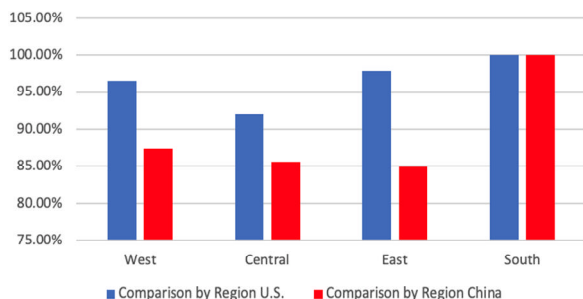
Sustainability comparison by region: U.S. versus China

In relative terms, China had the most significant percentage of sustainable development in Southern and Eastern Africa as the other parts of Sub-Saharan Africa considered. The same was true of the United States. This finding could signal a development assistance competition in these two regions. The finding could also indicate that both countries are more adept at development assistance in these countries. The United States, for example, began diplomatic relations with each of the case study countries after the end of colonialism. Ethiopia was the exception, as it remained uncolonized. U.S. diplomatic relations began with Ethiopia in 1903, nearly 60 years before the other countries in this paper. Earlier relations with Ethiopia gave the United States an advantage compared to China. The sustainable development scores for the United States and China in Ethiopia are 95.65% and 87.50%, respectively (Fig. 5); this does not signal that Eastern and Southern Africa are ripe for development as the barriers to development (i.e., corruption, civil conflict) are not as prevalent. Ethiopia and Sudan have had civil wars that affect their growth. Although civil conflict is not present in Botswana, high HIV rates and high-income inequality hampers its development.

Sustainability comparison by income category: United States versus China

We used GNI to organize the countries into categories (low income, lower middle income, upper middle income, and high income) based on the Atlas Method at the World Bank. Figure 6 highlights the sustainability of the countries when grouped into income categories for the development assistance projects from the United States and China, respectively. The United States indicators had 95.61% and

Fig. 5 Sustainability comparison by region in Sub-Saharan Africa (U.S. versus China)



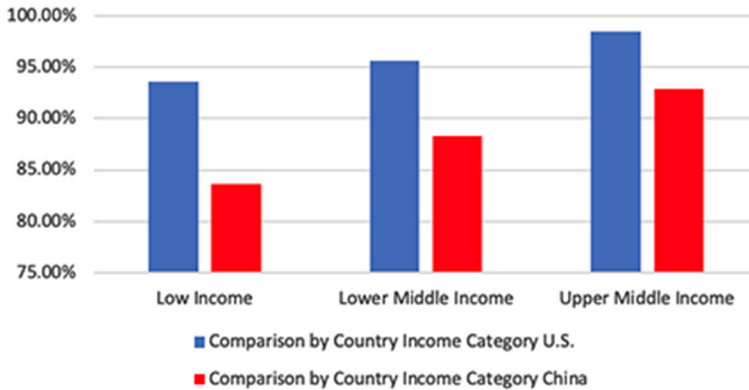


Fig. 6 Sustainability comparison by country income category (U.S. versus China)

98.48% sustainability scores for lower-middle and upper-middle-income countries, respectively (Fig. 6), and China's indicators were slightly less sustainable at 88.33% and 92.86% for lower-middle and upper-middle-income countries, respectively. Both donors were less sustainable in the low-income countries. Sierra Leone, Ethiopia, and DRC were classified as low-income countries with a GNI per capita below \$1045. The United States development assistance indicators across these low-income countries were 93.61% sustainable. China's development assistance indicators across these low-income countries were 83.63% sustainable. For DRC, in particular, conflict affects not only international trade and investment but also development assistance.

Additionally, development partners can become engrossed in the resources located in DRC, both to limit influence from other countries and to have direct access and control of these resources themselves. Resource control by donors can exacerbate conflict. China, for example, went beyond its standard economic development-focused development strategy in DRC; whether this was due to the Congolese people's needs or to encourage trade with the Congolese government is up for debate. Neither China nor the United States focused a great deal on institutional development in Ethiopia. The lack of institutional development programming may explain why some of the indicators for projects from both donor countries in Ethiopia were unsustainable. Development requires government participation and, at times, institutional policy change to lead to sustainable development. Otherwise, projects receive funding that the government may not be willing or able to continue funding once appropriation ceases.

