

## **An Inclusive Infrastructure, Industrialization and Innovation: A SDG 9 Goal for Uganda**

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## Abstract

This article examines the importance of inclusive infrastructure, industry, and innovation in attaining Sustainable Development Goal 9 (SDG 9) in Uganda and the significance of infrastructure development in promoting economic growth and sustainable industrialization, specifically by improving innovation and technical progress. The study seeks to examine the importance of an all-encompassing infrastructure, industry, and innovation in attaining Sustainable Development Goal (SDG) Goal 9 in Uganda. The research examines the distinct obstacles and prospects that Uganda has in attaining SDG 9, taking into account elements such as investments in transportation, energy, and information and communication technology.

SDG 9 focuses on constructing robust infrastructure, advancing inclusive and sustainable industry, and nurturing innovation. The report examines the precise difficulties encountered by Uganda in these domains and offers evidence-based suggestions to tackle them. This study provides a comprehensive examination of the contemporary condition of infrastructure, industry, and innovation in Uganda, using a variety of reliable print sources such as encyclopedias, nonfiction books, academic journals, and dictionaries. This research explores the possible advantages that inclusive infrastructure, industry, and innovation might provide to Uganda's sustainable development agenda through the adoption of a descriptive survey design. It analyzes the country's economic situation, technology breakthroughs, legislative frameworks, and social dynamics to identify these benefits.

Moreover, it examines the possible influence of inclusive industrialization on the creation of jobs, the production of money, and overall socio-economic progress. The report also examines the policy implications and provides ideas for fostering inclusive infrastructure, industry, and innovation to further the progress of SDG 9 in Uganda.

Keywords: SDGs goal 9, Inclusive infrastructure, Uganda SDG, Uganda Industrialization, Sustainable Development in Uganda

## 1. Introduction

The human generation is now living in an era that is characterized by fast technological developments and environmental difficulties, it is more important than ever before to construct robust infrastructure, support industrialization that is both inclusive and sustainable, and to encourage innovation. This all-encompassing strategy is not just a means to achieve economic success; it is also necessary for achieving sustainable development and improving the well-being of communities all over the globe. In particular, in developing nations such as Uganda, there should be an increase in the availability of financial services, especially lending at reasonable rates, for small-scale industrial and other businesses.

Uganda, a landlocked country in East Africa has been making notable progress in attaining the Sustainable Development Goals (SDGs) established by the United Nations. Specifically, the government has placed significant importance on SDG Goal 9, which centers upon the development of robust infrastructure, the advancement of inclusive and sustainable industry, and the cultivation of innovation. Uganda's development hinges on achieving this aim, since it establishes the basis for economic expansion, employment opportunities, and improving living conditions (Motlagh, 2021).

The article "An Inclusive Infrastructure, Industrialization, and Innovation: A SDG 9 Goal for Uganda" focuses on the significance of reaching Sustainable Development Goal 9 (SDG 9) in Uganda. The ninth Sustainable Development Goal (SDG) seeks to inspire and foster innovation, encourage fair and sustainable industrial development, and build resilient infrastructure. This paper will examine the significance of an all-encompassing infrastructure, industry, and innovation for Uganda's advancement, as well as provide strategies for the nation to attain these goals.

As the SDG Goal 9 objective is to create an infrastructure that is of high quality, dependable, sustainable, and resilient at both regional and transnational infrastructure. The program's SDGs goal 9 also aims to promote economic growth and human well-being, with a particular emphasis on providing affordable and equal access to all individuals. In addition to this, it intends to encourage industrialization that is both inclusive and sustainable, and by the year 2030, it will greatly increase the industrial sector contributes significantly to both employment and the gross domestic product (GDP), following the conditions of the country, and it will double its share in the least developed nations 21. There is an expectation that SDG Goal 9 will play a significant part in the introduction and promotion of new technologies, the facilitation of international commerce, and the efficient use of resources.

Infrastructure, industrialization, and innovation are intertwined and play a critical role in a country's development. Infrastructure, which includes roads, energy, telecommunications, and water supply, forms the backbone of any economy such as Uganda. It provides the necessary support for industries to thrive and drives innovation. Without proper infrastructure, businesses cannot grow, and economic development remains stunted. This is especially true for a country like Uganda, where insufficient infrastructure in rural areas has hindered the growth of industries and access to services for most of the population (Kuznetsova, 2022).

The achievement of this objective is essential for the expansion and development of Uganda's economy, as it creates the groundwork for a society that is both sustainable and welcoming to everyone. Creating job opportunities, increasing productivity, and improving the general quality of life for Uganda's population are all things that may be accomplished via the implementation of initiatives such as investing in the development of infrastructure, boosting industry, and encouraging innovation. Additionally, these businesses should be integrated into value chains and marketplaces. Moreover, it is to support the development of the advancement of technology, research, and innovation in developing nations. This includes providing a policy climate that is favorable to, among other things, the diversification of industries and the addition of value to commodities.

Improving infrastructure, industrialization, and innovation is important to spur economic growth and development in any country globally. SDG 9 was established to improve infrastructures, promote industrialization, and improve research and innovation globally (United Nations, 2023).

