

INTERNATIONAL MONETARY FUND

Climate Change Vulnerabilities and Strategies

The Gambia

Xuehui Han and Koralai Kirabaeva

SIP/2024/005

IMF Selected Issues Papers are prepared by IMF staff as background documentation for periodic consultations with member countries. It is based on the information available at the time it was completed on December 18, 2023. This paper is also published separately as IMF Country Report No 24/016.

2024
FEB



SELECTED ISSUE PAPER

IMF Selected Issues Paper
African Department

Climate Change Vulnerabilities and Strategies: The Gambia
Prepared by Xuehui Han and Koralai Kirabaeva

Authorized for distribution by Ivohasina Razafimahefa
February 2024

IMF Selected Issues Papers are prepared by IMF staff as background documentation for periodic consultations with member countries. It is based on the information available at the time it was completed on December 18, 2023. This paper is also published separately as IMF Country Report No 24/016.

ABSTRACT: This paper analyzes The Gambia's vulnerability to climate change, highlighting risks like flooding, droughts, and coastal erosion, which threaten food security and key industries. It details The Gambia's climate strategies, including the National Climate Change Policy, 2050 Climate Vision, and Long-Term Climate-Neutral Development Strategy, targeting net-zero emissions by 2050. Despite its minimal global emissions contribution, The Gambia's focus on renewable energy expansion offers dual benefits for energy security and development. The paper underscores the need for improved land management, crop diversification, and irrigation to boost adaptive capacity and resilience, ensuring food security amidst climate challenges.

RECOMMENDED CITATION: Han, Xuehui and Koralai Kirabaeva. 2024. "Climate Change Vulnerabilities and Strategies in The Gambia." IMF Selected Issues Papers 2024/005. International Monetary Fund, Washington, DC.

JEL Classification Numbers:	Q54
Keywords:	Climate, Natural Disasters, Resilience
Author's E-Mail Address:	xhan@imf.org ; KKirabaeva@imf.org

SELECTED ISSUES PAPERS

Climate Change Vulnerabilities and Strategies

The Gambia

Prepared by by Xuehui Han and Koralai Kirabaeva.¹

¹ The authors would like to thank Balazs Stadler and Sylke von Thadden-Kostopoulos for helpful comments.



THE GAMBIA

SELECTED ISSUES

December 18, 2023

Approved By
African Department

Prepared by Xuehui Han and Koralai Kirabaeva.

CONTENTS

THE GAMBIA: CLIMATE CHANGE VULNERABILITIES AND STRATEGIES	2
A. Vulnerabilities to Climate Hazards	2
B. Climate Strategy and Planning	4
C. Emissions and Mitigation	6
D. Adaptation	7
E. Climate Financing	9
F. Public Finance Management	10
G. Conclusion	11

FIGURES

1. Total Number of Natural Disasters	2
2. Economic Loss in The Gambia After Natural Disasters, 1990-2023	3
3. Agriculture and Food Vulnerability Indicators	4
4. Cereal Yield	4
5. GHG Emission: Total Baseline and Mitigation Scenario 2010-2030	5
6. Kaya Identity in The Gambia	6
7. GHG Emissions by Sector in The Gambia	6
8. Access to Electricity and Clean Fuels	7
9. Air Pollution: Welfare Costs of Premature Mortalities from Exposure to Ambient PM2.5, GDP Equivalent	7
10. Adaptation, SDG and Agriculture	9
11. Fertilizer Consumption	9
12. Investment in Adaptation to Climate Change Needs and Aid Flows	9

TABLE

1. Selected Climate Financing Announced in 2022-2023	10
References	12

THE GAMBIA: CLIMATE CHANGE VULNERABILITIES AND STRATEGIES¹

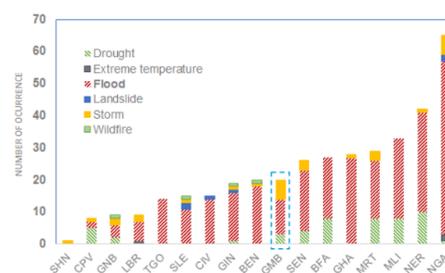
The Gambia is highly vulnerable to the impacts of climate change, including flooding, storm, droughts, and coastal erosion, which can trigger food insecurity and losses of tourism and fishing. The authorities have developed several strategies, including The National Climate Change Policy (NCCP), The Gambia 2050 Climate Vision, and The Gambia's Long-Term Climate-Neutral Development Strategy 2050 (LTS), aiming for net-zero carbon emissions by 2050. Although The Gambia is a small contributor to global emissions, mitigation policies to expand renewable energy have also co-benefits for energy security and development. Strengthening adaptive capacity require improvements in land management, crop diversification, and irrigation systems to enhance resilience and ensure food security.

