Beyond the Conflict: Charting a Path to Sustainable Growth and Development in Sudan

Annex

Enoch Randy Aikins

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Annex

Table 1: Project datafile

Series Name in IFs	Description	Years Updated	Data Source
PopulationUrban	Urban population	2015-2023	World Development Indicators (WDI), World Bank
PopulationRural	Rural population	2015-2023	World Development Indicators (WDI), World Bank
Corruption	Level of corruption	2018, 2024	Transparency International
FreedomEcon	Economic freedom level	2022	Fraser Institute
EnElecAccess%National	Access to electric energy, National percentage	2021-2022	World Development Indicators (WDI), World Bank
EnElecAccess%Urban	Access to electric energy, urban percentage	2021-2022	World Development Indicators (WDI), World Bank
EnElecAccess%Rural	Access to electric energy, rural percentage	2021-2022	World Development Indicators (WDI), World Bank
IncBelow2D15c%WDI	Population below the poverty line of US$2.15 per day PPP (2017)	2020-2024	World Bank Macropoverty datasheet
ChildStuntingPercentWDI	Stunting (Height for age) amongst children aged under 5	2000-2022	World Development Indicators (WDI), World Bank
GovtDebt%GDP	Central government debt as % of GDP	2015-2023	World Bank Macropoverty datasheet

AgProdCereals	Production of Cereals	2015-2023	FAO
AgProdMeat	Meat, Total + (Total) Production in Tonnes	2015-2023	FAO
LandAgri	Agricultural Land Area	2021-2022	World Development Indicators (WDI), World Bank

Table 2: Current Path Adjustment

Series Name in IFs	**Description**	Adjustment in IFs 8.38
govriskm	Governance Security Risk	2023 and 2024 =1.4 2025-2030= interpolate from 1.4 to 1.0 and maintain afterwards
gdprext	GDP growth rate	2023=-29.4 2024=-14 2025=5 2026=9.3 2027=4.1
ylm	Agricultural yields	2023=0.85 2024=0.93
Mul	Manufacturing input in the economy	2023=0.74 2024=0.87
inputservm	Service input in the economy	2023=0.57 2024=0.78
xsm	Export Multiplier	2023=0.63 2024=1.16

msm	Import Multiplier	2023=0.87 2024=0.78
gdsm	Government expenditures (Infrastructure)	2023=0.75 2024=0.8
gdsm	Government expenditures (Health)	2023=0.6 2024=0.7
gdsm	Government expenditures (Education)	2023=0.5 2024=0.7

Table 3: Scenario intervention

Name and Description	Adjustments within IFs 8.38	Benchmarking and Justification
All interventions start in 2027, are interpolated over 10 years, and then maintained at that level.		
Governance		
Democracy multiplier (democm)	Interpolate from 1 to 1.58	Sudan's democracy score, which is the sixth lowest in Africa, ranking only above Congo, Equatorial Guinea, Eritrea and Eswatini, needs to be improved. Between 2000 and 2010, Sudan doubled (100%) its democracy score on the Polity Index, reaching a score of 8 in 2010 as the highest in the country's recent history. As a benchmark, Burkina Faso improved its democracy by 60% between 2008 and 2018. In the Governance scenario, democracy in Sudan is projected to improve by 33.2% between 2027 and 2036. By 2043, Sudan's score in the scenario will be 23.3% above the Current Path forecast and 43% higher

		than the average for low-income countries in Africa. However, this will still be 35% behind the average scores for low-income African countries.
Economic freedom (econfreem)	Interpolate from 1 to 1.5	Sudan currently ranks last in Africa on the Fraser Institute's Economic Freedom of the World index. As a benchmark, Rwanda improved its score by about 23% between 2000 and 2010. In this intervention, Sudan's average score increased by 23.3% between 2027 and 2036. By 2043, Sudan's score on the economic freedom index will be 26.3% higher than the Current Path forecast but 23.5% below the average for low-income countries in Africa.
Gender Empowerment (gemm)	Interpolate from 1 to 1.55	According to the Ibrahim Index of African Governance, the country currently ranks second-lowest in Africa, only ahead of Somalia. Between 1995 and 2009, gender empowerment improved by 126% in Ethiopia. The intervention will increase gender empowerment in Sudan by 37.5% from 2027 to 2036. By 2043, Sudan's score will be 30% above the Current Path forecast, but it will still be 23% behind the average of low-income African countries.
Government corruption multiplier (govcorruptm)	Interpolate from 1 to 1.35	Sudan currently ranks 170 out of 180 globally on the Corruption Perceptions Index (CPI), with a score of 15. This is a seven-point decline from its peak of 22 in 2022. This shows that corruption has increased with the onset of the war in 2023. As a benchmark, Tanzania improved its transparency by 58% between 1998 and 2008. Between 2013 and

		2022, Sudan improved its score on the CPI by 100% The intervention improves transparency in Sudan by about 48% between 2027 and 2036. By 2043, Sudan's score will be 42.6% higher than the Current Path forecast but 13.3% below the average for low-income countries in Africa.
Government effectiveness multiplier (goveffectm)	Interpolate from 1 to 1.25	Historically, Rwanda improved its government effectiveness by 66% from 1996 to 2006. In 2022, Sudan ranked 49th in Africa on the World Bank government effectiveness index, with its scores only better than those of CAR, Eritrea, DRC, Libya, Somalia and South Sudan. The intervention increased Sudan's score by 47% between 2027 and 2036. By 2043, Sudan's score on the government effectiveness index in the scenario will be 1.75, close to the average of 1.78 for low-income African countries.
Multiplier on government security index (govindsecurm)	Interpolate from 1 to 1.12	Sudan has long been beset by conflict and instability. Two rounds of north–south civil war cost the lives of 1.5 million people, and a continuing conflict in the western region of Darfur has driven 2 million people from their homes and killed more than 200 000. Long-term peace and security are necessary for Sudan's inclusive and sustainable development. Between 2015 and 2018, Mali improved its IIAG score for security and safety by 33%. Similarly, Libya also improved its score in the same category on the IIAG by 60% from 2014 to 2023 From a very low base, the intervention will improve government security in Sudan by 78% % between 2027 and 2036 and will be 9% above