### Study Objectives

The study aims to link the current state of infrastructure, industrialization, and innovation in Uganda to achieving SDG Goal 9, identify the challenges and opportunities in these sectors, and propose strategies for promoting inclusive growth and sustainable development. Other objectives include the following;

- a) To examine the impact of growing populations on the volume of air transportation passengers in Uganda
- b) To examine the effect of manufacturing value added on the GDP growth in the least developed nations.
- c) To establish the relationship between overall employment and employment in the manufacturing sector in the least developed countries
- d) To examine the effect of research and development expenditure on GDP growth globally.
- e) To determine the impact of government development aid received on the economic development growth of the least developed nations.
- f) To establish the effect of official development assistance received on GDP growth in Sub-Saharan Africa.
- g) To examine the relationship between population growth and mobile cellular subscriptions in the least developed countries.

## 2. Literature Review

The United Nations has established the Sustainable Development Goals (SDGs) with the objective of tackling worldwide issues such as poverty, inequality, and environmental degradation. SDG Goal 9 is centered on the development of robust infrastructure, the advancement of inclusive and sustainable industrialization, and the encouragement of innovation.. This literature review seeks to explore the significance of achieving SDG 9 in the context of Uganda, with a focus on inclusive infrastructure, industrialization, and innovation (Onyilo & Adong, 2019). Uganda, like a great number of other developing nations, is confronted with tremendous problems in the development of its infrastructure. The insufficient energy systems, transportation networks, and information and communication technologies all work together to impede the expansion of the economy and the enhancement of social development. The lack of adequate infrastructure in Uganda has been a significant barrier to the country's progress toward industrialization and economic development, as stated by Mawejje and Bategeka (2018).

The need for equitable infrastructure, industry, and innovation has been amplified in light of the COVID-19 epidemic. The epidemic has shown the susceptibility of nations with insufficient infrastructure and underscored the need to allocate resources to these domains. An example of this is the absence of a dependable electricity source, which has posed challenges for hospitals and healthcare institutions in operating efficiently, impeding the country's ability to effectively address the epidemic. Moreover, the implementation of border closures and the disruption of global supply chains have had a detrimental impact on Uganda's industrial sector, resulting in a decrease in economic development.

To tackle these obstacles and accomplish Sustainable Development Goal 9, Uganda has established a National Development Plan (NDP) III, which focuses on constructing a robust and enduring economy via the advancement of infrastructure and industrialization. The objective of the strategy is to enhance infrastructure investments, stimulate industry, and leverage innovation to foster economic expansion. The recognition of the need for inclusive development is evident, with a particular emphasis on narrowing the gap between rural and urban areas and advancing gender equality (Behuria, 2021).

The paper underlines the importance of inclusive infrastructure that is accessible to all parts of the population, particularly in rural regions where access to fundamental services is needed. The process of industrialization plays a significant part in both the expansion of the economy and the generation of job possibilities. On the other hand, in comparison to its potential, Uganda's industrial sector has been modestly undeveloped. Within the scope of this paper, Othieno et al. (2017) emphasize the significance of sustainable industrialization that fosters the addition of value, the progress of technology, and the creation of employment opportunities. They contend that inclusive industrialization tactics are necessary for lowering the prevalence of poverty and fostering shared wealth among the many socioeconomic groupings that exist in Uganda.

Innovation is a key driver of sustainable development and economic diversification. The integration of new technologies and innovative practices can enhance productivity and competitiveness across various sectors. Kiggundu (2019) underscores the significance of fostering a culture of innovation in Uganda's development agenda. The author emphasizes the need for policies that support research and development, entrepreneurship, and knowledge transfer to spur technological innovation and adaptation. To achieve SDG Goal 9 in Uganda, it is imperative to address the interlinkages between infrastructure development, industrialization, and innovation. As highlighted by Ssewanyana et al. (2020), a holistic approach that integrates these components is essential for promoting sustainable development outcomes. The paper stresses the importance of policy coherence and investment in critical infrastructure sectors to enable inclusive industrialization and technological advancement.

Significantly, achieving SDG 9 in Uganda requires concerted efforts to develop inclusive infrastructure, promote sustainable industrialization, and foster innovation. Addressing these interconnected goals is crucial for advancing economic transformation, reducing inequalities, and enhancing overall well-being in Uganda.

## 2.2 Study Hypothesis

The hypothesis of the study titled "An Inclusive Infrastructure, Industrialization, and Innovation: A SDG 9 Goal for Uganda" posits that by prioritizing inclusive infrastructure development, industrialization, and innovation, Uganda can attain sustainable economic growth, generate employment opportunities, and foster technological progress. The objective of the study is to examine the potential influence of investing in infrastructure, promoting industrialization, and fostering innovation on Uganda's advancement towards Sustainable Development Goal 9 which focuses on constructing resilient infrastructure, encouraging inclusive and sustainable industrialization, and fostering innovation. The null hypotheses below were used to answer the specific objectives of the study;

Ho<sub>1</sub>: Population growth has no significant effect on the number of passengers carried by air transport in Uganda

Ho<sub>2</sub>: Manufacturing value added has no significant effect on GDP growth in the least developed countries

Ho<sub>3</sub>: Overall employment is not significantly related to employment in the manufacturing sector in the least developed countries

Ho<sub>4</sub>: Research and development expenditure has no significant effect on GDP growth globally.

