



# The Gambia

## Adaptation & Resilience Options for the Inland Water Transport Sector

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**Contributing Authors:** This brief builds on national and investment-level climate analyses conducted by GCA under the Africa Adaptation Acceleration Program (AAP). The work benefited from collaboration with the World Bank teams for The Gambia Infrastructure Project and CCDR, as well as insights shared by the Ministry of Transport Works & Infrastructure, the Ministry of Environment and Climate Change, NAWEC, the Department of Water Resources and the National Roads Authority.

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### EXECUTIVE SUMMARY

- The Gambia river, despite strong potential, remains largely unused for trade and transport, while facing major flow variability and future discharge declines.
- The Port of Banjul faces rising flood and sea-level risks—up to 25 lost days/year by 2050.
- Inland ports identified for investment by the Government of The Gambia, such as Basse, Bansang, and Kaur face rising river flood risks—up to 90% of asset value impacted by 2050 in some locations.
- Floods also isolate 11% of people from markets and hospitals and 8% from schools, which could benefit from resilient water transport to maintain access during floods and ensure multimodality.
- Enhancing asset design standards and adaptive capacity would ensure river transport

The Global Center on Adaptation (GCA) is an international organization working to accelerate action on adapting to climate change and building resilient economies.

Under the African Adaptation Acceleration Program (AAP), GCA supports The Gambia in embedding climate resilience into national planning and infrastructure investment projects –including The World Bank Gambia Infrastructure Project, The African Development Bank Banjul Port 4<sup>th</sup> Expansion and Senegambia Bridge Asset Recycling projects. Since 2024, GCA has partnered with IFIs, government institutions, and the National Roads Authority to assess climate risks to the transport sector, water resources, identify adaptation solutions, and strengthen local capacity through training activities.

## 1. KEY SECTORIAL VULNERABILITIES

**The Gambia’s transport sector underpins national connectivity, trade, and access to services, yet it relies on a few highly critical assets.** The Port of Banjul handles about 80 % of national imports, including food and fuel essential for food and energy security, while Banjul International Airport serves as the country’s only aviation hub. Inland, the South and North Bank roads and key urban axes form the main economic and social lifelines for communities, while the Trans-Gambia Corridor forms the country’s principal north–south link, vital for domestic mobility, regional trade and Senegal’s food supply chains.

**Rural communities are particularly vulnerable to low infrastructure redundancy, limiting access to essential services and economic opportunities;** with global assessments placing The Gambia among African countries with the lowest road network extent per capita<sup>1</sup>. The South and North Bank roads, and connecting feeder roads, provide vital links for food transport, service access, and agricultural markets. Network analysis<sup>2</sup> shows that most critical roads are unpaved rural feeder roads (Figure 1).

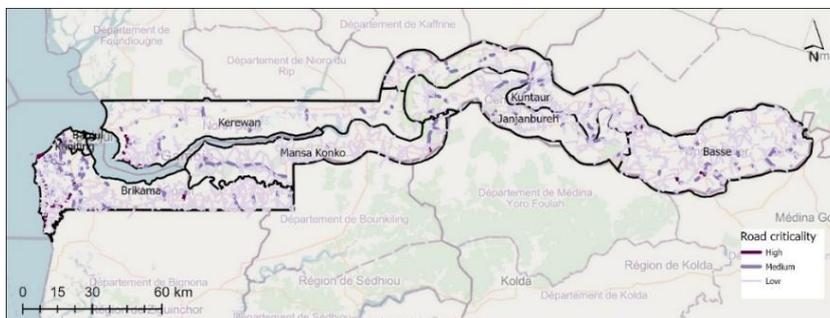


Figure 1. Road criticality for social (schools, markets, and hospitals), economic (between major markets, border crossings, and the Port of Banjul), and tourism connections (from hotels to the airport).