A. Vulnerabilities to Climate Hazards

1. The Gambia's geographical features make it vulnerable to the effects of climate change. Over the past sixty years, the average temperature has risen by 1.0°C, an average rate of 0.19°C per decade.² The IPCC (2022) has estimated that in West Africa, temperature may rise by 3–6 °C by the end of the 21st century and sea levels are anticipated to increase by 0.26–0.55 m even under low-emission scenario. The Gambia's coastal zone, consisting of 80 km of open ocean coast and 200 km sheltered coast, is prone to flooding and erosion. The predicted sea level rise threatens to inundate Banjul and its port, groundwater resources and ecosystems. The temperature and sea-level rises will also pose higher risks of flooding, droughts, coastal erosion, food insecurity, damage to infrastructures, and losses to tourism and fishing. The Gambia is ranked 106th out of 191 countries with the middle-ranged risk according to Climate-driven INFORM Risk Indicator 2022.³

2. As a small state, The Gambia is facing frequent natural disasters of flooding, storm, and droughts. Over the past three decades, there has been at least one such disaster that struck the country approximately every two years. Flooding accounts for more than half of the events. Across the western African region, the Gambia is in the middle of the national disaster risks. Although droughts were much less frequent than flooding and storms, the affected population is much larger due to a broader scale of impact. The drought

Figure 1. Total Number of Natural Disasters Occurrence from 1990 to 2023



Source: The EM-DAT database and IMF staff estimates.
Note: The data are for selected western African countries from 1990 to 2023. The most frequent six types of natural disasters across countries are listed.

¹ Prepared by Xuehui Han and Korlai Kirabaeva, with comments from Balazs Stadler and Sylke von Thadden-Kostopoulos.

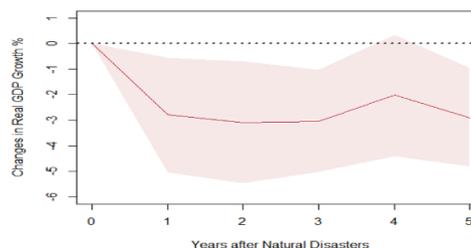
² [Gambia, The - Climatology | Climate Change Knowledge Portal \(worldbank.org\)](https://www.worldbank.org/en/region/wa/indicator/SH.UV.CD)

³ <https://climatedata.imf.org/datasets/7cae02f84ed547fbbd6210d90da19879/explore>

in the country in 2012 has affected 428,000 people, one out of five of the total population, while the storm in 2021 affected 16,849 people and the flood in 2022 affected 17,201 people (EM-DAT database, 2023).⁴

3. Natural disaster-induced economic loss could be far reaching and huge. From a cross-country analysis, the GDP per capita after large natural disasters can be substantially and persistently lower than the would-be scenario of no disasters – 2-5 percent lower in the four years after the disasters; while the public debt is 6 percent of GDP higher in the three years after the disasters (IMF, 2019). Natural disasters also generate significant social costs in terms of lost lives, worsening food insecurity, and deterioration in human capital, with longer-term ramifications for growth and poverty in poorer countries (IMF, 2016). Cheng and Han (2022) have estimated that the economic loss due to damage of flooding on infrastructure can reach 3.8 percent of GDP when the probability of flooding is one third per year (once every three years). In the past three decades, the probability of flooding in The Gambia is higher than one half, which implies an even larger loss. Direct assessments of economic damages caused by natural disasters for the Gambia is limited. However, Koks et al. (2019) recognize The Gambia among the top twenty countries with the highest multi-hazard Expected Annual Damages (EAD) relative to the country's GDP, attributable to the exposure of road and railway infrastructure, at above 0.2 percent of GDP annually. The commonly sourced EM-DAT database that provide economic damage estimates for countries does not provide such assessments for The Gambia. Thus, a local projection regression is used to assess the economic loss in percent of GDP for The Gambia. The real GDP growth remains 2.0–3.1 percent lower than the pre-disaster level in the five years after the natural disasters hit.

Figure 2. Economic Loss in The Gambia After Natural Disasters, 1990-2023 (Percent)



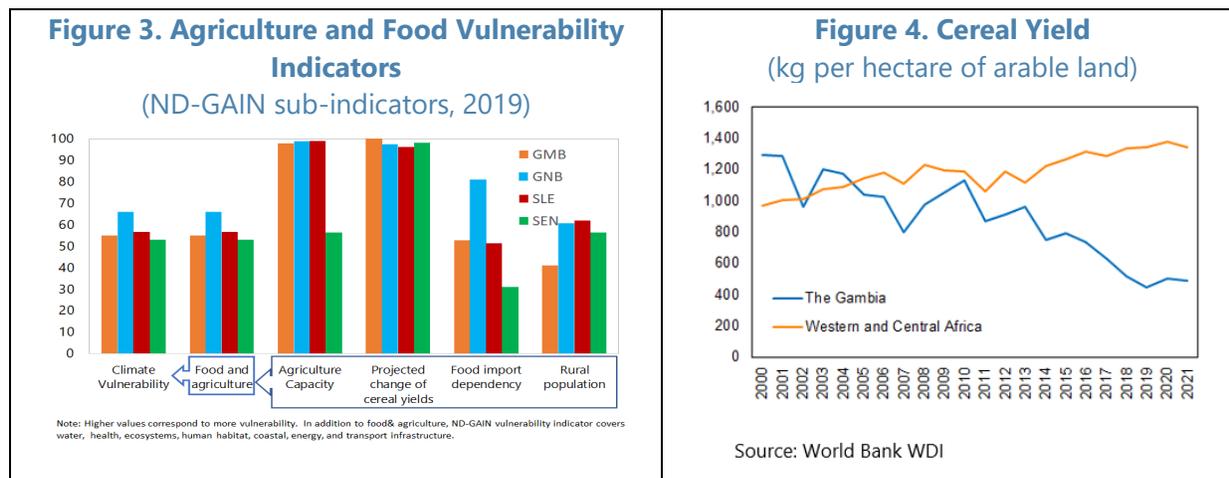
Source: IMF WEO April 2023, the EM-DAT database and IMF staff estimates. Note: The data is from 1990 to 2023. A local projection regression is employed to estimate the real GDP growth loss after the natural disasters. The left-hand-side variable is real GDP growth in $t+h$ minus the real GDP growth in t . The right-hand-side variables include one period and two period lagged real GDP growth as control variables and the total number of natural disasters, including flood, storm, drought, epidemic, and insect infestation.

