Technology for Socio-Economic Development in Africa:

Considering the Nuances of Leveraging Digital Public Goods in Africa.

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Acknowledgment

The preparation and publication of this report have been made possible through funding from Hewlett Foundation. We would like to thank the organisations for their continued support. We would like to recognize Florence A. Ogonjo, the primary author supported by Gia Sajan, who was instrumental in shaping the report's content. We are equally grateful to our editors, Nelly Chepngetich Rotich and Joshua Kitili, whose insights and editorial expertise significantly elevated the quality and depth of the final publication. Lastly, we wish to thank the administrative team for their continued support throughout the process of developing this report, as well as Gloria Muthoka for designing the final version.

Executive Summary

This research report explores the critical role that Digital Public Goods (DPGs) can play in addressing the socio-economic challenges faced in Africa. The research begins by identifying the key challenges hindering socio-economic development in Africa, including inadequate infrastructure, limited digital skills, and concerns regarding data privacy and security. The report emphasizes the importance of contextualizing DPGs to meet local needs and cultural norms, ensuring their successful adoption and utilization.

Methodologically, the study employs a qualitative approach, drawing on case studies and insights on the current landscape of DPGs in Africa. It examines existing initiatives and collaborations that demonstrate the potential of DPGs to drive positive change and highlights the importance of building a robust digital infrastructure to support their implementation. The findings reveal that DPGs can significantly enhance access to vital services and empower marginalized communities. However, the report also identifies several challenges that must be addressed, including the need for capacity building, the establishment of strong data protection frameworks, and the promotion of collaboration among stakeholders. The research outlines a set of recommendations aimed at fostering an enabling environment for the development and deployment of DPGs, including policy reforms, investment in digital infrastructure, and targeted training programs to improve digital literacy.

In conclusion, this research underscores the potential of Digital Public Goods as a strategic tool for socio-economic development in Africa. By addressing existing barriers and promoting the effective implementation of DPGs, stakeholders can unlock the benefits of digital innovations, ultimately improving the quality of life for individuals and communities across the continent. The report calls for continued action to harness the power of DPGs, paving the way for a more inclusive and equitable digital future in Africa.

1.0 Introduction

The development of Information Communication Technology (ICT) has presented the opportunity to exchange online information, services, content, and ideas, leading to the occurrence of new socio-economic development trends.[1] Research on digital platforms has focused more on studies of commercial, for-profit platforms situated in the regulative institutions of the Global North. However, the potential for translating and contextualizing digital platforms for socio-economic development remains understudied, especially in the African continent.[2] In acknowledging that digital technologies play a crucial role in addressing global challenges, Digital Public Goods (DPG) are being endorsed by international organizations and governments alike to provide safe, trustworthy, and inclusive public and private services.[3] The Digital Public Good Alliance defines digital public goods as 'open source software, open data, open AI systems, and open content collections that adhere to privacy and other applicable laws.[4]This definition is operationalized through the DPG Standard, a set of nine indicators that are used to determine whether or not a solution is a digital public good.[5]

On 29th September 2022, the Digital Impact Alliance launched the Digital Public Goods Charter, a global campaign to galvanize interest, nurture critical discussion, and mobilize action from governments, private sector companies, foundations, and other relevant actors from around the world.'[6] The campaign aims to advance the use of digital public goods by enabling countries to build safe, trusted, and inclusive digital public infrastructure at scale. DPGs are noted to have significant benefits for long-term development both in the public and private sectors.[7] These benefits include inclusion, availability, efficiency, knowledge sharing, innovation, transparency, accountability, and security.

This study aims to contextualize and understand digital public goods and their role in enhancing development on a general scale with a focus on socio-economic development. The discussion will be guided by global views and perspectives on digital public goods to understand the motivations around endorsing digital public goods for development. In line with this, the study examines the role of digital public goods in building digital public infrastructure within an African context, clarifying their often-abstract nature by exploring how they can be and are currently used, particularly across the African continent. The study will be grounded in identifying and further understanding existing barriers to adopting digital public goods and policy implications that must be considered.

2.0 Contextualizing the Concept of Digital Public Goods

The concept of DPGs has emerged as a crucial element in leveraging digital technologies to address global challenges. This mainly arose in the context of achieving the United Nations Sustainable Development Goals (SDGs). DPGs are digital resources created, modified, shared, and accessed through

[1]Timur Ablyazov and Viktoriya Rapgof, 'Digital Platforms as the Basis of a New Ecological System of Socio-economic Development.' (2019) IOP Conf. Ser.: Mater. Sci. Eng. 497 012002 https://iopscience.iop.org/article/10.1088/1757-899X/497/1/012002#:~:text=Development%20of%20information%20and%20communication,socio%2Deconomic%20development%20of%20society. accessed 22 May 2024

[2]Brian Nicholson, Peter Nielsen, Sundeep Sahay & Johan Ivar Sæbø, 'Digital public goods platforms for development: The Challenge of Scaling.' (2022) The Information Society. https://www.tandfonline.com/action/showCitFormats?doi=10.1080%2F01972243.2022.2105999> accessed 22 May 2024

[3]'USAID Endorses the Charter for Digital Public Goods.' (Relief web, April 2023) <https://reliefweb.int/report/world/usaid-endorses-charter-digital-public-goods#:~:text=Digital%20technologies%20 play%20a%20 crucial,inclusive%20public%20 and%20 private%20services.> accessed 22 May 2024

[4]Digital Public Goods (Digital Public Goods Alliance) <https://digitalpublicgoods.net/digital-public-goods/>accessed 22 May 2024

[5] Digital Public Goods (Digital Public Goods Alliance) <https://digitalpublicgoods.net/digital-public-goods/>

[6] Digital Public Goods Charter (Digital Impact Alliance) <https://dial.global/work/charter-for-digital-public-goods/> accessed 22 May 2024

[7] ibid

digital or information technologies.[8] These resources have been noted to play a vital role in promoting open science, improving data accessibility, and fostering global cooperation in the digital realm.[9] While the concept of Global Public Goods (GPGs)[10] has been well-established in international collaboration, the development of DPGs is still evolving.[11] The distinction between what constitutes a digital service or resource as a "public good" is an ongoing debate, with efforts focused on defining key indicators and principles to guide the creation and utilization of DPGs.[12]

The purpose of DPGs is to facilitate the realization of the United Nations SDGs, which are seen as an essential mechanism in advancing information-driven policy and decision-making processes for the SDGs. They are intended to provide valuable data and digitized services that have enormous potential for both commercial and research purposes, supporting the implementation of solutions that are traceable, verifiable, and quantifiable by the scientific community across the world.[13]

The platform would engage different talents from tech and create a pool of open-source data sets in a manner that respects privacy, particularly in areas related to realizing the SDGs."[14] The Digital Public Goods Alliance (DPGA) has been instrumental in advancing the concept of DPGs, particularly in low- and middle-income countries. The alliance has defined a set of classification standards to categorize DPGs into areas such as open AI models, content, data, software, and standards. These indicators are linked to a classification system that emphasizes relevance to the SDGs, use of open licenses, clear ownership, privacy considerations, adherence to standards, and safe and secure content.[15] The standards include SDG relevance, open licensing, clear ownership, platform independence, documentation, mechanisms for extracting data, privacy and applicable laws, adherence to standards and best practice and doing no harm. The classification standards are further considered and explained in 3.0 below.

