Executive Summary

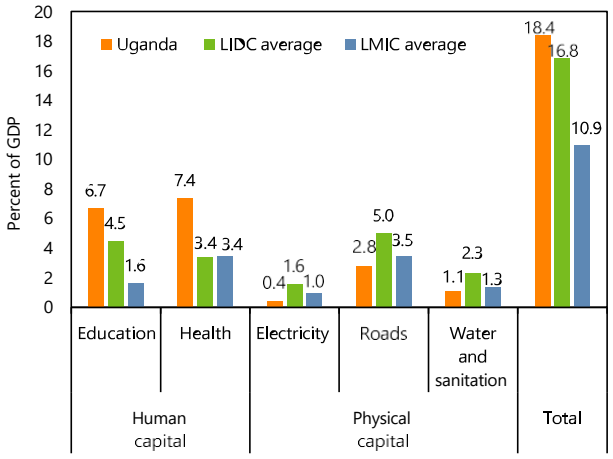
The mission estimates that making substantial progress in critical SDG sectors in Uganda would require additional annual spending of about 18.4 percent of gross domestic product (GDP) by 2030. Relative to low-income developing countries (LIDCs), additional spending in Uganda is higher in the social sectors and lower in the infrastructure sectors (Figure). Overall, Uganda's additional spending is above the median LIDC and similar to the median Sub-Saharan African (SSA) country. (This analysis is an assessment of the spending to achieve a high performance in selected SDGs in Uganda and does not include an examination of options to finance the spending needs.)

- *Health—expanding the supply of medical staff.* Total health care spending is low (4.2 percent of GDP) relative to peers, and there is substantial room to increase the efficiency of spending: health outcomes are below those of several other countries with similar spending. Overall, we estimate that total health care spending would have to gradually increase by an additional 7.4 percent of GDP in 2030 relative to today's spending, to deliver superior health care outcomes. A major contributor to the additional cost is the need to substantially increase the supply of doctors—more than 16-fold—and to nearly triple the number of other health personnel.
- *Education—strengthening both quality and quantity of services.* Uganda's young population—60 percent are school-aged, a higher share than in the East African Community (EAC) and LIDC peers—combined with a relatively low enrollment rate, means that the country needs to invest in getting its children into schools. However, just as important is improving the currently low level of educational quality. Toward this goal, class sizes need to fall by hiring more teachers, thus bringing the student-teacher ratio down from 28 to 19. Public spending, currently well below LIDC and EAC averages, would need to triple as a share of GDP to help deliver on these goals. We estimate that Uganda's total expenditures on education would need to increase by an additional 6.7 percent of GDP from its current level of 7.1 percent of GDP.
- *Water and sanitation—aiming at safely managed water and sanitation for all.* Uganda is below regional and income-group peers in water and sanitation standards. In particular, while there has been progress in water provision, sanitation services have hardly improved in the past two decades, and its provision is lower than most countries in the subregion. Closing the water and sanitation gaps will require an additional annual spending of 1.1 percent of GDP, including maintenance costs to counteract depreciation. The bulk of the cost burden comes from safely managed water in rural areas, given the relatively high unit cost of such facilities and the large rural population unserved by this type of facility.
- *Electricity—investing in transmission and distribution networks to increase access.* The vast majority of Uganda's electricity is generated by renewable energy (hydropower). Overall electricity consumption per capita, at 83kilowatt-hour (kWh), strongly lags LIDCs and is below what would be expected given its level of GDP per capita. Transmission and distribution networks need to catch up with installed capacity, which, at 1,347 megawatts (MW), is far ahead of peak demand at 793 MW. We estimate that expanding current access, serving the future population through 2030, and increasing consumption in line with economic growth, will require annual investments reaching 0.4 percent of GDP in 2030.
- *Roads—gradually increasing rural access.* Raising access to roads from its current level of 53 percent of the rural population to 75 percent by 2030 will require about 20.4 thousand additional kilometers of all-weather roads. While rural road access is higher than LIDCs, road quality lags subregional peers, thus the expansion of access will also need to include upgrading of roads in that are in poor condition. We estimate that this will require annual investments of 2.8 percent of GDP in 2030.

Figure. Additional Spending in Critical SDG Sectors

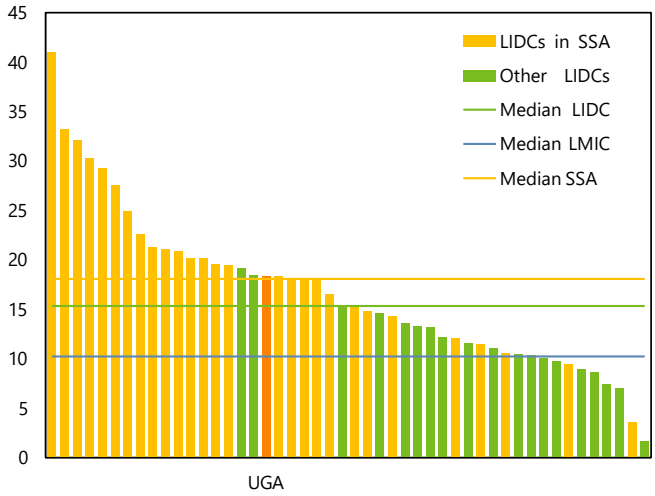
By Sector

(Percent of 2030 GDP)[1]



Low-income Developing Countries

(Percent of 2030 GDP)



Source: IMF staff calculations.[2]
Note: Country group estimates are based on the IMF SDG Costing Tool (2nd edition).

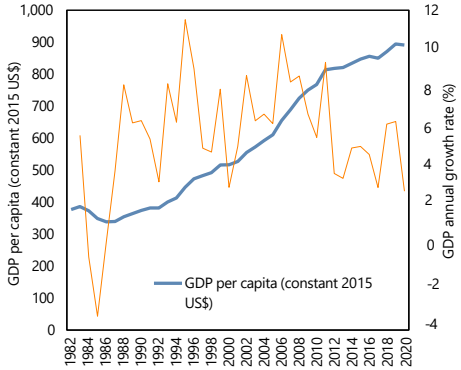
[1] All country-group averages in the report are based on simple averages, unless indicated otherwise.

[2] Where estimations in this report rely on a very large number of data sources, these are not all listed under the respective chart. The appendix can be consulted for details on data sources.

I. Introduction

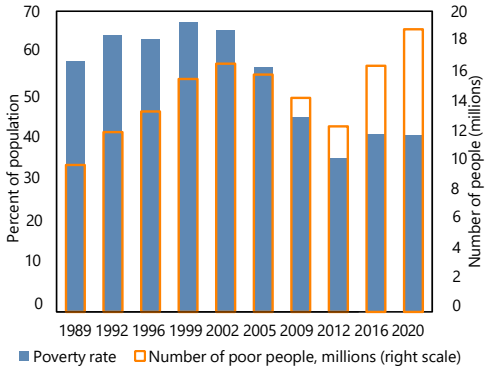
1. A broad view of growth and welfare in Uganda shows that the steady rise in the average incomes in Uganda over the past decades was followed by poverty reduction only after a long lag. Uganda has enjoyed a sustained increase in income per capita since the mid-1980s, following the end of armed conflict during which the country experienced years of negative growth (Figure 1). Yet, the income increase did not translate into reductions in extreme poverty for another decade and half: The poverty rate in the country (measured based on the internationally widely used definition as the population with less than US dollars (US$) 1.90 a day) continued to increase throughout the 1990s from 58.3 percent to 67.5 percent, and the number of poor people rose in this period from 9.8 million to 15.5 million (Figure 2; with further details in Appendix I).[3] In the 2000s and until early 2010s, poverty came down dramatically (from 67.5 percent in 1999 to 35.7 percent in 2012). However, in the course of the last 8 years of the past decade, the poverty rate rose yet again, adding more than 6 million to the population in extreme poverty. This was caused in part by a devastating drought in 2016 that eroded agricultural households' income, and more recently by the economic effects of the pandemic.

Figure 1. Gross Domestic Product: Per Capita and Annual Growth



Source: World Economic Outlook (WEO), Database, January 2021.[4]

Figure 2. Extreme Poverty



Source: Data for 1989-2016: World Development Indicators, accessed March 2022.[5] Data for 2020: Uganda Bureau of Statistics, UBOS (2021).[6]
Note: Extreme poverty is defined as having less than US$1.90 a day, expressed in 2011 purchasing-power parity (PPP) international dollars.[7]

2. Uganda has linked its development strategy to the SDGs. Its broad strategic direction is encapsulated in its 'Vision 2040', which sets out that the country is to develop six 5-year national

[3] Ferreira, F., et al. 2015. "The international poverty line has just been raised to $1.90 a day, but global poverty is basically unchanged. How is that even possible?" World Bank Blogs.

[4] IMF (International Monetary Fund) 2021. World Economic Outlook Update, January 2021: Policy Support and Vaccines Expected to Lift Activity.

[5] The World Bank. World Development Indicators. Washington, D.C.

[6] UBOS (Uganda Bureau of Statistics) 2021. The Uganda National Household Survey 2019/20. Kampala, Uganda.

[7] Ferreira, F., et al. 2015.

development plans (NDPs) covering the time span 2010 through 2040.[8] The third such plan (NDP III) charts out the country's development priorities for the period 2021 to 2025.[9] It is oriented around three areas: industry, governance, and the environment. The decision to prioritize these areas was informed by a simulation model that sought to cost NDP III's programs and assess the potential of each of the programs to further the attainment of the 17 SDGs.[10] Uganda also carried out its second broad assessment in mid-2020 (following the first one in 2016) of its progress toward the SDGs, in the form of a Voluntary National Review.[11] In mid-2021, the Office of the Prime Minister, with the support of the United Nations Development Program (UNDP), developed a four-year roadmap to ensure that implementation of all of the SDGs remains consistent with NDP III, and to identify ways to mobilize resources for financing the SDGs (OPM 2021).[12] The roadmap focuses on establishing the relevant institutional infrastructure to achieve this objective, for example, through the creation of an SDG Secretariat in OPM and revitalization of existing SDG working groups.

3. The Coronavirus disease 2019 (COVID-19) forced a reprioritization of the latest five-year development plan. The country's current plan was developed in early 2020, just as COVID-19 was gaining momentum in Uganda. As in many countries around the world, the pandemic constrained the government's revenue mobilization and led to stalled external financing as international partners sought to cope with COVID-19's fallout in their own economies. This led Uganda to cut back on many planned interventions that were part of NDP III. In particular, activities were scaled back that did not meet the criteria of: having a public investment character, having a direct impact on reducing poverty and food security, having strong spillovers on other areas, and aiding the economic recovery from the pandemic. The areas in which the largest share of planned interventions were cut included manufacturing, petroleum development, housing and urban development, but also human capital development.[13]

4. Uganda is ahead of peers in seven of the SDGs and lags in nine. An SDG index developed by the United Nations (UN) and reported on in the annual Sustainable Development Report enables a broad look at Uganda's performance in 16 Goals (no data on Uganda are available for one Goal, SDG 14). The SDG index aggregates values of several variables related to each Goal and normalizes them to range from 0 to 100, whereby these values represent the worst and best possible performance, respectively.[14] The comparison of Uganda's values against those of its regional and income groups shows that the country is particularly far ahead of the mean of peers in Goals such a ending hunger and achieving food security (SDG 2) and in SDG 9 on infrastructure and industrialization (Figure 3). In

[8] GoU (Government of Uganda) 2013. Uganda Vision 2040.

[9] NPA (National Planning Authority) 2020a. Third National Development Plan (NDP III) 2020/21 – 2024/25.

[10] NPA (National Planning Authority) 2020b. Dynamic Analysis of Sustainable Development Goals: Achieving the SDGs with Uganda's Third National Development Plan. Millennium Institute.

[11] Countries' Voluntary National Reviews serve as the basis for United Nations led reviews on global progress toward the SDGs, undertaken annually by the High-Level Political Forum, the main UN platform on sustainable development.

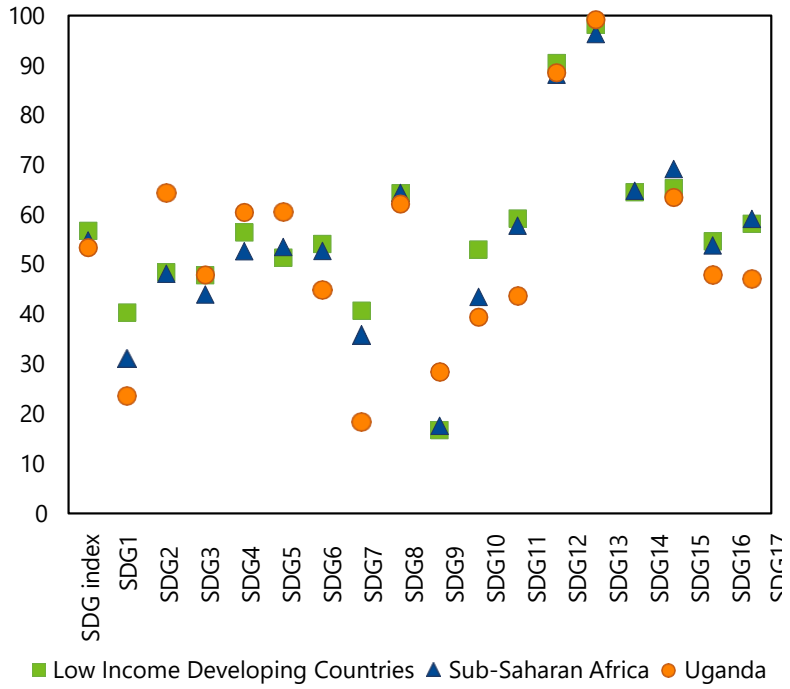
[12] OPM (Office of the Prime Minister) 2021. Roadmap for the Implementation of the Sustainable Development Goals in Uganda: SDGs 2020/21 – 2024/5.

[13] Based on data provided by the National Planning Authority. The mission team did not have further disaggregation of these categories.

[14] The detailed methodology underlying the SDG indexes is presented in Lafortune, Guillaume, et al. (2018). SDG Index and Dashboards: Detailed Methodological Paper.

absolute terms, it achieves a strikingly high score in the SDG on combating climate change (SDG 13). On the other hand, the country lags peers by a large margin in moving toward ending poverty (SDG 1) and the provision of affordable and clean energy (SDG 7). It is important to mention that here as well as throughout the report, descriptive comparisons of Uganda with peer countries provide helpful insights and serve as background to the costing analysis, but the latter uses its own well-defined benchmark countries and targets as part of the derivation of additional spending needed to perform well on the SDGs. The approach is detailed in the next paragraph as well as in the subsequent sections. To pointedly illustrate this message: While Figure 3. shows for example that Uganda's SDG index is higher than LIDCs' and SSA's average for health and education, it does not follow from this that the country's additional spending needs to perform well in SDG 3 and SDG 4 by 2030 would be low.