Ho<sub>5</sub>: Official development assistance received has no significant effect on GDP growth in the least developed countries

Ho<sub>6</sub>: Official development assistance received has no significant effect on GDP growth in Sub-Saharan Africa

Ho<sub>7</sub>: Population growth has no significant relationship with mobile cellular subscriptions in the least developed countries

### 3. Methodology

The study adopted a descriptive survey design to identify the gaps and challenges faced in achieving SDG Goal 9 targets through quantitative approaches. A descriptive survey is a research methodology used to collect data on the distinctive attributes, viewpoints, or actions of a particular community (Pandey, P., & Pandey, M. M. 2021). Its objective is to provide a comprehensive description and analysis of the present condition of certain phenomena. Within the framework of "An Inclusive Infrastructure, Industrialization, and Innovation: A SDG 9 Goal for Uganda," a descriptive survey would entail gathering data to comprehend the current state of infrastructure, industrialization, and innovation in Uganda, with a specific emphasis on attaining Sustainable Development Goal 9. The descriptive design was preferred because the study involved descriptive, correlation, and regression analysis. The study used secondary data obtained from the World Bank development indicators of 2023. The data was openly accessed from the website of the World Bank (link: <https://data.worldbank.org/indicator>). The analysis involved descriptive analysis, correlation, and regression analysis. The variables that were normally distributed involved the use of parametric tests of correlation and regression analysis. Meanwhile, variables that were not normally distributed involved the use of non-parametric tests of correlation and regression analysis.

#### 3.1 Results and Findings

For Uganda to achieve Sustainable Development Goal 9, it is essential to have an inclusive infrastructure, along with industry and innovation. The objective of SDG 9 is to provide robust infrastructure, encourage inclusive and sustainable industrial development, and stimulate innovation (Du et al., 2023). This objective acknowledges the significance of enhancing infrastructure,

promoting industry, and fostering innovation as key drivers of economic expansion, job creation, and the enhancement of living conditions. Uganda, similar to several other emerging nations, confronts obstacles to insufficient infrastructure and restricted industrialization. Inadequate infrastructure impedes economic progress by restricting the availability of essential amenities such as power, transportation, and communication. Lack of industrialization hampers the ability to create jobs and diversify the economy. Nevertheless, by prioritizing an all-encompassing strategy that guarantees the involvement of every sector of the population, Uganda may surmount these obstacles and attain Sustainable Development Goal 9.

Infrastructure investment is a crucial measure in Uganda to accomplish SDG 9. Infrastructure development includes the building of transportation networks such as roads, railroads, airports, ports, and energy infrastructure. These investments not only raise the level of connectivity inside the nation but also contribute to the improvement of regional integration and commerce. Moreover, allocating resources towards renewable energy sources may effectively tackle Uganda's energy shortfall while also fostering sustainability. Consequently, Industrialization is a crucial mechanism for fostering economic growth and advancement for driving economic development and generating employment opportunities (Hossin & Hossain, 2023). It also contributes considerably to the economy of Uganda by generating job opportunities and fostering growth.

Uganda may expand its economy beyond agriculture and extractive sectors by actively fostering inclusive and sustainable industrialization. This may be accomplished by creating designated areas for economic activity, encouraging the growth of small and medium-sized businesses, and fostering the expansion of interconnected production processes. Inclusive industrialization guarantees equitable access for excluded groups, such as women and youth, to engage in economic endeavors. SDG Goal 9 places significant emphasis on innovation. Adopting technological progress and promoting innovation may result in heightened productivity, effectiveness, and competitiveness. In Uganda, the promotion of innovation may be achieved by investing in research and development (R&D), implementing capacity-building initiatives, and establishing a conducive climate for entrepreneurship (Mohan, 2023). Supporting and empowering local inventors and businesses is essential to use the promise of technology for sustainable development.

Significantly, the attainment of SDG 9 in Uganda necessitates the presence of an all-encompassing infrastructure, industry, and innovation. Uganda can overcome its obstacles and achieve a wealthy and sustainable future by making investments in infrastructural development, encouraging inclusive and sustainable industrialization, and stimulating innovation. The results section presents the descriptive, normality, correlation, and regression analysis.

### 3.2 Descriptive and Normality Test

The descriptive and normality tests are presented in Table 1.