4. Agriculture is the most vulnerable sector to the climate change while it is The Gambia's main source of income for a significant share of households. Agriculture covers about quarter of the total output and about a half of total employment. Agricultural production is largely dependent on rain-fed subsistence farming which is inhibited by various climate factors including rainfall variability, increased temperatures, and sea level rise.⁵ The country also depends on imports of many agriculture products as the sectors is challenged by poor infrastructure, soil fertility depletion, and low private investment. The Gambia is particularly vulnerable to a decline in cereal yields. In the past two decades, while the average cereal yields in Western and Central African

⁴ The population is 2.06 million in 2012 reported by World Bank.

⁵ [Climate-Smart Agriculture in the Gambia \(2018\) https://reliefweb.int/report/gambia/climate-smart-agriculture-gambia](https://reliefweb.int/report/gambia/climate-smart-agriculture-gambia)

countries have remained steady and slightly increased, the cereal yields in The Gambia have continuously declined.



B. Climate Strategy and Planning

5. The National Climate Change Policy (NCCP) of the Gambia is one of the early climate-related policies developed. The NCCP (2016) sets the country's institutional arrangements for coordination and mainstreaming, outlines an integrated approach to resource mobilization, and develops a policy direction for human resource development, while emphasizing the links between climate change adaptation and disaster risk reduction. The NCCP outlines the approach to develop the implementation framework for the Policy through the subsequent National Climate Change Response Strategy and Action Plan. The goal of the NCCP is, by 2025, to achieve the mainstreaming of climate change into national planning, budgeting, decision-making, and program implementation, through effective institutional mechanisms, coordinated financial resources, and enhanced human resources capacity.⁶

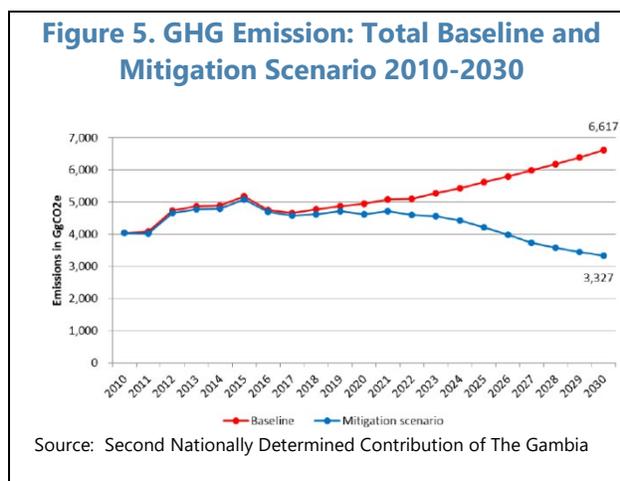
6. The Gambia 2050 Climate Vision (2021) sets the government's vision to meet commitments made under the Paris Agreement, move towards resilience and net zero carbon emissions by 2050. The Vision underscores the high level of commitment to decarbonization and establishes the political aspiration for The Gambia to achieve net zero emissions by 2050. Four strategic axes of policy action are identified: 1) Climate-resilient food and landscapes: Agriculture, food security, forestry, and natural resources (including water, biodiversity and wildlife), 2) Low emissions and resilient economy: Energy, transport, infrastructure and the key economic sectors of tourism and financial services, 3) Climate-resilient people: Health, education, equitable social development and human settlements, and 4) Climate-aware Integrated Coastal Zone Management.⁷

⁶ https://climate-laws.org/document/climate-change-national-policy_58ad

⁷ https://climate-laws.org/document/the-gambia-2050-climate-vision_f462

7. The Gambia has put climate change at the center of its sustainable development strategy, more purposefully than most other small countries.