Figure 3. Uganda's Performance in the SDGs, Compared to Income-group and Region Averages



Source: IMF SDG Performance Tool (2021 edition), which draws on SDG index data from Sachs et al. (2021).[15]
Note: No data are available for Uganda for SDG 14 (Life below Water).

5. This report estimates the additional spending associated with achieving a strong performance in selected SDGs. These SDGs in human capital development (health and education) and infrastructural development (water and sanitation, electricity, and road infrastructure) make up a significant proportion of countries' budgets and are at the core of inclusive and sustainable growth. Using the IMF SDG costing methodology developed by Gaspar et al. (2019), we assess the total (i.e., public plus private) additional annual spending in 2030 relative to a baseline of current spending, expressed in percentage points of GDP.[16] (All reference in this report to expenditures, inputs e.g., number of doctors,

[15] Sachs, J., et al. 2021. The Decade of Action for the Sustainable Development Goals: Sustainable Development Report 2021. Cambridge: Cambridge University Press.

[16] Gaspar, V., et al. (2019). Fiscal policy and development: Human, social, and physical investments for the SDGs. Sustainable Development Note SDN/19/03, International Monetary Fund.

and other variables always refer to public plus private resources/inputs taken together, unless otherwise specified.) In each of the five sectors, the methodology benchmarks Uganda's 2030 target levels of inputs and other cost drivers to current levels of strongly performing peers and to established good practices. Uganda's 2030 target levels of infrastructure and service provision and the associated spending are also informed by 2030 projections of various factors, such as the country's 2030 population size, rural-urban composition, age distribution, and GDP (the Appendix details data sources and calculations for these and other variables). This report includes both descriptive analysis and SDG costing analysis. For the costing analysis, wherever available, sectoral data for the most recent year available are obtained from sources provided the team by the authorities prior to and during the mission. For the descriptive analysis, in addition to data received during the mission, statistics on Uganda are drawn from well-established cross-country databases, especially where a long time series is needed or where data on Uganda are required that are analytically comparable to those of other countries. It should be noted that this report focuses on assessing the additional SDG spending needs; outside of the scope of this work is an analysis of the options for financing these expenditures. However, the concluding Section VI briefly engages this issue. Further details on the methodology are discussed in Gaspar et al. (2019).[17]

6. Both the descriptive analysis and the SDG cost assessment benchmark Uganda to relevant comparator countries. The primary country groups used for comparison in the descriptive analysis are: SSA; the EAC; LIDCs; and the World Bank category of lower-middle income countries (LMICs). Inclusion of the latter is motivated by Uganda's broad development plan, 'Vision 2040', which expresses the aspiration to change the country into an upper-middle income country by 2040.[18,19] For the SDG cost assessment in the social sectors, the benchmark values of cost drivers are derived from the well-performing peers, which are defined as those countries that have a GDP per capita below US$3,000 (Uganda's projected 2030 GDP falls within this income range) and have an SDG 3 and SDG 4 index value above 72 and 88, respectively. The subsequent sections first each provide an overview of progress over time and of performance relative to peers in sector-specific inputs and outcomes. This is followed, within each section, by an assessment of the additional costs in 2030 to achieve a high SDG outcome in the sector.

II. Human capital development

A. HEALTH

7. Uganda has made significant progress in health outcomes, but there is room for improvement. The under-five mortality rate fell from 182 to 46 deaths per 1,000 live births between 1990 and 2018, a reduction of 75 percent (Figure 4.a). In addition, the increase in the proportion of women attending the recommended four ante-natal care visits during pregnancy from 42 percent in 2000 to 60 percent in 2016,[20] and the increase in the proportion of hospital deliveries from 57 percent in 2011 to 60 percent in 2016, contributed to a reduction in maternal mortality by 35 percent between 2000 and

[17] Gaspar, V., et al. (2019).

[18] Ferreira, F., Jolliffe, D. M. and Prydz, E. B. 2015.

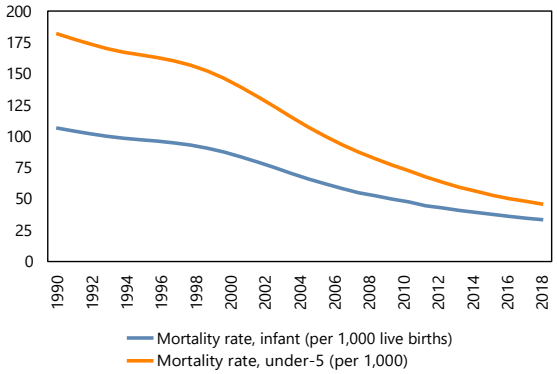
[19] We use LMICs rather than upper-middle income countries as a comparator, given the country's higher aspiration is aimed for 2040, one decade after the SDG target year of 2030. Currently, Uganda is in a World Bank income group below LMICs, i.e., is a low-income country (LIC).

[20] UBOS (Uganda Bureau of Statistics) 2017. Uganda Demographic and Health Survey 2016.

2017.[21,22] However, Uganda still has a high burden of communicable diseases. For example, the incidence of malaria (per 1,000 people at risk) in the country is 289, compared to 70 in Kenya, 124 in Tanzania, and 219 in SSA countries.[23] On average, Uganda's health system relies more heavily on household out-of-pocket expenditures than other EAC countries, even if it is slightly lower than the LIDC average (Figure 4.b). This renders both access to health services as well as households' welfare precarious: More than 60 percent of the population are at risk of facing financial instability if they were to require a surgery or anesthesia that they had to pay for out-of-pocket, given these expenditures would amount to 10 percent or more of their income—the definition of facing catastrophic health expenditures.[24] Uganda's overall performance on the index pertaining to SDG 3 on health[25] is similar to the LIDC median, however remains far from reflecting the levels of Uganda's well-performing peers (Figure 5).

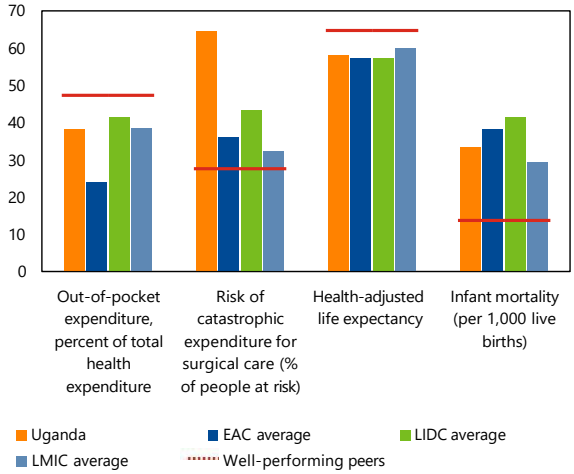
Figure 4. Health Outcomes

a. Infant and Child Mortality



Source: IMF staff calculations using the World Bank's World Development Indicators database.[26]

b. Health Outcomes



Source: IMF staff calculations using the World Bank Health Nutrition and Population Statistics[27] and the IMF FAD Expenditure Assessment Tool.
Note: The statistics are for the latest year available. The dotted line shows the average for countries with GDP per capita under US$3,000 and an SDG 3 index score above 72.

[21] NPA (National Planning Authority) 2020a.

[22] IMF staff calculations using the World Bank: Health Nutrition and Population Statistics.

[23] Ibid.

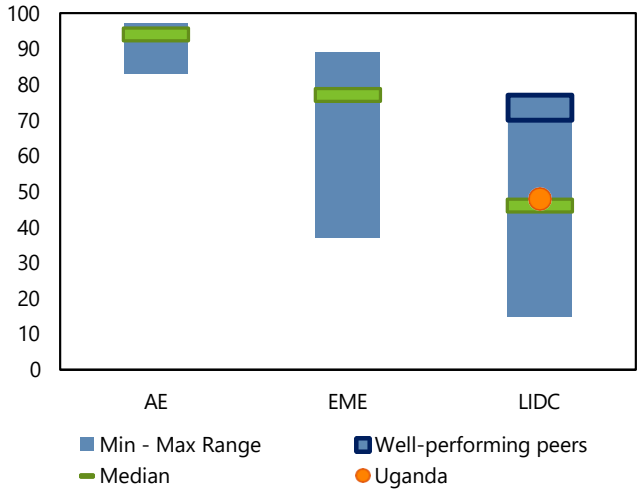
[24] As defined by The Program in Global Surgery and Social Change (PGSSC) at Harvard Medical School.

[25] The SDG 3 index comprises 14 variables: maternal, neonatal, and under-5 mortality rates; incidence of tuberculosis; new HIV infections; death rates from selected noncommunicable diseases, air pollution, and traffic accidents; life expectancy; adolescent fertility rate; professionally attend births; vaccination rates; the Tracer index; and a subjective wellbeing measure. Sachs, et al. 2021.

[26] The World Bank. World Development Indicators.

[27] The World Bank. Health Nutrition and Population Statistics. Washington, D.C.

Figure 5.SDG 3 Index for Uganda and Income Groups



Source: IMF staff estimates using the IMF SDG Performance Tool, which draws on Sachs, J., et al. (2021).[28]

8. Health care spending is low, with government expenditures significantly lower than Uganda's peers. Relative to its GDP, Uganda's total health spending, at 4.2 percent, is lower than the averages of LMICs, LIDCs, well-performing peers, and all but one EAC country (Figure 6.a). Government spending on health (according to data provided by Ugandan authorities) makes up 0.8 percent of GDP and represents 17.2 percent of total health expenditure, which is significantly lower than EAC countries and LIDCs (Figure 6.b.).[29] Additionally, government expenditure on health as a proportion of total government expenditure had fallen over the last decade from 7 percent in 2010 to 3 percent in 2019.[30] 41.4 percent of total health expenditure comes from international development partners, a significantly larger share than in Uganda peers (Figure 6.b.). This heavy reliance on external sources could lead to volatility in resource availability and may contribute to health inefficiencies as a large proportion of this support comes through off-budget support and is largely dedicated to specific interventions.[31]

[28] Sachs, J., et al. 2021.

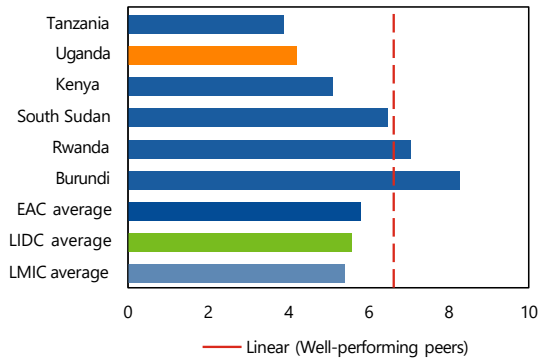
[29] MoH (Ministry of Health) 2022. Uganda Health Accounts 2016-19.

[30] World Health Organization. Global Health Expenditure Database.

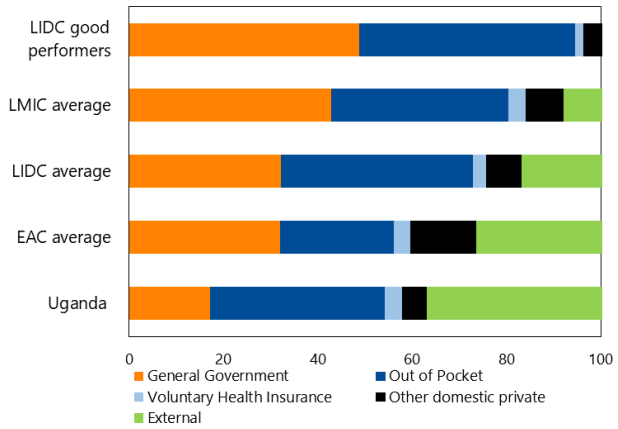
[31] See page 3 of MoH (Ministry of Health) 2020. Tracking Off-budget Financial Resources in the Health Sector FY 2018/19. Ministry of Health, The Republic of Uganda.

Figure 6. Health Spending

a. Total Health Spending
(Percent of GDP)



b. Health Spending by Source
(Percent of total health spending)



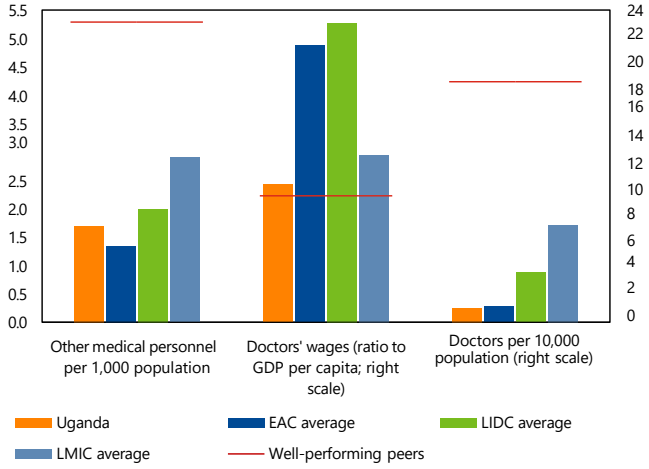
Source: IMF staff estimates using data for Uganda from the MoH, and for other countries from the IMF SDG Costing Tool, which draws on World Bank Health Nutrition and Population Statistics.[32]
Note: The dotted line shows the average for countries with GDP per capita under US$3,000 and SDG 3 index score above 72.

9. Additional health spending and improved spending efficiency would lead Uganda to better health outcomes. Uganda's low level of expenditure relative to its income is mirrored in low health care inputs in terms of staffing (especially with regard to doctors) and compensation of medical staff, compared to LIDCs (Figure 7.a). However, relative to its population size, Uganda does spend a similar amount on health as other LIDCs (in purchasing-power parity PPP terms) and has slightly better results in health-adjusted life expectancy (Figure 7.b). However, Uganda—just like the comparator country groups—could still achieve substantially better outcomes at the same level of per-capita spending, as seen in the large vertical distance to the health spending efficiency frontier. In other words, many LIDCs reach a distinctly higher health-adjusted life expectancy with similar or less spending per capita.

[32] IMF staff calculations using the World Bank: Health Nutrition and Population Statistics.

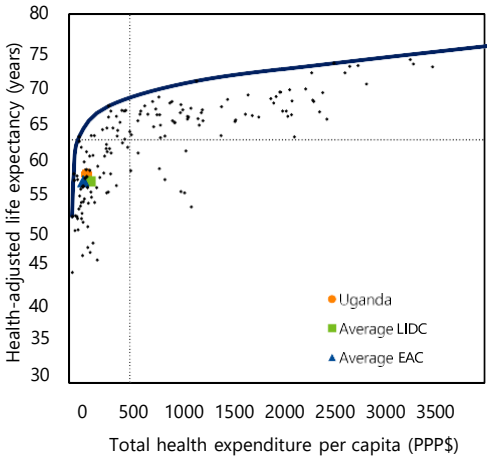
Figure 7. Health Inputs and Expenditure Efficiency

a. Health Inputs



Source: IMF staff estimates using the IMF SDG Costing Tool.
Note: The dotted lines show the average for countries with GDP per capita under US$3,000 and SDG 3 index score above 72.

b. Health Efficiency Frontier



Source: IMF staff estimates using the IMF FAD Expenditure Assessment Tool. [33]
Note: Health-adjusted life expectancy is the number of years that a person can expect to live in full health by taking into account disease and injury.