		the low-income African average by 2043. However, it will still rank 12th highest in the group.
Government regulatory quality multiplier (govregqualm)	Interpolate from 1 to 1.2	This intervention aims to improve Sudan's regulatory environment. Currently, Sudan has the fourth-lowest score on governance regulatory quality among low-income countries in Africa. As a benchmark, between 1996 and 2006, Rwanda increased its average score on the governance regulatory quality index by about 59%. The intervention will improve government regulatory quality in Sudan by 43% between 2027 and 2036. By 2043, Sudan's score in the scenario will be 33% above the Current Path but 14% below the low-income African average.
Mortality from intentional injuries-hlmort (IntInj)	Interpolate from 1 to 0.8	Long-term peace and security are necessary for Sudan's inclusive and sustainable development. Sudan has long been beset by conflict and instability. Two rounds of north–south civil war cost the lives of 1.5 million people, and a continuing conflict in the western region of Darfur has driven 2 million people from their homes and killed more than 200 000. As a benchmark, between 1995 and 2005, Rwanda reduced the total number of deaths per 1 000 people from societal violence by 91%. This intervention will increase Sudan's mortality from intentional injury by 30% between 2027 and 2036. By 2043, it will be 28% below the Current Path forecast.
Government-to-household welfare transfers-govhhtrnwelm (unskilled)	Interpolate from 1 to 1.4	Transfers to households are necessary to offset the negative redistribution effect of manufacturing.

		Government-to-household welfare transfers in Sudan are very low. They ranked fifth-lowest in Africa and accounted for less than 1% of GDP in 2023. Low-income countries such as Liberia, Zambia, and Rwanda have welfare transfers that constitute more than 10% of GDP. By 2043, the Sudan government will make transfers to households equivalent to 3.4% of GDP in the scenario above, the projected 2.4% of GDP in the Current Path. However, this will be far below the average rate of 5.4% of GDP among low-income countries in Africa.
Household tax rate multiplier, by skill level (hhtaxrm)	Skilled labour: interpolate from 1 to 1.2	This intervention aims to redistribute income from poorer households (unskilled labour) to richer households (skilled labour) to offset inequality caused by aggressive manufacturing. Improving tax revenue is necessary to fund Sudan's development aspirations. Sudan's total revenue as a percentage of GDP was estimated at 3.4% in 2024, far below the 10% it obtained in 2022. The World Bank recommends a tax-to-GDP ratio of 15% as a crucial threshold for countries to graduate from low-income status. In this intervention, government tax revenue from taxing skilled labour increased significantly from 2027 to 2036. By 2043, tax revenue from skilled labour in the scenario will be 38% higher than in the Current Path.
Demographics and Health		
Contraception use multiplier (contrusm)	Interpolate from 1 to 1.5	To reduce the total fertility rate among women in Sudan. The use of modern contraceptives among fertile women in Sudan is very low, currently estimated at 9% and ranks fourth

		lowest in Africa after Chad, Somalia and South Sudan. Consequently, the total fertility rate among fertile women in Sudan, estimated at 4.3 births, is the 14th highest in Africa. As a benchmark, Rwanda increased modern contraceptive use from 17% in 2005 to 52% in 2015. From a low base, the intervention increases contraception use by 84% between 2027 and 2036. By 2043, modern contraceptive use in Sudan will reach 29% in the scenario instead of 20% in the Current Path. However, this will be far below the average of 48% for its income peers in Africa.
Water Services, Per cent of Population with Access, Multiplier (SafelyManaged, Total) waterhhm	Interpolate from 1 to 1.2	Between 2010 and 2020, Ethiopia increased the proportion of its population with access to piped water by 93%, and DR Congo by nearly 70%. Sudan currently ranks fifth among low-income countries in Africa in access to piped water connections, at 46%. However, this is just half the rate in Gambia. The intervention improves access to safely managed water by 73% between 2027 and 2036. By 2043, about 43% of Sudanese will have access to safely managed water in this scenario, compared to the 38.5% in the Current Path. Although this will be higher than the average for low-income countries, it will still be behind the access rate in countries such as Gambia, Eritrea and Rwanda.
Sanitation Services, Per cent of Population with Access, Multiplier (SafelyManaged, Total) sanithhm	Interpolate from 1 to 1.2	With about 37% of the population having access to improved sanitation, Sudan ranks 7th among low-income African countries. However, by 2043, Sudan's performance will drop to 10th position on the current path. As a benchmark, Mali improved its

		population's access to improved sanitation by 87% between 2000 and 2010. In this scenario, Sudan's population with access to safely managed sanitation will increase by 67% from 2027 to 2036, from its low base. By 2043, 34% of Sudanese will have access to safely managed sanitation above the average for low-income countries in Africa. Despite the progress in the scenario, it will still be lower than countries such as Rwanda, Eritrea and Gambia in 2043.
Maternal mortality ratio multiplier (matmortatiom)	Interpolate from 1 to 0.75	Between 2000 and 2010, Rwanda reduced its maternal mortality rate by over 200%. Although the maternal mortality ratio in Sudan is below the average for low-income countries in Africa and ranks 6th lowest in the group, it is still more than twice the rate in Mozambique. The intervention will reduce Sudan's maternal mortality rate by 87% between 2027 and 2036. By 2043, the maternal mortality rate in Sudan will be 62.0% lower than the Current Path. However, this will still be higher than countries such as Rwanda and Mozambique.
Mortality for children under five (hlmortcdchldm)	Interpolate from 1 to 0.8	Between 2000 and 2010, Rwanda reduced its under-five mortality rate by over 200%. Sudan has the fifth-lowest under-five mortality rate among low-income countries in Africa, but it is still below Rwanda's. The intervention will reduce under-five mortality in Sudan by 91.4% between 2027 and 2036. By 2043, the under-five mortality rate will be 46.7% lower than the Current Path and below the average for low-income countries in Africa. However, it will still be higher than Rwanda's rate.