3.0 Digital Public Infrastructure and Digital Public Goods

Digital Public Infrastructure (DPI) refers to the foundational digital systems and platforms that enable the delivery of essential services and functions to society.[16] The 2020 Roadmap for Digital Cooperation describes DPI as platforms such as identification (ID), payment, and data exchange systems that help countries deliver vital services to their people.[17]These systems include the technological components and the institutional and legal frameworks surrounding them.[18]

DPI is crucial in facilitating access to services,

[8] UNDP, 'Digital Public Goods for the SDGs Emerging Insights on Sustainability, Replicability & Partnerships. <https://www.undp.org/sites/g/files/zskgke326/files/2023-04/Digital%20Public%20Goods%20for%20the%20SDGs%20-%20Emerging%20Insights%20on%20Sutainability%2C%20Replicability%20%26%20Partnerships.pdf> accessed 24 May 2024

[9] ibid

[10] Global public goods are those whose benefits affect all citizens of the world. They encompass many aspects of our lives: from our natural environment, our histories and cultures, and technological progress down to everyday devices such as the metric system. Moya Chin, 'What is a Public Good.' (International Monetary Fund, December 2021) <https://www.imf.org/en/Publications/fandd/issues/2021/12/Global-Public-Goods-Chin-basics#:~:text=Global%20public%20goods%20are%20those,such%20as%20the%20metric%20system.> accessed 14 October 2024

[11] UNDP, 'Digital Public Goods for the SDGs Emerging Insights on Sustainability, Replicability & Partnerships. <https://www.undp.org/sites/g/files/zskgke326/files/2023-04/Digital%20Public%20Goods%20for%20the%20SDGs%20-%20Emerging%20Insights%20on%20Sutainability%2C%20Replicability%20%26%20Partnerships.pdf> accessed 24 May 2024

[12] Kulmala, Zeeshan Shirazi, Fang Chen, Gretchen Kalonji, Dongmei Yan, Jianhui Li, Robert Duerler, Lei Luo, Qunli Han, Siming Deng, Yuanyuan Wang, Lingyi Kong & Thorsten Jelinek, 'A Future for Digital Public Goods for Monitoring SDG Indicators.' (Scientific Data, 07 December 2023) <https://doi.org/10.1038/s41597-023-02803-x> accessed 24 May 2024

[13] ibid

[14] UNICEF, 'Ghana: Catalyzing Innovation Ecosystems Through Impactful Collaborations.' (Unicef.org, 2 September 2022)https://www.unicef.org/innovation/dpg-pathfinding-countries/ghana accessed 22 January 2024

[15] UNDP, 'Digital Public Goods for the SDGs Emerging Insights on Sustainability, Replicability & Partnerships. <https://www.undp.org/sites/g/files/zskgke326/files/2023-04/Digital%20Public%20Goods%20for%20the%20SDGs%20-%20Emerging%20Insights%20on%20Sutainability%2C%20Replicability%20%26%20Partnerships.pdf> accessed 24 May 2024

[16] Asthar Kapoor, Eric Watson, 'Defining the Digital Public Infrastructure Approach.'(T20 Policy Brief, August 2023) <https://images.hindustantimes.com/images/app-images/2023/8/t20-pb-tf-2-251-definingdpi.pdf> accessed 24 May 2024

[17] UN Secretary-General, Road map for digital cooperation: implementation of the recommendations of the High-level Panel on Digital Cooperation, (United Nations, New York,2020) https://undocs.org/A/74/821 .

[18] Asthar Kapoor, Eric Watson, 'Defining the Digital Public Infrastructure Approach.'(T20 Policy Brief, August 2023) <https://images.hindustantimes.com/images/app-images/2023/8/t20-pb-tf-2-251-definingdpi.pdf> accessed 24 May 2024

promoting digital inclusion, and driving societal development. DPI is the backbone of a digital ecosystem, providing the necessary infrastructure for various stakeholders, including governments, private sector entities, and citizens, to interact and access services efficiently. It encompasses open, interoperable technology building blocks supported by transparent, accountable, and participatory governance frameworks.[19]

Notably, Digital Public Goods are distinct from DPI. Digital Public Goods are defined by their open-source nature and alignment with SDGs, whereas DPI is not constrained by these alignments. It is more comprehensive, forming the wider fabric on which digital technologies can exist and thrive in a functional manner. Additionally, while DPI can utilize Digital Public Goods, it is not constrained by them.[20] This distinction highlights the potential for hybrid models that leverage open-source components while accommodating diverse contexts and needs, a shared means to many ends. DPI is a critical enabler of digital transformation that helps improve public service delivery on a scale.[21] DPGs can accelerate the establishment of DPI and facilitate the utilization of digital solutions for complex challenges at scale.

Perceived in a more nuanced context, the link between DPIs and DPGs lies in their complementary roles in leveraging digital technologies to address global challenges and accelerating progress towards SDGs.[22] DPI is still considered an evolving concept. However, there is growing consensus on it being a combination of (i) networked open technology standards built for public interest, (ii) enabling governance, and (iii) a community of innovative and competitive market players working to drive innovation, especially across

The purpose of DPGs is to facilitate the realization of the United Nations SDGs, which are seen as an essential mechanism in advancing information-driven policy and decision-making processes for the SDGs

[19] Asthar Kapoor, Ericc Watson, 'Defining the Digital Public Infrastructure Approach.' (T20 Policy Brief, August 2023) <https://images.hindustantimes.com/images/app-images/2023/8/t20-pb-tf-2-251-definingdpi.pdf>

[20] 'Navigating Digital Public Infrastructure: A Path to Inclusive Digital Finance and Beyond Digital Frontiers.' (Digital Frontiers Institute, August 2023)< https://digitalfrontiersinstitute.org/navigating-digital-public-infrastructure-a-path-to-inclusive-digital-finance-and-beyond/>accessed 6 June 2024

[21] UNDP, 'Digital Public Infrastructure.' <https://www.undp.org/digital/digital-public-infrastructure>

[22] Haoliang Xu, 'Scaling up Digital Public Infrastructure and Digital Public Goods to accelerate the SDGs.' (UNDP, July 2023) <https://www.undp.org/speeches/scaling-digital-public-infrastructure-and-digital-public-goods-accelerate-sdgs>accessed 6 June 2024

public programmers.[23] The first combination of open technology further links it to leveraging digital public goods.[24]

African countries have started building extensive National Backbone and E-government Infrastructure. Countries like Uganda, Ghana, Kenya, Sierra Leone, Rwanda, and Senegal have taken aggressive steps to ramp up enabling infrastructure for DPI[25]. These countries have also developed legislation, policy frameworks, and established institutions to promote and implement digital services essential for DPI. Digital identification is a crucial pillar of successful DPI in Africa, potentially improving access to public services like healthcare, mobile money transactions, birth certification, and school enrollment.[26] Reports show that approximately 85 percent of African countries have national ID systems backed by electronic databases, with more than 70 per cent collecting biometric data.[27]

Kenya transitioned from its failed Huduma Namba ID cards to a new UPI system.[28] Nigeria is engaged in various digital ID initiatives through the eID Programme while Benin has a digital identity management platform that allows users to register with local authorities to create and manage certificates for their virtual ID, which can be used for signing, and Mobile ID, which can be used for authentication.[29] In August 2023, the Namibian government approved the introduction of contactless microchip identity documents (IDs) into all national documents. The new IDs will include QR code instead of a fingerprint and a machine-readable zone (MRZ) instead of a barcode reader.[30]

The interplay between DPI and DPGs emanates from the fact that, for sustainability of DPGs, there must already be established DPI which could include digital IDs, digital payments, and data exchange.[31] DPI emphasizes interoperability, flexibility, and reusability, as such it is structured to provide public benefit, particularly enabling public service delivery and private sector innovation.[32]

Digital public infrastructure in Africa plays a vital role in enhancing intra-African trade. The need for efficient trade processes and market access drives the demand for digital infrastructure to facilitate cross-border transactions and business connectivity. In line with this is the growing need for interoperable digital platforms that can seamlessly interact with each other to support trade activities.[33] The Adoption of the Protocol to the Africa Continental Free Trade Area (AfCFTA) on Digital Trade also signifies commitments towards developing DPI in Africa with provisions encouraging state parties to promote the continuous development of digital infrastructure (Article 18) and emphasize the promotion of interoperability and interconnectivity between different digital infrastructures among State Parties (Article 19).[34]