10. Substantial additional resources are needed to achieve the health SDG. The assessment of the additional spending to achieve a strong performance in SDG 3 in 2030 uses an input-outcome approach. We identify the average level of inputs of well-performing peers, i.e., countries that, like Uganda, have a GDP per capita lower than US$3,000 (peers), and that have an SDG 3 index at or above 72 (well-performing). We then derive Uganda's spending in 2030 by assigning these levels of inputs. More details on the methodology and computations are in Appendix II. The results show that to perform well on SDG 3, Uganda's total (public plus private) health spending needs to increase substantially, by 7.4 percent of GDP in 2030, compared to current spending levels (Table 1). In real terms, per capita spending needs to quadruple, from the current US$33.5 per person to US$127.7, while other recurrent and capital spending in 2030 needs to be 4.3 times today's analogous spending. The cost estimates reflect the following key adjustments needed:

- *Raising the number of health workers:* To reach the standards of well performing peers, the number of doctors per 1,000 population needs to increase substantially (more than 16-fold) from 0.109 to 1.849, while the number of other health personnel per 1,000 population needs to approximately triple from 1.743 to 5.288.
- *Maintaining the competitiveness of doctor wages.* The salary of doctors is slightly higher in terms of GDP per capita than that of workers in the best-performing peer countries. Reducing these wages as a ratio to GDP per capita from 10.6 to 9.7 will prevent the resources needed to achieve SDG 3 from being even higher. This adjustment still reflects a growth in doctors' salaries—in real monetary terms—by 26.4 percent, although this growth is slower than that of average incomes.

[33] IMF FAD Expenditure Assessment Tool.

Table 1. Additional Spending for High Performance in Health SDG

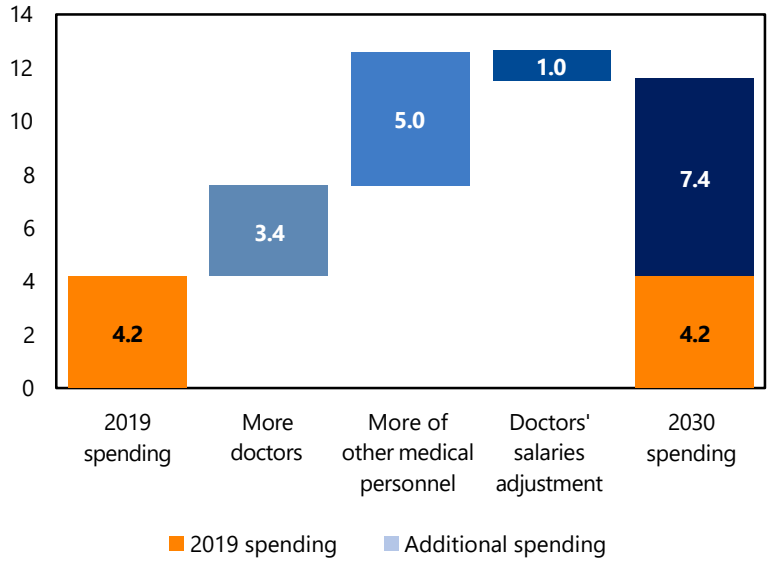
	GDP per capita $0-$3000			Uganda	
	All	Low performance	High performance	2019	2030
GDP per capita	1,360.9	1,232.6	2,241.0	797.2	1,101.2
Main factors					
High-cost population (<1 and 60+), % of total population	10.0	9.0	16.9	6.8	6.9
Doctors per 1,000 population	0.5	0.3	1.85	0.1	1.8
Other medical personnel per 1,000 population	2.0	1.5	5.29	1.7	5.3
Doctor wages (ratio to GDP per capita)	22.2	24.2	9.72	10.6	9.7
Other recurrent and capital health spending (% total health spen	67.4	68.2	62.3	75.1	62.3
Results					
Total health spending (percent of GDP)	5.4	5.2	6.63	4.2	**11.6**
Per capita health spending (USD 2018)	73.3	64.1	148.6	33.5	127.7
SDG3 index	49.3	45.4	75.8	47.9	>72

Source: IMF staff estimates.
Note: All countries with an SDG 3 index at or above (SDG 3 index below) 72 in 2021 are classified as high (low) performing peers.

11. The needed increase in medical personnel results in sizeable additional spending. We estimate that to increase the number of doctors while keeping the current salaries but reducing the proportion of other recurrent and capital spending to that of the well performing peers, an additional expenditure of 3.4 percent of GDP is required (Figure 8). The increase in other medical personnel to the levels of the good performers requires a more sizeable rise in additional spending, 5 percent of GDP: Although other medical staff only triple while the number of physicians increases 16-fold, the former increase implies a substantial number of additional staff in absolute terms. Finally, the adjustment of salaries of medical personnel reduces the additional spending by 1 percent of GDP.

Figure 8. Decomposition of Additional Spending on Health

(Percent of GDP)



Source: IMF staff calculations.
Note: The additional costs assume an adjustment of non-medical wage spending to that of well-performing peers.

12. A rebalancing of the system seems necessary, with the government playing an important role. Uganda's health expenditure relies heavily on external resources (with a large proportion coming from off-budget support) and private expenditure. Government spending from domestic sources represents only 17.2 percent of total health expenditure.[34] Greater government funding could improve priority, especially preventive, healthcare interventions,[35] given that only a limited share of off-budget resources are dedicated to preventive activities, and none of the off-budget projects in FY2019/20 targeted non-communicable diseases and associated risk factors.[36] Addressing this disease area through higher government resource allocation would be crucial as the number of persons reporting having one of the three most common non-communicable diseases in Uganda (diabetes, high blood pressure, and heart disease) has increased in recent years.[37]

13. Plans toward a universal health care insurance system seem promising, but more political commitment, communication and outreach are needed. The parliament passed the National Health Insurance Bill in March 2021; however, the bill has not yet been assented to by the president. Currently, only four percent of the Ugandan population is covered by any form of health insurance, with the highest levels of coverage in the urban areas.[38] More political commitment would be called for to sign the bill into law and implement the insurance scheme, as well as pedagogy and outreach to increase community awareness about the value of health insurance (only 13.4 percent of the population in Uganda is currently aware of what health insurance is and how it works in the most basic sense).[39] Ensuring the financial sustainability of the insurance system is a necessary condition for the successful implementation of the scheme.[40]

14. COVID-19 disrupted the delivery of non-coronavirus-related essential health services, leading to a reversal of some health gains, while Uganda still remains vulnerable to the virus. The country's COVID-19 preparedness plan for March 2020 to June 2021 reports a total budget for the multisectoral response to COVID-19 of 1.8 percent of GDP; however, as of mid-2021, only 35 percent of resources were committed, leaving a significant financial gap to be filled.[41] Correspondingly, as of March 9, 2022, only 6.7 percent of the population was fully vaccinated.[42] Of the committed budget, 4.9 percent was used to increase human resources, 14.2 percent to improve health infrastructure, and only 0.8 percent to ensure the continuity of essential health services. The change in priorities of the health system to respond to the coronavirus strongly impacted the provision and use of reproductive, maternal and child

[34] MoH (Ministry of Health) 2022.

[35] NPA (National Planning Authority) 2020a.

[36] MoH (Ministry of Health) 2021. Tracking Off-budget Financial Resources in the Health Sector FY 2019/20. Ministry of Health, The Republic of Uganda.

[37] UBOS (Uganda Bureau of Statistics) 2021.

[38] Ibid.

[39] UBOS (Uganda Bureau of Statistics) 2021.

[40] Gottret, Pablo, et al. 2008. Good Practices in Health Financing: Lessons from Reforms in Low and Middle-Income Countries. Washington, DC: World Bank. © World Bank.

[41] MoH (Ministry of Health) 2021. Coronavirus disease-2019 (COVID-19): Preparedness and Response Plan. Uganda Ministry of Health.

[42] Center for Systems Science and Engineering at Johns Hopkins University. Coronavirus COVID-19 Global Cases.

health services and human immunodeficiency virus (HIV) services, leading to the loss of some of the progress made in improving health outcomes in the last five years.[43]

15. Climate change represents a significant challenge for the Ugandan health system in the medium-to-long term. Changes in weather patterns, rainfall variability, and rising temperatures could pose additional health threats by affecting the prevalence and distribution of waterborne, foodborne, and vector borne diseases. In addition, the increased frequency of extreme weather events can, directly and indirectly, affect the health system; for example, in the recent past, 130 health facilities in Uganda were damaged by a natural hazard.[44] It is projected that by 2030, an additional 56,200 people may be at risk of inland river flooding, of which more than half can be attributed to climate change. The number of people at risk of malaria will increase to around 93.3 percent of the population in the next 50 years, even in a low greenhouse gas emissions scenario.[45] Furthermore, in a high emissions scenario, heat-related deaths among the elderly in Uganda are expected to be around 20 per 100,000 per year in 2030 and up to 80 per 100,000 per year in 2080, up from 0.5 on average in the period 2014-2019.[46]Although Uganda has a national strategy[47] for health adaptation to climate change, there is currently no project or program whose ultimate objective is such an adaptation. Additionally, there appear to be no funds for said objective, and the budget does not include a line dedicated to financing health systems adaptation.

B. EDUCATION

16. Uganda has shown improvement in education in the past decade. The gross enrollment rate (for all levels) increased from 44.1 percent in 2007 to 55.6 percent in 2019, with the most significant increase observed at the pre-primary education level (Figure 9.a).[48] The increase in enrollment rates led to a rise by one year in the average years of schooling (Figure 9.b). Furthermore, adult literacy (pertaining to people over 15 years of age) rose from 68.1 percent in 2003 to 76.5 percent in 2018.[49] Uganda's performance on the index pertaining to SDG 4 on education is similar to the LIDC median (Figure 10). The SDG 4 index aggregates performance on countries' net primary enrollment rate, lower secondary completion rate, and youth literacy rate.[50] To further boost education outcomes, the authorities' third NDP

[43] Atim, M. G., et al. 2021. COVID-19 and Health Sector Development Plans in Africa: The Impact on Maternal and Child Health Outcomes in Uganda. Risk Management and Healthcare Policy, 14, 4353.

[44] NPA (National Planning Authority) 2020a.

[45] WHO (World Health Organization) 2015. Climate and Health Country Profile – 2015: Uganda. World Health Organization.

[46] IMF team computation based in data from Watts, N., et al. 2021. The 2020 report of the Lancet Countdown on health and climate change: responding to converging crises. *The Lancet*, *397*(10269), 129-170.

[47] GoU (Government of Uganda) 2007. Climate Change: Uganda National Adaptation Programmes of Action.

[48] The gross enrollment rate corresponds to all levels of education (from pre-primary to tertiary).

[49] The World Bank. Education Statistics (EdStats). Washington, D.C.

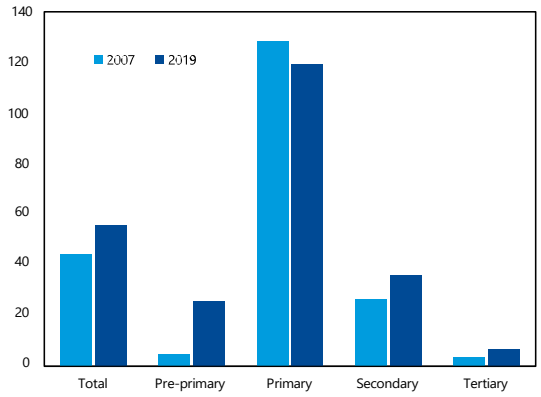
[50] The SDG 4 index uses additional variables for OECD countries, as the better data landscape for these countries makes this possible.

for the period 2020/21 to 2024/25 focuses on interventions that have the objectives of improving the quality of education and producing the appropriate skills required by the economy.[51]

Figure 9. Trends in Educational Outcomes

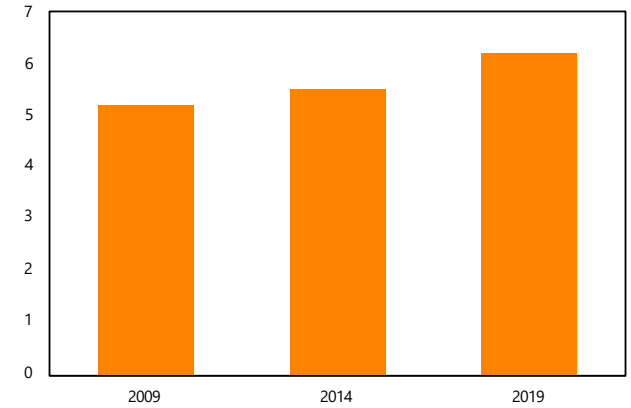
a. Gross Enrollment Ratio

(Percent)



Source: IMF staff calculations using the World Bank Education Statistics (EdStats) database,[52] UNDP (2019),[53] and data provided from the Uganda MoES.
Note: The gross enrollment rate is computed as the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education. For tertiary education, the number of students in the light blue bar pertains to 2006.

b. Average Years of Schooling



Source: IMF staff calculations using the World Bank EdStats database[54] and UNDP (2019).[55]

[51] NPA (National Planning Authority) 2020a.

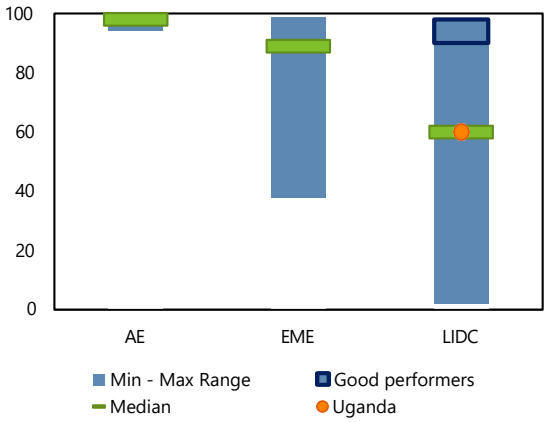
[52] The World Bank. Education Statistics (EdStats).

[53] UNDP (United Nations Development Program) 2019. United Nations World Population Prospects.

[54] The World Bank. Education Statistics (EdStats).

[55] UNDP (United Nations Development Program) 2019.