Discussion and conclusions

The projects developed and implemented by the United States are more sustainable than their counterparts in China. China, however, is newer to the development assistance arena. As the PRC learns, their development assistance will likely

improve. This finding assumes that economic development is Beijing's goal instead of geopolitical and geostrategic ones and is open to debate. The aid from each donor country is what they do best. USAID is great at capacity building. China is great at fostering economic growth by providing infrastructure. These strategies seem to complement each other. The OECD (2019b) reported that "the North-South divide has given way to a more diverse and heterogeneous world where international inequalities remain, but along a more graduated spectrum of development levels" (p. 2). OECD recommends that more cooperation is needed and that co-operation must "[c]atalyze knowledge, innovation, financing, and capacity by teaming up smartly with public, private and civil society actors, being informed by their unique value, and equipped with the right incentives and safeguards" (OECD 2019b, p. 17).

These findings also suggest that donors must ensure their development assistance complements each other. The Organisation for Economic Co-Operation and Development (OECD) stated that donor countries coordinate their development assistance. Coordination should include simplifying procedures and sharing information so that projects are not duplicative. The OECD also suggested that harmonization can emerge through joint analysis and missions, coordination, harmonizing practices across donors, having joint aid programs, and increasing incentives for donor agency field staff to harmonize and coordinate with other development agencies (OECD 2015). Nevertheless, China and the United States soon working together for development assistance on the continent of Africa is not likely. The United States has recently determined that China's influence in developing countries is malign. In January 2020, before Congress, General Stephan J. Townsend stated the following:

China and Russia have long recognized the strategic and economic importance of Africa and continue to seize opportunities to expand their influence across the continent...The U.S. encourages constructive partners helping to develop Africa's economic, infrastructure, humanitarian, and security sectors to the benefit of all Africans. However, unencumbered by international norms and professional military standards, malign actors leverage the speed of action and access to economic and security arenas in many parts of the continent. Their coercive and exploitative activities undermine and threaten many African countries' stability. (U.S. Embassy in Ethiopia 2020, p. 3)

Additionally, a revision to section 889 of the 2019 National Defense Authorization Act bars U.S. federal government agencies and contractors (using U.S. federal government funding) from contracting with any entity that uses telecommunications equipment or services from PRC-owned companies such as Huawei or ZTE (Waldron 2017). The revision is compounded by the Pentagon limiting the Semiconductor Manufacturing International Corporation's (SMIC) ability to produce smartphone chips and possibly affecting its ability to provide semiconductors to PRC-backed partners such as Huawei (Kelion 2020). These factors will no doubt affect China's Belt and Road Initiative.

Fighting between the United States and China leaves developing countries in the middle, deciding between two potential trade partners and donors.

Kituyi (2018) stated, “Developing countries that played no role in starting the conflict would be even less able to afford it. On average, tariffs on developing countries’ exports could rise from 3 percent to 37 percent” (para 8). Economic stagnation due to the COVID-19 pandemic could prove catastrophic. [E]xternal private finance inflows to developing countries could drop by USD 700 billion in 2020 compared to 2019, exceeding the immediate impact of the 2008 Global Financial Crisis by 60%. This [drop] exacerbates the risk of significant development setbacks that would, in turn, increase our vulnerability to future pandemics, climate change, and other global public bad actors in development finance and beyond the need to collaborate closely to “build back better” for a more equitable, sustainable, and thus resilient world” (OECD 2020, p. 1).

COVID-19 affected economic growth worldwide, but some countries experienced the opposite despite the pandemic—China, for example, saw up to 3% growth. Other countries, such as Ethiopia and South Sudan, showed growth rates above 3% per year, indicating that development assistance, along with internal development activities, had successfully fostered economic development. Growth could also indicate that Ethiopia and South Sudan remained shielded from international economic shocks, which could prove helpful now and in the future. Other countries, such as the Democratic Republic of Congo and Nigeria, did not fare well and grew at -3%. In some development assistance challenges, such as civil conflict, donors cannot be controlled.