[23] Haoliang Xu, 'Scaling up Digital Public Infrastructure and Digital Public Goods to accelerate the SDGs.' (UNDP, July 2023) <https://www.undp.org/speeches/scaling-digital-public-infrastructure-and-digital-public-goods-accelerate-sdgs> accessed 6 June 2024

[24] ibid

[25] Bernard Sabiti, 'Africa Has Leapfrogged its Way to Becoming a Leader in Digital Payments. Could it Do the Same with DPI?' (Digital Impact Alliance, September 2023) <https://dial.global/africa-digital-public-infrastructure-progress/> accessed 6 June 2024

[26] Bernard Sabiti, 'Africa Has Leapfrogged its Way to Becoming a Leader in Digital Payments. Could it Do the Same with DPI?' (Digital Impact Alliance, September 2023) <https://dial.global/africa-digital-public-infrastructure-progress/> accessed 6 June 2024

[27] United Nations Economic Commission for Africa, 'Africa Digital Identity Landscape 2022.' (United Nations, 2023) https://www.uneca.org/sites/default/files/DITE-AFRICA/Africa%20Digtial%20ID%20Landscape%20Report%20%282023%29.pdf accessed 6 June 2024

[28] Sharon Resian, 'Cabinet Endorses UPI Protocol to Rid public Service of Ghost Workers.' *Capital News* (Nairobi, 18 September 2024)<https://www.capitalfm.co.ke/news/2024/09/cabinet-endorses-upi-protocol-to-rid-public-service-of-ghost-workers/> accessed 11 October 2024

[29] Melody Musoni, Ennatu Domingo and Elvis Ogah, 'Digital ID systems in Africa: Challenges, risks and Opportunities.' (ECDPM Discussion Paper No.360, December 2023)<https://ecdpm.org/work/digital-id-systems-africa-challenges-risks-and-opportunities#:~:text=Authors&text=Melody%20Musoni%2C%20Ennatu%20Domingo%20and,%2C%20Nigeria%2C%20Benin%20and%20Namibia.> accessed 6 June 2024

[30] Hikmatu Bilali, 'Namibia Approves Contactless Microchip Identity Documents. (Wearetech.Africa, August 2023) <https://www.wearetech.africa/en/fils-uk/news/namibia-approves-contact-less-microchip-identity-documents> accessed 6 June 2024

[31] 'What is Good Digital Public Infrastructure.' (*Digital Impact Alliance*, 11 October 2024) <https://dial.global/good-dpi/> accessed 14 October 2024

[32] 'What is Good Digital Public Infrastructure.' (*Digital Impact Alliance*, 11 October 2024) <https://dial.global/good-dpi/> accessed 14 October 2024

[33] ibid

[34] Africa Continental Free Trade Secretariat, 'Draft Protocol to the Agreement Establishing the Continental Free Trade Area on Digital Trade.' <https://www.bilaterals.org/IMG/pdf/afcfta_digital_trade_protocol_-_9_february_2024_draft.pdf>accessed 6 June 2024

India's 2023 G20 presidency focused on DPI for sustainable development, as evidenced by its report, *'Acceleration of SDGs through Digital Public Infrastructure: A Compendium of the Potential of Digital Public Infrastructure.'*.[35] The report emphasizes the importance of foundational digital public infrastructure and the role of DPGs in advancing digital public infrastructure. It notes that DPGs can help overcome many challenges in developing foundational digital public infrastructure. These challenges include interoperability issues, which relate to ensuring that different digital systems can work together seamlessly as well as issues of access and inclusivity concerning populations that do not have access to digital technologies.[36] However, specific conditions must be intentionally created and nurtured for DPGs to become a sustainable and long-term solution for digital public infrastructure.[37]Conditions include, focusing on long term sustainability of DPGs which can be achieved through investments, governance frameworks that support transparency and accountability to build public trust among users. Additionally, legal and regulatory frameworks are necessary to protect user rights, ensure data privacy, and promote responsible use of digital technologies.[38] These conditions will not naturally emerge on their own, highlighting the need for coordinated efforts to establish an ecosystem that supports the viability and longevity of DPGs in advancing digital public infrastructure.[39]

India has demonstrated significant success in leveraging DPG initiatives which have primarily succeeded due to government led initiatives. India's commitment to inclusive digital growth and the potential economic benefits of DPGs, estimated to be worth $700 billion by 2030, underscore this success. This estimation speaks to the existing investment capacity in not only securing DPGS but also in building DPI. Shared similarities with African countries may help propel the continued investment in DPI, further advancing the uptake of DPGs.

4.0 Classification and Governing Structure of Digital Public Goods.

4.1 Classification

DPGs are classified based on adherence to specific criteria outlined in the Digital Public Goods Standard. The classification of digital public goods is determined by assessing whether a digital solution meets the baseline requirements outlined in the standard. The standards provide for nine indicators and requirements:[40]

1. Relevance to Sustainable Development Goals: Digital public goods must demonstrate relevance to advancing the SDGs. This means that the DPG must address either one or more of the SDGs.

2. Use of Approved Open Licenses: Digital public goods must use approved open licenses, such as Open-Source Initiative (OSI) approved licenses for open-source software and Creative Commons licenses for open content collections.

3. Clear Ownership: Ownership of assets produced by the digital public good must be clearly defined and documented through copyright, trademark, or other publicly available information.

4. Platform Independence: The digital public good must demonstrate independence

[35] 'Acceleration of SDGs through Digital Public Infrastructure: A Compendium of the Potential of Digital Public Infrastructure.' (UNDP, 2023) <https://www.undp.org/india/publications/accelerating-sdgs-through-digital-public-infrastructure-compendium-potential-dpi> accessed 14 October 2024

[36]'Acceleration of SDGs through Digital Public Infrastructure: A Compendium of the Potential of Digital Public Infrastructure.' (UNDP, 2023) <https://www.undp.org/india/publications/accelerating-sdgs-through-digital-public-infrastructure-compendium-potential-dpi> accessed 14 October 2024

[37]ibid

[38] ibid

[39]Chrissy Meier and Heath Arensen, 'Co-Creating Our Digital Future: How open-source technology can expand inclusive digital public infrastructure.' (Digital Impact Alliance, April 2023) accessed 10 June 2024 <https://dial.global/wp-content/uploads/2023/04/Co-creating-Our-Digital-Future.pdf> accessed 10 June 2024

[40]Digital Public Goods Standard (Digital Public Goods Alliance) < https://digitalpublicgoods.net/standard/> accessed 10 June 2024

from closed components and indicate the existence of functional, open alternatives that can be used without significant changes to the core product.

5. Documentation: Depending on the type of digital solution, digital public goods require documentation of source code, use cases, and functional requirements.

6. The mechanism for Extracting Data: Digital public goods with non-personally identifiable information (PII) must be designed to extract or import non-PII data and content in a non-proprietary format.

7. Adherence to Privacy and Applicable Laws: Digital public goods must be designed and developed to comply with privacy and other applicable laws. This is especially relevant in the African context in consideration of regional instruments i.e. the Malabo convention and national data protection law.

8. Adherence to Standards & Best Practices: Digital public goods must align with relevant standards, best practices, and principles, such as the Principles for Digital Development. These principles were designed to address the challenges in digital development programs as they were increasingly fragmented, uncoordinated and struggled to scale.[41] The Principles for Digital Development serve as guidelines to promote sustainable and inclusive development in the digital landscape. These principles include the need to understand the existing digital ecosystem, share, reuse and improve use, design with people in mind, design for inclusion, build digital solutions for sustainability, establish people first data practices, create open and transparent practices, anticipate and mitigate harms of digital solutions and use

The Principles for Digital Development serve as guidelines to promote sustainable and inclusive development in the digital landscape

[41] 'Principles of Digital Development.' <https://digitalprinciples.org/> accessed 10 June 2024

evidence to improve outcomes.[42]

9. Do No Harm by Design: Digital public goods must be designed to anticipate, prevent, and do no harm by design, including considerations for data privacy and security, inappropriate and illegal content, and protection from harassment.