Figure 10. SDG 4 Index for Uganda and Income Groups



Source: IMF staff estimates using the IMF SDG Performance Tool, which draws on Sachs, J., et al. (2021).[56]

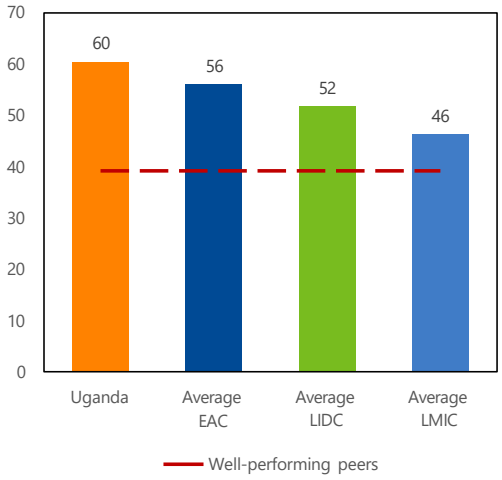
17. The coverage of the education system is, however, still falling short. Uganda has a relatively young population—even more so than LIDCs on average. This may be an opportunity, with the economy able to draw on a large pool of working-age citizens; but for this population to be productive Uganda first faces the challenge of enhancing the human capital of the large cohort of youth. Today, about 60 percent of the population is of school age (Figure 11.a). The country's 1997 Universal Primary Education plan and its 2007 Universal Secondary Education (USE) plan sought to ensure broad access to education. However, Uganda has not yet risen to this demographic challenge: Nearly half of the school-age population—close to 12 million Ugandan children and youth—do not receive any formal education (Figure 11.b). In this respect, while Uganda performs better than the average of EAC countries, it still lags income-group peers.

[56] Sachs, J., et al. 2021.

Figure 11. Demographics and Enrollment

a. School-Age Population

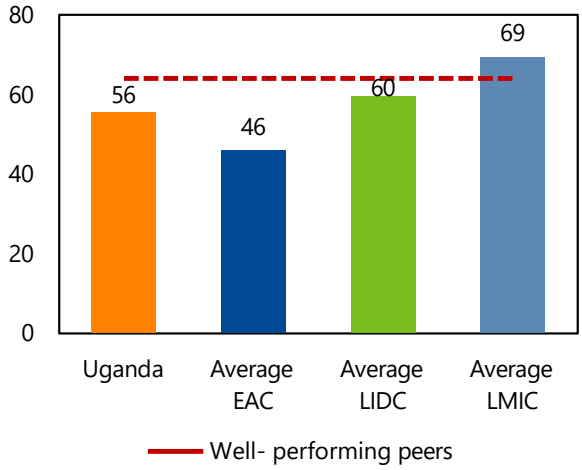
(Percent of total population)



Source: IMF staff estimates using IMF SDG Costing Tool, which draws on UNDP (2019).[57]
Note: School-age population is defined as population aged 1 to 22.

b. Gross Enrollment

(Percent of school-age population)



Source: IMF staff estimates using for Uganda data provided by MoES, and for other countries the IMF SDG Costing Tool, which draws on the World Bank EdStats database.[58]

18. The challenge of inadequate access to education is compounded by insufficient quality, manifested in low functional literacy and numeracy levels. About 50 percent of sixth-graders are not proficient in reading, compared to 20 percent in Kenya and Mauritius and 10 percent in Tanzania. Furthermore, 70 percent of sixth-graders are not proficient in mathematics, compared to 45 and 40 percent in Tanzania and Kenya, respectively.[59] Adding to the quality challenge are the high dropout rates in primary school, with only one out of every three students who enter primary school completing the last grade of the primary level. This helps explain why Uganda has one of the lowest completion rates among EAC countries. The primary education completion rate in Uganda in 2016 was 43.6 percent, compared to 79.5 in Tanzania, 84.1 in Kenya, 53.3 in Burundi, and 54.3 in Rwanda.[60]

19. The lack of public funding explains part of these shortcomings. Public resources devoted to education seem insufficient to provide universal and high-quality education. At 2.8 percent of GDP, Uganda's public spending on education is significantly lower than the average expenditures of EAC countries and LIDCs (3.5 and 4.0 percent of GDP, respectively; Figure 12). Additionally, households in Uganda must incur large expenditures to access education services. High costs are the third most common reason for not attending school.[61] Likewise, 68 percent of 6–24-year-old who drop out of school

[57] UNDP (United Nations Development Program) 2019.

[58] The World Bank. Education Statistics (EdStats).

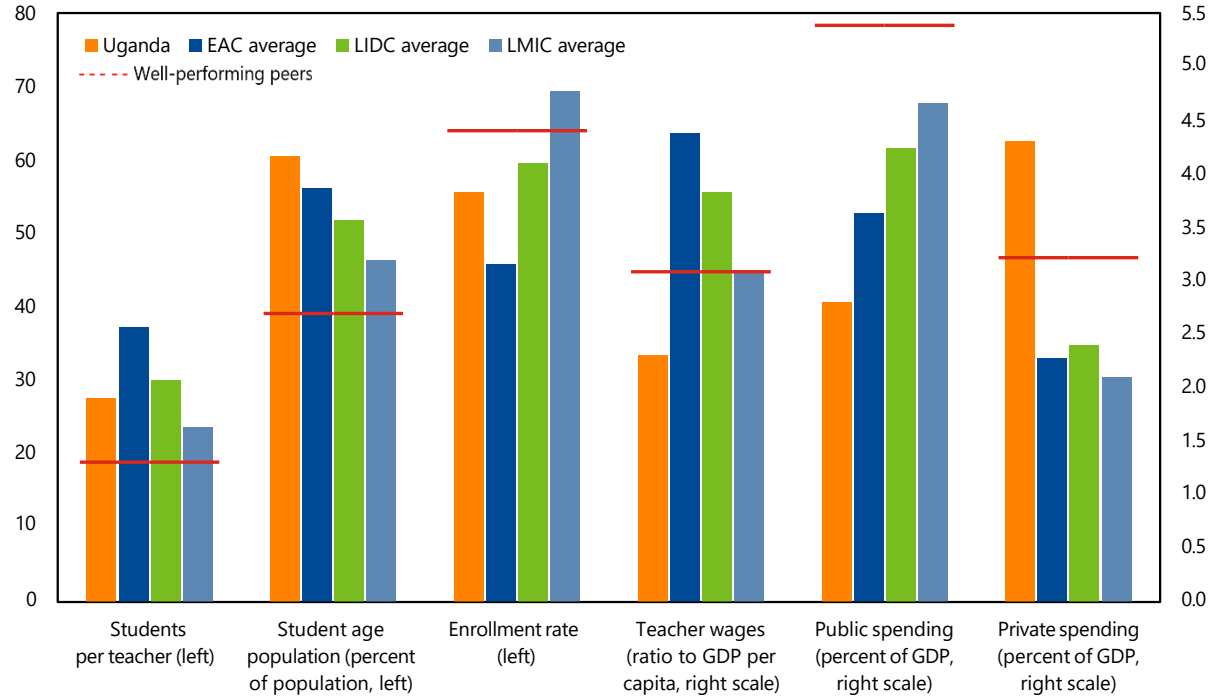
[59] UNDP (United Nations Development Program) 2019. United Nations World Population Prospects.

[60] Filmer, D., & Rogers, H. 2018. Learning to realize education's promise. World Development Report. The World Bank.

[61] UBOS (Uganda Bureau of Statistics) 2021.

state high personal spending on educational resources as the reason for dropping out.

Figure 12. Uganda and Peers: Demographics, Inputs, and Outcomes Pertaining to Education



Source: Data on Uganda: provided by MoES; data on other countries: IMF staff estimates using the IMF SDG Costing Tool, which draws on World Bank EdStats,[62] UNDP,[63] United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.[64]
Note: Enrollment rate refers to gross enrollment and student age population is defined as the population between 1 and 22 years of age.

20. To overcome these challenges and continue on the path to achieving SDG 4, Uganda would require substantial additional resources. The assessment of the additional spending to achieve a strong performance in SDG 4 in 2030 uses an input-outcome approach, in which performance is a function of a set of input variables and demographic factors. We identify the average level of inputs of well-performing peers, i.e., countries with a GDP per capita lower than US$3,000 and an SDG 4 index larger than 88 and derive Uganda's spending in 2030 by assigning these levels of inputs, while accounting for Uganda's population and GDP growth (more details on the methodology and computations are in Appendix III). The results show that to achieve a good performance in SDG 4, Uganda's total spending (i.e., public plus private) in education would need to increase by 6.7 percent of GDP in 2030 from the current spending of 7.1 percent of GDP (Table 2).[65] In real monetary terms, total spending in

[62] The World Bank. Education Statistics (EdStats).

[63] UNDP (United Nations Development Program) 2019.

[64] UNESCO (United Nations Educational, Scientific, and Cultural Organization). UNESCO Institute for Statistics (UIS).

[65] The 2020 World Bank report "Tackling the demographic challenge in Uganda" produced by the Poverty and Equity Practice of the Africa Region estimates the additional public spending needed to ensure universal primary and secondary education, while improving the quality significantly, in line with the Government of Uganda's medium-term goal and the achievement of the SDG goals. The report finds that

education in 2030 would need to be 3.6 times current spending, while capital and non-teacher-wage recurrent spending would need to triple. These estimates arise from the need to boost enrollment, reduce class size, and raise teacher wages:

- *Increasing enrollment rates.* The additional spending in 2030 is consistent with Uganda increasing enrollment to about 80 percent of the school-age population by 2030, i.e., achieving universal coverage of two years of pre-primary, full primary and secondary, and two years of tertiary education.[66]
- *Increasing the quantity and quality of teachers.* While Uganda has smaller class sizes than the average LIDC, further reductions from its current level of 27.6 down to 19 students per teacher would be needed by 2030 to reach today's SDG 4 levels of the good performers among Uganda's peers. Reducing class size is particularly important in public schools, which have an average of 45 students per teacher. To attract more teachers, compensation can increase from its current level of 2.3 times the average income to 3.1. Doing so may also contribute to reducing absenteeism, although additional measures are needed to address this problem (discussed below).

Table 2. Uganda: Additional Spending for High Performance in Education SDG

	GDP per capita US$0-US$3000			Uganda	
	All	Low performance	High performance	2019	2030
GDP per capita	1,380.5	1,327.2	1,738.3	797.2	1,101.2
Main factors					
Students per teacher ratio	29.9	31.5	19.0	27.6	19.0
Teacher wages (ratio to GDP per capita)	3.7	3.8	3.1	2.3	3.1
Other current and capital spending (% total spending)	45.8	45.0	51.5	60.5	51.5
Other					
Student age population (% total population)	50.9	52.6	39.2	60.5	51.3
Enrollment rate (preprimary to tertiary)	50.4	48.4	64.0	55.6	80.1
Private share (% of total spending)	35.0	34.7	37.4	60.1	37.4
Results					
Education spending (percent of GDP)	5.9	5.6	8.4	**7.1**	**13.8**
Public	3.9	3.7	5.3	2.8	8.6
Private	2.1	2.0	3.1	4.3	5.2
Spending per student (USD 2018)	319.2	294.2	582.5	168.3	369.0
SDG4 index	60.3	55.1	94.9	60.5	>88

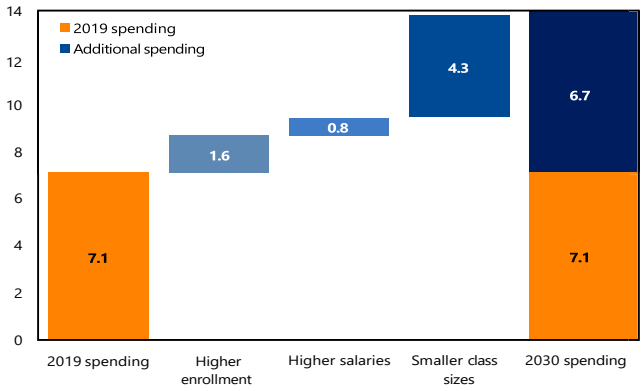
Source: IMF staff calculations.
Note: All countries with an SDG 4 index greater than (below) 88 in 2021 are classified as high (low) performing peers.

for meeting the objectives cited above, the government needs to increase its average annual spending on education in the period 2020-2025 by US$499 million. However, the computations and the assumptions made to carry out the cited study are different from those used in this report, so the results of the two studies are not strictly comparable. For example, this report considers (i) total expenditure (public and private) and, (ii) universal access to two years of complete pre-primary, primary, and secondary education and two years of tertiary education. In contrast, the World Bank report only considers public spending, and primary and secondary levels.

[66] This differential emphasis on coverage across levels follows Gaspar et al. (2019) and is in line with a similar differentiation in SDG4—in the list of SDG targets and indicators, see Target 4.1 calling for "completion" of primary and secondary education, and 4.2 and 4.3 calling for "access" to pre-primary and tertiary education, respectively.

21. Given the relatively large additional spending, a gradual approach could be considered. We estimate that increasing enrollment rates while keeping the current level of spending per student would require an additional spending of 1.6 percent of GDP (Figure 13). With the higher enrollment rate, raising teachers' wages while reducing other recurrent and capital expenditures as a percentage of total spending would require additional spending of 0.8 percent of GDP. Finally, to reduce the class sizes, an additional 4.3 percent of GDP is needed.

Figure 13. Decomposition of Additional Spending in Education
(Percent of GDP)



Source: IMF Staff calculations.

22. As a complement to the standard public and private systems, a continuation of engagement in public-private partnerships (PPPs) might help increase education service supply and quality. More than 800 schools are currently part of a PPP program launched by the Ugandan government after adopting the USE plan in 2007. In 2016, of the total number of students enrolled in secondary education, one-third attended a PPP school.[67] Participation in the PPP program led schools to have a lower repetition rate and show somewhat better student progress than government USE schools.[68] Participation also resulted, for private schools, in higher enrollment rates and better student performance.[69]

23. With the right educational policies, Uganda could harness the potential gains from its future workforce. To extract a demographic dividend, in addition to increasing enrollment rates it is necessary to improve the quality of education and reduce the mismatch between the skills required by the labor market and the knowledge produced by training institutions. Teacher absenteeism, limited teaching capacity, weak pedagogical skills, and poor assessment methods are among the factors that affect Uganda's education performance. Uganda's teacher absenteeism is one of the highest in the region,

[67] O'Donoghue, J., et al. 2018. A Review of Uganda's Universal Secondary Education Public Private Partnership Programme. Education Partnerships Group (EPG).

[68] Ibid.

[69] Barrera-Osorio, F., et al. 2020. The impact of public-private partnerships on private school performance: Evidence from a randomized controlled trial in Uganda. Economic Development and Cultural Change, 68(2), 429-469.

especially in the form of late arrival at and early departure from school.[70] On average, teachers in Uganda are present in the classroom for only 40 percent of the time that they are paid to teach.[71] Reducing teacher absenteeism could lead to a significant improvement in educational outcomes. Analysis in other African LIDC contexts suggests that each additional 5 percent increase in teacher absenteeism reduces learning by 4 to 8 percent of the average student's learning in a year.[72] Policies focused on improving teacher monitoring, training, and professional progression, on reducing inequalities in teacher workload, and on incentivizing hardship postings, have been shown to reduce teachers' absenteeism.[73]

24. School closures and cuts in the education budget due to COVID-19 have exacerbated learning inequalities and are likely to have increased dropout rates. Uganda's school closure period was the longest in the world: From March 2020 to January 2022, schools were closed for 83 weeks.[74] Given the country's low internet penetration—only 6.1 percent of people aged 10 and above use the internet for any purpose—most students were unable to receive lessons once the schools closed.[75] In order to minimize the long-term implications of the pandemic on human capital accumulation, it will be necessary among other measures to ensure adequate resources for education and to invest in digital literacy.[76]

[70] Karamperidou, D., et al. 2020. Time to Teach: Teacher attendance and time on task in Eastern and Southern Africa. UNICEF Office of Research – Innocenti, Florence.