Table 1: Descriptive And Normality Test

| Variables  | N | Minimum | Maximum | Mean  | Normality test (P-value) |
|--|---|---------|---------|-------|--------------------------|
| Population of Uganda from 2015 to 2020 (in Millions) | 6 | 37.48   | 44.40   | 40.87 | .961                     |
| Passengers carried by Air                            | 6 | 6159    | 52187   | 26025 | .264                     |

|   |   |                    |                    |                    |      |
|---|---|--------------------|--------------------|--------------------|------|
| transport in Uganda from 2015 to 2020   |   |                    |                    |                    |      |
| Manufacturing value added in LDC from 2015 to 2021 (% of GDP)                                       | 7 | 10.79              | 14.91              | 13.36              | .665 |
| Employment in industry in LDC from 2015 to 2019 (% of total employment)                             | 5 | 12.34              | 12.62              | 12.45              | .279 |
| World research and development expenditure from 2015 to 2020 (% of GDP)                             | 6 | 2.10               | 2.63               | 2.25               | .239 |
| Net official development assistance received in LDC from 2015 to 2019 (current US\$)                | 5 | 43434439<br>846.04 | 556967600<br>66.99 | 49103597914.5<br>1 | .291 |
| Net official development assistance received in Sub Saharan Africa from 2015 to 2020 (current US\$) | 6 | 44277760<br>107.99 | 668378800<br>19.19 | 51557788245.6<br>0 | .411 |
| Mobile cellular subscriptions in LDC from 2015 to 2020  | 6 | 63539432<br>4      | 814058923          | 702184197.83       | .083 |
| Population in LDC from 2015 to 2021 (Million)   | 7 | 951.93             | 1099.57            | 1024.50            | .966 |
| GDP growth in Sub-Saharan Africa from 2015 to 2021 (annual %)                                       | 7 | -2.00              | 4.14               | 2.00               | .061 |
| GDP growth in LDC from 2015 to 2021 (annual %)  | 7 | .68                | 4.86               | 3.23               | .182 |
| World GDP growth from 2015 to 2021 (annual %)   | 7 | -3.12              | 5.87               | 2.56               | .718 |
| Employment in LDC from 2015 to 2021 (% of total population)   | 7 | 61.37              | 63.81              | 63.05              | .609 |

Source: World Bank (2023)

The findings from Table 1 reveal that all the variables were normally distributed since their p-values were above 0.05 level of significance. This indicates that parametric tests for correlation and regression analysis were performed.

### 3.3 Examining the effect of population growth on the number of passengers carried by air transport in Uganda

The first target indicator of SDG 9 was to improve infrastructure to enhance economic development. Therefore, this study examines the effect of population growth on the number of passengers carried by air transport in Uganda. The findings are presented in Table 2 using Poisson regression.



Table 2: Poisson Regression model examining the effect of population growth on the number of passengers carried by air transport in Uganda

```

. poisson UgandaAirtransportpassenger Uganda_PopninMillions, irr

Iteration 0:  log likelihood = -8604.9013
Iteration 1:  log likelihood = -8604.8597
Iteration 2:  log likelihood = -8604.8597

Poisson regression              Number of obs   =           6
                                LR chi2(1)        =       41340.85
                                Prob > chi2         =         0.0000
                                Pseudo R2          =         0.7061

Log likelihood = -8604.8597
    
```

| UgandaAirtransportpassenger | IRR      | Std. Err. | z       | P> z  | [95% Conf. Interval] |          |
|-----------------------------|----------|-----------|---------|-------|----------------------|----------|
| Uganda_PopninMillions       | .7954484 | .0009403  | -193.59 | 0.000 | .7936075             | .7972936 |
| _cons                       | 2.61e+08 | 1.22e+07  | 412.59  | 0.000 | 2.38e+08             | 2.86e+08 |

Source: World Bank (2023)

The findings from the Poisson regression reveal that population growth has a negative and significant effect on the number of passengers carried by air transport in Uganda from 2015 to 202 (IRR=0.795, P-value (0.000) <0.05). It is evident that as the population increased, the number of passengers carried by air transport in Uganda was likely to reduce from 2015 to 2020. This is an indication that there was a decline in the number of passengers carried by air transport in Uganda from 2015 to 2020 which is not consistent with the recommendation of SDG 9.

### 3.4 The effect of manufacturing value added on GDP growth in the least developed countries

The second attempt of the study was to examine the contribution of the industrial sector to GDP growth in the least developed countries. Thus, the examines the effect of the manufacturing value added on GDP growth in LDC from 2015 to 2021. The findings are presented in Table 3 using linear regression.

Table 3: Linear regression findings of the effect of manufacturing value added on GDP growth in the least developed countries

```

. regress GDPgrowthinLDCannual LDCManufacturingvalueadded

Source |           SS          df          MS          Number of obs   =           7
-----+-----+-----+-----+-----+-----
Model |   .268288857          1   .268288857          F(1, 5)         =           0.09
Residual |  14.4610558          5   2.89221116          Prob > F         =           0.7730
-----+-----+-----+-----+-----
Total |  14.7293447          6   2.45489078          R-squared        =           0.0182
                                           Adj R-squared    =          -0.1781
                                           Root MSE        =           1.7007
    
```

| GDPgrowthinLDCannual       | Coef.     | Std. Err. | t     | P> t  | [95% Conf. Interval] |          |
|----------------------------|-----------|-----------|-------|-------|----------------------|----------|
| LDCManufacturingvalueadded | -.1407322 | .4620694  | -0.30 | 0.773 | -1.328519            | 1.047055 |
| _cons                      | 5.106656  | 6.206504  | 0.82  | 0.448 | -10.84767            | 21.06098 |

Source: World Bank (2023)

The findings in Table 3 reveal that manufacturing value added had no significant effect on GDP growth in LDC (P-value (0.773) >0.05). This indicates that GDP growth in LDC is not dependent on manufacturing value addition. However, it is observed that growth in manufacturing value added was associated with a reduction in GDP growth in LDC from 2015 to 2021. The findings are not consistent with the recommendations from SDG 9.