The above standards serve as a governing structure for DPGs in consideration of the fact that DPGs must also adhere to the global Principles for Digital Development. A further classification of DPGs beyond meeting the nine criteria standard involves a structured process where organizations or individuals can nominate a digital solution for review against this standard. The review includes assessing its relevance to the SDGs, use of approved open licenses, clear ownership, platform independence, documentation, a mechanism for extracting data, adherence to privacy and laws, alignment with standards and best practices, and design to prevent harm.[43]

The Digital Public Goods Alliance reviews nominations to determine if the solution meets the standard's requirements. If successful, the solution is recognized as a digital public good and listed on the DPG Registry for one year. Transparency is maintained through publicly available documentation and communication during the review process on the GitHub repository.[44] Currently, 163 DPGs have been registered, with most digital solutions being open software.[45] SDG 3, on good health and well-being, has the highest number of classified DPGs, reflecting health as one of the core areas where DPGs are leveraged and utilized, followed by SDG 4 on quality education, and SDG 10 on reduced inequality.[46]

DPGs classified under SDG 3 on health are primarily open software that provides healthcare delivery, data management, hospital administration, and communication in various contexts.[47] Some of the DPGs noted in the registry include Bisa Health, which will be further discussed in the report, Care Open Health Network, cboard, and the most commonly used worldwide DHIS2.[48] DPGs in education highlight their role in providing tools and platforms for digital lessons, skill development and learning, social-emotional learning, accessibility and offline learning, and customizable learning management while DPGs aimed at reducing inequality focus on health systems transformation, social benefits delivery, accessibility and inclusion, data collection and management, and citizen participation and governance.[49]

4.2 Data Governance Structures

Beyond the set standards, the governance structure of DPGs is built upon adherence to data privacy regulations and frameworks, aligning compliance with data protection laws. Standard 9(a) on data privacy and security requires that: -

> 'Digital public goods that collect, store and distribute personally identifiable data, must demonstrate how they ensure the privacy, security and integrity of this data in addition to the steps taken to prevent adverse impacts resulting from its collection, storage and distribution.'

DPGs have the potential to contribute to the public good. However, consideration must be given to protecting privacy and individual rights. The Standards recognize that data can erode privacy and undermine autonomy, emphasizing the need for careful data management in line with existing data protection frameworks to prevent harm.[50] Research suggests that data governance of DPGs should consider data as a digital public good to balance access and protection.[51] Data should, therefore, be treated as a non-excludable resource with open access, similar to

[42] Principles of Digital Development.'<https://digitalprinciples.org/> accessed 10 June 2024
[43] ibid
[44] Digital Public Goods Registry (Digital Public Goods Alliance) < https://digitalpublicgoods.net/registry/> accessed 10 June 2024
[45] Digital Public Goods Registry (Digital Public Goods Alliance) < https://digitalpublicgoods.net/registry/> accessed 10 June 2024
[46] Digital Public Goods Registry (Digital Public Goods Alliance) < https://digitalpublicgoods.net/registry/> accessed 10 June 2024
[47] ibid
[48] Digital Public Goods Registry (Digital Public Goods Alliance) < https://digitalpublicgoods.net/registry/> accessed 14 June 2024
[49] See n24
[50] 'Exploring Data as and in Service of the Public Good' (Digital Public Goods Alliance, Global Partnership for Sustainable Development Data, Jain Family Institute, UN Global Pulse, and UNICEF,2023)<https://digitalpublicgoods.net/PublicGoodDataReport.pdf> accessed 14 June 2024
[51] 'Exploring Data as and in Service of the Public Good' (Digital Public Goods Alliance, Global Partnership for Sustainable Development Data, Jain Family Institute, UN Global Pulse, and UNICEF,2023) <https://digitalpublicgoods.net/PublicGoodDataReport.pdf> accessed 14 June 2024

open-source software, with the benefit of maximizing its use and reuse while removing barriers.[52]

The decision on how to govern data depends on the level of risk involved. Data that can be safely made openly available should be managed as a digital public good. In contrast, data requiring more fine-grained governance should be treated as a club good with specific considerations on membership, rules, and mandate to preserve the focus on the public good. The need to balance access to data for public benefit with the protection of individual rights and privacy highlights the importance of thoughtful data governance frameworks in achieving positive outcomes for society.[53]

Additionally, the elements of security speak to cyber security, the nature of digital public goods, digital public infrastructure, cyber security risks and mitigation measures[54]. In the context of cyber security governance, providing and protecting digital public goods are essential for ensuring the availability, integrity, authenticity, and confidentiality of digital data stored and transmitted through cyberspace. Strong cyber defenses and well-guarded computer networks contribute to system-wide cyber security, benefiting not only the owner of the network but also other interconnected networks to which digital public infrastructure comes into play.[55]

However, the challenge arises when actors are likely to exploit the efforts of others to provide DPGs without contributing themselves, leading to the under-provision of DPGs.[56] Therefore, effective cyber security governance must outline the overall data governance structure. Further, it requires recognizing DPGs as essential components in safeguarding cyberspace and addressing the collective action problems inherent in ensuring cyber security at a global level owing to their being founded on open-source data.[57]

36 African countries have enacted data protection laws regionally.[58] Together with the Malabo Convention on Cyber Security and Data Protection, these laws and existing cyber security frameworks are a foundational basis for regulating the data infrastructure of DPGs, both personal data and other categories of data. Additionally, the AU Data Policy Framework, designed to strengthen and harmonize data governance frameworks across Africa, and to create a shared data space and standards to regulate the increasing production and use of data on the continent, may be instrumental in building data governance structures for DPGs in Africa.

The AU Data Policy Framework presents a strategic approach to advancing the governance of DPGs in Africa.[59] Although the framework does not explicitly provide for DPGs, data is the foundation for DPGs and falls under the governance structure. By providing for the harmonization of data governance frameworks, promoting cooperation among Member States, and creating a safe and trustworthy digital environment, the framework outlines the foundational basis for effective governance. The focus on stimulating innovation, ensuring equitable distribution of benefits, and building trusted digital infrastructure aligns with the objectives of governing DPGs in a transparent, inclusive, and sustainable manner.[60]

The AU Data Policy Framework outlines several guiding principles on unity and solidarity, promoting balanced and inclusive economic development while protecting human rights. It is further guided by the principles of transparency, accountability, the

[52]'Exploring Data as and in Service of the Public Good' (Digital Public Goods Alliance, Global Partnership for Sustainable Development Data, Jain Family Institute, UN Global Pulse, and UNICEF,2023) <https://digitalpublicgoods.net/PublicGoodDataReport.pdf> accessed 14 June 2024

[53]ibid

[54]ibid

[55]Mischa Hansel, "Cyber Security Governance and the Theory of Public Goods," <https://www.e-ir.info/2013/06/27/cyber-security-governance-and-the-theory-of-public-goods/>

'Exploring Data as and in Service of the Public Good' (Digital Public Goods Alliance, Global Partnership for Sustainable Development Data, Jain Family Institute, UN Global Pulse, and UNICEF,2023) <https://digitalpublicgoods.net/PublicGoodDataReport.pdf> accessed 14 June 2024

[56]Mischa Hansel, "Cyber Security Governance and the Theory of Public Goods," https://www.e-ir.info/2013/06/27/cyber-security-governance-and-the-theory-of-public-goods/.