[71] Filmer, D., & Rogers, H. 2018. Learning to realize education's promise. World Development Report.

[72] Das, Jet al. 2007. Teacher shocks and student learning evidence from Zambia. Journal of Human resources, 42(4), 820-862.

[73] Karamperidou, D., et al. 2020.

[74] IMF (International Monetary Fund) 2022. Uganda: 2021 Article IV Consultation and First Review under the Extended Credit Facility Arrangement and Requests for Modifications of Performance Criteria-Press Release; Staff Report; and Statement by the Executive Director for Uganda.

[75] UBOS (Uganda Bureau of Statistics) 2021.

[76] Das, S., et al. 2021. After-effects of the COVID-19 pandemic: Prospects for medium-term economic damage.

III. INFRASTRUCTURAL DEVELOPMENT

A. WATER AND SANITATION

25. In the course of the past two decades, the country has seen progress in providing its population access to improved water. The country's Vision 2040 strives for the ambitious goal of providing all people access to safe piped water by 2040, and a presidential directive mandates one improved water source per village,[77] defined as piped water, boreholes, tube wells, protected dug wells, protected springs, and packaged or delivered water. Even if the country is yet far from these goals, important improvements were accomplished in the course of the past two decades. Most rapid progress was achieved in increasing access to safely managed water, from 2 percent of the population in the year 2000 to 17 percent in 2020, and basic sources of improved water, from 27 to 56 percent (Figure 14); Basic and safely managed water access are distinguished by the distance to improved facilities, with the former referring to a household requiring 30 minutes or less roundtrip to reach such a facility, and the latter pertaining to the facility being on the household's premises. Major strides were also made in rural areas in raising basic water access. In urban areas, the greatest progress was achieved in providing hygiene (handwashing) and safely managed water facilities. Access of rural and urban households to these services rose by a significant 27 to 29 percentage points.

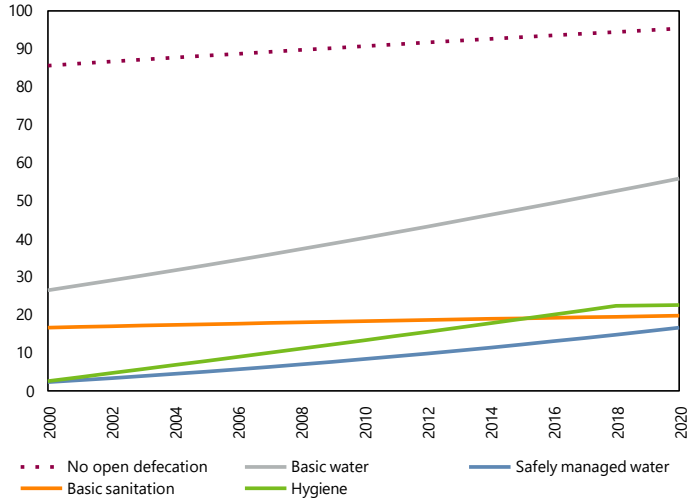
26. However, sanitation services have stagnated over the past 20 years. Access to basic sanitation services—referring to improved facilities (flush/pour flush to piped sewer systems, septic tanks or pit latrines; ventilated improved pit latrines; compositing toilets; and pit latrines with slabs) that are not shared with other households—hardly improved (Figure 14). Both supply-side issues—such as poor terrain and soil type, making the installation of facilities more challenging—as well as demand-side issues, including low-income people's inability to pay sanitation fees, as well as cultural norms, are at play.[78]

27. Despite the (partial) progress over the past 20 years, Uganda lags peers in water and sanitation. Among the EAC countries, only South Sudan has a share of the population with access to basic water and sanitation facilities that is lower than Uganda's; and the country is far behind LMICs in this regard (Figure 15). For a broader sectoral view, we also consider the country's overall SDG 6 performance. Beyond water, sanitation, and hygiene (WASH), Goal 6 captures various other outcomes relating to water resources management, such as water quality, water-use efficiency, water-related ecosystems. Benchmarking Uganda on this wider indicator against EAC countries, income and regional groups reveals a similar result. The country lags all EAC countries other than South Sudan, LMICs (by a larger distance), LIDCs, and SSA (Figure 16 and Figure 17). It also has a lower performance than the weakest emerging market economy (EME) (Figure 17).

[77] GoU (Government of Uganda) 2013.

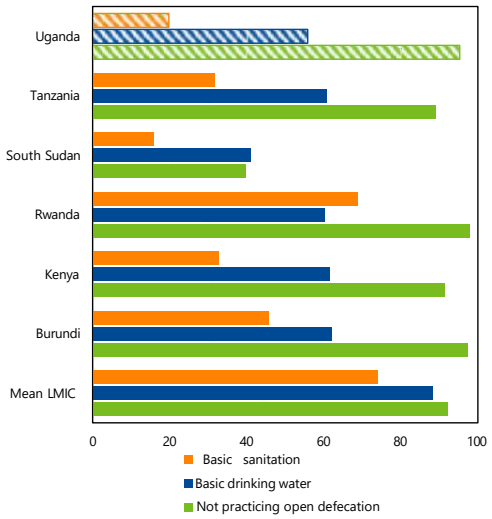
[78] Tsimpo, C. and Wodon, W. 2018. Water and Sanitation in Uganda. World Bank Studies. Washington, DC: World Bank. doi: 10.1596/978-1-4648-0711-4.

Figure 14. Access to Water and Sanitation Services Over Time
(Percent of the population)



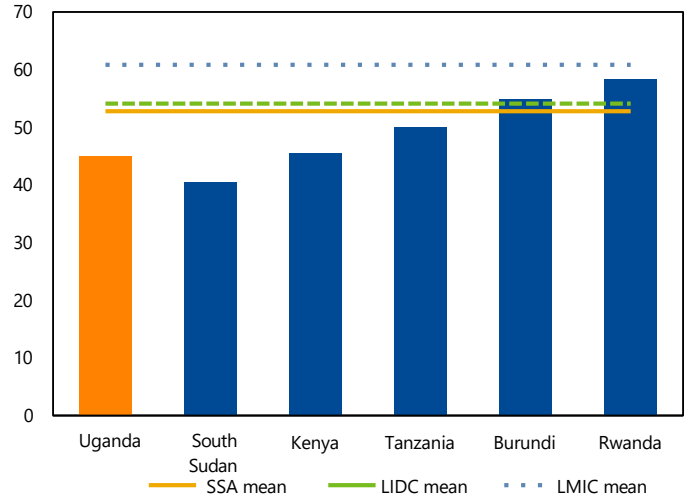
Source: World Development Indicators, 2021.[79]

Figure 15. Access to Water and Sanitation Compared to Peers
(Percent of the population)



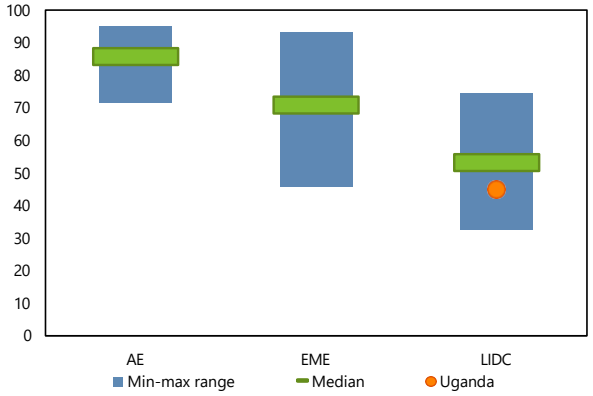
Source: World Development Indicators, 2021.[80]

Figure 16. SDG Index: EAC Countries
(0=worst and 100=best score)



Source: IMF SDG Performance Tool (2021), which draws on Sachs et al. (2021).[81]

Figure 17. SDG 6 Index: Income Groups
(0=worst and 100=best score)



Source: IMF SDG Performance Tool (2021), which draws on Sachs et al. (2021).[82]

28. The cost to close the water and sanitation infrastructure gap by 2030 is based on a WASH

[79] The World Bank. World Development Indicators.

[80] Ibid.

[81] Sachs, J., et al. 2021.

[82] Ibid.

model developed by the World Bank.[83] The analysis employs updated Uganda data from a report prepared for the MWE and Environment.[84] The estimation approach accounts for the population size that remains unserved and the additional population growth over the next years until 2030, as well as the estimated cost per capita in Uganda of providing WASH facilities, including the maintenance cost to counteract depreciating infrastructure. Both the number of people that need to be served and the unit costs of provision are distinct for each type of facility, i.e., facilities to replace open defecation, basic and safely managed WASH facilities. The unserved population size and unit costs are furthermore estimated separately for urban and rural areas of the country.

29. Uganda's investment to meet the WASH goals of SDG 6 amount to approximately 1.1 percent of GDP. The results indicate that on a cumulative basis, closing the infrastructure gap to provide water and sanitation services for the unserved population of 53.5 million by 2030 will require an estimated US$9.4 billion, or US$175 per unserved person, by 2030 (Table 3). This means that Uganda will need to invest, on an annualized basis, $720 million, or about 1.1 percent of 2030 GDP, to achieve universal coverage of water and sanitation. The single largest contributor to this investment need, making up nearly half the annual additional cost, is the provision of safely managed water in rural areas, owing both to its relatively large unit cost of US$109 per person—given the costliness of investing in piped water supply—as well as to the significant size of the rural population that will need to be provided such access by 2030 (41 million; cf. Figure 18). Safely managed sanitation for rural areas constitutes another 22 percent of the annual additional investment for WASH. The population in 2030 to be served with such facilities is, at 39 million, nearly the same size as the population that will need to access safely managed water.

Table 3. Additional Spending to Achieve Universal Coverage of Water and Sanitation Services in 2030

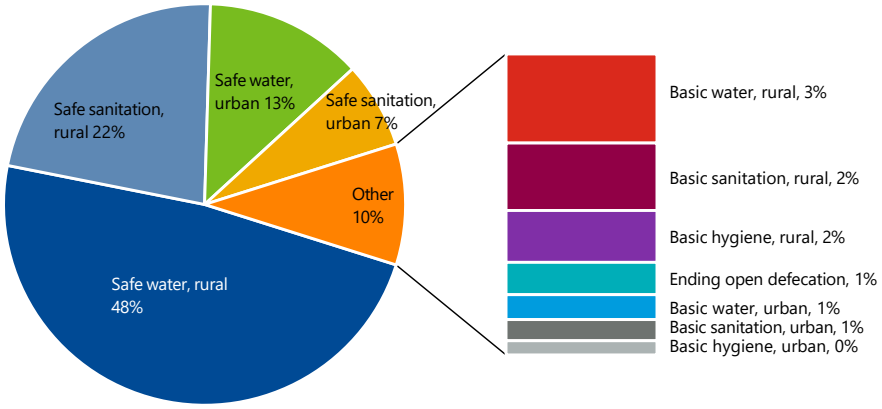
	Ending open defecation	Basic						Safely Managed				Total
		Water		Sanitation		Hygiene		Water		Sanitation		
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
Population (millions)												
Population	32.9	32.9	9.9	32.9	9.9	32.9	9.9	32.9	9.9	32.9	9.9	42.9
Projected population in 2030	40.9	40.9	18.5	40.9	18.5	40.9	18.5	40.9	18.5	40.9	18.5	59.4
Total unserved population until 2030	19.4	22.5	6.3	36.3	11.3	27.8	7.7	41.4	10.9	39.0	12.1	53.5
Population unserved	2.9	6.0	2.3	19.7	7.3	11.3	3.7	24.9	6.9	22.5	8.1	33.0
Population addition through 2030	16.5	16.5	4.0	16.5	4.0	16.5	4.0	16.5	4.0	16.5	4.0	20.5
Cost												
Cost (per capita, US$)	10.0	24.0	24.0	5.6	5.6	5.6	5.6	109.2	109.2	53.6	53.6	175.0
Total cost (% of 2030 GDP)	0.30	0.83	0.23	0.32	0.10	0.24	0.07	6.96	1.84	3.23	1.00	34.22
Total additional cost (US$ million)	195.3	539.3	150.9	204.6	64.0	156.9	43.6	4,516.7	1,190.7	2,092.2	649.8	9,361.3
Annual additional cost (US$ million)	15.0	41.5	11.6	15.7	4.9	12.1	3.4	347.4	91.6	160.9	50.0	720.1
GDP)	**0.02**	**0.06**	**0.02**	**0.02**	**0.01**	**0.02**	**0.01**	**0.54**	**0.14**	**0.25**	**0.08**	**1.11**

Source: IMF staff calculation
Note: Latest year available for unserved population and unit costs in 2017.

[83] Hutton, G. and Varughese, M. 2016. "The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene" Water and Sanitation Program Technical Paper.

[84] Strzepek, K., et al. 2018. "Strategic Investment Plan for the Water and Environment Sector, Uganda (2018-2030)" Prepared for the Ministry of Water and Environment.

Figure 18. Annual Cost of Providing WASH to Unserved Population by 2030, by Type
(Percent of annual cost)



Source: IMF staff calculations

30. On the supply side, in addition to expanding access to improved water, there is a need to upgrade to higher-quality sources. A recent stocktaking of WASH technologies in 102 of the country's 135 districts suggested the sources most widely used among those that qualify as improved water sources are those that are relatively lower in quality, such as protected springs and shallow wells.[85] About 44 percent of the districts used no technology for large-scale purification or treatment of water prior to distribution. Even relatively simple point-of-use technologies are not yet adequately supported. For example, one-third of the districts do not undertake an effort to promote water-boiling at the household level. NGOs are the primary actors in supporting point-of-use water treatment and purification technologies. The MWE and Environment plans to promote the application of water source protection guidelines more strongly and initially support urban areas in their preparation of plans to this effect.

31. The pandemic detrimentally affected water and sanitation supply and quality through budget reallocations and constrained operations during lockdowns (MWE 2021).[86] Reallocation of the budget during FY2020/21 to fight the COVID-19 pandemic has led to a reallocation in funds away from the water, sanitation and environment sector by over 9 percent.[87] In addition to the lower resources, monitoring and technical supervision of water and sanitation projects were greatly affected by pandemic restrictions on movements, and the functionality of piped water supply especially in urban areas declined as a consequence. The MWE is therefore exploring the introduction and development of remote monitoring approaches. Water quality also suffered as water testing laboratories had to operate with only 10 percent of the staffing. Foreign experts, who have an important involvement in externally financed WASH activities, were unable to carry out activities in-country given travel restrictions. Water utilities also accumulated arrears given their inability to collect fees when households' pandemic-induced income losses meant they were could not pay for the tariffs, and a directive of "no disconnection" of users during

[85] MWE (Ministry of Water and Environment) 2021. Natural Resources, Environment, Climate Change, Land and Water Management Program. Performance Report 2021.