Economic development

The poor advice that the United States gave to Latin America via the Washington Consensus led to economic downturns in Latin America, as stated by Balassa (1980) and Edwards (1996) and as highlighted in the literature review led to the proposition that economic development in Sub-Saharan Africa is affected negatively by the United States’ development strategies. Through its *One Belt, One Road Initiative*, China’s development strategy was to look for new markets and untapped resources and develop infrastructure to facilitate trade. This economic growth focused on China’s development strategy led to the proposition that economic development in Sub-Saharan Africa is affected positively by China’s development strategies.

Social development

The holistic nature of post-development theory and its ability to include critical local actors in the development space, as highlighted in the successes of the Kusakabe (2013) study in the literature review, led to the proposition that social development in Sub-Saharan Africa is affected positively by the United States’ social development strategies. The 2018 creation of 12 areas of concern that China wished to address in their development assistance, as mentioned in Dhar (2018) and highlighted in the literature review of this paper, led us to assume that China would incorporate social development (specifically gender equality) in its economic

development-focused development strategy. Further, Dhar suggested that China's development strategies affect social development in Sub-Saharan Africa.

Environmental development

Udo and Jansson (2009) and Vachon and Mao (2008) found that incorporating responsible environmental practices led to sustainable development. These findings led to the proposition that environmental development in Sub-Saharan Africa is affected positively by the United States' development strategies. The respect China holds for state sovereignty, as highlighted in the literature review and exhibited in Brautigam (2009), assumed that China would not likely press other developing nations regarding their environmental preservation. Combined with their development strategy of infrastructure development and trade with developing countries for their natural resources, that led to the proposition that environmental development in Sub-Saharan Africa is negatively affected by China's development strategies.

Institutional development

The new colonialism research by Engerman and Sokoloff (2005), Said (2012), and Banerjee (2003) highlighted the effects that colonialism had on economic growth in developing countries worldwide. However, Spain, Portugal, France, or England, not the United States or China, colonized African states. The North-South relationship between developed and developing nations led to the proposition that institutional development in Sub-Saharan Africa is affected negatively by both the United States and China's development strategies. Although China claims to have a South-South relationship with many of the nations in this study, the one-sided nature of the development of China to Africa and not the other way around leads to the concept that the new colonialism research applies to Sino-Africa relations and development assistance as well.

Extrapolations

The economic development strategies pursued by the United States and China were sustainable and led to economic development. The U.S.-sponsored programs focused on training and partnership creation—a strategy leading to positive development outcomes such as trade shows that make African apparel available worldwide and the construction and maintenance of one of the most significant textiles and manufacturing industries in Sub-Saharan Africa in Lesotho. All the U.S. economic development indicators arose as sustainable in this research. China's development projects were also very successful, albeit less successful than the U.S. ones. Seventy-seven percent of its projects supported economic growth in the countries upon completion. Only 13 out of 362 indicators were found not to be sustainable. There were challenges with completing some projects and others that went uncompleted because negotiations failed with the local government in a given country. As only 96.41% of the sustainable development indicators from the PRC-backed projects were

sustainable, the U.S. economic development strategy was deemed more sustainable. The research conducted does not support the first proposition that the economic development strategies used by China in Sub-Saharan Africa are more sustainable than those employed by the United States in achieving sustainable development goals.

Social development projects by China and the United States were sustainable in the case study countries. Only four of the 50 sustainable development indicators and five of the 239 indicators for both donors' projects, respectively, were not sustainable. This finding led to 92% and 97.91% social development sustainability for China and the U.S., respectively. Therefore, the research supports the second proposition that the social development strategies used by the United States in Sub-Saharan Africa are more effective than those employed by China in achieving sustainable development goals. Only one of the environmental development indicators from the projects completed by the United States was found unsustainable compared to 14 of the 58 PRC-backed indicators. This research led to the environmental sustainability of 100% and 96.41% for the U.S. and China, respectively. This research supports the proposition that the environmental development strategies used by the United States in Sub-Saharan Africa are more effective than those employed by China in achieving sustainable development goals.