The Gambia's second National Determined Contribution (NDC2)⁸ submitted in 2021 is assessed by the Climate Action Tracker as an overall almost sufficient, with policies and action against its fair share as 1.5°C compatible.⁹ The NDC2 has a GHG reduction target of 49.7 percent by 2030, compared to the baseline emission expected to increase from 4,935 GgCO₂e in 2020 to 6,617 GgCO₂e in 2030. This target covers the sectors of Agriculture, Forestry and Other Land Use (AFOLU), Industrial Processes and Product Use (IPPU), Energy, Transport and Waste. The NDC2 covers the entire AFOLU sector, in line with the 2006 IPCC guidelines, while the first NDC submitted in 2016 (NDC1) addressed only agricultural emissions. The waste sector now includes emissions for both solid waste and wastewater, while the NDC1 did not include wastewater emissions.



8. The Gambia's Long-Term Climate-Neutral Development Strategy 2050 (LTS)¹⁰ is designed to be instrumental to achieve the 2050 Climate Vision and NDC commitments. The LTS provides a comprehensive plan for reaching the net zero GHG emission by 2050 and it needs a 4 billion USD financing supports. It is at the stage of detailed cost estimations. It would be advisable to include transparent quantifiable targets for how The Gambia will switch its Land use, Land-use Change, and Forestry (LULUCF) sector from a net carbon source to a net carbon sink by 2050 or extending coverage of GHG emissions from the current 81 to 95 percent. (Climate Action Tracker, 2023)¹¹

9. The Gambia is developing its National Development Plan 2023-2027 with climate resilience as one of the pillars. The NDP aims at achieving sustainable environmental and natural resources management, enhanced climate action, and disaster risk reduction through implementation of seven program priorities, including AFOLU; sustainable waste management – waste sector adaptation; coastal resilient and adaptation; hazardous chemical and pesticides management; greening energy and transport sectors; integrated water resources management; and disaster risk reduction. The proposed interventions for coastal resilience include nature-based solution measures (re-vegetation), technique advice to reduce coastal hazard risks in settlements,

⁸ <https://unfccc.int/documents/497523>

⁹ <https://climateactiontracker.org/countries/gambia/>

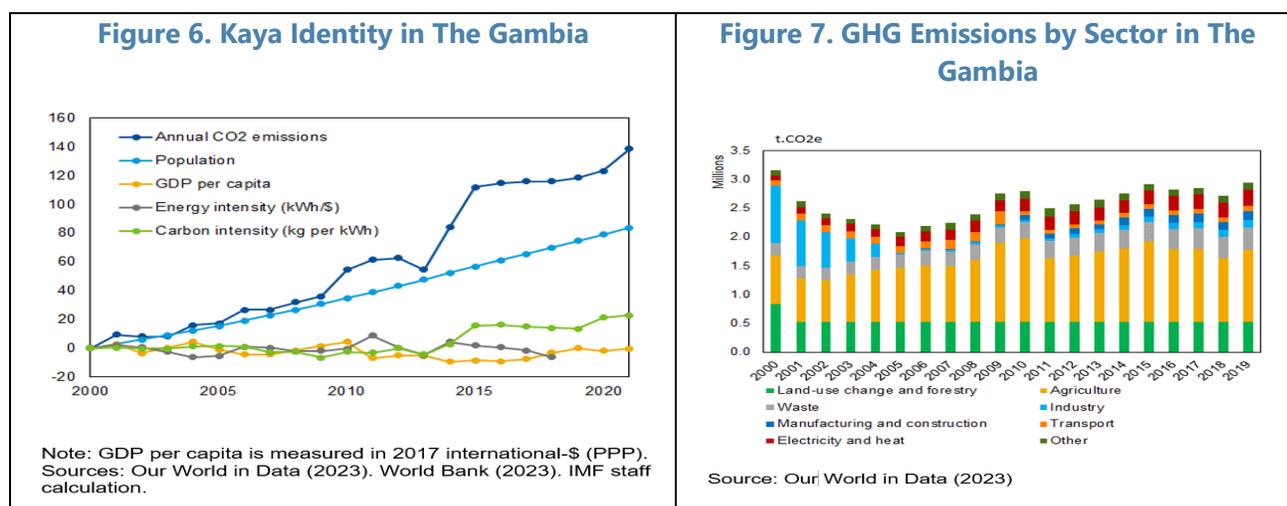
¹⁰ https://unfccc.int/sites/default/files/resource/Long_Term_Climate_Change_Strategy_of_The_Gambia_Final.pdf

¹¹ <https://climateactiontracker.org/countries/gambia/>

creating natural sinks by avoiding infrastructural development within the adjacent wetlands, formulating and implementing climate change adaptation strategies, finalizing the Integrated Coastal Zone Management (ICZM) Bill and Strategy, etc. Disaster risk management plans include implementing measures to manage urban flood risk¹², raising risk awareness, introducing preventative measures, enhancing risk financing mechanisms through an emergency relief fund, risk transferring by developing policy framework to support insurance schemes, responding to climate related hazards through Weather Index Insurance (WII), etc.