[86] MWE (2021). Which is the performance report for the Natural Resources, Environment, Climate Change, Land and Water Management program, provides further details discussed in this paragraph on the budget reallocation away from the water and sanitation sector due to resources needed to fight the pandemic, on the lockdowns in the sector affecting supply, and on several other ways that the pandemic affected the sector.

[87] MWE (Ministry of Water and Environment) 2021.

lockdown. The National Water and Sewerage Corporation, which serves urban areas, also saw a decline by 12 percent in the number of household connection in the pandemic fiscal year, due to movement restrictions. At the same time, within the water and sanitation sector, local governments took greater initiative than in the pre-COVID era to strengthen previously dormant water and sanitation committees, in order to be able to provide clean and safe water to communities to support pandemic hygiene standards.

32. Climate change will call for resilient water infrastructure alternatives, which may entail higher cost of WASH service provision. Regional climate models suggest seasonal drying over most parts of Uganda by the end of this century.[88] Although climate change in Uganda will bring about increased floods, among the expected significant impacts is a drop in water levels.[89] This is expected to emerge from diminishing groundwater sources and the drying up of surface water. This could exacerbate water scarcity for domestic and other purposes, and result in higher cost in WASH infrastructure due to the need to develop more climate-resilient technological infrastructure alternatives.[90] As also in the country's overall climate change strategy, Uganda's effort to combat climate change in the context of the water and sanitation strategy is primarily centered on adaptation. The country's Nationally Determined Contribution (NDC), thus, prioritizes improving water efficiency, for example, through promoting water harvesting and storage, better managing water resource systems, including wetlands, and designing water and sanitation facilities. The NDC also prioritizes implementing public awareness programs on hygiene, so as to limit occurrences of water-borne diseases. Uganda's standard national climate change indicators, which were developed as input for the budget process to be able to account for improvements in climate change mitigation and adaptation, include several indicators that reflect the interface between climate change and the water and sanitation sector.[91] A close and timely monitoring of these indicators will be useful to better track the impact of climate change on water quality.

B. ELECTRICITY

33. Uganda has made strides in increasing infrastructure to supply electricity. Over two decades (2000-2021) Uganda increased its installed capacity more than threefold, from 400 MW to 1,347 MW. The vast majority of installed capacity (80 percent) comes from hydropower (Figure 19). The transmission network has more than doubled in just a few years from 1,178km in 2016 to 3,431km in 2021, and transmission losses have remained stable in the last five years at an average of 3.9 percent. Distribution has also improved: the main distributor, Umeme, has halved its distribution losses from 34.2 percent in 2008 to 17.9 in 2021.[92] The authorities plan to significantly expand installed electricity

[88] Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, 2014: Africa. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265.

[89] MWE (Ministry of Water and Environment) 2015. Uganda's Intended Nationally Determined Contribution (INDC).

[90] IRC 2021. Climate Change, Water Resources, and WASH Systems—Country Case: Uganda.

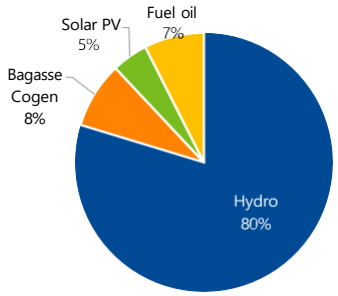
[91] MWE (Ministry of Water and Environment) 2018. Standard National Climate Change Indicators and Indicator Reference Sheets.

[92] ERA (Electricity Regulatory Authority): Data and Statistics.

generation capacity; for example, two large hydropower dams, Karuma and Isimba, are expected to increase capacity by 783 MW.[93] However, the transmission and distribution network will need to catch up with the expansion in capacity, given that peak demand is currently at 793 MW, well below current capacity.

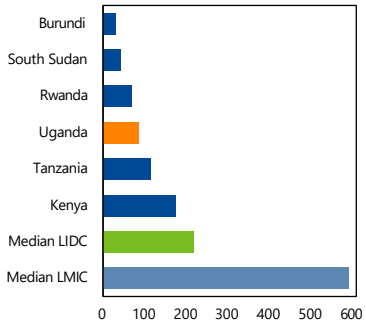
34. Uganda is similar to EAC countries in electricity consumption, but lags LIDCs. Total consumption increased from 780 gigawatts-hours (GWh) two decades ago to 3,918 GWh today. However, current per capita consumption, at 83 kWh, is far behind that of the average LIDC, and also falls short of consumption levels in Kenya (172kWh) and Tanzania (113kWh)—even as it remains higher than in other EAC countries (Figure 20 and 22). SDG 7.1.1 indicator measures the proportion of the population with access to affordable, reliable, and modern electricity services. Uganda's electricity access is still low (41.3 percent; Figure 21) especially in rural communities, which represent more than 74 percent of the total population. The objective of the authorities is to ensure that 60 percent of the population have access to electricity by 2027, which will still be well below the SDG 7.1 target of universal access.[94] Given the constraints in reaching the rural population with the grid, the authorities envisage accompanying continued grid extension and measures that lower households' cost of connection with the installation of off-grid solutions such as solar photovoltaic systems. The current upfront grid connection costs are about US$160, which is equivalent to over two months of the average income and thus not affordable to many households. The Electricity Connection Policy establishes a roadmap to connect 300,000 people per year from 2018 to 2027 and fully subsidize consumers' upfront connection costs.[95] Besides the welfare gains from expanding electricity use among the population, increasing electricity access to expand demand is also crucial for the country to avoid incurring the costs of excess generation.

Figure 19. Installed Capacity
(Percent, 2021)



Source: Data provided by the MEMD and ERA.
Note: Photovoltaics.

Figure 20. EAC and LIDCs: Electricity Consumption per Capita
(kWh; latest year available)



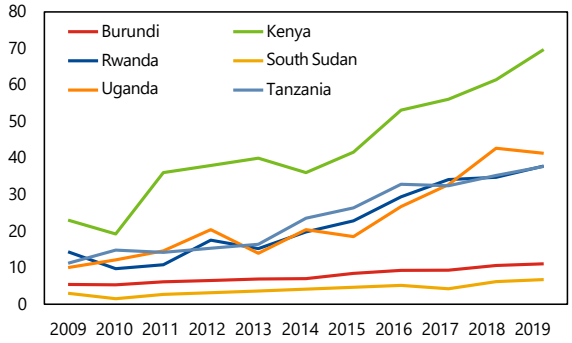
Source: IMF staff calculations based on data provided by MEMD and ERA for Uganda. For other countries data is from the International Energy Agency (IEA). Data for Uganda is from 2021.

[93] MEMD (Ministry of Energy and Mineral Development). Uganda Electricity Connection Policy 2018-2027.

[94] IEA (International Energy Agency), IRENA (International Renewable Energy Agency), United Nations Statistics Division, World Bank, WHO (World Health Organization) 2021. Tracking SDG 7: The Energy Progress Report.

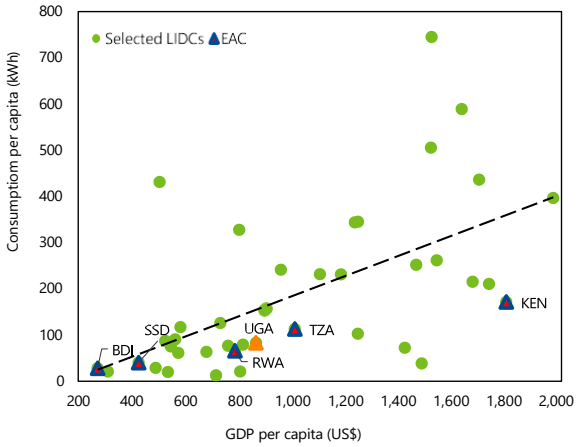
[95] MEMD (Ministry of Energy and Mineral Development).

Figure 21. Electricity Access
(Percent of population)



Source: IEA *et al.* (2021).[96]

Figure 22. EAC and LIDCs: GDP per Capita and Electricity Consumption
(Latest year available)



Source: IMF staff calculations based on data provided by MEMD and ERA, the IEA,[97] and WEO.[98]
Note: Data for Uganda is from 2021. For easier visualization, we included only LDICs with GDP per capita lower than US$2,000.

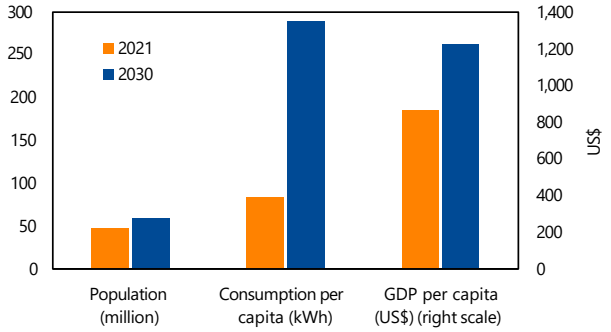
35. Electricity generation needs to rise to support universal access as well as needs to keep up with population and economic growth. In the last decade of the 2030 Agenda, the population is projected to increase from 47.1 to 59.4 million, and GDP per capita from US$862 to US$1,221. Electricity generation will thus need to grow not only to extend electricity access to reach the entire population, but also to account for population growth between now and 2030, and to serve the increase in electricity demand that arises from income growth. These factors (access share, population growth, and income growth) entail a rise in electricity consumption per capita from 83kWh in 2020 to 289kWh by 2030 (Figure 23). To expand its electricity network, at a unit cost (including generation, transmission, and distribution costs) of US$1,188 per kilowatt, Uganda will need to invest an aggregate of US$1.8 billion, which on an annual basis is equivalent to 0.4 percent of GDP, including replacement costs (Table 4).

[96] IEA (International Energy Agency), IRENA (International Renewable Energy Agency), United Nations Statistics Division, World Bank, WHO (World Health Organization) 2021.

[97] Ibid

[98] IMF (International Monetary Fund) 2021. World Economic Outlook Update, October 2021: Recovering During A Pandemic.

Figure 23. Economic and Electric Power Consumption Statistics



Source: IMF staff calculations.

Table 4. Additional Investment Needs in the Electricity Sector

A. Additional consumption (GWh)	13,251
B. Unit cost including generation, transmission and distribution costs (US$ per kW)	1,188
A*B/(hours per year)=Total investment (US$ billion)	1.795
Total annual investment plus depreciation (percent of 2030 GDP)	0.400

Source: IMF staff calculations.
Note: The cost of reaching the SDG is calculated as a function of per capita GDP growth, investment cost per additional kilowatt (including generation, transmission, and distribution), and replacement costs.

36. COVID-19 has hindered the authorities' activities in the electricity sector. The two lockdowns that Uganda underwent and the concomitant movement and transport restrictions detrimentally affected the implementation of construction projects already underway. The disruptions in the global supply chain also delayed the acquisition of critical electrical equipment. The planned network expansion as envisaged in the Electricity Connection Policy experienced a slowdown. The pandemic also drove home the importance of increasing connectivity. For example, with only about 47 percent of health centers connected to grid electricity, the health care system faced significant constraints in implementing a successful and coordinated health response against COVID-19, including by carrying out contact tracing and testing.[99] Furthermore, with the two-year-long school closure (see Section II.B.), the low access to remote learning platforms, powered by electricity, severely affected human capital development during the pandemic.

37. Uganda has a very high percentage of renewable electricity generation. Uganda is a low green-house gas emitter in large part due to its overall low energy consumption. But climate change mitigation is also helped by the fact that practically all electricity generation (98.7 percent) comes from renewable sources (primarily hydropower), rendering it the country with the highest reliance on renewables among peers (Figure 24). On the adaptation side, Uganda's high reliance on hydropower could become an issue in the long run in the case of drastic climate events, in particular drought. The authorities are planning to diversify the energy mix, primarily by increasing the share of solar power. On the demand side and considering energy more broadly besides its use in electricity, Uganda is still a low performer when it comes to energy consumption, especially for cooking. It is one of the 20 largest deficit countries in terms of the population without access to clean cooking and is one of the countries that show slower progress.[100] In Uganda, only 1 percent of the population has access to clean fuel technology, and this leads to increased pollution. The World Health Organization highlights that household air pollution from cooking in Uganda is estimated to have caused over 12,000 deaths every year.[101] Furthermore,

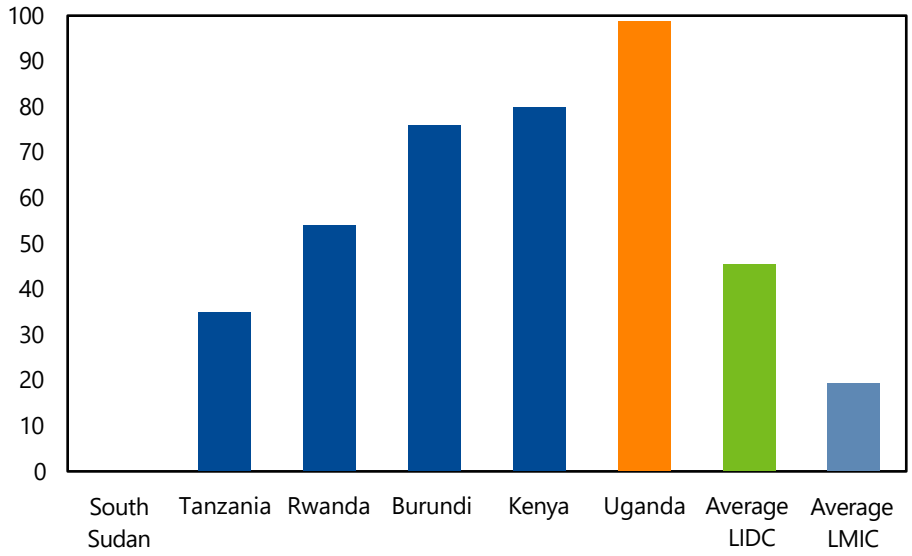
[99] MEMD (Ministry of Energy and Mineral Development) 2020. National Electrification Report.

[100] IEA (International Energy Agency), IRENA (International Renewable Energy Agency), United Nations Statistics Division, World Bank, WHO (World Health Organization) 2021.

[101] WHO (World Health Organization) 2018. Global Health Observatory.

reliance on solid biomass, such as wood, could put pressure on natural resources.

Figure 24. Electricity Generation from Renewable Sources
(Percent of total electricity generation; latest year available)



Source: Uganda (2021 data) provided by MEMD, ERA; Other countries: International Renewable Energy Agency (IRENA).
Note: South Sudan's statistic is zero (i.e., not a missing value).

C. ROAD INFRASTRUCTURE

38. Uganda's national network of paved roads has more than doubled since 2008. However, the vast majority (76 percent) of the total road network of nearly 160 thousand km pertains to subnational roads. In fact, half of the total network consists of community access roads (i.e., feeder roads), which are entirely non-paved.[102] The quality of these community access roads appears to be very low, with only 2.8 percent of them (2,239km) that are considered all-season roads (Table 5).[103] The relevant SDG indicator for road access and quality is SDG 9.1.1, based on the Rural Access Index (RAI), which measures the proportion of the rural population that lives within 2km of an all-season road.