Mortality multiplier- hlmortm (cardiovascular)	Interpolate from 1 to 0.70	According to the WHO, the leading causes of death in Sudan are: Ischaemic heart disease, stroke, preterm birth complications, COVID-19, lower respiratory, road injury, malaria and measles. According to IFs, the main causes of mortality in Sudan include cardiovascular diseases, other communicable diseases, other non-communicable diseases, malignant neoplasms, traffic accidents and diarrhoea. Cardiovascular disease is the leading cause of death in Sudan, resulting in 79 deaths per 1 000 people in 2023. This is confirmed by the WHO, which lists Ischaemic heart disease as the leading cause of death in Sudan in 2021. By 2043, death from cardiovascular diseases in Sudan will be 30.0% in the scenario below the Current Path forecast.
Mortality multiplier- hlmortm (diarrhoea)	Interpolate from 1 to 0.85	In 2023, diarrhoea was the fifth-highest cause of death in Sudan, resulting in 20.3 deaths per 1 000 people. As a benchmark, Uganda reduced diarrhoea mortality by 42% between 1998 and 2008. The intervention will reduce diarrhoea deaths in Sudan by 104% between 2027 and 2036, from a low base. By 2043, death from diarrhoea in Sudan will be 55.2% lower than the Current Path forecast.
Mortality multiplier- hlmortm (malignant neoplasms)	Interpolate from 1 to 0.85	Deaths from malignant neoplasms are the fourth highest in Sudan, causing 20.3 deaths per 1 000 in 2023. In the scenario, deaths from MaligNePl in Sudan will be 11.8% lower than the Current Path forecast by 2043.

Mortality multiplier- hlmortm (respinfection)	Interpolate from 1 to 0.8	Respiratory infections are currently low, but on the current path, they are likely to increase to rank the fifth cause of death by 2043. Between 2010 and 2020, Malawi reduced deaths from respiratory infections by 40%. The intervention is poised to decrease deaths in Sudan by 34.9% between 2027 and 2036. By 2043, death from respiratory infections in Sudan will be 18.0% lower than the Current Path.
Mortality multiplier -hlmortm (Traffic Acci)	Interpolate from 1 to 0.8	Also, based on the Current Path in IFs, road accidents will become one of the leading causes of death by 2043. By 2043, deaths from traffic accidents in Sudan will be 22% lower than the Current Path.
Mortality multiplier-hlmortm (OthCommumDis)	Interpolate from 1 to 0.75	Other communicable diseases are prevalent in Sudan, resulting in 51 deaths per 1 000 people in 2023. As a benchmark, between 2007 and 2017, Ethiopia reduced deaths from other communicable diseases by about 40%. The intervention will reduce deaths from communicable diseases in Sudan by 100% between 2027 and 2036 from a small base. By 2043, deaths from other communicable diseases will be 81% lower than the Current Path.
Mortality multiplier-hlmortm (OtherNonComm)	Interpolate from 1 to 0.8	Other non-communicable diseases, such as stroke and preterm birth complications, are widespread in Sudan, leading to 25.6 deaths per 1 000 people in 2023. As a benchmark, Malawi reduced deaths from other non-communicable diseases by 21% between 1994 and 2003. The intervention will reduce deaths in Sudan by 8.9% between 2027 and 2036. By 2043, deaths from other non-communicable diseases will be 28.4% lower than the Current Path.

Mortality multiplier, severe acute malnutrition SAM prevalence-(malnchpsamm)	Interpolate from 1 to 0.75	This intervention aims to reduce the prevalence of severe acute malnutrition (SAM) in Sudan. Currently, Sudan ranks 8th in Africa for SAM prevalence. As a benchmark, between 2006 and 2014, SAM prevalence declined by over 259% in Togo. In this intervention, SAM prevalence in Sudan declined by 29.3% between 2027 and 2036. By 2043, SAM prevalence in Sudan under the scenario will be 47% lower than the Current Path.
Education		
Lower secondary, vocational share, additive factor, decimal rate (edseclowrvocadd)	Interpolate to 4 for both males and females	Sudan has the lowest share of lower-secondary vocational education in Africa, estimated at less than 1%. As a benchmark, Burkina Faso increased vocational training in lower-secondary schools by 115% between 2009 and 2019. The intervention will see Sudan significantly improve its lower-secondary vocational training, from a very low base between 2027 and 2036. By 2043, Sudan's 4% rate will be above the average for low-income countries in Africa.
Upper secondary, vocational share, additive factor, decimal rate (Edsecupprvocadd)	Interpolate to 7 for females and 5 for males	Coming from a low base of 2.6, Ethiopia increased its vocational training share of upper-secondary education from 21.56% to 59.20% between 2001 and 2011. Sudan's share of upper-secondary vocational education is low, at only 2.3% of students. The intervention will see Sudan improve its upper-secondary vocational training by 180% between 2027 and 2036 from a very low base. By 2043, Sudan's 8.4% rate will be below the average for low-income countries in Africa.