Of 113 indicators, only five were not sustainable for the institutional development pillar for the U.S.-sponsored institutional development assistance projects. China only had two indicators that measured institutional development. Both of those indicators were sustainable. Nevertheless, those findings are inconclusive, as the number of development projects from China in Sub-Saharan Africa was meager compared to the overall number of indicators across projects. This research does not support the proposition that neither the institutional development strategies used by the United States or China in Sub-Saharan Africa are effective in achieving sustainable development goals.

Based on the findings presented and analyzed in the paper, the U.S. and PRC strategies have effectively achieved sustainable development in Sub-Saharan Africa. Each country does what it does well. The United States has a holistic development approach focusing on training and building capacity. China focuses on infrastructure that can serve as a solid foundation for economic growth. Both strategies have their drawbacks. U.S.-sponsored development projects do not always consider the importance of securing local government buy-in. They also aid with conditions. For example, if a country has an authoritarian government that challenges human rights, the United States could decide not to trade or provide development assistance (e.g., Sudan). This decision can affect the economic growth of that country. China also does not consider all the local, national, and international effects of its development assistance projects. Even if China acknowledges potential adverse effects, that does not deter them from moving forward. This decision can lead to negotiations coming to a halt and projects not being completed. Nevertheless, both countries' strategies seem adept at achieving sustainable development in Sub-Saharan Africa. As noted throughout this paper, these strategies seem to complement each other.

Policy and strategy prescriptions for the United States

Provide support to host country partners that have bought into the intervention to ensure buy-in and minimize delays

The World Wildlife Fund (WWF) indicated that it was not successful in its work with local institutions because those institutions were not willing to openly discuss their support for this program (WWF 2012). An analysis during project design could have determined if they had gained local support for the anti-poaching project. Questions regarding local government support for this activity should have received a response before any spending occurred; this decision could have been due to the desire to meet the Country Development Cooperation Strategy (developed at the national level) but not asking questions at the local level. The decision could also be because these questions arose upon learning that the local government was lukewarm to the project; a decision surfaced to forge ahead in the hopes that the local government would ascribe to anti-poaching methodology after seeing the project's success. Regardless of why the local government decided not to openly discuss their support for the program, this resulted in a less-than-ideal development outcome.

Understand that China is more successful in some countries because they give development assistance and other terms with no conditions

Comparably, China's development reporting provided very little information about Beijing-sponsored projects compared to the United States. This finding supports Brautigam's (2009) statement that China deemed its development assistance a state secret. The sheer number of reports on AidData reflects that China is a significant donor in Africa and developing countries worldwide. Therefore, China's influence on developing countries worldwide is significant and growing. Suppose the goal of the U.S. government is to maintain its position as the country that provides the most development assistance worldwide to showcase its role as a hegemon in the international system. In that case, it should consider spending more annually on that effort. USAID spends less than 1% of the national budget on foreign assistance. If a larger budget share goes unspent, more money within that 1% should shift to ensuring sustainable projects see completion. In this way, the United States spends less but is more effective at delivering foreign assistance. The results of this paper reflect this, but in the future, as China's development dollars increase, it may become even more essential to highlight U.S. sustainable development successes.

Support privatization

The Reagan Administration recognized the need for private sector development in Sub-Saharan Africa. Development assistance practitioners indicate that the lack of private-sector infrastructure and the inability of the local private sector to take advantage of economic liberalization impedes development assistance (Doig 1995). Increasing trade between African countries and the United States will allow the

economies of Sub-Saharan African countries, particularly, to grow. Increasing trade is a task for the Office of the United States Trade Representative. However, the development community can help by assisting developing countries in creating an environment that enables trade. China does this, in part, by the infrastructure projects they provide. However, building roads will not always get goods to market if the trading environment remains unnurtured.