C. Emissions and Mitigation

10. The Gambia is a small emitter, contributing less than 0.01 percent to the global CO₂e emissions. The increase in emissions in the last two decades reflected primarily population growth and more recently carbon intensity, while energy intensity has remained broadly stable. The main source of emissions is the agricultural sector (over 40 percent of total emissions excluding LULUCF), with livestock as a major contributor. The land-use, land-use change, and forestry (LULUCF) contributed to almost one fifth to the country's total emissions in 2019.¹³

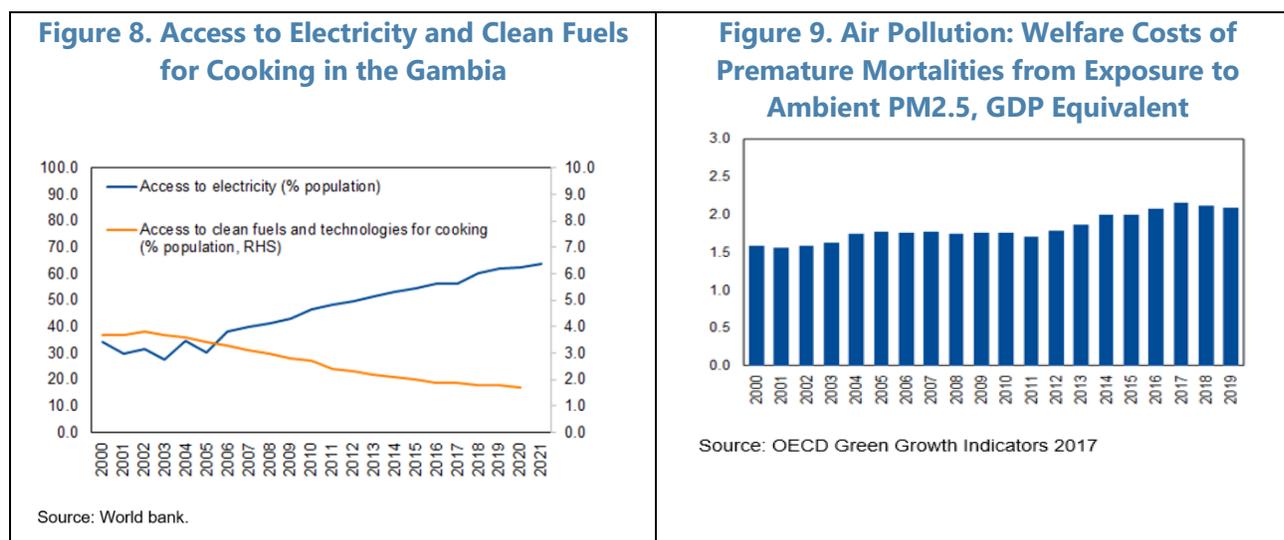


11. Mitigation policies would also support energy security and development. The Gambia is highly dependent on fossil fuel imports for its energy supply, making it vulnerable to oil market disruptions. The potential discovery from ongoing oil exploration can reduce dependence on fossil fuel imports but implies risks of stranded assets in the future. Increasing its renewable energy generation would improve its energy security. It could also help to facilitate access to electricity, clean fuels for cooking, and reduce air pollution. The Gambia has been increasing its renewable

¹² The government has selected Kotu stream covering 2,476 ha with estimated population of more than 200,000 people as a priority project area to implement fluvial and pluvial risk reduction measures partly using nature-based solutions.

¹³ The Kaya identity is a decomposition that expresses the level of energy related CO₂ emissions as the product of four indicators: (1) carbon intensity (CO₂ emissions per unit of total primary energy supply (TPES)), (2) energy intensity (TPES per unit of GDP), (3) gross domestic product per capita (GDP/cap) and (4) population.

energy capacity with a total of 170 MW in solar PV projects in the pipeline for 2021-2025, partially financed by the World Bank and the European Investment Bank.¹⁴



12. Fossil fuel subsidy reforms are important to achieve greener economy and enhance the revenue mobility. Phasing out government support to fossil fuels can play a significant role in climate mitigation. This can be achieved through reducing direct budget support, as well as price reform. The Gambia has initiated the process to allow full pass-through of fuel prices as the first step. The Gambia has conducted an analysis of automatic price mechanism with the technical assistance from the IMF with a view to move to automatic price mechanism in the long-term. The electricity tariff increased by 30 percent in April 2023 to be more cost reflective and reduced indirect subsidies needed by NAWEC.

D. Adaptation

13. The country recognizes the importance of adaptive capacity to climate change ahead of mitigation and other climate change strategies and has embarked on the development of a National Adaptation Plan (NAP) early on. The Gambia initiated the updating of its 2007 NAP in 2015 with funding from UNDP. A NAP roadmap was developed covering a two-year implementation period that aims to address capacity and capability gaps along the entire spectrum of policy planning, review, development, and outreach.¹⁵ In 2017, the authority developed the Strategic Program for Climate Resilience (SPCR), which provides guidance on adaptation investment until the NAP will become the new reference framework for adaptation planning. The SPCR focuses on developing (i) an enabling environment for climate resilience, (ii) climate-resilient land use mapping, planning and information systems, (iii) climate-resilient infrastructure, services and energy systems and (iv) an integrated approaches to build rural climate resilience. Sectors that have been identified

¹⁴ <https://climateactiontracker.org/countries/gambia/>

¹⁵ https://www.adaptation-undp.org/sites/default/files/downloads/gambia_stocktaking_report_for_nap_and_roadmap_for_cambodia_nap_gsp_and_giz_31.pdf

as in particular vulnerable to the impact of climate change are agriculture, water and sanitation, energy, and roads.