[57]ibid

[58]'Mapping the Progress (and delays) for Data Protection in Africa.'(Data Protection Africa , 2023)<https://dataprotection.africa/data-protection-in-africa-progress/> accessed 14 June 2024

[59]AU Data Policy Framework (African Union) https://au.int/sites/default/files/documents/42078-doc-AU-DATA-POLICY-FRAMEWORK-ENG1.pdf

[60] AU Data Policy Framework (African Union) <https://au.int/sites/default/files/documents/42078-doc-AU-DATA-POLICY-FRAMEWORK-ENG1.pdf> accessed 14 June 2024

inclusion of stakeholders, equity among citizens, and fair competition among market players, emphasizing trust, accessibility, interoperability, security, quality, integrity, representatively, and non-discrimination.[61]

5.0 Achieving Socio-economic Development through Digital Public Goods in Africa.

Socio-economic development in Africa encompasses a wide range of interconnected factors that contribute to the overall well-being and prosperity of individuals and communities on the continent.[62] At its core, socio-economic development in Africa aims to improve the quality of life, reduce poverty, and create sustainable economic opportunities for all. One aspect of socio-economic development in Africa involves enhancing access to essential services such as healthcare, education, clean water, and sanitation. By ensuring that basic needs are met, individuals can lead healthier and more productive lives, ultimately contributing to the overall development of society.

Consideration is given to the originating elements of DPGs, i.e. the concept of public goods in addressing socio-economic development. Ostrom and Samuelson argued that the notion of public goods, originating in the economics discipline, centers on two principles; non-rivalry and non-exclusion.[63] Public goods are non-rivalrous, implying that one individual's consumption of the good does not influence what is available for others. They are also non-excludable because no one can be excluded from the consumption of public goods. In the context of digital public goods, Ostrom's principles of collective action and self-governance can be valuable in understanding how communities can come together to create and sustain digital platforms for the public good. Ostrom's emphasis on the importance of local knowledge, user participation, and community-based governance can be relevant in the development and scaling of digital public goods platforms.[64]

DPGs are linked to the achievement of SDGs.[65] Notably, socioeconomic factors are crucial in influencing this achievement in various ways.

SDG	Socio-Economic impact
SDG 1 on No Poverty	Socioeconomic disparities such as income inequality and lack of access to resources, directly impact the goal of eradicating poverty in all its forms.
SDG 2 on Zero Hunger	Points to how socioeconomic status affects food security and access to nutritious food. Poverty and income inequality can hinder efforts to ensure food security for all.
SDG 3 on Good Health and Well-being	Addresses socioeconomic factors, including income, education, and access to healthcare services, which significantly influence health out-comes.
SDG 4 on Quality Education	Socioeconomic status often determines access to quality education and is tied to socioeconomic factors such as poverty and inequality.
SDG 8 on Decent Work and Econom-ic Growth	Economic factors, including job opportunities, wages, and working conditions, are central to achieving sustainable economic growth and promoting decent work.
SDG 10: Reduced Inequalities:	Socioeconomic factors contribute to inequalities between and among countries. Addressing these disparities is essential for reducing inequalities and promoting social inclusion and cohesion.

[61] ibid, viii para 1

62Economic Development in Africa Report 2021(United Nations Conference on Trade and Development,2021)<https://unctad.org/system/files/official-document/aldcafrica2021_en.pdf> accessed 26 June 2024

63 Brian Nicholson, Peter Nielsen, Sundeep Sahayb, and Johan Ivar Sæbø, 'Digital Public Goods Platform for Development: The Challenge of Scaling.' (The Information Society, 2022 Vol 38 No 5)
'<https://www.tandfonline.com/doi/epdf/10.1080/01972243.2022.2105999?needAccess=true>accessed 26 June 2024

[64]ibid

[65]'Digital Public Goods: Promoting Open-Source Solutions for a more Equitable World.' <https://www.un.org/techenvoy/content/digital-public-goods#:~:text=-To%20unlock%20a%20more%20equitable,achieving%20the%20Sustainable%20Development%20Goals.> accessed 26 June 2024

Distinct from meeting the SDGs, DPGs play a pivotal role in advancing socio-economic development by offering a range of benefits to societies and economies. These goods facilitate inclusive development by ensuring individuals from different socio-economic backgrounds have access to essential services and information, which is especially noted in most African countries.[66] By providing a platform for innovation, DPGs drive the development and customization of DPI.[67] Additionally, DPGs contribute to building resilience within societies, enabling them to better cope with challenges and uncertainties in advancing socio-economic development.[68] Through the development of well-structured DPI enabled by DPGs, trust in public institutions can be enhanced as services become more inclusive, rights-based, and secure, thereby strengthening the social fabric.[69]

Social and economic factors include income, education, employment, community safety and social support. These factors impact the choices that are available in a community. Examples of areas where DPGs can be leveraged to build socio-economic development include DPG-based tools to enhance agricultural productivity. Such tools include AGROVOC multilingual thesaurus by the Food and Agriculture Organization of the United Nations (FAO).[70] The tool provides agricultural concepts and relationships in up to 42 languages, available for public (human and machine) use to facilitate access and interoperability of data across institutions and languages.[71] The open data set allows for the creation of tools that would provide farmers with access to digital solutions like weather information, pest control strategies, and online dispute resolution systems.[72] The result would therefore empower smallholder farmers to increase their yields, improve food security, and boost their incomes, thereby contributing to economic growth in rural communities.[73]

Additionally, DPGs are pivotal in improving public service delivery systems by leveraging digital technologies and open-source software.[74] This enhancement ensures better access to essential services for all citizens, fostering socio-economic development by meeting basic needs and safeguarding rights. Further, DPGs foster innovation and collaboration by serving as catalysts for progress across borders. By facilitating the development and sharing of digital resources, this collaborative approach benefits vulnerable populations and promotes sustainable development and tangible improvements in society, illustrating the transformative potential of digital public goods in building inclusive, resilient, and thriving communities.[75]

5.1 Challenges in Leveraging DPGs for Socio-economic Development

Leveraging DPGs for socio-economic development in Africa presents a promising opportunity to address various challenges and drive positive change. However, the adoption and utilization of DPGs in Africa are not without obstacles. The challenges are characterized by limitations ranging from infrastructure limitations to data privacy concerns, as discussed below.[76]

1. Infrastructure Limitations: Many African regions need help developing their DPI, which is constrained by limited internet connectivity, unreliable power supply, and insufficient technological resources. These infrastructure limitations hinder the adoption and utilization of DPG platforms.
2. Capacity Building: Building and

66 'The Social and Economic Impact of Digital Public Infrastructure based on Digital Public Goods' (Digital Public Goods Alliance, September 2022)<https://digitalpublicgoods.net/Bold-Investments-Methodology.pdf>accessed 26 June 2024

67 'The Social and Economic Impact of Digital Public Infrastructure based on Digital Public Goods' (Digital Public Goods Alliance, September 2022)<https://digitalpublicgoods.net/Bold-Investments-Methodology.pdf> accessed 26 June 2024

68 'The Human and Economic Impact of Digital Public Infrastructure.'(Dalberg, 2023)<https://www.undp.org/sites/g/files/zskgke326/files/2023-07/undp-the-human-and-economic-impact-of-digital-public-infrastructure-final.pdf> accessed 26 June 2024

69 ibid

70 'AGROVOC is now a certified Digital Public Good.' (FAO, 2024) https://www.fao.org/agris/news/agrovoc-now-certified-digital-public-good#:~:text=The%20Food%20and%20Agriculture%20Organization,and%20contribute%20to%20the%20SDGs. accessed 11 October 2024

71 'AGROVOC.' <https://www.fao.org/agrovoc/> accessed 11 October 2024

72 ibid

73 ibid

74 'Inclusive Digital Infrastructure can Help Achieve the SDGs, Here's How.'(World Economic Forum , 2022),https://www.weforum.org/agenda/2022/09/how-inclusive-digital-infrastructure-help-achieve-sdgs/> accessed 14th October 2024

75 ibid

76 Brian Nicholson, 'Digital public goods platforms for development: The challenge of scaling' (2022) pp. 364–376. <https://www.tandfonline.com/doi/full/10.1080/01972243.2022.2105999> accessed 06 June 2024

enhancing the digital skills and capacity of African individuals and organisations is crucial for successfully adopting DPGs. Lack of technical expertise and training impedes the effective use of these platforms for development purposes and the possibility of scaling up DPGs.