Tertiary, Sci-Eng share of graduates, additive factor, decimal rate (edtersciencshradd)	Interpolate to 5	An increase in the number of science and engineering graduates is necessary to build quality human capital for sustainable growth and development. Between 2004 and 2016, the share of science and engineering graduates in Mali increased by 73.8%. The share of graduates with a science and engineering background is the second-highest among low-income countries in Africa, estimated at 27.9%, and is only behind Eritrea. The intervention pushes the science and engineering graduate share in Sudan to about 31%, slightly above the rate in Eritrea.
Primary net intake rate multiplier (total) edpriintnm)	Females: Interpolate from 1 to 1.13 Males: Interpolate from 1 to 1.14	To increase net primary enrolment. Sudan has the 7th-lowest net enrolment rate in Africa at 64.1%. As a benchmark, Niger has increased primary net intake by 54% between 2007 and 2017. In this scenario, net enrolment will increase by 20% from 2027 to 2036. By 2043, net enrolment in Sudan will reach 86.6%, close to the 87% average for low-income countries in Africa.
Primary, survival rate, multiplier (total) (edprisum)	Females: Interpolate from 1 to 1.09 Males: Interpolate from 1 to 1.1	Sudan's primary survival rate is currently the sixth-highest among low-income countries in Africa. However, on its current path, Sudan is set to progress more slowly than its peers, thereby dropping to 7th position by 2043. Also, the escalation of the conflict is likely to cause more children to drop out. As a benchmark, Malawi improved its primary-level survival rate by 60% between 2004 and 2013. The intervention will increase the survival rate in Sudan by 12%

		between 2027 and 2036, so that by 2043, it will reach 91% instead of the 83% projected in the Current Path. However, this will still be lower compared to the rates in Gambia.
Lower secondary transition rate (edseclowrtran)	Males: Interpolate from 1 to 1.12 Females: Interpolate from 1 to 1.2	Between 2000 and 2010, Niger improved its lower secondary transition rate by 45%. Sudan had the 8th-highest primary-to-lower-secondary transition rate among low-income countries in Africa in 2023, at 91.4%. However, this is a drop from the 96.3% it achieved in 2009. Also, the escalation of the conflict is likely to cause more children to drop out. The intervention aims to raise the lower-secondary transition rate in Sudan to 100% by 2043, as is the case in Togo, Mozambique, Sierra Leone and Eritrea.
Upper secondary transition rate, multiplier (edsecupprtranm)	Males: Interpolate from 1 to 1.1 Females: Interpolate from 1 to 1.08	The estimated lower-to-upper-secondary transition rate in Sudan, at 80.3%, ranks it 10th among low-income countries in Africa. On the Current Path, Sudan's score will decline to rank 14th by 2043. Between 1994 and 2005, the upper-secondary transition rate in Mali almost tripled. In this scenario, the upper-secondary transition rate will increase by 7.8% from 2024 to 2033. By 2043, the upper-secondary transition rate in the scenario will reach 86.7%, above the average for low-income countries but far below the rates in the DR Congo and Togo, which will reach 100%.
Lower secondary, graduation rate, multiplier (edseclowrgram)	Males: Interpolate from 1 to 1.2 Females: Interpolate from 1 to 1.29	The lower-secondary graduation rate in Sudan is high, estimated at 47.3% in 2023, ranking it second among low-income countries in Africa. However, on the Current Path,

		progress will be slow, only reaching 55.1% by 2043. The intervention pushes the lower-secondary graduation rate by 25% between 2027 and 2036. By 2043, Sudan's lower-secondary graduation rate of 68% will be above the low-income average but close to the levels in Gambia.
Upper secondary graduation rate, multiplier (total) (edsecupprgram)	Males: Interpolate from 1 to 1.27 Females: Interpolate from 1 to 1.22	The upper-secondary graduation rate in Sudan is high, estimated at 27.3% in 2023, ranking it second among low-income countries in Africa. However, on the Current Path, progress will be slow, only reaching 37.4% by 2043. This intervention pushes the upper-secondary graduation rate by 37% between 2027 and 2036. By 2043, it will reach 45.6% above the average for low-income countries, but close to Rwanda's rate.
Tertiary, intake rate, multiplier, total (edterintm)	Males: Interpolate from 1 to 1.25 Females: Interpolate from 1 to 1.29	Tertiary enrolment is relatively high in Sudan, ranking highest among the low-income countries. 16.3% of people within the age group are enrolled in tertiary institutions in Sudan. However, on the Current Path, Sudan’s progress will lag, reaching only 17.8% by 2043 and declining to the 5th highest in the group. Madagascar improved its tertiary enrolment by 61% between 2007 and 2017. From a low base, the intervention will increase Sudan's tertiary intake by 107% between 2027 and 2036. By 2043, gross tertiary enrolment in Sudan will improve to 37.4%, above the average for its income group but close to Namibia's rate.
Tertiary, graduation rate multiplier	Males: Interpolate from 1 to 1.5	Tertiary graduation is relatively high

(edtergradm)	Females: Interpolate from 1 to 1.3	in Sudan, ranking highest among the low-income countries. 10.1% of people within the age group are enrolled in tertiary institutions in Sudan. However, on the Current Path, Sudan's progress will lag, reaching only 11.7% by 2043 and falling to the 4th-highest in the group. As a benchmark, between 2007 and 2017, Madagascar increased tertiary education graduation rates by 160%. The intervention will improve Sudan's tertiary graduation rate by 34.4% between 2027 and 2027. In this scenario, Sudan's tertiary graduation rate will improve to about 15.8% by 2043, above the average for low-income countries in Africa but close to Rwanda's rate.
Quality, multiplier on primary (total) (edqualpriallm)	Interpolate from 1 to 1.2	Sudan's primary test scores are low. In 2023, they averaged about 28.3 out of 100 for Mathematics, Reading, and Science, ranking 10th among its income peers in Africa. On the Current Path, this score is expected to improve slowly to only 30.5% by 2043. As a benchmark, Burkina Faso improved primary-level quality by 31% between 2008 and 2018. The intervention improved primary quality by 17.4% from 2027 to 2036. By 2043, the average test score for primary students in Sudan will be 35, above the average for low-income countries but below the rates in Togo and Uganda.
Quality, multiplier on secondary (total) (edqualsecallm)	Interpolate from 1 to 1.2	Sudan's average secondary student test score of 38.3 out of 100 is the seventh highest among low-income countries in Africa. On the Current Path, Sudan's score will stagnate, rising only marginally to 39.2 in 2043, making it the 11th-highest in the group. The intervention increases the quality