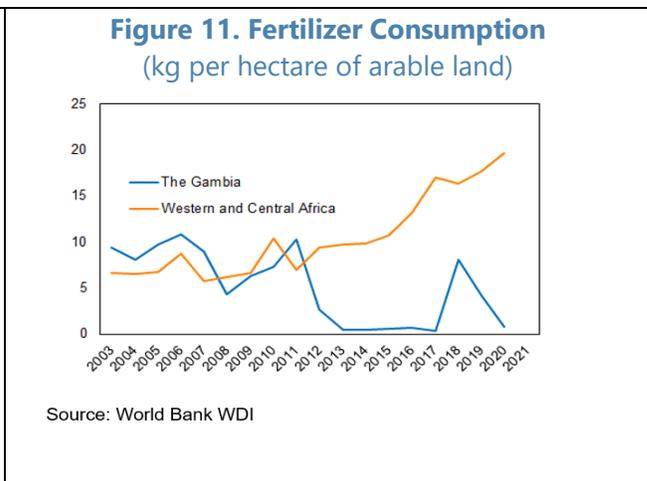
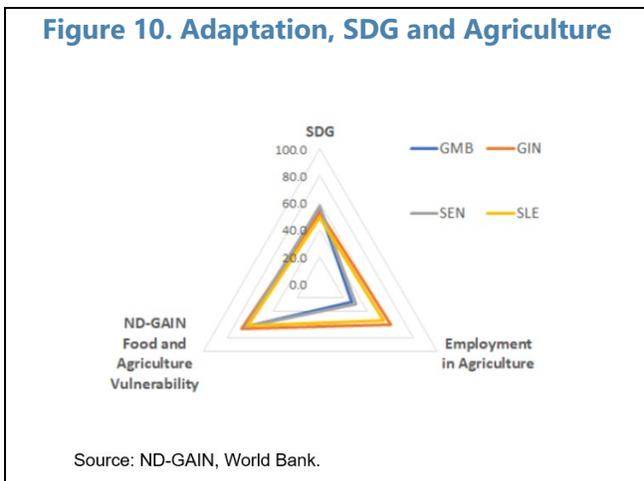
14. Adaptation measures to adapt to climate change should be urgently taken. The adaptive response in addressing the impacts of increased flood intensity includes improving regulations to restrict agriculture and livestock grazing activities, enhancing land cover to improve water retaining, and strengthening of early-warning systems. Nonetheless, with erratic weather patterns, such as the entire season's worth of rain falling in a single day, forecasting and early warnings become more challenging. There is a pressing need to bolster the predictive capabilities. The adaptive response in addressing the increase in temperature includes increase crop diversification and rotation to reduce total crop failure and switching to drought-tolerant crop and animal species (Amuzu et al., 2018). To address water scarcity, water harvesting, and retention should be used as well as improved irrigation systems. The introduction of crop insurance policies¹⁶ and the establishment of a National Climate Fund represent crucial tools for addressing the growing challenges posed by climate vulnerabilities. Furthermore, local authorities are in a unique position to identify the climate change adaptation strategies that align with local requirements and should be engaged to bolster adaptation capabilities.¹⁷

15. Strengthening adaptation capacity in agriculture would improve output productivity and resilience, contributing to food security and SDG. The country has some climate-smart agriculture practices undertaken by smallholder farmers, however, overall adaptation capacity in agriculture remains relatively limited.¹⁸ Scaling up existing good practices in agriculture would require more and better-structured support and investment. To reduce delivery costs and increase the reach of support to vulnerable populations, there is an urgent need to improve efficiency of support delivery. Conversely, advancements in Sustainable Development Goals (SDGs) such as promoting decent work and economic growth, ensuring quality education, and facilitating access to affordable and clean energy, can help reduce the strain on essential natural resources, like the use of firewood for cooking.

¹⁶ The central bank has initiated the development of a micro insurance program to assist farmers in mitigating the financial impact of crop failure resulting from natural disasters.