3. Sustainability: Ensuring the long-term sustainability of DPG initiatives in Africa is a significant challenge. Most initiatives do not go past the pilot stage and are often stagnated due to a lack of funding. Securing funding, maintaining technical support, and addressing governance issues are essential for sustaining these platforms and maximizing impact.
4. Localization and Contextualization: Adapting DPGs to local contexts and ensuring their relevance to the specific needs and challenges faced by African communities is a key challenge. Much like other technological advancements, DPGs leveraged in the West cannot be leveraged similarly without considering local context and needs. Customizing platforms to address local languages, cultural norms, and socio-economic conditions is essential for their successful adoption of DPGs.
5. Data Privacy and Security: Safeguarding data privacy and ensuring the security of information shared on DPG platforms is challenging due to the lack of enforcement power of already existing data protection laws or the non-existence of such laws altogether. These concerns related to data protection, cybersecurity and privacy regulations must be addressed to build public trust and confidence among the ultimate users.
6. Interoperability: DPGs being open-source leverage interoperability for optimum functionality. Interoperability and integration among different digital platforms and systems have been challenging owing to the need for well-established digital infrastructure. As a result, this is likely to limit seamless data exchange and collaboration between

Most initiatives do not go past the pilot stage and are often stagnated due to a lack of funding

various stakeholders and platforms, which would facilitate an environment for effectively leveraging DPGs for socio-economic development.

7. Limited Data Availability: The need for more reliable subnational income and output data can impede the effective implementation of DPGs, as these digital tools often rely on accurate and up-to-date data for decision-making and resource allocation. Without comprehensive data at the regional level, the development and deployment of DPGs may be hindered, limiting their potential impact on addressing socioeconomic disparities.

The challenges reflect nuanced areas that must be addressed collectively to create a conducive environment for leveraging DPGs for socio-economic development in Africa. Though generalized, these challenges are reflected across most African countries, depicting overlapping challenges that emanate from the lack of a well-conceptualized DPI, directly impacting the extent to which DPGs can be effectively leveraged.

6.0 Case Studies and Initiatives

The case studies and initiatives in this section showcase real-world examples of how digital solutions, particularly DPGs, are leveraged to address socioeconomic challenges and promote sustainable development. These case studies highlight innovative projects and collaborations that demonstrate the potential of digital technologies to drive positive impact in various sectors, including healthcare, education, and governance. The case studies will focus on the adoption of DPGs in the global south, giving a core example from India and narrowing it down to the African Continent with a focus on DPG initiatives in Ghana. Highlighting these initiatives contextualizes the use of DPGs, giving valuable insight into their practical applications, narrowing down use cases and identifying gaps and areas of policy development. Within the global south, India and Ghana have demonstrated the most use cases with DPGs, as will be further discussed below, thus bringing them in focus as case studies. Additionally, these countries have more publicly available literature on the uptake of Digital Public Goods.

6.1 DPGs in India

Digital public goods have played a significant role in India's digital transformation journey.[77] The Digital India initiative has played a crucial role in helping achieve the ambitious goal of becoming a 5 trillion economy by 2025.[78] Launched in 2015 by Hon Prime Minister Shri Narendra Modi, the initiative aimed to propel India into a digitally empowered society and knowledge economy.[79]Through the flagship initiative, the uptake of DPGs India has grown.[80]Consequently, DPGs have been adopted in India through a unique, primarily government-led phantomization strategy.[81] The platforms play a crucial role in enhancing government-citizen engagement by empowering citizens, ensuring ease of governance and ease of doing business and improving the effectiveness of government policies.[82] Additionally, the success of the public digital platforms in India is driven by their low-cost development, interoperable design & large-scale adoption and reach. [83]

In 2021, India began pioneering the concept of digital public goods that enhance the ease, transparency and speed with which individuals, markets and governments interact. Three of the largest digital public goods in India are:

[77]Digital India: Digital Public Goods Phantomization Play (2021)<https://nasscom.in/knowledge-center/publications/digital-india-digital-public-goods-platformisation-play> accessed 4 June 2024
[78]ibid
[79]'Digital India,' (Common Services Center, 2024) <https://csc.gov.in/digitalIndia>
[80]Shankar Maruwada, 'Digital Public Goods for Education: The Indian Experience.' (Carnegie Endowment for International Peace, 2023), <https://carnegieendowment.org/research/2023/03/digital-public-goods-for-education-the-indian-experience?lang=en> accessed 11 October 2024
[81]Shankar Maruwada, 'Digital Public Goods for Education: The Indian Experience.' (Carnegie Endowment for International Peace, 2023) <https://carnegieendowment.org/research/2023/03/digital-public-goods-for-education-the-indian-experience?lang=en> accessed 11 October 2024
[82]'Digital India,' (Common Services Center, 2024) <https://csc.gov.in/digitalIndia> 11 October 2024.
[83]ibid

- Aadhar: Aadhar serves as a crucial digital public good by providing residents with a unique identification number, enabling efficient and secure access to various government and private services.[84]

- Unified Payments Interface (UPI): UPI is India's most used digital payments system. It has revolutionized the digital payments landscape by offering a seamless, instant, and interoperable payment system that allows users to transfer funds between bank accounts using their smartphones.[85]

- CoWIN: CoWIN is the largest vaccination platform in India. It played a pivotal role in managing and tracking the COVID-19 vaccination drive across the country, facilitating the registration, scheduling, and monitoring of vaccination doses for millions of citizens. As it is built on the foundation of Aadhaar and India Stack, modular applications, big and small, it has also been leveraged to facilitate payments, withdrawal of provident funds, acquiring a passport and driving license and checking of land records among other government services.[86]

These are but a few state-led initiatives leveraging DPGs that have enhanced government-citizen engagement and facilitated ease of governance and business operations. Shared tech infrastructure and breaking data silos have enabled these initiatives to form multi-stakeholder ecosystems, driving economic, societal, and governance impact across different areas.[87] The low-cost inclusive digitalization at scale in India, supported by the government's phantomization strategy of DPGs, has paved the way for expanding and adopting Indian platforms globally. This showcases the country's commitment to inclusive global growth through the digital innovation potential of open digital ecosystems in India's digital transformation journey. Statistics highlight that open digital ecosystems can unlock significant opportunities for the country, estimated to be worth $700 billion by 2030.[88]

While India has made significant strides in leveraging DPGs through state-led initiatives, challenges are associated with their effective utilization. Specifically observed during the implementation of the COVID-19 vaccine using CoWIN were issues related to access, connectivity, and digital literacy.[89] These challenges can hinder the effective implementation and utilization of digital solutions. Additionally, the security and privacy of digital public infrastructure were crucial in successfully utilizing the DPG. Ownership of software and intellectual property, leading to complexities in managing vendors and ensuring software availability as a public good, was observed as a challenge. This, along with the need to avoid vendor lock-ins in software procurements when building DPI.[90] These challenges primarily highlight the importance of addressing issues related to software ownership, vendor management and ensuring that digital solutions can be effectively utilized as public goods.[91]

6.2 DPGs in Africa

Investments in DPGs in Africa have risen, highlighting their relevance in the continent's rapid digital transformation and economic growth. The adaptable nature of DPGs, combined with advancements in digital infrastructure, presents opportunities to

[84] 'What is Aadhar?' https://www.uidai.gov.in/en/16-english-uk/aapka-aadhaar/14-what-is-aadhaar.html

[85] 'UPI: Revolutionizing Real-Time Digital Payments in India.' (European Payments Council, 2024) https://www.europeanpaymentscouncil.eu/news-insights/insight/upi-revolutionising-real-time-digital-payments-india#:~:text=UPI%20is%20India's%20popular%20mobile,transactions%20in%20May%202024%20alone. accessed 11 October 2024

[86] 'Digital Public Goods' (Drshtiias.com, December 2021) <https://www.drishtiias.com/daily-news-editorials/digital-public-goods> accessed 4 June 2024.