		of secondary education by 10.9% between 2027 and 2036, above the average for low-income Africa. By 2043, the average secondary test score in Sudan, currently 42.5, will be above the average for low-income countries in Africa but slightly below the levels in Togo and Uganda.
Agriculture		
Yields multiplier (ylm)	Interpolate from 1 to 1.4	Sudan was the largest agricultural producer in Africa and the Middle East and is seen as a potential "breadbasket" for the region and beyond. It has the largest area of arable land in Africa. However, the yield per hectare in Sudan is low, ranking third lowest among the low income countries in Africa. As a benchmark, Mali improved yields per hectare by 100% between 2009 and 2019. The intervention will improve agricultural yields in Sudan by 44.6% between 2027 and 2036. By 2043, the average yield of 2.3 per hectare will be lower than the average of 3.5 per hectare for low-income countries in Africa.
Multiplier on land actually irrigated (landirareaactualm)	Interpolate from 1 to 1.2	Sudan's irrigation potential is significant, with estimates ranging from 2.5 to 4.8 million hectares, depending on whether water resources or land resources are considered. A considerable portion of the cultivated area (26%) is currently under water management, totalling around 1.95 million hectares. Sudan ranks third after Egypt and South Africa as the country with the largest irrigated land area in Africa. The intervention will increase the irrigated land by 22% between 2027 and 2036.

Multiplier on land equipped for irrigation (landirareaequipm)	Interpolate from 1 to 1.15	Sudan ranks second after Egypt as the country with the largest land area equipped for irrigation in Africa. As a benchmark, Ethiopia significantly increased the land equipped for irrigation by 455% between 2002 and 2010. This intervention improved land equipped for irrigation by 12.1% between 2027 and 2036. By 2043, land equipped for irrigation in Sudan of 525 per 1000 hectares will be higher than the average for Africa, but below the levels in Egypt.
Loss rate of agricultural production (total) (aglossprodm)	Interpolate from 1 to 0.8	To reduce agricultural loss and waste as a share of production. Agricultural loss and waste as a share of production are estimated at 25.1% for Sudan. Of this, 9.9% of the production is estimated to be post-harvest losses for crops. By 2043, Sudan will reduce agricultural production losses below its Current Path forecast.
Loss rate of agriculture as it moves from producer to consumer multiplier (total) (aglosstransm)	Interpolate from 1 to 0.8	To reduce agricultural loss and waste as a share of production. Agricultural loss and waste as a share of production are estimated at 25.1% for Sudan. Of this, 11.6% of the production is estimated to be transmission losses for crops. The intervention will reduce food transmission loss by 22.8% between 2027 and 2036, and by 2043 Sudan will reduce food waste to levels lower than those of its average low-income African peers.
Per capita calorie demand multiplier (total) (clpcm)	Interpolate from 1 to 1.15	This intervention ensures that increases in agricultural production are not all exported but are reserved for local demand to boost domestic food security. Currently, Sudan has the 7th-highest per capita calorie demand among low-income countries in Africa. To benchmark this, between

		2009 and 2019, calories available in Sudan increased by 56%. The intervention will increase Sudan's available calories by 17.5% between 2027 and 2036. By 2043, the calories per day available in Sudan will be slightly above those in Mali, which has the highest rate among low-income African countries, but will still be behind countries such as Ghana and Egypt.
Water withdrawal (ground) (waterwithdrawalm)	Interpolate from 1 to 1.05	Dryland conditions, variable rainfall and non-perennial rivers necessitate access to sustainable water resources such as groundwater. High rainfall bands with fewer meteorological droughts can utilise either rainwater harvesting or surface water sources and therefore not increase. Approximately 72% of Sudan's total area is arid and semi-arid, covering 1.78 million square kilometres. This makes Sudan one of the countries most affected by desertification in Africa, necessitating significant intervention in this area.
Forest protection multiplier (forest)	Interpolate from 1 to 1.02	In 2020, Sudan had approximately 3.75 million hectares of natural forest, covering about 2% of its land area. Global Forest Watch Between 1990 and 2010, the country lost an average of 321,600 hectares of forest annually, totalling about 6.4 million hectares, representing an 8.4% decrease in forest cover over that period. Mongabay.com The annual rate of forest and woodland decrease has been estimated at approximately 175,000 hectares over the past two decades. FAOHome For the sustainability of agriculture. Intervention helps in reducing the rate of conversion of agricultural land. This ensures that deforestation

		is stopped and slowly reforestation takes shape over decades.
Road access Target Value in per cent access to rural roads and the years within to reach this. (infraroadraitrgtval) + (infraroadraitrgtyr)	Set year to 40 and value to 90%	To improve rural areas for easy access for agricultural products.
Investment in the economy by sector, multiplier (idsm (agriculture))	Interpolate from 1 to 1.1	Sudan has significant agricultural potential, yet investment in the sector has been low over the years. According to the SUDNAIP, it is a five-year investment plan that maps the investments needed to achieve the Sudan Comprehensive Africa Agriculture Development Programme (CAADP) target of a six per cent annual growth in Agricultural Domestic Product (GDP). The Sudan will pursue this target by allocating at least 10% of its budget to the agricultural sector. https://faolex.fao.org/docs/pdf/sud2015
Manufacturing		
Government regulation of business index multiplier (govbusregindm)	Interpolate from 1 to 0.80	Between 1996 and 2006, Rwanda increased its average score on the governance regulatory quality index by about 59%. Sudan has the fourth-lowest score among low-income countries in Africa. Reducing bureaucratic government regulations is necessary to promote manufacturing in Sudan. This intervention improves the business environment to stimulate private investment in the manufacturing sector and to enhance private-sector-led growth.
Investment in the manufacturing sector (idsm)	Interpolate from 1 to 1.05	Investment in manufacturing in Sudan is low, currently ranking 15th among the 22 low-income countries in Africa. Interventions are based on