Treat host country partners as partners and hold them accountable

In the post-colonial environment, having honest leaders is crucial to development in Sub-Saharan Africa. Good governance can lead to a lack of citizen participation, discouraging foreign investment and development assistance and minimizing local private investments through entrepreneurship. All of these affect economic growth. Local governments must agree with the development approach and objectives and play a part in their development in the development space. It is up for debate if USAID should reduce funding to countries not responsible for development assistance funding, tax revenue, or other income or are not using those funds toward their development.

Policy and strategy prescriptions for China

The PRC government seems to believe that attempting to develop governmental institutions undermines the country's sovereignty; the low number (two) of institutional development indicators across China's development assistance projects reflects that sentiment. However, the PRC government is adept at providing construction projects that could be provided to the local government, either through loans or development assistance, to support local citizens without jeopardizing government sovereignty. Nonetheless, capacity building for managing the revenue from the PRC-backed infrastructure projects could prove helpful to Sub-Saharan African countries.

Ensure all parties are aware of intervention to ensure buy-in and avoid delays

An analysis of China's projects indicated some were not sustainable because of problems with host and nearby local governments. PRC projects in Sudan caused issues with the Egyptian government, and recordings of the Egyptian government trying to determine how best to sabotage the project materialized. Discussing projects or analyzing all the effects of their development assistance (e.g., tribally, locally, internationally) before initiating construction would provide better development outcomes. Additionally, as some projects go unfinished due to a lack of government buy-in, other end-stage indicators, such as the increased proportion of the population living in households with access to basic services or increased population with access to electricity, could not be deemed sustainable.

Lastly, some of China's projects have an aid-for-trade angle or receive partial funding from the local government. Several PRC-backed projects indicated incomplete construction because the local government could not fund their portion of the

project. No data emerged regarding the status of loan repayment. Future research should study China's loans to countries in Sub-Saharan Africa to determine if those countries are repaying them. Loan repayment could affect future development assistance (at least in the form of loans) from China. In some cases, the African governments did not give preferential bidding rights to China in other non-related businesses (e.g., China's loan for the Grand Poubara Hydroelectric Project). Aid Data reported this as a reason why the construction project stopped for several projects. This response signals that the African governments do not want to give preferential treatment to China in business dealings in response to development assistance. Beijing should decide if the denial of preferential bidding rights should affect development assistance and, if it does, if that is in the best interest of the nations they want to support.

Consider effects on the environment

Another reason some of China's projects were not sustainable is due to biodiversity challenges. Although dams provide access to clean power, they cause problems in some projects. China deemed the Gibe III Dam in Ethiopia partially unsustainable because it was drying up a central fishing area in a nearby lake. The Merowe Dam, although deemed sustainable, has been reported to be the cause of ethnic conflict as groups fight over access to clean water. These conditions were apparent before the development assistance started, but these projects could worsen these challenges.

Reconsider "State-Secret" development assistance strategy

China does not widely publicize its development assistance. On the China International Development Cooperation Agency website, they report the amount of development assistance they provide to regions worldwide (The People's Republic of China 2014). However, actual projects to individual countries went unmentioned. Additionally, the latest report provided was dated July 2014. More information should arise regarding their projects and the associated development outcomes, which will serve to build trust among the international development community. Besides Xinhua, PRC-backed news outlets gather very little of this information. Instead, African media sources report development assistance projects. When mistakes occur, news outlets in the West or the local press report the incident. Not sharing information about its development projects does not allow China to tell its story; it does not enjoy an opportunity to explain unsuccessful development projects. A lack of information from China leads to mistrust from the West and others regarding their goals and purpose for delivering development assistance to Sub-Saharan Africa. Lastly, China's positive outcomes may also go unreported—China is at the mercy of local news outlets to cover those successes. There are reports that the government of China has silenced some adverse reporting. However, one might assume that if China did silence negative reporting and reporters in this case, it could silence reporters of their development assistance. Therefore, the government of China should advocate for the freedom of the press and encourage reporting, whether positive or negative.