¹⁷ [https://www.unCDF.org/local/homepage#:~:text=The%20Local%20Climate%20Adaptive%20Living%20\(LoCAL\)%20Facility%2C%20designed%20by,support%20they%20need%20to%20respond](https://www.unCDF.org/local/homepage#:~:text=The%20Local%20Climate%20Adaptive%20Living%20(LoCAL)%20Facility%2C%20designed%20by,support%20they%20need%20to%20respond)

¹⁸ [Climate-Smart Agriculture in the Gambia \(2018\) https://reliefweb.int/report/gambia/climate-smart-agriculture-gambia](https://reliefweb.int/report/gambia/climate-smart-agriculture-gambia)



E. Climate Financing

16. International financing aid plays a critical role in assisting The Gambia to achieve its goals.

The multinational and biliteral donors are active in supporting The Gambia’s mitigation and adaptation developments, including supports to renewable energy, marine protection areas, costal area management, etc. (Table 1). However, the low-income developing countries’ climate adaptation needs are much larger than the adaptation aid flows received. The Gambia’s annual adaptation annual needs are three times of the aid flow received (45 million USD versus 16 million USD) (Fiscal Monitor Oct 2020). Continued and strengthened financing aids are much needed. The international community is scaling-up the global supports, e.g., the IMF established the Resilience and Sustainability Trust (RST) in April 2022 to provide long-term financing to support policy reforms that reduce macro-critical risks associated with climate change and pandemic preparedness, and augment policy space and financial buffers to mitigate the risks arising from such long-term structural challenges (IMF, 2022).

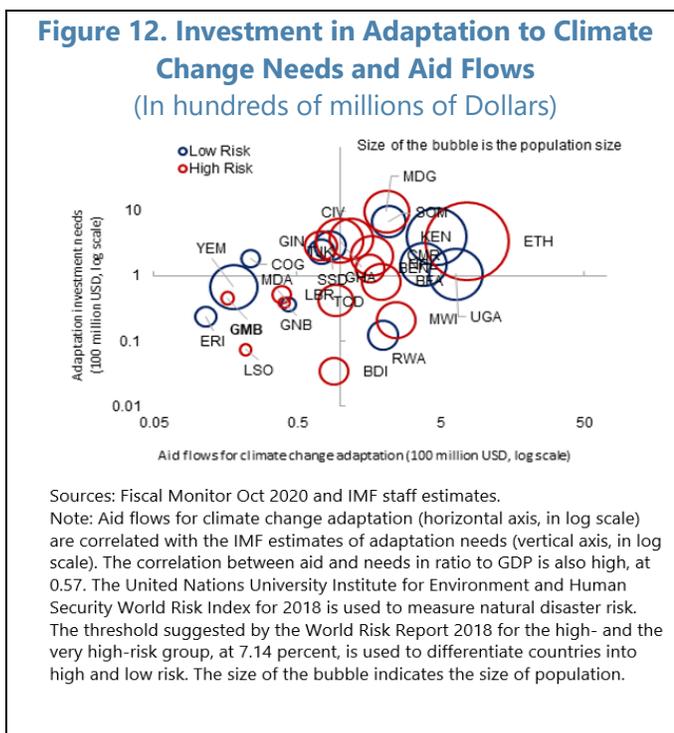


Table 1. The Gambia: Selected Climate Financing Announced in 2022-2023

No.	Source and Purpose	Amounts
1	Grant from the Government of Canada on climate related problems	Canada Dollar 20 million
2	Grant from the West Africa Coastal Area Management funded by the World Bank	USD 45 million
3	Grant from the French Development Agency to support five marine protected areas and the communities around them	Euro 6.9 million
4	Grant from the electricity restoration and modernization project co-financed by the World Bank and the European Investment Bank to build the solar plant and an eight megawatts energy storage system	USD 27 million

F. Public Finance Management

17. Strong Public Finance Management (PFM) can attract the climate finance aids. Cheng and Han (2023) have documented both the quality of the budget and financial management and the quality of public administration assessed in the World Bank's Country Policy and Institutional Assessments (CPIA)¹⁹ significantly enhanced the likelihood of receiving aid, and the quality of public administration contributed to attracting larger amount of funding for adaptations. Across countries, an increase of the quality of the budget and financial management to the frontier peer level (best performance in the group) could boost the annual adaptation funds by 9.2 percent and an increase of the quality of the public administration to the frontier could boost the funds by 33.6 percent.²⁰ IMF (2021a) highlighted that compliance with key PFM requirements, such as effective internal and external audit functions, robust control frameworks, and effective procurement processes and procedures supports access to global climate funds. The Gambia has been seeking strengthening in these areas reflected by the new PFM Act, which would allow better access to global climate funds.

18. Strengthening the Public Investment Management (PIM) benefits climate investments. The infrastructure investment and development are critical to The Gambia's development. To assess the institutions to deliver efficient infrastructure investments, a Public Investment Management Assessment (PIMA) was conducted with the assistance from the IMF in 2019. Since then, progresses have been made, guided by the recommendations, during the Extended Credit Facility (ECF) program 2020-2023 period, e.g., the use of the investment selection tool under The Gambia Strategic Review Board (GSRB) to strengthen appraising, prioritizing and selecting infrastructure projects; the approval of a three-year public investment program (PIP) in 2022 for selected priority sectors (i.e., health, education, agriculture, infrastructure, energy, and environment) to strengthen the investment planning while rationalizing public investment and anchoring debt sustainability. In addition, a sound PIMA paves the road to sound climate measures.

¹⁹ <https://databank.worldbank.org/source/country-policy-and-institutional-assessment>

²⁰ The Gambia has both indicators assessed as 3.0 in 2018 compared to the frontier peers' scores of 4.5 for the quality of budgetary and financial management and of 4 for the quality of public administration.