		the African industrialisation index produced by the African Development Bank. According to the index, countries are divided into five quintiles by rank: Ttp, upper-middle, middle, low-middle and bottom. Sudan is ranked in the low-middle quintile, signalling low manufacturing activity in the country. As such, the intervention aims to promote investment in the country's manufacturing sectors. By 2043, Sudan's projected manufacturing share of GDP in the scenario will surpass the Current Path.
R&D research development activities (total) (randdexpm)	Interpolate from 1 to 1.2	Building technological capability through R&D is crucial for a robust manufacturing sector. It stimulates innovation, increases productivity and improves product quality. However, Sudan's R&D spending as a share of GDP is very low, below 0.5%. The intervention improves R&D spending as a share of GDP by 20.1% between 2027 and 2036 from a low base, and by 2043, the R&D share of GDP in Sudan will be 0.4% instead of 0.3%.
Total labour participation rate (male & female), female more aggressive (labparm)	Males: Interpolate from 1 to 1.15 Females: Interpolate from 1 to 1.45	The labour participation rate in Sudan is very low, far below the average for low-income countries in Africa. Historically, male labour participation rates have been higher than those of females in Sudan. For every 100 males in the labour market, there are only 45 females. This is below the average for low-income countries, where 85 females participate in the labour market for every 100 males. The intervention will increase labour participation by 26.4% between 2027 and 2036. By 2043, the labour participation rate for males in Sudan will be 64%, below the low-income Africa average of 72.6%. Additionally,

		the gender gap will close significantly, such that by 2043, there will be 72 females for every 100 males in the labour market.
Large Infrastructure and Leapfrogging		
eninvtm- Energy investment multiplier (gas)	1.2	Sudan holds 3 trillion cubic feet (Tcf) of proven gas reserves as of 2017, accounting for about 0.043% of the world's total gas reserves of 6 923 Tcf.
eninvtm -Energy investment multiplier (hydro)	1.2	The total electric power potential from hydro dams is estimated at 4 860 MW, with about 2 200 MW technically feasible through 2030 (Lahmeyer International, 2012; UNEP, 2017). Of this potential, Sudan's installed hydro capacity was 1 928 MW as of 2017 and consisted of six large reservoir dams (IRENA, 2019).
eninvtm -Energy investment multiplier (wind)	1.2	Sudan possesses a promising outlook for wind energy. It has significant wind power potential, with an estimated capacity of up to 1.5 GW. However, wind energy remains underutilised, with a single 0.8-MW wind turbine connected to the grid, although a 100-MW wind power plant is under construction. The government envisions 1 550MW of wind capacity by 2035. https://www.afsic.net/renewable-energy
eninvtm -Energy investment multiplier (solar)	1.3	As a Sunbelt country, Sudan has one of the highest solar radiation rates in the world, with the potential to generate up to 15 GW of solar energy. Yet it has only constructed a 10-MW solar PV plant (5MW on-grid). Two additional 10-MW solar projects are under construction, and the government aims to install 2 190MW

		of grid-connected solar PV and 50MW of solar thermal energy by 2035. https://www.afsic.net/renewable-energy .
eninvtm -Energy investment multiplier (other renew)	1.25	Sudan has bioenergy capacity, predominantly from sugar industry cogeneration, totalling 199MW, with less than 20MW on-grid. Plans aim to install 270MW of grid-connected bioenergy by 2032. Also, despite possessing geothermal potential in the Red Sea region, no geothermal plants have been installed. However, 54MW of geothermal projects are planned by 2030.
Increase production of hydro energy (enpm –hydro)	Interpolate from 1 to 1.3	The total electric power potential from hydro dams is estimated at 4 860 MW, with about 2 200 MW technically feasible through 2030 (Lahmeyer International, 2012; UNEP, 2017). Of this potential, Sudan's installed hydro capacity was 1 928 MW as of 2017 and consisted of six large reservoir dams (IRENA, 2019). While hydropower generates approximately 54.6% of Sudan's electricity, other renewable sources contribute only 0.78% to the national grid. https://climateactiontransparency.org/w .
Increase production of gas energy (enpm –gas)	Interpolate from 1 to 1.25	Sudan holds 3 trillion cubic feet (Tcf) of proven gas reserves as of 2017, accounting for about 0.043% of the world's total gas reserves of 6 923 Tcf. https://www.worldometers.info/gas/suc
Increase production of solar energy (enpm –solar)	Interpolate from 1 to 1.3	As a Sunbelt country, Sudan has one of the highest solar radiation rates in the world, with the potential to generate up to 15 GW of solar energy. Yet it has only constructed a 10-MW

		solar PV plant (5MW on-grid). Two additional 10-MW solar projects are under construction, and the government aims to install 2 190MW of grid-connected solar PV and 50MW of solar thermal energy by 2035.
Increase production of wind energy (enpm –wind)	Interpolate from 1 to 1.2	Sudan possesses a promising outlook for wind energy. It has a significant potential for wind power, with an estimated capacity of up to 1.5 GW. However, wind energy remains underutilised, with a single 0.8-MW wind turbine connected to the grid, although a 100-MW wind power plant is under construction. The government envisions 1 550MW of wind capacity by 2035.
Energy production multiplier for other renewables- enpm (OthRenew)	Interpolate from 1 to 1.3	Sudan has bioenergy capacity, predominantly from sugar industry cogeneration, totalling 199MW, with less than 20MW on-grid. Plans aim to install 270MW of grid-connected bioenergy by 2032. Also, despite possessing geothermal potential in the Red Sea region, no geothermal plants have been installed. However, 54MW of geothermal projects are planned by 2030.
Electricity access multiplier urban-infraelecaccm (urban)	Interpolate from 1 to 1.2	Access to electricity is positively correlated with income across Africa. Sudan has a high urban electricity access rate, currently estimated at 83.2%, making it the 5th-highest among the 23 low-income countries after Mali, Rwanda, Ethiopia and Togo. However, on the Current Path, Sudan's progress will stall, improving only 88.7% by 2043, leaving it in 8th position in the group. As a benchmark, Burkina Faso improved urban electricity access by 45% between 2009 and 2019. The