### 3.5 Relationship between overall employment and employment in the manufacturing sector in the least developed countries

SDG 9 calls for improved employment in the manufacturing sector in the least developed countries. Therefore, the study examined the association between overall employment and employment in the manufacturing sector in the least developed countries. The findings are presented in Table 4 using Pearson's correlation test.

Table 4: Pearson's Correlation between overall employment and employment in the manufacturing sector in the least developed countries from 2015 to 2019

|   |                     | Employment in the manufacturing sector in LDC | Overall employment in LDC |
|---|---------------------|---|---------------------------|
| Employment in the manufacturing sector in LDC | Pearson Correlation | 1   | .307                      |
|   | Sig. (2-tailed)     |   | .616                      |
|   | N                   | 5   | 5                         |
| Overall employment in LDC                     | Pearson Correlation | .307  | 1                         |
|   | Sig. (2-tailed)     | .616  |                           |
|   | N                   | 5   | 7                         |

Source: World Bank (2023)

The findings in Table 4 reveal that overall employment had a positive and non-significant relationship with employment in the manufacturing sector in the least developed countries from 2015 to 2019. However, the findings show that as employment in the manufacturing sector increases, overall employment increases in LDC. This may imply that employment in the manufacturing sector has increased in LDC which is in agreement with the targets of SDG 9.

### 3.6 The effect of research and development expenditure on GDP growth globally

The indicators of SDG 9 recommend the improvement in innovation globally which is driven by research and development expenditure. Thus, the study examines the effect of research and development expenditure on GDP growth globally. The findings are presented in table 5 using linear regression at a 5% significance level.

Table 5: Linear regression findings of the effect of research and development expenditure on GDP growth globally from 2015 to 2020

. regress WorldGDPgrowthannual worldResearchanddevelopment

| Source   | SS         | df | MS         | Number of obs | = | 6      |
|----------|------------|----|------------|---------------|---|--------|
| Model    | 27.7894139 | 1  | 27.7894139 | F(1, 4)       | = | 27.08  |
| Residual | 4.10462785 | 4  | 1.02615696 | Prob > F      | = | 0.0065 |
| Total    | 31.8940417 | 5  | 6.37880834 | R-squared     | = | 0.8713 |
|          |            |    |            | Adj R-squared | = | 0.8391 |
|          |            |    |            | Root MSE      | = | 1.013  |

  

| WorldGDPgrowthannual        | Coef.     | Std. Err. | t     | P> t  | [95% Conf. Interval] |          |
|-----------------------------|-----------|-----------|-------|-------|----------------------|----------|
| worldResearchanddevelopment | -11.70228 | 2.248732  | -5.20 | 0.006 | -17.94576            | -5.4588  |
| _cons                       | 28.3807   | 5.085346  | 5.58  | 0.005 | 14.26152             | 42.49989 |

Source: World Bank (2023)

The findings in Table 5 reveal that research and development expenditure had a negative and significant effect on GDP growth globally from 2015 to 2020 (Coeff=-11.70%, P-value (0.006) <0.05). This indicates that as research and development expenditure increased by 1%, the GDP growth globally reduced by 11.7% annually from 2015 to 2020. The reduction in GDP growth between 2015 to 2020 was attributed to the outbreak of Covid-19 which affected several sectors. The findings are not consistent with the recommendations of SDG 9 indicators.

### 3.7 The effect of official development assistance received on GDP growth in the least developed countries

SDG 9 indicators recommend the provision of official development assistance to least developed countries to improve economic growth and development. Thus, the current study examines the effect of official development assistance received on GDP growth in the least developed countries. The findings are presented in Table 6 using linear regression at a 5% significance level.

Table 6: Linear regression findings of the effect of official development assistance received on GDP growth in the least developed countries from 2015 to 2019

. regress GDPgrowthinLDCannual LDCNetofficialdevelopmentas

| Source   | SS         | df | MS         | Number of obs | = | 5      |
|----------|------------|----|------------|---------------|---|--------|
| Model    | 2.00396829 | 1  | 2.00396829 | F(1, 3)       | = | 4.46   |
| Residual | 1.34699173 | 3  | .448997243 | Prob > F      | = | 0.1251 |
| Total    | 3.35096002 | 4  | .837740004 | R-squared     | = | 0.5980 |
|          |            |    |            | Adj R-squared | = | 0.4640 |
|          |            |    |            | Root MSE      | = | .67007 |

  

| GDPgrowthinLDCannual        | Coef.    | Std. Err. | t     | P> t  | [95% Conf. Interval] |          |
|-----------------------------|----------|-----------|-------|-------|----------------------|----------|
| LDCNetofficialdevelopmentas | 1.24e-10 | 5.89e-11  | 2.11  | 0.125 | -6.30e-11            | 3.12e-10 |
| _cons                       | -2.10338 | 2.908123  | -0.72 | 0.522 | -11.35833            | 7.151566 |

Source: World Bank (2023)

The results in Table 6 reveal that official development assistance received had a positive but non-significant effect on GDP growth in the least developed countries from 2015 to 2019 (P-value (0.125) >0.05). This may imply that growth in GDP in LDC is not associated with official development assistance received from abroad. Meanwhile, it is observed that there has been an increase in development assistance received from abroad for development which is in agreement with SDG 9 target indicators.