[102] MoWT (Ministry of Works and Transport) 2021. National Integrated Transport Master Plan 2021-2040.

[103] The analysis considers as all-season roads those district, urban, and community access roads deemed motorable and passable. In the case of national roads, the classification by MoWT of roads being "in good condition" is used as a proxy for all-season roads. See MoWT (2022).

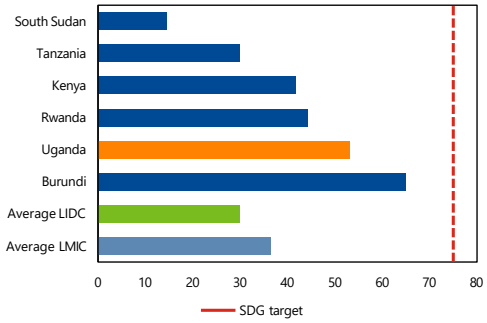
Table 5. Total Road Network
(Kilometers, latest year available)

	Paved	Non-Paved	Total	Of which, all-season roads
National	6,107	14,747	20,854	10,561
District	107	38,497	38,603	6,447
Urban	1,230	18,729	19,959	3,074
Community access	0	79,948	79,948	2,239
Total	**7,443**	**151,921**	**159,364**	**22,320**

Source: Data provided by the Ministry of Works and Transport (MoWT) and the OPM Delivery Unit

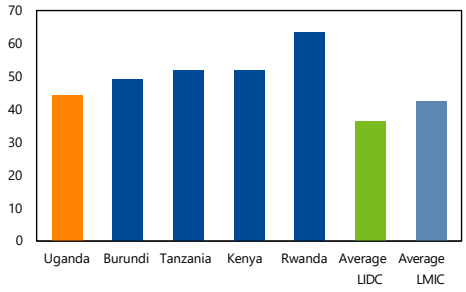
39. With somewhat more than half of the rural population with access to an all-season road, Uganda is well ahead of LIDCs and even LMICs. Uganda's RAI is 53. While rural road access is thus higher than most EAC countries and income group comparators, it is still well below the IMF's performance target for LIDCs (RAI of 75, Figure 25; see Gaspar et al. 2019). Despite the commendable road quantity, the quality of the overall road network appears to be lower than most peers (Figure 26). Given the predominantly rural nature of Uganda's population and the importance of agriculture for the economy, having a widespread and good-quality road network is crucial for rural development, since roads foster access to economic and social services and improve the trade potential of rural areas.

Figure 25. Rural Access Index
(Percent, latest year available)



Source: Uganda: MoWT (2022). [104]Other countries: Rozenberg et al. (2019).[105]

Figure 26. EAC: Quality of Roads
(Score range from 0 to 100, 2019)



Source: Global Competitiveness Index 4.0, World Economic Forum (2019).[106]
Note: Score 0-100 as linear transformation based on the response to the survey question "In your country, what is the quality (extensiveness and condition) of road infrastructure?" 1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world. No data are available for South Sudan. See Appendix VI for further details.

40. Uganda would need to invest a total of US$14.6 billion to improve its rural access. Increasing the RAI from its current level to 75 by 2030 will require an annual additional investment of 2.8 percent of GDP (Table 6). To close the infrastructure gap, the country has to increase the stock of all-season roads (whether through upgrading, rehabilitation, or construction) by about 20.4 thousand additional kilometers (Figure 27). This takes into account the expected decrease in the rural population share, which reduces the length of roads needed, *ceteris paribus*, as well as the increase in GDP per capita. The unit cost is estimated at US$716,042 per kilometer considering costs from rehabilitating/upgrading the existing network and constructing new roads.[107]

41. Climate change could have a severe impact on Ugandan infrastructure. Given the exposure of roads to climate-change induced severe weather events (especially flooding and landslides), building climate-resilient infrastructure is key to avoiding disruptions of the economy. The authorities estimate that 2,180km of roads are exposed to the risk of landslides and 2,850km are at risk of flooding. Mapping the more at-risk parts of the country, improving drainage, and putting in place vegetation to stabilize roads are important steps toward adaptation. Climate change will additionally require greater spending on road maintenance, which already suffers from perennial underinvestment (Figure 28).

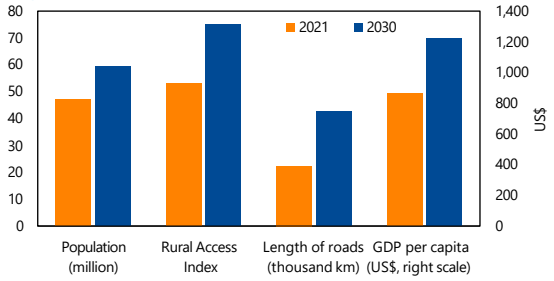
[104] MoWT (Ministry of Works and Transport) 2022. Integrated Transport and Infrastructure Services Program Performance Report.

[105] Mikou, M., et al. (2019). Assessing Rural Accessibility and Rural Roads Investment Needs Using Open Source Data. The World Bank, Policy Research Working Paper 8746.

[106] World Economic Forum, 2019. The Global Competitiveness Report 2019.

[107] The unit costs for rehabilitation and upgrading come from the Integrated Transport and Infrastructure Services Program Performance Report 20/21. MoWT. The unit cost for new construction is derived from MoWT (2021): "Presentation on Unit Cost Study Findings, Road Construction & Maintenance in Uganda."

Figure 27. Economic and Road Indicators



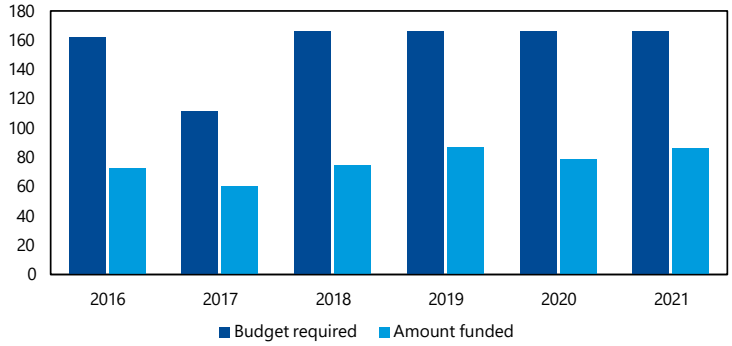
Source: IMF staff calculations.
Note: See Appendix VI for detail on the calculations of all season road length needed in 2030.

Table 6. Additional Investment in Roads

A. Additional roads (thousand km)	20.4
B. Unit cost (US$/km)	716,042
A*B= Total investment (US$ billion)	14.6
Total annual investment plus depreciation (percent of GDP)	2.8

Source: IMF staff calculations, based on unit costs from MoWT (2022)[108] and MoWT (2021).[109] See Appendix VI.

Figure 28. Maintenance Needs
(Millions US$)



Source: MoWT (2022).[110]

42. COVID-19 has further impacted the capability of maintaining road infrastructure. The pandemic has affected the capability of resolving the backlog of road maintenance, and this will further negatively affect the asset life and quality of road infrastructure.[111] Since most of the contractors in the sector are foreign, and materials and machinery imported, the slowdown of the global supply chain has stalled the implementation of road projects already in place. The pandemic is also expected to have an impact on the future cost of construction, since contractors are now pricing in the risk of other pandemics and similar shocks. Finally, the activities of the Uganda National Road Authority have been hampered, with the construction of new roads slowed by the two lockdowns that Uganda experienced, and land acquisition for road building was stymied during the pandemic.

[108] MoWT (Ministry of Works and Transport) 2022.

[109] MoWT (Ministry of Works and Transport) 2021. Presentation on Unit Cost Study Findings Road Construction & Maintenance in Uganda.

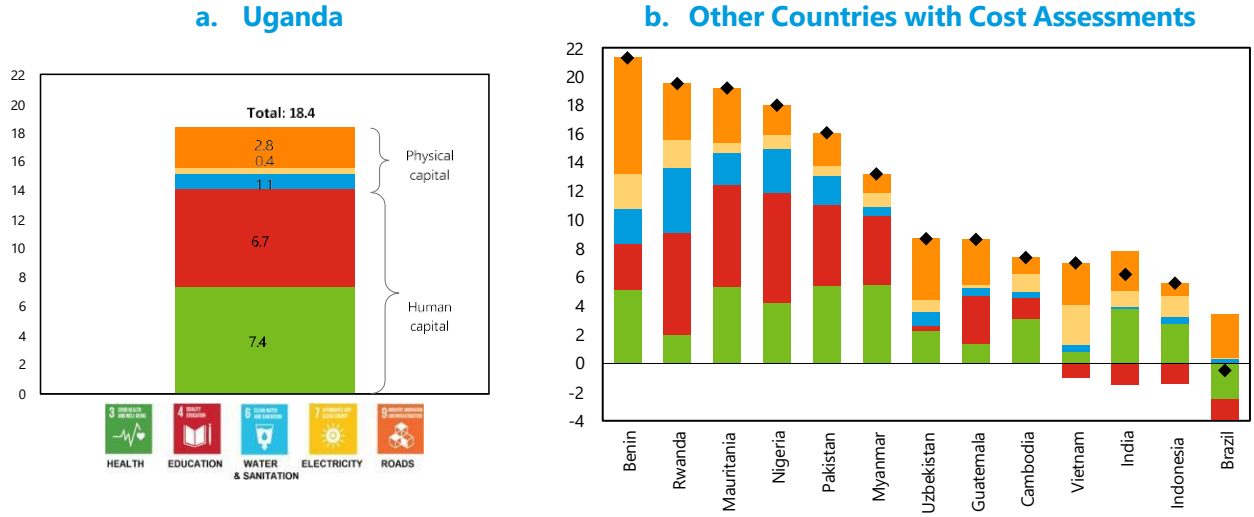
[110] MoWT (Ministry of Works and Transport) 2022.

[111] The total unconstrained cost for rehabilitation or removal of backlog of all roads has increased from US$1,154.3 million in FY 2019/2020 to US$1,160.7 in 2020/2021. MoWT (2022), Integrated Transport and Infrastructure Services Program Performance Report.

IV. Conclusion

43. Uganda's additional annual spending needs to perform well in these SDGs in 2030 amount to 18.4 percent of GDP, of which over three quarters derive from spending on human capital development (Figure 29.a)**.** Additional spending to achieve high performance in the health SDG is largest, followed by spending in education. Despite Uganda's substantial needs to arrive at high SDG outcomes, these are not the largest among recent similar SDG cost assessments carried out by the IMF in collaboration with country authorities. Benin, Rwanda and Mauritania, for example, have costs exceeding those of Uganda, and Nigeria's costs are similar in magnitude to those of Uganda (Figure 29.b).

Figure 29. Additional Annual Spending in Uganda and Other Countries
(Percent of GDP)



Source: IMF staff calculation

44. Changing the assumptions on efficiency and cross-sectoral effects would vary cost estimates. Underlying this cost assessment is the expectation that Uganda will raise its efficiency in transforming inputs (such as the number of teachers per student, or compensation of health workers) into outcomes (e.g., the SDG 3 or SDG 4 index) to the efficiency levels of well-performing peers. Without making such progress in efficiency, the expenditure needs would be even higher. On the other hand, the SDG spending needs analysis does not explicitly measure all cross-sector contributions to outcomes (for example, the reduction in the health risks of water-related diseases that emanate from improved water and sanitation access)—these cross-sectoral effects may reduce the cost to achieve the SDGs. It should also be noted that this analysis does not prescribe a specific time path to arrive at the additional expenditures in 2030. Policymakers can, for example, choose gradual trajectories to get to the estimated higher levels of spending in health and education. And the additional annual spending in infrastructure is an average yearly target that could be distributed evenly across time, frontloaded, or backloaded. While this report focuses on 2030 as the "end-year" to sustain SDG levels after this year, spending in the social sectors would need to recur, and infrastructure spending would have to keep up with population and GDP growth and cover the depreciation of the capital stock built up through 2030.

45. In Uganda, climate change adaptation, rather than mitigation, will need to be high on the agenda for achievement of the SDGs. Uganda's green-house gas emissions are very low given overall low levels energy consumption, as well as since the country overwhelmingly relies on a renewable energy

source, hydropower, for electricity. However, social and infrastructure sectors will need to incur additional costs of adaptation to be on track to perform well in the SDGs. Changes in weather patterns, rainfall variability, and rising temperatures will pose additional health threats by affecting the prevalence and distribution of waterborne, foodborne, and vector-borne diseases. The increased frequency of extreme weather events is accelerating damage to health facilities. And heat-related deaths among the elderly are expected to rise. Climate change will also call for resilient water infrastructure alternatives, which may entail higher costs of WASH service provision as seasonal drying increases and water levels drop. Given the exposure of roads to climate-change induced severe weather events, building climate-resilient infrastructure is key to avoiding disruptions of the economy.

46. Further analysis, including by policymakers, can explore options for financing the SDG spending needs. While it was beyond the scope of the technical assistance mission underlying this report, future work by authorities and development partners would be useful to determine the role, opportunities, and challenges in enabling the needed spending through: (i) more vigorous domestic revenue mobilization through revenue administration and tax policy measures and through structural reforms, (ii) grants, (iii) concessional loans, (iv) expenditure reallocation and increasing efficiency, and (v) strengthening the business environment to enable private financing. An IMF study of four case countries found, for example, that Rwanda and Nigeria would be able to cover one-third and 35 percent, respectively, of their SDG financing needs through the above steps (i), (iv), and (v), pointing to the need for significant international development assistance in the form of grants and concessional loans.[112]

47. Beyond spending to achieve SDGs, managerial and policy constraints need to be addressed, and lessons for future risks can be drawn from COVID-19 and the impact of climate change. The estimates assume that Uganda would be able to combine different inputs efficiently to deliver across the analyzed sectors.[113] This would require important reforms. For example, the pandemic has strained Uganda's health systems and has exposed the criticality of making the system resilient to future health shocks. In education, Uganda's public system can identify key lessons from other country examples and Uganda's private school system on how managerial approaches could reduce teacher absenteeism. In the water and sanitation sector, climate change will call for resilient infrastructure alternatives along with more efficient use of existing water. In the electricity sector, authorities are considering some diversification to other renewable sources, given the potential vulnerability of hydropower facilities to climate-change-induced drought in the decades to come. In the case of road infrastructure, there is an imbalanced allocation of resources between new road construction and road maintenance, with maintenance spending currently being disfavored. The policy constraints leading to this imbalance should be better analyzed and overcome.

[112] Benedek, D., et al. 2021. A Post-Pandemic Assessment of the Sustainable Development Goals. SDN/2021/003. International Monetary Fund.

[113] In particular, it is assumed that Uganda would be able to operate with the same efficiency as the well-performing peers. If efficiency is lower, additional spending needs would be even higher than the estimates in this report.