		intervention improves urban electricity access by 6.6% between 2027 and 2036, reaching 98% in 2043.
Electricity access multiplier rural-infraelecaccm (rural)	Interpolate from 1 to 1.4	Access to electricity is positively correlated with income across Africa. While the electricity access rate is very high in urban centres, it is very low in rural areas. Currently, 45% of rural dwellers in Sudan have access to electricity, indicating a huge disparity between urban and rural areas. As a benchmark, Eritrea improved rural access to electricity by 99% between 2009 and 2019. Rwanda also increased its rural access to electricity from 1.1% in 2011 to 38.2% in 2019. The intervention improves rural access by 20.0% between 2027 and 2036. By 2043, the rural electricity access rate will reach 70% above the average for low-income countries, but will remain lower than Rwanda's.
Electricity transmission and distribution loss (infraelectranlossm)	Interpolate from 1 to 0.80	Historical data indicate that transmission and distribution losses are highest at low-income levels. About 12% of all electricity generated in Sudan is lost during transmission and distribution. As a benchmark, between 2001 and 2011, Sudan reduced its electricity transmission and distribution losses by 67%. This intervention will reduce electricity transmission losses by 32% between 2027 and 2036, such that by 2043, transmission losses in Sudan will constitute 7.6% of production. This will be below the average in low-income countries but still higher than rates in South Sudan.
ICT mobile broadband multiplier (ictbroadmobilm)	Interpolate from 1 to 1.15	As a benchmark, Uganda improved mobile broadband subscriptions by 134.7% between 2010 and 2017 from a low base. Sudan has the 7th-highest

		mobile broadband subscriptions among low-income countries. Owing to the aggressive Current Path, the intervention has minimal impact. By 2043, mobile broadband subscriptions will reach 126 subscriptions per 100 people, slightly below the average rate in low-income African countries.
ICT broadband multiplier on the cost of adding a connection (ictbroadcostm)	Interpolate from 1 to 0.8	Reduced connection costs improve connectivity to ICT broadband infrastructure. Sudan will need more broadband connections to leverage the opportunities that digitalisation offers. Reducing the cost of mobile broadband will make it more affordable and improve access.
Cost of adding an ICT mobile broadband connection (ictmobilbroadcostm)	Interpolate from 1 to 0.8	Reduced connection costs improve connectivity to ICT broadband infrastructure. Sudan will need more broadband connections to leverage the opportunities that digitalisation offers. Reducing the cost of fixed broadband will make it more affordable and improve access.
ICT fixed broadband multiplier (ictbroadm)	Interpolate from 1 to 1.25	Like many African countries, fixed broadband subscriptions in Sudan are very low, currently estimated at 2.3 subscriptions per 100 people. Togo improved its connection by 283.5% between 2008 and 2018. From a very low base, the intervention improves fixed broadband subscriptions by 220% between 2027 and 2036. By 2043, the intervention pushed Sudan to reach 24 subscriptions per 100 people above the average for low-income countries, but will be lower than the rates in countries such as Somalia, Gambia and Rwanda.

Increase population with internet access	Interpolate from 1 to 1.2	Between 2009 and 2019, Gambia increased the share of its population with Internet access from a paltry 7.6% to 51%. Only 27% of Sudan's population has access to the Internet, which is below the rates in Gambia and Togo. The intervention had very little impact on improving the population's access to the Internet over the forecast period.
Paved roads (Infraroadpavedpcntm)	Interpolate from 1 to 1.15	An improved road transportation network is an important driver of growth. Sudan has the third-highest paved road network among low-income countries in Africa, estimated at 25.8% of all roads, below the rates in Gambia and Mozambique. Guinea-Bissau increased the length of paved roads from 9.4% in 1993 to 27% in 2003. The intervention improves the paved road share of total roads by 38.1% between 2027 and 2036. By 2043, the intervention will push paved roads in Sudan to constitute about 46.2% of the total road network, above the average for low-income countries in Africa but below the rates in countries such as Rwanda, Togo, the Gambia and Uganda.
gdsm (InfraOther)- Government expenditures by destination multiplier	Interpolate from 1 to 1.3	This is to emulate investment in other large infrastructure, such as ports and harbours, in Sudan. In 2022, Sudan signed a US$6 billion agreement with a consortium led by the United Arab Emirates' AD Ports Group and Invictus Investment to develop a new port and economic zone in the Red Sea. Although this deal was cancelled in November 2024, we use it as a benchmark for the need for critical investment in this area in the country.
idsm - Investment in the economy by	Interpolate from 1 to 1.2	This is to increase investment in ICT

sector, multiplier (ICTech)		in Sudan.
Trade/AfCFTA The AfCFTA is benchmarked against the full implementation schedule of the African Continental Free Trade Agreement. For further details and justification, please consult our AfCFTA theme.		
Increase multifactor productivity (mfpadd)	Interpolate from 0 to 0.005	Free trade unleashed productivity growth. Calculations or adjustments were based on annual average growth rates for the period 2010–2018 using the Penn World Tables data - TFP at current PPPs (USA=1).
Export shift as a result of the promotion of the export manufacturing ratio (xshift)	Interpolate from 0 to 0.005	In the World Bank policy research paper, export promotion agencies for developing countries will have an elasticity of 8%. Manufacturing export value as a percentage of GDP improves by 23.1% between 2024 and 2033. By 2043, Sudan's projected manufacturing export share of GDP will be 19.8% higher in the scenario than in the Current Path.
XSM-Export multiplier – Agriculture	Interpolate from 1 to 1.08	By 2043, the agricultural export share of Sudan's GDP will be 13.8% lower in the scenario than in the Current Path.
XSM-Export multiplier – Services	Interpolate from 1 to 1.03	By 2043, the services export share of Sudan's GDP will be 1.3% lower in the scenario than in the Current Path.
XSM-Export multiplier – ICT Tech	Interpolate from 1 to 1.02	The ICT export share will be 68.8% lower in the scenario than in the Current Path by 2043.
XSM-Export multiplier – Materials	Interpolate from 1 to 1.1	The materials export share will be 32.1% higher in the scenario than in the Current Path by 2043.
XSM-Export multiplier –	Interpolate from 1 to 1.01	The manufacturing export share will