**Climate change is set to amplify existing vulnerabilities and cascading socio-economic impacts, primarily driven by rising temperatures, more extreme rainfall patterns, and sea level rise.** By 2050, coastal areas including The Greater Banjul Area are projected to face two additional weeks per year above 35 °C, while inland regions could experience extreme heat events every two years (up from once every 25 years) and up to 290 days above 40 °C under moderate scenarios. Flood risks will also intensify, with short, high-intensity rainfall events becoming 17–45% more frequent—especially in the middle river regions—and rising fluvial, tidal, and coastal flooding driven by sea-level rise of 0.25 m by 2050 and 0.42 m by 2070 threatening coastal infrastructure.

## 2. BUILDING RESILIENCE IN THE ROAD TRANSPORT SECTOR

The road transport sector is highly exposed to climate hazards, with impacts projected to intensify. Flooding will continue to be the dominant physical risk to The Gambia’s road network, with coastal, pluvial and fluvial flooding representing more than 90% of total risks towards 2050 under all scenarios:

- **Pluvial flooding** currently affects 57 % of roads, rising to 61 % by 2050 under the SSP2-4.5-4.5 scenario, blocking roads during peak events and accelerating surface degradation.
- **Fluvial flooding** places around 5 % of roads at very high direct risk near river crossings, with nearly half of the network potentially exposed by 2050. Bridges are particularly vulnerable: about 80 % face flooding impacts, with scour and hydraulic forces threatening structural stability during extreme events<sup>3</sup>.
- **Coastal flooding** exposure is projected to expand from 91 km of exposed roads today to 141 km by mid-century, equivalent to 1.6 % of the national network.
- **Extreme heat** will emerge as a dominant hazard in the longer term. By 2050, more than 70 % of inland roads are expected to face very high thermal stress, leading to faster asphalt deformation. By 2070 (SSP2-4.5-4.5), heat risks are projected to surpass floods as the primary risk, especially in the eastern regions.

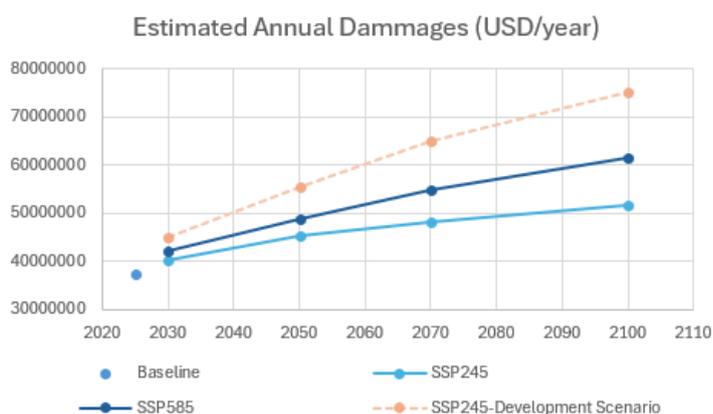
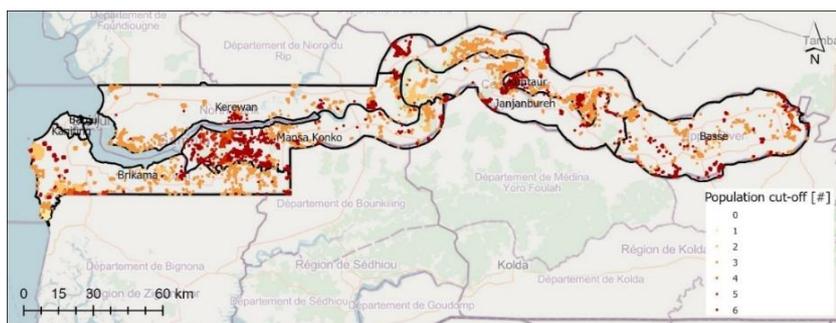


Figure 2. Evolution of climate risks to the road sector (in Estimated Annual Damgages (USD/yr)), as estimated annual damages under SSP2-4.5 and SSP5-8.5 scenarios, and a road development scenario (all residential roads are paved)

**Flood-driven transport disruptions have rising socio-economic consequences in The Gambia. During flood events, 11 % of the population loses access to markets (≈261,000 people), 8 % to schools, 11 % to hospitals, and 8 % become completely isolated from all of them under current climate conditions.** Rural local government areas (LGA) such as Kuntaur, Mansa Konko, and Basse are disproportionately affected. Network analysis identified 3,252 km of critical roads for maintaining access during floods, including 320 km at high criticality—with Brikama alone hosting 704 km of these links. The cascading effects are significant: loss of rural access undermines incomes, food security, and delivery of services; trade disruptions constrain national imports and exports since rural areas supply most food and cash crops; and blocked routes to tourism hubs threaten one of The Gambia’s key economic sectors.