Appendix I. Poverty Statistics

The poverty statistics in Figure 2 are sourced as follows:

Table AI.1. Poverty Statistics

Year	A: Poverty rate		B: Population		Number of poor people (millions)	
	Value	Source	Value	Source	Value	Source
1989	58.3	World Development Indicators, World Bank, https://databank.worldbank.org/source/world-development-indicators# (accessed March 2022; data available only through 2019). Series: Poverty headcount ratio at $1.90 a day (2011 purchasing-power parity - PPP$) (% of population) (SI.POV.DDAY). More details on the series: https://data.worldbank.org/indicator/SP.POP.TOTL	16,763,041	World Development Indicators, World Bank, https://databank.worldbank.org/source/world-development-indicators# (accessed March 2022). Series: Population, total (SP.POP.TOTL). More details on the series: https://data.worldbank.org/indicator/SI.POV.DDAY	9.772852903	= (A / 100) * (B / 1,000,000)
1992	64.4		18,561,668		11.953714192	
1996	63.4		21,032,817		13.334805978	
1999	67.5		22,952,406		15.492874050	
2002	65.6		25,167,261		16.509723216	
2005	57.0		27,684,590		15.780216300	
2009	45.3		31,411,096		14.229226488	
2012	35.7		34,558,700		12.337455900	
2016	41.3		39,649,173		16.375108449	
2019	41.0		44,269,587		18.150530670	
2020	41.1	UBOS (2021). The Uganda National Household Survey 2019/2020. See Box 6.2: "The poverty headcount at US$1.9 per person per day (2011 purchasing-power parity -PPP$) is 41.1 percent" (p. 114).	45,741,000		18.799551000	

Appendix II. Health Care[114]

The SDG cost estimate for health is expressed as the total additional spending needed to perform well in the health SDG (i.e., SDG 3), that is, the difference between the spending needed in 2030 and the spending level today.

Both today's total health expenditures (as a percent of GDP), E^{2019}, and the levels needed by 2030, E^{2030}, are expressed as an identity:

$$EE = 10ww\frac{DD + 0.5MM}{100 - EE^{ooooh}}$$

where *w* refers to doctors' annual wages as a ratio to GDP per capita, *D* and *M* are the numbers of doctors and other medical personnel, respectively, per 1,000 population, and E^{oth} pertains to all spending besides the health workers' wage bill as a percent of total expenditures in health.

The spending needed in 2030 to perform well in the SDG 3 is the level of expenditures Uganda would incur by 2030 in light of projected demographics (the projected population share of infants and the elderly, who have greater medical needs) and if it matched, by 2030, today's levels of the health cost-drivers of the high performers among Uganda's peers. The number of doctors and other medical personnel (*D* and *M*) of the well-performing peers are adjusted to account for Uganda's demographic structure, as described above, before being used as benchmarks for Uganda. These cost drivers include doctors' wages, the number of doctors relative to the population size, the number of other medical personnel relative to the population size, and public plus private health spending besides the health workers' wage bill as a share of total health spending. The approach of matching Uganda's 2030 cost drivers to today's level of the well-performing peers is seen in the corresponding columns of Table 1. Table A II.1 gives the data sources and computations of demographic factors and cost drivers for Uganda (latest estimates available are from 2019).

Table A II.1. Computation and data sources for variables used in health SDG costing estimation

Variable	Value	Computation	Data source
Number of doctors (*D*)	4,811	Extracted from the source	Provided directly by MoH
Number of other medical staff (*M*)	81,982	Extracted from the source	Provided directly by MoH
Population (*pop*)	44,269,598	Extracted from the source	UN World Population prospects, 2019
Projected population (2030)	59,437,918	Extracted from the source	UN World Population prospects, 2019
Doctors per 1,000 population (*D_pth*)	0.11	*D* / *pop*	Derived
Other medical personnel per 1,000 population (*M_pth*)	1.7	*M* / *pop*	Derived
Public recurrent health expenditure, billion Uganda shilling (billion UGX)	3,090	total_health_spending * (government_expenditure + donors_expenditure) /total_health_expenditure	Variables for computation provided directly by MoH, and available in National Health Accounts 2016-2019

[114] All variables refer to the total (i.e., public plus private) in this annex unless otherwise indicated.

Variable	Value	Computation	Data source
Private recurrent health expenditure (billion UGX)	2,183	total_health_spending * private_share_in_health_spending	Variables for computation provided directly by MoH, and available in the National Health Accounts 2016/2019
Capital health expenditure (billion UGX)	219.5	Extracted from the source	Provided directly by the MoH, and available in the National Health Accounts 2016/2019
Total wage bill (billion UGX)	1,463.9	Extracted from the source	National Health Accounts 2016/2019
Average monthly salary of doctors in the public sector (million UGX), *w_pub*	1,908,592	Derived using the official salary structure, assuming that ¼ of the doctors are ranked as U1-U4, and ¾ are on ranked U5-U8	Based on information provided by MoH
Average monthly salary of doctors in the private sector (million UGX), *w_pri*	3,817,184	Based on discussions with authorities during mission, we assume the average private doctor salary is two times the average public doctor salary	Assumption was discussed with the authorities
Average monthly salary of doctors (million UGX)	2,624,739	α * w_pub + (1- α) * w_pri (α is based on the distribution of hours worked by the doctors in the public and the private sector)	Derived
Average monthly salary of other medical personnel (million UGX)	1,312,369	We assume the average salary of other medical personnel is half doctor's salary	Derived
Doctor wages, *w* (ratio to GDP per capita)	10.6	average_monthly_doctor_salary * 12 / GDP_per_capita	Derived
Nominal GDP (billion UGX)	131,569	Extracted from the source	Provided by IMF Uganda country team
Nominal GDP (billion US$)	35.3	Extracted from the source	Provided by IMF Uganda country team
Nominal GDP per capita (US$)	797.2	nominal_GDP / *pop*	Derived
Real GDP, 2030 (billion US$)	65.5	Computed by the IMF team	IMF team
Total health spending, *E* (percent of GDP)	4.6	100 * public_spending + private_spending / GDP	Derived
Other recurrent and capital spending (percent of total spending)	75.6	The level of E^{oth} that satisfies $EE = 10\ ww\frac{DD + 0.5MM}{100 - EE^{ooooh}}$	Derived

Appendix III. Education[115]

The SDG costing estimate for education is expressed as the total additional spending needed to perform well in the education SDG (SDG 4), that is, the difference between the spending needed in 2030 and the spending level today. Both today's total education expenditures (as a percent of GDP), E^{2019}, and the levels needed by 2030, E^{2030}, are expressed as an identity:

$$EE = \frac{ww}{SSSSSS} \cdot \frac{SSSSSS}{100 - EE^{ooooh}}$$

where *w* refers to teachers' annual wages as a ratio to GDP per capita, *STR* is the student teacher ratio, *e* signifies the enrollment rate, i.e., the number of students as a percentage of the student-age population, *SAP* indicates the student-age population as a percent of total population, and E^{oth}, pertains to all education spending besides the teacher wage bill as a percent of total expenditures in education.

The spending needed in 2030 to perform well in the SDG 4 is the level of expenditures Uganda would incur by 2030 due to projected demographics (e.g., student-age population) and if it matched, by 2030, today's levels of the education cost-drivers of the high performers among Uganda's peers. These cost drivers include teachers' wages, the student-teacher ratio, the enrollment rate, and education spending other than the teacher wage bill as a share of total education spending. The approach of matching Uganda's 2030 cost drivers to today's level of the high performers is seen in the corresponding columns of Table 2. Table AIII.1 gives the data sources and computation of demographic factors and cost drivers (latest estimates available are for 2019).

[115] All variables refer to total (i.e., public plus private) spending in this appendix unless otherwise indicated.

Table AIII.1. Computation and data sources for variables used in the education SDG costing estimation

Variable	Value	Computation	Data source
Students per teacher ratio *(STR)*	27.6	100 * students / teachers	Variables for computation provided directly by MoES
Population (*pop*)	44,269,598	Extracted from the source	UN World Population prospects, 2019
Projected population (2030)	59,437,918	Extracted from the source	UN World Population prospects, 2019
Student age population, *SAP* (percent of total population)	60.5	100 * population_aged_1_to_22 / *pop*	UN World Population prospects, 2019
Teacher's wage *(w)*	2.3	Extracted from the source	Evans, et al (2022)[116]
Enrollment rate, *e* (preprimary to tertiary)	55.6	100 * students / *SAP*	Variables for the computation provided directly by MoES; UN World Population prospects, 2019
Total Public spending (billion UGX)	3,398	Extracted from the source	Provided to us directly by the MoES
Adjustment factor to include off budget public spending (*adj*)	0.102	off_budget_govt_spending_in_edu / govt_spending_in_edu	Uganda National Education Accounts, 2016
Public spending (billion UGX)	3,745	Total_public_spending* (off_budget_govt_spending_in_edu / govt_spending_in_edu)+1)	Derived
Private spending (billion UGX)	5,641	Expenditure by households on education	UBOS, Uganda National Survey Report 2019-2020
Nominal GDP (billion UGX)	131,569	Extracted from the source	Provided by IMF Uganda country team
Nominal GDP (billion US$)	35.3	Extracted from the source	Provided by IMF Uganda country team
Nominal GDP per capita (US$)	797.2	nominal_GDP / *pop*	Derived
Projected real GDP, 2030 (billion US$ 2019)	65.5	Computed by the IMF team	IMF team
Total education spending, *E* (percent of GDP)	7.1	Sum of public and private spending, then divided by GDP, and multiplied by 100	Derived
Other recurrent and capital spending (% total spending)	60.5	Level of E^{oth} that satisfies $EE = \frac{ww}{SSSSSS}\frac{SSSSSS}{ee\ 100 - EE^{oooth}}$	Derived

[116] Evans D. K., et al. 2022. Teachers pay in Africa: Evidence from 15 countries. *World Development* Vol. 155.

Appendix IV. Water and Sanitation

The number of people that are unreached by each type of service (WASH, and ending open defecation), disaggregated by level of service (basic versus safely managed) and by area (rural, urban), as well as the cost per person of providing access to these facilities, are obtained from the MWE's Strategic Investment Plan for the Water and Environment Sector, Uganda (2018-2030). This sector plan's statistics on these variables are for 2017. The report also provides estimates for the population to be served between 2018 to 2030.

As the goal in water and sanitation is full coverage in each service category (i.e., basic WASH, safely managed water, and sanitation provision), the cost per type of service and population strata was computed as the product of the population unserved times the cost per capita of providing the service by type of service and population strata.

To avoid double counting and since the services are incremental (i.e., populations with safely managed sanitation have access to more basic services like water and latrines), we compute the total population unserved as the maximum of rural population unserved by type of service plus the maximum of urban population unserved by type of service. Following the WASH methodology developed by the World Bank (Hutton and Varughese, 2016), the total cost was calculated as the full cost of providing safely managed water and sanitation services plus half of the cost of providing the basic water and sanitation.

Appendix V. Electricity

We obtained the cost of investment in generation, transmission, and distribution from Uganda's ERA (Table A V.1). and converted these costs to US$ at a rate of 3,587 UGX per US$.

Table AV.1. Unit Cost of Investment

Generation cost	706
Transmission cost	93
Distribution cost	390
Overall investment cost	1,188

Source: Electricity Regulation Authority

We estimate the additional electricity network needed, accounting both for the need of connecting new users, and the foreseen increase in consumption per capita given the projected GDP per capita growth. The additional population that will need to have electricity access by 2030 is 100 percent minus the population that is currently connected. The estimated total cost of the additional electricity network is the additional population multiplied by the unit cost per kilowatt.

Appendix VI. Road Infrastructure

Road Length Needed

Using a sample of low-income and emerging economies, we estimate the length of all-weather roads by regressing road density on GDP per capita, population density, rural population share, and Rural Access Index—i.e., the share of the population that has access to all-season roads within two kilometers. This approach assumes contemporaneous reverse causality is partially mitigated, given that road density is expected to affect income per capita and population density with a substantial lag. The regression specification is as follows:

$$\ln SSDD_{ii} = \alpha + \beta_1 \ln GGDDSS_{cccccc,ii} + \beta_2 \ln SSPPPPDDeePPss_{ii} + \beta_3 SSSSII_{ii} + \beta_4 SSRRRRSSoPP_{ii} + \epsilon_{ii}$$

Where $SSDD_{ii}$ is the road density of country *i* (length of roads in km divided by the area of the country in km^2, $GGDDSS_{cccccc,ii}$ is the GDP per capita, $SSPPPPDDeePPss_{ii}$ is the population density (total population divided by area of the country in km^2), $SSSSII_{ii}$ is the Rural Access Index, and $SSRRRRSSoPP_{ii}$ is the percent of the population that lives in rural areas. All variables are for the latest date available (in most cases, 2018). The regression is restricted to LIDCs, and EMEs with medium-range road density (i.e., it does not incorporate advanced economies, or countries with too low or too high road density). The point estimates from the regression are used to calculate the additional kilometers of road needed given Uganda's projected population and GDP per capita growth and the increase in the RAI from 53 to at least 75 percent by 2030. The estimated total cost of the additional road network is the additional kilometers needed multiplied by the unit cost of constructing one kilometer, which is set at US$716,042 per kilometer (see below for further details). We include a 5 percent depreciation rate to account for maintenance spending needs.

Unit Cost per Kilometer of Road

We assume that a part of the additional stock of roads will be created by upgrading of currently unpaved roads to paved ones and by rehabilitating paved roads that are not motorable/ passable. The unit cost of rehabilitation and the unit cost of upgrading are extracted from MoWT (2021), Integrated Transport and Infrastructure Services Program Performance Report 2020/21. The unit cost of new construction is derived from MoWT (2021), Presentation on Unit Cost Study Findings: Road Construction & Maintenance in Uganda.

To estimate the unit cost per km, we assume that of the additional kilometers of all-weather roads needed, 36 percent would be from upgrading unpaved roads (based on the current share of unpaved roads that need upgrading), 1.5 percent would be from rehabilitating paved roads (based on the share of current paved roads that need rehabilitating), and the rest would come from new construction. As a result, the average cost is estimated at US$716,042 per kilometer. This unit cost is quite high, but in line with other SSA countries. For example, the in-depth study of Rwanda has a unit cost of more than US$1 million and Benin is more than US$600 thousand. In fact, there are challenges in some parts of Uganda, due to the type of terrain, and the reachability of these areas, which increase construction and transportation costs of the materials.

Road Quality Measurement

Figure 26 depicts the overall road infrastructure quality index from the World Economic Forum Global Competitiveness report. The index is based on an expert opinion survey administered at the country level. The respondents are drawn from a long list of senior business leaders, from fields reflecting the relative weights of different sectors of the economy. The survey is then administered to a random sample from within the list. To increase accuracy of the data, results from respondents that give the same answer to at least 80 percent of the questions or with a completion rate inferior to 50 percent are excluded. To increase consistency, the final score is an aggregate of the two most recent editions of the survey. For further information on how the survey is administered, refer to Appendix B of The Global Competitiveness Report 2019, World Economic Forum.