Continue employing local workers

Few Aid Data projects reported hiring locals for the China-backed infrastructure projects. Also, none of the development assistance reported training doctors; instead, China provided doctors from China for the Sub-Saharan African hospitals. China should be working with its host country counterparts to train engineers, business people, and doctors, mainly so they are not dependent on foreign assistance. This exclusion does not seem to be across the board. PRC-owned businesses recognize that bringing workers from China is more expensive, and the African workers understand the local market. If this phenomenon is considered only by PRC-backed businesses, then the PRC should use it in its development projects. Additionally, per the recommendation above, the media should report China's training and employing local African workers, and the PRC should encourage reporting.

Consider some of this assistance is "Too Much Too Soon"

Most of the loans that China provided to Sub-Saharan Africa were concessional loans, usually meaning it must award these development assistance projects to PRC-backed firms. These loans support China's firms and not local businesses. Giving loans that are not concessional can foster positive trading relationships and may even lead to better trading terms. When African countries could not pay the loans, China responded by extending their term limits or eliminating fees. Some countries (such as Ethiopia) have been able to have some of their debt written off. Writing off bad debt makes China a generous development partner. However, should these loans have been given if they were written off as debt later? Whether there is a possibility that the PRC is overestimating the ability of the infrastructure projects that they provide as development assistance to generate income to create a debt trap is up for debate. Some African countries have taken on more loans than they can repay. Additionally, some PRC-backed construction contractors may have taken on projects they cannot complete competently. Either way, a portion of the funding for these development projects should be spent on building local capacity to ensure the sustainability of these projects. Further, development assistance may have been too much for these African countries to receive and, in some cases, too much for China to complete competently.

Findings connected to the propositions

Proposition 1: economic development strategies

The economic development strategies used by China in Sub-Saharan Africa are more effective than those employed by the United States in achieving sustainable development goals.

The research findings offer valuable insights into Proposition 1, which posits that China's economic development strategies are more effective in achieving sustainable development goals in Sub-Saharan Africa than in the United States. The comparative analysis of development programs reveals a complex picture. While

China has made substantial investments in infrastructure development, particularly in countries like Ethiopia, and has contributed to economic growth, there are also concerns about the long-term sustainability of some of its projects. For instance, the Gibe III Dam in Ethiopia raised environmental concerns, challenging the sustainability of such economic initiatives. Conversely, the United States' economic development strategies, which often emphasize private sector development and trade, have yielded positive outcomes in terms of economic growth. For example, trade and investment promotion efforts supported by the United States connect to Botswana's progress. However, the effectiveness of economic development strategies varies across countries and contexts. Therefore, while the research findings offer insights into the relative effectiveness of China's and the United States' economic strategies in achieving sustainable development goals, the findings underscore the need for context-specific approaches.

Proposition 2: social development strategies

The social development strategies of the United States in Sub-Saharan Africa are more effective than those used by China in achieving sustainable development goals.

Proposition 2 focuses on social development strategies, and the research findings provide valuable insights. The United States and China have engaged in social development programs in Sub-Saharan Africa, albeit with different approaches. Findings indicate that the United States' emphasis on healthcare and education initiatives has contributed to improvements in societal well-being. For instance, Nigeria witnessed reductions in disease prevalence due to sustainable healthcare programs, while Botswana and Sudan showed progress in education indicators. However, China's social development efforts, while notable, have sometimes faced challenges related to local acceptance and alignment with host country priorities, highlighting the compound nature of social development strategies. While the research findings suggest the effectiveness of certain aspects of the United States' social development strategies, such as healthcare and education, it is essential to recognize the diversity of social challenges and priorities across Sub-Saharan African countries. Therefore, Proposition 2 highlights the importance of tailored, context-specific approaches to social development.

Proposition 3: environmental development strategies

The environmental development strategies used by the United States in Sub-Saharan Africa are more effective than those employed by China in achieving sustainable development goals.