LGA	Population cut-off [%]				Increased travel time [%]
	Markets	Schools	Hospital	All	
Banjul	0%	0%	0%	0%	0%
Kuntaur	32%	33%	33%	31%	6%
Janjanbureh	12%	11%	15%	9%	9%
Kanifing	0%	0%	0%	0%	0%
Mansa Konko	23%	23%	25%	22%	1%
Kerewan	9%	7%	9%	8%	9%
Basse	26%	22%	26%	23%	7%
Brikama	8%	3%	8%	3%	1%
Total	11%	8%	11%	8%	3%

Figure 3. Population cut-off (in thousands of people in the map, in % of total population in the table) from access to critical services due to flood events

### Priority investments for impact-based adaptation

**Targeted adaptation investments requiring less than 5% on additional financing could reduce up to 50% of climate risks to The Gambia’s road network by mid-century<sup>2</sup>—providing 3\$ in benefits for each dollar invested— and securing development goals<sup>4</sup>.** Priority measures towards 2050 include:

- **Expanding and diversifying drainage infrastructure, including NbS solutions,** to increase capacity, reduce maintenance costs, and avoid maladaptation, particularly in the Greater Banjul Area. This requires both greater investment in drainage and tailored climate-resilient design guidelines that are context-specific.
- **Rising bridge design standards** to higher flood return periods (above RP50 for common bridges), with larger hydraulic openings and scour protection against stronger river discharges.
- **Expanding preventive maintenance capacity,** currently hampered by budget constraints, and including climate-resilient practices is vital, supported by establishing early-warning systems, and engaging communities in routine monitoring and debris clearance.
- **Incorporating heat-resistant modified binders** in critical roads over the longer term, a cost-effective measure to reduce asphalt deformation, particularly in eastern regions.

For the road sector alone, cost-benefit analysis of these measures suggests that resilience investments would require about 5 % of asset value every 25 years. The present value of benefits is estimated at US\$465 million, compared to costs of US\$150 million—yielding a net present value of US\$310 million and a benefit-cost ratio of 3.

**Adaptation needs are also rising for the Senegambia Bridge, Banjul Airport, and the Port of Banjul, where indirect risks are driven by vulnerable access roads,** despite relatively low projected direct impacts<sup>5</sup>. Feeder roads north of the Senegambia Bridge are prone to recurrent flooding and deformation under extreme heat and heavy traffic, while airport-coastal connectors in the Greater Banjul Area are among the most exposed corridors, threatening connectivity to tourism hubs. At the Port of Banjul, sea-level rise will compound risks to road access, amplifying disruptions to trade and food security.

### 3. BUILDING RESILIENCE IN INLAND WATER TRANSPORT

Inland water transport on the Gambia river remains largely undeveloped, with no river borne import/export traffic and activity limited mainly to ferry crossings—especially Banjul–Barra and several upstream links that carry people, vehicles, and goods—despite clear latent economic potential, including for tourism. Navigability is constrained by strong hydrological seasonality: low dry-season flows can render reaches difficult or impassable, while rainy-season peaks reshape conditions; looking ahead, modeled trends point to a likely tightening of the dry-season navigation window<sup>6</sup>.

**At present, the Port of Banjul handles nearly all import and export flows, which are then redistributed inland exclusively by road. In this context, the river—once a facilitator of movement—now acts more as a barrier than an asset for inter-urban connectivity due to the lack of landing sites and functional river infrastructure<sup>7</sup>.** The government and development partners have nonetheless identified several strategic sites for river transport upgrades, including:

- **Kaur**, envisioned as a dry port and inland container depot (ICD);
- **Basse**, proposed as a priority inland port and logistics hub, potentially serving as the historic terminus of navigation;
- **Bansang**, targeted for jetty rehabilitation and trans-shipment functions;
- **Farafenni**, identified as a multimodal river–road interface hub; and
- Other smaller landing points such as Janjanbureh, Kuntaur, Kerewan, and Fatoto.