Manufacturing		be 19.8% higher in the scenario than in the Current Path by 2043.
XSM-Export multiplier – Energy	Interpolate from 1 to 1.02	The energy export share will be 9.6% higher in the scenario than in the Current Path by 2043.
Import tariff tax multiplier by country and sector- Mtarifftaxrm (agriculture)	Interpolate from 1 in 2027 to 0.1 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. Under the AfCFTA, agricultural products are considered sensitive products and are subject to a fixed 10% tariff. Current tariffs can be maintained during the first five years with a phase-down starting in year six.
Import tariff tax multiplier by country and sector- Mtarifftaxrm (manufacturing)	Interpolate from 1 in 2027 to 0.05 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. Several manufactured products, such as most goods and passenger vehicles, are excluded from the non-sensitive list, resulting in a 95% tariff reduction.
Import tariff tax multiplier by country and sector- Mtarifftaxrm (energy)	Interpolate from 1 in 2027 to 0 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. Energy goods are classified as non-sensitive products and are subject to a 100% tariff reduction.
Import tariff tax multiplier by country and sector- Mtarifftaxrm (service)	Interpolate from 1 in 2027 to 0 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. All services are classified as non-sensitive products and receive a 100% tariff reduction.
Import tariff tax multiplier by country and sector- Mtarifftaxrm (ICT)	Interpolate from 1 in 2027 to 0 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. ICT goods are all classified under non-sensitive products, and are subject to a 100% tariff reduction.

Import tariff tax multiplier by country and sector- Mtarifftaxrm (materials) -	Interpolate from 1 in 2027 to 0.01 in 2041	Lower import tariffs promote free trade between countries and boost growth and development. Non-sensitive products are subject to a 100% tariff reduction under the AfCFTA. A few material products are included among the 3% of excluded products, e.g., corrugated flat-rolled steel; thus, the 99% reduction in material tariffs.
Financial Flows		
Worker remittances multiplier (xworkremitinm)	Interpolate from 1 to 1.20	According to the UNDP, annual remittances of around US$3 billion are essential to Sudan's economy and society, driven by a global diaspora, as current remittance inflows are less than US$300 million. Remittances to Sudan are currently low, estimated at less than 1% of GDP and ranked 6th lowest in 2023. As a benchmark, Uganda increased its remittance share of GDP by 234% between 2009 and 2019. This intervention increases remittances' share of GDP, which is projected to increase by 69% between 2027 and 2036. By 2043, total remittances in Sudan will constitute about 3.7% of GDP, up from 2.7% under the Current Path. Although this is far above the average for low-income countries, it is below the rates in Gambia and Uganda.
Aid (foreign) receipts multiplier (aidrecm)	Interpolate from 1 to 1.25	On average, low-income countries in Africa, such as Sudan, receive more aid than lower-middle-income countries, as they rely more on aid. Currently, Sudan's aid as a percentage of GDP is estimated at 8.5% in 2023, ranking 13th among low-income countries. As a benchmark, Liberia increased its aid-to-GDP ratio from 8.7% in 2000 to 97% in 2007. The scenario will

		increase Sudan's share of aid receipts in GDP by 11% between 2030 and 2040. By 2043, aid to GDP in Sudan will constitute 8.6% of GDP above the Current Path and the average for low-income countries. However, this will be one-third the rate in Somalia, CAR and Burundi.
FDI, stocks of investment from abroad, multiplier (xfdistockm)	Interpolate from 1 to 1.1	Foreign direct investment (FDI) is an enabler of growth. Sudan's FDI inflows, estimated at 3.3% of GDP, are currently ranked 11th among 23 low-income countries in Africa. As a benchmark, Togo improved its FDI receipt by 132% between 2010 and 2020. Under the intervention, the FDI stock will increase to 7.1% between 2027 and 2036. By 2043, FDI stock in Sudan will constitute 77.7% of GDP. However, this will be below the rate in Liberia, Mozambique and Sierra Leone.
FDI, stocks of outward investment, multiplier (xfdistoutm)	Interpolate from 1 to 0.8	Reducing the outflow of FDI, which is a proxy for capital flight and illicit financial flows, is paramount to building Sudan's domestic capital stock. Sudan loses about US$5.4 billion in illicit financial flows (IFFs) every year, according to a report prepared by a team of African and United Nations Economic Commission for Africa on Wednesday. Reducing these illicit flows can boost Sudan's domestic finance. https://sudantribune.com/article67874/
Portfolio investment, stocks of investment from abroad, multiplier (xportfoliom)	Interpolate from 1 to 1.2	Investment in financial assets in Sudan promotes the development of the financial market and its long-term growth. Sudan's FDI inflows, estimated at 3.3% of GDP, are currently ranked 11th among 23 low-income countries in Africa. As a

		benchmark, Togo improved its FDI receipt by 132% between 2010 and 2020. Under the intervention, the FDI stock will increase to 7.1% between 2027 and 2036. By 2043, FDI stock in Sudan will constitute 77.7% of GDP. However, this will be below the rate in Liberia, Mozambique and Sierra Leone.
No-Conflict scenario: GDP growth 2023: -12.1 2024: -20.3 2025: 8.3 2026: 13.5		
Protracted scenario: Current Path interventions plus govriskm - Governance Security Risk. (2023-2030 =1.4) (2030-2043= interpolate from 1.4 to 1.0)		

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About the authors

Mr Enoch Randy Aikins joined the AFI in May 2021 as a Researcher. Before that, Enoch was a research and programmes officer at the Institute for Democratic Governance in Accra in charge of local governance reforms, poverty and inequality and public sector reforms. He also worked as a research assistant (economic division) with the Institute for Statistical Social and Economic Research at the University of Ghana. Enoch's interests include African politics and governance, economic development, public sector reform, poverty and inequality. Enoch is a Young African Fellow at the School of Transnational Governance, European University Institute in Florence and has an MPhil in economics from the University of Ghana, Legon.

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