Proposition 3 centers on environmental development strategies, and the research findings shed light on this critical aspect of sustainability. The United States and China have engaged in environmental preservation and resource management efforts in Sub-Saharan Africa. The research revealed instances where the United States' conservation partnerships have had positive outcomes, notably in Gabon, contributing to environmental sustainability. Conversely, China's projects, such as dams in

Ethiopia, have raised concerns about biodiversity challenges. The findings emphasized the significance of environmental considerations in development programs. While certain aspects of the United States' environmental strategies have demonstrated effectiveness, we acknowledge the complex interplay of environmental factors, host country priorities, and project-specific contexts. Proposition 3 underscores the importance of aligning environmental development strategies with local conditions and environmental preservation goals to achieve sustainable outcomes.

Proposition 4: institutional development strategies

Neither the institutional development strategies used by the United States nor China in Sub-Saharan Africa effectively achieve sustainable development goals.

Proposition 4 focused on institutional development strategies, and the research findings provided valuable insights into this challenging domain. Both the United States and China have implemented various institutional development programs aiming to enhance governance, transparency, and accountability in Sub-Saharan Africa. Findings revealed instances where institutional development efforts faced challenges, particularly related to local government buy-in and broader political contexts. While both countries have invested in this area, the effectiveness of these strategies varied widely across countries and contexts. The findings highlight the complexity of institutional development and the need for adaptive approaches that consider the unique political, cultural, and governance dynamics of each Sub-Saharan African country. Proposition 4 stresses the challenges and complexities inherent in institutional development and emphasizes the importance of continuous assessment and adaptation to achieve sustainable development goals effectively.

Summary

Examining the sustainability of developmental programs from the U.S. and China in Sub-Saharan Africa has revealed a complex and intricate landscape that demands a thorough understanding. Throughout this journey, we explored development assistance provided by the United States and China to countries in Sub-Saharan Africa. We examined their distinct strategies and approaches, each leaving its unique footprint on the region's quest for sustainable development. A significant revelation from this study is the substantial roles played by both the United States and China in providing development assistance to Sub-Saharan Africa. The United States, primarily through its agency USAID, boasts a long history of involvement in the region, targeting a wide array of development initiatives spanning health, education, and economic growth. In contrast, China has rapidly become a pivotal player in African development, concentrating on colossal infrastructure projects and economic collaboration.

However, the degree of effectiveness exhibited by these development programs in promoting sustainable development across Sub-Saharan Africa varies significantly. Our analysis has spotlighted common challenges and pitfalls faced by U.S. and PRC-backed initiatives. In various instances, development endeavors

from both donors have encountered resistance or encountered lukewarm support from local governments. The absence of robust local engagement often compromises the long-term sustainability of projects and diminishes their overall impact. Transparency and accountability issues have frequently surfaced, particularly concerning PRC-backed development assistance. The scarcity of project details and outcomes has fueled suspicions and raised concerns about concealed agendas. Environmental concerns have arisen, particularly concerning specific infrastructure projects from China—concerns that encompass biodiversity loss and conflicts arising from disputes over access to clean water. These issues underscore the importance of considering environmental sustainability when formulating development strategies. Debt sustainability has become increasingly pertinent, with several African nations accumulating significant debt burdens to fund infrastructure projects. Considerable debt raises questions regarding the long-term financial viability of these projects and the potential for falling into debt traps. Both the United States and China have room for improvement in terms of investing in local capacity building, including the training and development of local workers and professionals. The fostering of local capacity is integral to ensuring the sustainability of development initiatives. China's approach to development assistance, characterized by limited information sharing, has contributed to a lack of understanding and trust among international partners. Encouraging open reporting and engagement can help build trust and cooperation. However, it is imperative to acknowledge that development is a multifaceted and protracted process. Africa comprises a diverse array of nations, each grappling with unique development challenges. Sustainable development necessitates a comprehensive approach that addresses governance, economic growth, social well-being, and environmental protection and demands active participation and unwavering commitment from donor and recipient nations.