3.8 The effect of official development assistance received on GDP growth in Sub-Saharan Africa

The SDG 9 target indicators also recommend the provision of development assistance to Sub-Saharan Africa for economic growth and development. Thus, the study examines the effect of official development assistance received on GDP growth in Sub-Saharan Africa. The findings are presented in Table 7 using a linear regression model at a 5% significance level.

Table 7: Linear regression findings of the effect of official development assistance received on GDP growth in Sub-Saharan Africa

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. regress GDPgrowthinSubSaharanAfrica SubSaharanAfricaNetofficial
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| Source   | SS         | df | MS         | Number of obs | = | 6      |
|----------|------------|----|------------|---------------|---|--------|
| Model    | 11.3817066 | 1  | 11.3817066 | F(1, 4)       | = | 7.39   |
| Residual | 6.1580413  | 4  | 1.53951033 | Prob > F      | = | 0.0530 |
| Total    | 17.5397479 | 5  | 3.50794958 | R-squared     | = | 0.6489 |
|          |            |    |            | Adj R-squared | = | 0.5611 |
|          |            |    |            | Root MSE      | = | 1.2408 |

  

| GDPgrowthinSubSaharanAfrica | Coef.     | Std. Err. | t     | P> t  | [95% Conf. Interval] |
|-----------------------------|-----------|-----------|-------|-------|----------------------|
| SubSaharanAfricaNetofficial | -1.83e-10 | 6.73e-11  | -2.72 | 0.053 | -3.70e-10 3.87e-12   |
| _cons                       | 11.0813   | 3.507702  | 3.16  | 0.034 | 1.342357 20.82024    |

Source: World Bank (2023)

The findings in Table 7 show that official development assistance received had a negative but non-significant effect on GDP growth in Sub-Saharan Africa from 2015 to 2020 (P-value (0.053) >0.05). Meanwhile, the evidence from the study shows that there has been increased official development assistance received by Sub-Saharan Africa.

3.9 The relationship between population growth and mobile cellular subscriptions in the least developed countries

SDG 9 also recommends increased mobile cellular subscriptions in the least developed countries. Thus, the study examines the relationship between population growth and mobile cellular subscriptions in the least-developed countries. The findings are presented in Table 8 using Pearson's correlation test.

Table 8: Pearson's Correlation between population growth and mobile cellular subscriptions in the least developed countries

|   |                     | Population growth | Mobile cellular subscriptions |
|---|---------------------|-------------------|-------------------------------|
| Population growth   | Pearson Correlation | 1                 | .916*                         |
|   | Sig. (2-tailed)     |                   | .010                          |
|   | N                   | 7                 | 6                             |
| Mobile cellular subscriptions                               | Pearson Correlation | .916*             | 1                             |
|   | Sig. (2-tailed)     | .010              |                               |
|   | N                   | 6                 | 6                             |
| *. Correlation is significant at the 0.05 level (2-tailed). |                     |                   |                               |

Source: World Bank (2023)

The correlation findings in Table 8 reveal that population growth had a strong positive and significant association with mobile cellular subscriptions in the least-developed countries from 2015 to 2020 ( $r=0.916$ ,  $P\text{-value} (0.01) < 0.05$ ). This may imply that as the population increased, the number of people who subscribed to mobile cellular increased from 2015 to 2020 which is in agreement with the target indicators of SDG 9.

#### 4. Discussions and Conclusions

Sustainable development necessitates the incorporation of inclusive infrastructure, industry, and innovation. Uganda's economic development and social progress heavily rely on the attainment of SDG 9 objectives within the country's setting. This article examines the significance of an all-encompassing infrastructure, industry, and innovation for the advancement of Uganda. It also delves into the obstacles and prospects linked to these objectives.

Infrastructure development is crucial for facilitating economic operations, enhancing connectivity, and alleviating poverty. A comprehensive infrastructure guarantees that all sectors of society may reap the advantages of development activities. It entails delivering fundamental services, such as transportation, electricity, water supply, and telecommunications, to geographically isolated regions and disadvantaged populations. Uganda can bolster its productivity and competitiveness, attract investments, and provide job opportunities by allocating resources to infrastructure development (Ssewanyana, & Kasirye, 2016).

Industrialization is another key aspect of sustainable development. It involves the transformation of raw materials into finished goods through manufacturing processes. Industrialization promotes economic diversification, technological advancement, and job creation. By developing a robust industrial sector, Uganda can reduce its reliance on primary commodities and increase value addition to its products. This will contribute to economic growth, increase export earnings, and foster sustainable development (Manyuchi, 2018). Nevertheless, there are obstacles to overcome to accomplish the objectives of SDG 9 in Uganda. Insufficient access to financial resources impedes the progress of infrastructure development and industrialization endeavors. Inadequate financing results in subpar upkeep of current infrastructure and setbacks in the implementation of new developments. To tackle this difficulty, it is necessary to harness local resources and attract foreign

direct investment (Eunice Annan-Aggrey et al., 2021). Another obstacle is in the scarcity of a proficient workforce and technical aptitude required for industrialization and innovation. Uganda should allocate resources towards education and vocational training to cultivate a proficient labor force. In addition, fostering research and development initiatives and bolstering collaborations among academia, business, and government may augment technical capacities and foster innovation.