19. The Climate PIM emphasizes the climate change consideration in PIM, which is crucial for efficient green and resilient public investments. “Climate-PIMA” (C-PIMA) adds a climate-responsive dimension into the PIMA framework and assesses countries’ capacity to manage climate-related infrastructure. Five institutions of public investment management are reckoned by the C-PIMA as key for climate-resilient infrastructure, including climate-aware planning, coordination between entities, project appraisal and selection, budgeting and portfolio management, and risk management while considering three cross-cutting equally important issues of the legal and regulatory framework, information systems, and government staff capacity (IMF, 2021b). A C-PIMA assessment and integrating climate considerations in PFM processes, procedures and tools can bring large benefits to The Gambia. For instance, incorporating climate considerations in project selection can enhance the attractiveness of resilient investments. Resilient and green public investments can be essential to strengthen The Gambia’s adaptive capacity and support its transition to green infrastructure. Investing in resilient infrastructure results in fewer disruptions to public services, reduced exposure of assets to natural hazards, and reduced need for maintenance and reconstruction.

G. Conclusion

20. Despite The Gambia being situated within the mid-range of countries in terms of Climate-driven risk, the impact of natural disasters on affected populations and economic losses can be both persistent and substantial, with the agriculture sector being the most vulnerable. Given the pressing urgency of climate change, the country has initiated various strategies and initiatives. Considering The Gambia’s high dependence on fossil fuel imports for its energy supply, mitigation measures such as increasing renewable energy generation hold the potential to enhance energy security and reduce emissions. Equally important are fossil fuel subsidy reforms, which are crucial for transitioning to a greener economy and improving revenue mobility. Urgent adaptation actions are also imperative. These include enhancing regulations to restrict agriculture and livestock grazing activities to promote better land cover, strengthening early warning systems, increasing crop diversification and rotation, and transitioning to drought-tolerant crop and animal species. Lastly, to bridge the gap between climate financing requirements and actual aid received, The Gambia should enhance its public finance management, public investment management, and Climate Public Investment Management capabilities. These efforts will be instrumental in attracting climate financing aid and progressing towards achieving net-zero greenhouse gas emissions by 2050 while simultaneously enhancing resilience to climate risks.

21. This annex provides the background information for a broad set climate-related diagnostic assessment in the future. The broad set assessment would be crucial to identify critical policy, legal, data, and institutional gaps in terms of climate resilience. The gaps identified would guide effective reform measures that the climate-resilience financing, e.g., Resilience and Sustainability Facility, should be used.

References

- Amuzu, J., B. P. Jallow, A. T. Kabo-Bah, and S. Yaffa, 2018, "The Climate Change Vulnerability and Risk Management Matrix for the Coastal Zone of The Gambia" *Hydrology* 5: 1-14.
<https://doi.org/10.3390/hydrology5010014>
- Cheng, Y. and X. Han, 2022 "Assessing the Economic Loss due to Natural Disasters from Outer Space" *Climate Services* 26,100286.
<https://www.sciencedirect.com/science/article/pii/S2405880722000048>
- Fiscal Monitor Oct 2020, "Public Investment for the Recovery", International Monetary Fund.
<https://www.imf.org/en/Publications/FM/Issues/2020/09/30/october-2020-fiscal-monitor>
- Han, X. and Y. Cheng, 2023 "Drivers of Bilateral Climate Finance Aid: The Roles of Paris Agreement Commitments, Public Governance, and Multilateral Institutions." *Environmental and Resource Economics* (2023). <https://doi.org/10.1007/s10640-023-00783-5>
- International Monetary Fund, 2016, "Enhancing Resilience to Natural Disasters in Sub-Saharan Africa," in *Regional Economic Outlook "Sub-Saharan Africa Multispeed Growth,"*
- International Monetary Fund, 2019. "Building Resilience in Developing Countries Vulnerable to Large Natural Disasters", IMF Policy Paper.
- International Monetary Fund, 2021a. "Unlocking Access to Climate Finance for Pacific Island Countries", Asia-Pacific and Fiscal Affairs Departments.
- International Monetary Fund, 2021b. "Strengthening Infrastructure Governance for Climate-Responsive Public Investment" IMF Policy Paper.
- International Monetary Fund, 2022. "Proposal to Establish a Resilience and Sustainability Trust", IMF Policy Paper No. 2022/013 <https://www.imf.org/en/Publications/Policy-Papers/Issues/2022/04/15/Proposal-To-Establish-A-Resilience-and-Sustainability-Trust-516692>
- Intergovernmental Panel on Climate Change (IPCC). 2014 "Climate Change 2022–Impacts, Adaptation and Vulnerability: Regional Aspects." Cambridge University Press: Cambridge, UK.
- IPCC. 2021. "Climate Change 2021: The Physical Science Basis." Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
- Koks, E.E., Rozenberg, J., Zorn, C. et al. 2019. "A Global Multi-Hazard Risk Analysis of Road and Railway Infrastructure Assets." *Nature Communication* 10, 2677. <https://doi.org/10.1038/s41467-019-10442-3>