Recommendations

Considering the insights from this extensive exploration, several policy and strategy recommendations materialize for both the United States and China. Both countries should prioritize fostering robust engagement with local governments and communities to ensure that development initiatives align with local priorities and needs. China should enhance transparency by providing more comprehensive information about its development projects, while the United States should continue to emphasize accountability within its assistance programs. Environmental impact assessments should occur for projects undertaken by the U.S. and China, with measures implemented to mitigate any detrimental effects. African nations should exercise caution when acquiring excessive debt, and development partners should provide support for responsible debt management. Both China and the United States should allocate resources toward building local capacity and skills to ensure the sustainability of development efforts. China should contemplate greater transparency in reporting its development activities to cultivate trust and cooperation among international partners.

Appendix

United Nations developmental pillars and alignment to sustainability indicators

Table 3 Sustainable development indicators

Goal (Per U.N. Sustainable Development Goals)	Indicator
Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.	Increase aid for trade commitments and disbursements. Increase number of informal employment in non-agriculture
End poverty in all its forms everywhere	Employment increased, disaggregated by sex Increased proportion of the population living in households with access to basic services
Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.	Increased total official international support to infrastructure Increased passenger and freight volumes by mode of transport, increased reliably and sustainably Increased proportion of the rural population who live within 2 km of an all-season road

Table 4 Sustainable development indicators

Goal (Per U.N. Sustainable Development Goals)	Indicator
Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Increased adoption of legislative, administrative, and policy frameworks to ensure fair and equitable sharing of benefits Increased expenditures on conservation and sustainable use of biodiversity and ecosystems
End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.	Increased proportion of agriculture area under productive and sustainable agriculture
Ensure access to affordable, reliable, sustainable, and modern energy for all.	Increased proportion of the population with access to electricity Increased proportion of the population with primary reliance on clean fuels and technology
Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.	Increased proportion of fish stocks within biologically sustainable levels

Table 5 Sustainable development indicators

Goal (Per U.N. Sustainable Development Goals)	Indicator
Ensure healthy lives and promote well-being for all at all ages	Reduced Malaria incidence per 1000 population Reduced number of new HIV infections per 1000 unaffected population by sex, age, and key populations Increased participation rate in organized learning, by sex

Table 5 (continued)

Goal (Per U.N. Sustainable Development Goals)	Indicator
	Increased proportion of births attended by skilled health personnel
	Increased proportion of schools with access to electricity
	Increased proportion of schools with basic drinking water
	Reduced maternal mortality ratio
End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.	Decreased prevalence of undernourishment
	Increased average income of small-scale food producers by sex and indigenous status
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Increased participation rate of youth and adults in formal and non-formal education and training in the previous 12 months by sex

Table 6 Sustainable development indicators

Goal (Per U.N. Sustainable Development Goals)	Indicator
Take urgent action to combat climate change and its impacts	Increased communication from the government regarding the strengthening of institutional, systemic, and individual capacity-building to implement adaptation, mitigation, and technology transfer, and development actions
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels	Reduced conflict-related deaths per 100,000 population by sex, age, and cause
	Reduced number of victims of human trafficking per 100,000 population by sex, age, and form of exploitation
	Increased proportions of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions by sex, age, persons with disabilities, and population groups
Policy and institutional coherence	Increased number of countries with mechanisms in place to enhance policy coherence of sustainable development
Achieve gender equality and empower all women and girls	Whether or not legal frameworks are in place increased promotion, enforcement, and monitoring equality and non-discrimination based on sex
	Increased proportion of seats held by women in (a) national parliaments and (b) local governments

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Data availability The College of William & Mary's AID-Data Geocoded Chinese Official Finance Dataset is available at <https://www.aiddata.org/data/geocoded-chinese-global-official-finance-dataset>. Datasets from the China Africa Research Initiative are available at <https://www.sais-cari.org/data>. USAID's Foreign AID Explorer is available at <https://2012-2017.usaid.gov/data/dataset/54687edc-5876-45c3-84a0-9c0aa509c8fe>.

Declarations

Institutional review board Not applicable for this paper.

Informed consent Not applicable.

Conflict of interest The authors declare no conflict of interest.

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