[87] Digital India: Digital Public Goods Phantomization Play (2021) <https://nasscom.in/knowledge-center/publications/digital-india-digital-public-goods-platformisation-play> accessed 4 June 2024

[88] ibid

[89] 'Building Digital Public Goods: Takeaways from India's COVID-19 Vaccine Implementation Programme.' (UNDP,2022) <https://www.undp.org/digital/blog/building-digital-public-goods-takeaways-indias-covid-19-vaccine-implementation-programme> accessed 11 October 2024.

[90] The vendor lock-in describes a situation where customers are dependent (i.e. locked-in) on a single cloud provider technology implementation and cannot easily move in the future to a different vendor without substantial costs, legal constraints, or technical incompatibilities

[91] 'Building Digital Public Goods: Takeaways from India's COVID-19 Vaccine Implementation Programme' (UNDP, August 2022) <https://www.undp.org/digital/blog/building-digital-public-goods-takeaways-indias-covid-19-vaccine-implementation-programme> accessed 11 October 2024

address social issues. Specific domains in Africa, like healthcare, have already seen impactful contributions from DPGs, with innovations such as drone-based medical deliveries and ATM medicine dispensaries showcasing the potential for positive change.[92] Drone-based medical deliveries, for example, have grown in Malawi, Ghana, and Rwanda. This was primarily propelled by the need to improve patient healthcare and access to healthcare services in areas with inadequate infrastructural facilities and resources for service delivery. [93]

The growing startup ecosystem in Africa, supported by investments from global companies, is driving technological advancements and the adoption of DPGs across various sectors, fostering innovation and economic development. However, there is a recognized need for capacity building to ensure the successful introduction and sustainability of DPG initiatives, with a focus on training a technically competent workforce, including women and individuals in underserved areas, to maximize the long-term benefits of DPG investments in Africa.[94]

In Africa, government-led support has been essential in the development of locally developed digital public goods solutions, as seen in Niger, where the government has led efforts in supporting DPGs in health and education

In Africa, government-led support has been essential in the development of locally developed digital public goods solutions, as seen in Niger, where the government has led efforts in supporting DPGs in health and education. This has been through supporting the establishment of the African Drone and Data Academy (ADDA) and a curriculum module specific to the needs in the Sahel region. The aim is to create a trained workforce in drone operations to support public health initiatives, climate change adaptation and mitigation, strategies for technical and vocational training and education as well as national civil aviation strategies[95]

Additionally, organizations such as UNICEF have

[92]Ananyananda Dasari, Veda T Woods, Kamil Zakari, Renee Forney, Assane Gueye, and Conrad Tucker, 'West African Conference on Digital Public Goods and Cyber Security. (Cambridge , 2023)<https://www.cambridge.org/engage/api-gateway/coe/assets/orp/resource/item/630b949e0c52773a3cc5fae7/original/west-africa-conference-on-digital-public-goods-and-cybersecurity.pdf> accessed

[93]Edwin Ambani Ameso, Gift Mwonzora, 'Medical Drones in Africa: A Gamechanger for the Continent's 'Ailing' Health Sector.' (European Association for Development Research and Training Institution,2024) <https://www.developmentresearch.eu/?p=1800> accessed 10th June 2024

[94]ibid

[95]UNICEF, 'Niger: Empowering Young People Through Health and Climate Programs (*Unicef.org 2 September 2022*) <https://www.unicef.org/innovation/dpg-pathfinding-countries/niger> accessed 6 June 2024

identified Ghana as the home of West Africa's first DPGs through its Pathfinders project.[96] Since the inception of the Startup Lab in 2021, which functions as an incubator for DPGs by supporting startups that have already developed open source and offering training to those interested in open source, various capacity-building, discovery and development initiatives have been facilitated. This has led to the discovery and development of digital public goods such as Bisa App for health, EduNoss for education, and one still in the nomination stages, as well as consideration for DPG status, i.e. Project Konko.[97] These digital public goods are discussed in further detail below.

EduNoss, the first registered DPG in Ghana, is an education-based platform that provides pre-tertiary schools with a platform to support STEM learning and innovative solutions to promote national development.[98] This platform has been adopted by several schools in Ghana as a preferred operating system for STEM education and noted in the Government's Budget Statement of 2022 as a potential tool in meeting sustainable development goal 4 on quality education in West Africa.[99]

Bisa App is a mobile application that allows patients in Ghana to communicate with relevant healthcare professionals and receive information through mobile devices.[100] The application was mainly utilized during the COVID-19 pandemic and is now being utilized to the advantage of persons who need medical advice but are unable to visit the hospital either due to high costs, wait time or the fear of stigmatization.[101] On the other hand, Project Konko, still at its nomination stage, is a virtual reality lesson creator aimed at providing an aggregate toolkit to publish and manipulate 2D content, 360 video content, and 3D objects into virtual learning environments and assess learning outcomes.[102] This project is noted to have the potential of being integrated with open-source e-learning management systems, allowing educators to have tools that keep track of learning and school records.[103]

Ghana further notes a need to support the advocacy and discovery of DPGs among entrepreneurs and startups, including the availability of DPGA open-source licensing training, technical assistance during the nomination process, and availability of financial support for open-source developers.[104] This was noted through a training session in 2021 by Startup Lab, where 22 companies were being trained, and they noted knowledge gaps and limitations preventing them from applying as DPGs.[105]

The case studies note the potential of DPGs to impact socio-economic development in Africa by offering creative solutions to address crucial issues in healthcare, education, governance, and other areas. These have especially been demonstrated through the uptake of DPGs in countries like Ghana. Togo and Uganda are equally demonstrating a scaling of DPGs through the anticipated roll out of the Modular Open-Source Identity Platform (MOSIP).[106] MOSIP is a classified DPG as it is an open-source platform that offers countries modular and open-source technology to build and own their national identity systems.[107]

Despite challenges linked to limited infrastructure, capacity building and scalability, especially with startups, a collaborative approach and customized strategies built on capacity building can create

[96] Chris Szymczak, 'Ghana, Home to Some of West Africa's First.'DPGs (UNICEF, 1 December 2021) <https://www.unicef.org/innovation/stories/ghana-home-some-west-africas-first-dpgs> accessed 6 June 2024

[97] ibid

[98] 'Edu Noss Installation.' <https://noss.com.gh/guide/> accessed 6 June 2024

[99] Chris Szymczak, Ghana, Home to Some of West Africa's First.'DPGs (UNICEF, 1 December 2021) <https://www.unicef.org/innovation/stories/ghana-home-some-west-africas-first-dpgs> accessed 6 June 2024

[100] 'Bisa Health.' <https://digitalpublicgoods.net/registry/bisa-health.html> accessed 6 June 2024

[101] ibid

[102] ibid

[103] ibid

[104] UNICEF, 'Ghana: Catalyzing Innovation Ecosystems Through Impactful Collaborations.' (*Unicef.org, 2 September 2022*)https://www.unicef.org/innovation/dpg-pathfinding-countries/ghana accessed 22 January 2024

[105] ibid

[106] 'State of Digital Public Goods Ecosystem 2023.' (Digital Public Goods Alliance, 2023) <https://digitalpublicgoods.net/DPG-Ecosystem-2023.pdf> accessed 14 October 2024

[107] 'Mosip- A Digital Public Good for Identity.' <https://mosip.io/#1> accessed 14th October 2024

more opportunities and enhance the use of DPGs beyond Ghana. Knowledge sharing on identifying DPGs and financial investment for local open-source developers will further enable DPGs in the continent with consideration of local needs, effectively creating an environment for ownership and direct impact.