**In line with the National Development Plan (2018), the government has set an ambitious goal to raise the river’s share of freight transport to 30 % in the medium-term, which would require substantial investment** in infrastructure, logistics coordination, and institutional capacity—particularly upgrading river ports at Kaur and Basse, establishing a multimodal logistics center in Farafenni, and enhancing coordination among barge operators<sup>7</sup>.

**However, projected changes in rainfall intensity, river discharge, and increased flooding threaten to alter navigation windows, degrade port infrastructure, and undermine the viability of a multimodal transport vision that relies on the river as a backbone.**

#### Climate risks to unlocking inland water transport

**The Port of Banjul is highly exposed to climate risks, with downtime outweighing direct asset damage.** Handling most national imports, the port is vital for food and fuel security but sits in a low-lying area where 30–40 % of land-side assets are flood-prone. Sea level rise, storm surge, and extreme rainfall could cause up to 25 days of downtime annually by 2050, while ferry terminals already face around 3 % recurring damage from wave action. Economic losses are driven primarily by operational disruptions—68 % from land-side and 30 % from marine activities—rather than physical destruction, which accounts for only 2 %. Without adaptation, the port risks more than 45 disrupted days per year by mid-century, with knock-on impacts on trade, food distribution, and energy supply. These risks are compounded by ecological degradation, as the Tanbi Wetland Complex faces 10 % annual damage under drought conditions, threatening to collapse within a decade and removing a critical natural buffer.

**Key inland water transport landing areas identified and their access routes are also exposed to rising climate risks.** On average, those sites are expected to suffer up to +20% in direct fluvial flooding risks, with 60% of asset value being impacted by 2050 for the SSP5-8.5 scenario. By 2050, all areas are projected to be impacted by river floods of 3m for 1-in-100-year events, with Kaur and Bansang particularly impacted by short-term events, suffering floods above 2m during 1-in-5-year events. Basse is the most exposed area overall, with up to 90% of asset value impacted by 2050 by river and

pluvial flooding. At the network level, Kuntaur, Basse and Bansang present wide impacts of flooding beyond river landing areas, affecting entire towns and disconnecting most of the population from the main road network.

Table 1. Risk summary for main landing areas

	Direct Climate Risks by 2050 (SSP5-8.5) <sup>1</sup>	Importance for network resilience
<b>Port of Banjul</b>	<ul style="list-style-type: none"> <li>• <b>High</b> storm surge impacts to port dependencies and access roads, cascading into downtime</li> <li>• <b>Low</b> fluvial and pluvial flooding</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Medium</b>: main Ferry terminal, built to high standards</li> </ul>
<b>Kaur</b>	<ul style="list-style-type: none"> <li>• <b>Medium</b> river flood risk (50% of asset value, increasing by +30%)</li> <li>• <b>Low</b> pluvial flooding risks</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Medium</b>: directly connected to Kaur, could potentially serve northern disconnected villages</li> </ul>
<b>Basse</b>	<ul style="list-style-type: none"> <li>• <b>High</b> river flooding risks (80% of asset value, increasing by +10%)</li> <li>• <b>High</b> pluvial flood risk (15% asset value, and increasing by +40%)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Medium</b>: nearby villages disconnected during floods, and a large share of road network impact</li> </ul>
<b>Bansang</b>	<ul style="list-style-type: none"> <li>• <b>High</b> river flooding risk (70% of asset value, increasing by +10%)</li> <li>• Highest river flood depths (&gt;4m for RP100)</li> <li>• <b>Medium</b> fluvial flood risk (8% asset value, increasing by +50%)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>High</b>: both sides of the river heavily disconnected during floods; access to main road network also disrupted</li> </ul>
<b>Farafenni</b>	<ul style="list-style-type: none"> <li>• <b>Medium</b> river flood risk (40% of asset value, increasing by +30%)</li> <li>• <b>Low</b> pluvial flooding risks</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Low</b>: Senegambia Bridge is designed with high design standards and can serve as fallback</li> </ul>