Eventually, the establishment of an all-encompassing infrastructure, the promotion of industry, and the fostering of innovation are important for the sustained growth of Uganda. Uganda can bolster its economic growth, alleviate poverty, and promote the well-being of its population by allocating resources to infrastructure development, stimulating industry, and nurturing innovation. Nevertheless, it is crucial to tackle obstacles such as restricted financial resources and the scarcity of a proficient workforce to accomplish the objectives of SDG 9.

Innovation is a critical driver of economic growth and competitiveness. It involves the application of new ideas, technologies, and processes to improve productivity and create new products or services. Innovation enhances efficiency, fosters entrepreneurship, and drives sustainable development. By promoting innovation in various sectors such as agriculture, healthcare, education, and information technology, Uganda can address societal challenges and create opportunities for economic advancement (Oviawe, 2018). Therefore, there is progress in the achievement of SDG 9 indicators. There is an improvement in manufacturing value addition, an increase in employment in the industrial sector, an increase in research and development expenditure, an increase in official development assistance received in LDC, and an increase in mobile cellular subscriptions.

## 5. Recommendations for Policy Makers

Infrastructure, industrialization, and innovation are essential elements for achieving economic growth and development. Policymakers in Uganda must provide priority and allocate resources to these sectors to accomplish SDG 9. This article outlines the essential guidelines for policymakers to facilitate the advancement of inclusive infrastructure, industry, and innovation in Uganda. Despite that fact, there is a need to improve the number of people using air transport in Uganda as this would help to stimulate economic growth. However, there is still a need for the country to focus on SDG Goal 9 – to continue its path towards sustainable development. The following are hereby recommended for the

Increase investment in infrastructure development Infrastructure development is vital for economic growth and is a key factor in promoting inclusive and sustainable industrialization. Policymakers should prioritize the development of inclusive infrastructure that caters to the needs of all citizens, including marginalized communities and vulnerable groups. This includes ensuring access to basic services such as water, electricity, transportation, and telecommunications in both urban and rural areas. Infrastructure projects should be planned and implemented in a way that promotes social inclusion, reduces inequalities, and supports sustainable development. Furthermore, prioritizes investment in infrastructure projects such as roads, railways, airports, and ports to facilitate the movement of goods, services, and people. This will not only improve the country's connectivity but also attract foreign investments and promote trade.

Foster sustainable industrialization through targeted policies: Policymakers should implement targeted policies to foster industrialization in Uganda. This can be achieved by providing incentives for domestic and foreign investment in key sectors such as manufacturing, agribusiness, and renewable energy. Additionally, policymakers should support the development of local industries by promoting entrepreneurship, providing access to finance, and investing in research and development. As is key to economic growth and employment opportunities, the Government should ensure that industrialization is inclusive and sustainable, taking into consideration social and environmental factors. This can be achieved by promoting environmentally friendly industries, providing incentives for SMEs, and investing in human capital development to ensure a skilled workforce. Consequently, Small and Medium Enterprises (SMEs) play a crucial role in promoting inclusive industrialization and innovation. However, access to finance is a major challenge for SMEs in Uganda. Policymakers should develop policies and programs to provide easier access to finance for SMEs, such as creating a favorable business environment and establishing specialized financing institutions.

Encourage innovation and technological advancement: Policymakers should create an enabling environment for innovation and technological advancement in Uganda. This includes investing in research and development, promoting collaboration between academia and industry, and supporting the growth of technology hubs and incubators. Additionally, policies should be put in place to protect intellectual property rights and facilitate the transfer of technology from developed countries. Innovation and technological advancements are crucial for sustained economic growth. They should invest in research and development, and promote a culture of innovation and entrepreneurship. This can be done by providing incentives for research and development, creating a conducive environment for start-ups, and promoting public-private partnerships in this area.

Enhance skills development and education: Policymakers should prioritize skills development and education to support inclusive infrastructure, industrialization, and innovation in Uganda. This can be achieved by investing in quality education at all levels, promoting vocational training programs, and providing opportunities for lifelong learning. Skills development should focus on equipping individuals with the necessary technical and entrepreneurial skills to participate in the modern economy. Investment in education and skills development is crucial for fostering innovation and industrialization. Policymakers should prioritize increasing the budget for education and promote vocational training to equip the youth with the necessary skills for the job market. This will not only contribute to economic growth but also help in reducing youth unemployment.

Ensure sustainable and resilient infrastructure: Policymakers should prioritize the development of sustainable and resilient infrastructure in Uganda. This includes integrating climate change considerations into infrastructure planning and design, promoting renewable energy sources, and implementing measures to reduce the environmental impact of infrastructure projects. Additionally, policies should be put in place to ensure the maintenance and long-term sustainability of infrastructure assets. To achieve inclusive infrastructure, policymakers should not only focus on developing infrastructure in urban areas but also in rural areas. This will help to bridge the gap between the urban and rural populations and promote balanced economic growth. Investment in rural infrastructure such as roads, electricity, and water supply will also improve the living standards of people living in these areas.