7.0 Lessons and Recommendations

7.1 Lessons from India

India has been used as a prime example for leveraging DPGs owing to their observable high uptake of DPGs and investment in building DPI. Notably, the uptake has been propelled due to state - led initiatives. This is especially significant as state led initiatives carry legitimacy, building trust in the digital solutions being used and advancing informed implementation channels.

The uptake on India's digital public goods has also made it necessary to establish interoperability standards for seamless integration and data sharing, limiting fragmentation of data.[108] This is reflected through the Unified Payment System (UPI) as well as the Aadhar Systems. Most significantly India's DPI is quite robust, characterised by India Stack, which represents the three core layers through which digital solutions are used and leveraged, and highlights the benefits of interoperability and data sharing across the different layers. The layers include the identity layer, payments layer and data layer. Collectively this structured system has allowed for the continued upscale of DPGs due to the levels of efficiency.[109]

Consequently, African nations can borrow elements from the implementation and adoption of DPGs by considering:

- Government commitment: Digital public goods are noted to bring efficiency and effectiveness in offering public services particularly as they relate to public goods i.e. health. Strong government commitment to leveraging digital solutions not only builds public trust but also aids in the effective implementation process and ultimately leads to a positive impact.

- Regulatory mechanisms: Just as India has developed interoperability standards which are key in ensuring seamless use of DPGs, relevant regulatory mechanisms must equally be set up. Data protection laws inform the protection of personal data often used in DPGs. Just as the continent has common standards with the Malabo Convention on data protection, common interoperability standards will better facilitate uptake of DPGs in African countries, not only at the regional level but also national levels. However, it is important to note that at the continental level, the significance of cross - border data transfer comes into play.

- Investment in Digital Public Infrastructure: DPI is the backbone of leveraging DPGs, as a set of shared digital building blocks powered by interoperable open standards or specifications. Investing in these digital blocks will be especially significant in leveraging DPGs. The DPI is built upon three core pillars: Digital Identity Systems, Digital Payment Systems, and ICT Infrastructure.[110]Kenya for instance, can consider Mpesa as part of its set of digital building blocks. Continued investment in building the other layers will better facilitate the uptake of DPGs with the rationale being considered not only in Kenya but across African Countries.

7.2 Recommendations

The recommendations presented below reflect

[108]Cristian Alonso, Tanuj Bhojwani, Emine Hanedar, Dinar Prihardini, Gerardo Uña, and Kateryna Zhabska, 'Stacking up the Benefits: Lessons from India's Digital Journey' (International Monetary Fund 2023) vol 2023, no 078, ISBN 9798400240416, ISSN 1018-5941<https://www.elibrary.imf.org/view/journals/001/2023/078/article-A001-en.xml> accessed 10 November 2024

[109]ibid

[110]'Kenya's Digital Public Infrastructure: Paving the Way for Socio-Economic Transformation.' (DPI Africa, 2024) <https://dpi.africa.com/kenyas-digital-public-infrastructure-an-overview/ accessed November 10, 2024

different stakeholders' role in advancing DPGs and building the DPI aimed towards impacting socio-economic development in Africa. Further, the recommendations are guided by the findings and the need for a collaborative approach to create an ecosystem that considers distinctive roles in policy support, investment in infrastructure, collaboration, capacity building, and advocacy to deploy DPGs across various sectors effectively.

Government:

- Policy Support: Governments should create policies and regulatory frameworks that promote the development and use of DPGs in key sectors like healthcare, education, and agriculture. This can include incentives for creating DPGs and support for their integration into public services. Additionally, policies on open-source data supplemented by laws and policies on data security and privacy must be implemented to build public trust.
- Investment in Infrastructure: As seen in India, government investments and buy-in have a bigger impact on the extent to which DPGs can be leveraged. Allocating resources to build DPIs that support DPGs must be a budgetary priority. This will holistically include investing in broadband connectivity, digital identification systems, and e-government platforms to enhance access to public services and drive socio-economic development.
- Collaboration: Foster partnerships with international organizations and other stakeholders to promote the accreditation and sharing of digital initiatives such as DPGs. Additionally, collaborations with private sectors through Public Private Partnerships (PPPs) can be instrumental in not only leveraging funds for DPGs but in further scaling up already existing ones that are solution based and tailored to African needs. Collaborative efforts can drive the development and utilization of digital infrastructure for sustainable development.

Private Sector Users and Industry Players:

- Innovation: Industry players should develop innovative digital solutions that qualify as digital public goods. By creating open-source software, data, AI systems, and content collections that adhere to privacy and other best practices, industry players can contribute to addressing global challenges and achieving the SDGs.
- Partnerships: Collaborate with governments, NGOs, and other stakeholders to co-create and deploy digital solutions that can be classified as DPGs. Industry players can leverage their expertise and resources to drive socio-economic development through digital technologies by working together.
- Adoption: Private sector users should actively adopt and utilize DPGs in their operations, contextualizing use for local needs and solutions. By incorporating DPGs into their business processes, they can benefit from increased efficiency, innovation, and transparency and provide platforms through which governments can further leverage services working in collaboration towards advancing socio-economic development.
- Capacity Building: Scalability is an important component of DPGs' sustainability and life cycle. Investing in training capacity-building programs not just at organizational levels but also at community levels promotes the development of knowledge skills, thereby enhancing the understanding of digital public goods to maximize their socio-economic benefits and drive sustainable growth.
- Collaboration with grassroots organizations/communities: Collaboration with grassroots organizations and communities will likely inform needs that have to be addressed in identifying DPGs as a solution. This is likely to bridge the knowledge gap that may exist and enhance further collaboration with start-ups that will help the utilization of DPGs in key areas such as education, health and agriculture, leading to a cost-benefit in certain areas as well as promoting localization.

Civil Society Organizations:

- Advocacy: Civil society organizations can advocate for the importance of DPGs in addressing socio-economic issues by identifying needs, challenges, and gaps in promoting inclusive development. By raising awareness and promoting the adoption of DPGs, they can drive positive changes in their communities.
- Collaboration: Collaboration, especially with the government, is key in ensuring adequate access to DPGs, especially for marginalized communities. Together with other stakeholders, i.e. industry players, it will be possible to create a channel through which communities can co-create and implement digital solutions that benefit society. By working together, civil society organizations can leverage their networks and expertise to maximize the impact of DPGs on socio-economic development.
- Accountability: One of the primary roles of civil society organizations is to hold stakeholders accountable. This is mainly in terms of accessibility to DPGs, data privacy and user security, platform accountability, and identifying challenges, gaps, and opportunities in utilizing DPGs. Socio-economic development is fundamental not only nationally but also individually and is key to exercising social and economic rights.
- Community-based capacity building: Marginalized communities who are often left out in the use of digital technologies can significantly benefit from capacity-building initiatives aimed at ensuring accessibility and understanding of the types of DPGs in use as well as any risks relating to the use of data, ensuring that community members are not inadvertently disenfranchised.

8.0 Conclusion

In conclusion, the argument for leveraging DPGs for socio-economic development in Africa is marked by both opportunities and challenges. The potential of DPGs to drive positive impact in areas such as healthcare, education, and governance is evident, offering innovative solutions to address pressing societal needs. This, however, is not without challenges identified in relation to infrastructure limitations, data privacy and security concerns, which pose significant barriers to the effective implementation and governance of DPG initiatives in Africa. Addressing these challenges requires a multi-faceted approach that involves securing funding, enhancing technical support, promoting interoperability, and building strong institutional frameworks.

Despite these challenges, the transformative potential of DPGs in fostering inclusive, resilient, and thriving communities cannot be understated. African nations can harness the power of DPGs to drive socio-economic development, improve public service delivery, and empower marginalized populations. Therefore, it is essential to remain guided by user-centric design principles, scalability, data-driven decision-making, and collaboration among stakeholders with the mindset of utilizing DPGs as catalysts for positive change and sustainable development across the continent.

This study was made possible by a grant provided by the William and Flora Hewlett Foundation. We thank the organization for their continued support.