Encourage public-private partnerships (PPP): To bridge the funding gap for infrastructure projects, the Uganda Government should encourage public-private partnerships (PPP). This will not only bring in private sector expertise and efficiency but also reduce the burden on government finances. PPPs can also help to ensure better management and maintenance of infrastructure projects, making them sustainable in the long run.

Prioritize investment in renewable energy: The use of renewable energy is key to achieving sustainable industrialization and infrastructure development. Uganda has abundant sources of renewable energy such as solar, wind, and hydropower. Therefore, Uganda Government should prioritize investment in renewable energy projects to reduce dependence on fossil fuels, promote sustainability, and also create employment opportunities.

Foster regional and international cooperation: Regional and international cooperation can play a significant role in achieving SDG Goal 9. Collaboration with neighboring countries and international organizations to share best practices, technology, and knowledge. This will help in promoting innovation and industrialization and also improve regional integration and trade. In conclusion, achieving SDG Goal 9 is crucial for sustainable development in Uganda. Policymakers should prioritize and invest in infrastructure, industrialization, and innovation, while also taking into consideration social and environmental factors. By implementing these recommendations, Uganda can achieve inclusive and sustainable development and continue on its path towards achieving all the SDGs.

## References

1. Behuria, P. (2021). The political economy of reviving industrial policy in Uganda. *Oxford Development Studies*, 49(4), 368-385.
2. Du, J., Akhtar, N., & Dou, Y. (2023, November 13). Editorial: Towards 2030: sustainable development goal 9: industry, innovation and infrastructure. A communication perspective. *Frontiers in Communication*, 8. <https://doi.org/10.3389/fcomm.2023.1296574>
3. Eunice Annan-Aggrey, Elmond Bandauko, & Godwin Arku. (2021, June 28). Localising the Sustainable Development Goals in Africa: implementation challenges and opportunities. *Commonwealth Journal of Local Governance*, 4–23. <https://doi.org/10.5130/cjlg.vi24.7739>
4. Hossin, M. M., Azam, M. S., & Hossain, M. S. (2023). Understanding the Concept of SMEs in Driving Economic Growth and Development in Bangladesh. *International Journal of Finance, Economics and Business*, 2(3), 195-204.
5. Kiggundu, M.N. (2019). *Fostering innovation for sustainable development in Uganda: Policy options for action*. Kampala: Makerere University Press. (Print)
6. Kuznetsova, N. (2022, July 25). EXTERNAL ECONOMIC EFFECT OF THE INNOVATION FACTOR OF CREATIVE INDUSTRIES. *Management Theory and Studies for Rural Business and Infrastructure Development*, 44(2), 167–175. <https://doi.org/10.15544/mts.2022.17>
7. Manyuchi, A. E. (2018, June 7). Conceptualizing and institutions facilitating 'use' of innovation indicators in South Africa's science, technology and innovation policymaking. *African Journal of Science, Technology, Innovation and Development*, 10(4), 483–492. <https://doi.org/10.1080/20421338.2018.1475542>
8. Maweje, J., & Bategeka, L. (2018). *Infrastructure deficit in Uganda: Implications for public service delivery*. Kampala: Economic Policy Research Centre. (Print)



9. Motlagh, H. R. S. (2021, April 9). Study the Role of Maritime Energy Management in Achieving the United Nations Sustainable Development Goals (UN SDGs), in particular, Goal 7, in Oman Maritime Community. *Sustainable Marine Structures*, 2(2), 1–12. <https://doi.org/10.36956/sms.v2i2.300>
10. Onyilo, F., & Adong, A. (2019, February 1). Agricultural Cooperative Marketing and Credit Policy Reform in Uganda: An Opportunity for Poverty Reduction. *African Journal of Food, Agriculture, Nutrition and Development*, 19(01), 14156–14170. <https://doi.org/10.18697/ajfand.84.blfb1008>
11. Othieno, L., et al. (2017). Industrial policy options for Uganda: A synthesis report. Kampala: Ministry of Trade Industry & Cooperatives. (Print)
12. Oviawe, J. I. (2018). Revamping technical vocational education and training through public-private partnerships for skill development. *Makerere Journal of Higher Education*, 10(1), 73-91.
13. Pandey, P., & Pandey, M. M. (2021). *Research methodology tools and techniques*. Bridge Center.
14. Ssewanyana, S., & Kasirye, I. (2016). Industrialization in Uganda: Policy Perspectives for Economic Transformation. In *Industrialization in Developing Countries* (Print)
15. Ssewanyana, S., et al. (2020). Financing infrastructure for sustainable development in Uganda: Policy implications for achieving SDGs. *Journal of African Development Studies*, 2(1), 45-62. (Web)
16. United Nations. (2023). *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*. UN. Retrieved from <https://sdgs.un.org/goals/goal>
17. World Bank . (2023). *Development indicators*. World Bank Group.