Although annual average water resources are expected to remain overall stable within the next decades, increasing demand and rainfall variability could impact water levels and navigability, particularly upstream. Lower surface water levels in the river reduce navigable depth during the dry season, making river transport unreliable and cutting access for trade and services to inland communities. Today, during periods of low flow in the dry season, navigation becomes difficult or impossible in certain sections of the river<sup>8</sup>, a trend that is expected to increase in the future, as a downward trend in the Gambia river discharge rates is expected towards the year 2100, especially in the SSP5-8.5-8.5 scenario<sup>9</sup>.

**Wetlands across The Gambia, including the Tanbi Wetland Complex and the inland floodplains of the Lower and Central River Regions, provide vital ecosystem services for water resources and underpin the livelihoods of nearby communities.** However, rising temperatures, greater rainfall variability, salinity, and expanding land-use pressures are expected to drive wetland shrinkage and degradation, diminishing their capacity to buffer floods, supply freshwater, sequester carbon, and regulate salinity. These changes are already disproportionately affecting wetland-dependent populations, with some communities reporting income declines of up to 60%<sup>10</sup> due to reduced resource availability.

#### Water transport as a backbone for economic resilience

**The Global Center on Adaptation (GCA), under the Africa Adaptation Acceleration Program, supported the African Development Bank (AfDB) in the implementation of some of the adaptation solutions identified for the Port of Banjul 4<sup>th</sup> expansion project, which led to the enhancement of the access road’s standards to reduce flood impacts.**

<sup>1</sup> Estimations by the authors, considering low design standards and minimal pier and access road elevation (current conditions)

According to the GCA study for the Port of Banjul, targeted adaptation investments requiring 9% of additional finance, would yield high returns by reducing disruption and safeguarding trade flows, estimated at 30US\$ million over the next 30 years. Priority measures include upgrading Bund Road, the port’s sole access, with heat- and flood-resistant pavement; purchasing heat-resilient equipment and securing reliable power for reefers; and improving drainage across terminals. Structural defenses such as sea walls and terminal elevation would protect cranes and storage zones, reducing risks by US\$2–6 million each. Worker-focused measures—cooling stations, shade, and potable water—would further strengthen resilience (risk reduction up to US\$4.7 million). Together, these investments would reduce downtime, protect essential imports of food and fuel, and secure regional trade lifelines.

For inland water transport areas, without integrating climate resilience into asset design, hydrologic planning, and logistics operations, investments risk being short-lived. Increasing asset design standards and building adaptive capacity—through improved river monitoring, flexible port infrastructure, and nature-based approaches to bank stabilization—will therefore be essential to realizing the long-term potential of inland water transport in The Gambia. Adaptation measures to consider include:

- **Infrastructure upgrades** form the backbone of climate adaptation in ports and inland waterways, focusing on flood protection, elevation, and drainage improvements<sup>11</sup>.
- **Port elevation and retrofitting** of docks, terminals, and warehouses are increasingly adopted to remain above projected flood levels and minimize downtime<sup>12</sup>.
- **Erosion and sediment management**—including strategic use of dredged materials and enhanced waterway maintenance—supports navigability and mitigates low-water constraints<sup>13</sup>.
- **Fleet and vessel adaptations** target resilience to fluctuating river flows, through modified hull designs, fleet diversification, and load factor adjustments to sustain operations during low-water conditions<sup>14</sup>.
- **Operational and forecasting improvements** enable route planning, optimized cargo loading, and proactive risk management to maintain service reliability under changing climate conditions.

These combined infrastructure and fleet adaptations would enable water transport systems to maintain reliability and safety despite increasingly variable climate conditions.

At the national transport system level, adapting key areas for inland river transport could unlock multimodality and network redundancy, which will particularly ensure community’s access during flood events. This is particularly important for communities along the Central River region, where Kuntaur, Janjanbureh and Bansang landing areas could reconnect communities projected to be disconnected by flooding (see Figure 4. River landing areas as enablers of alternative access after flood events.

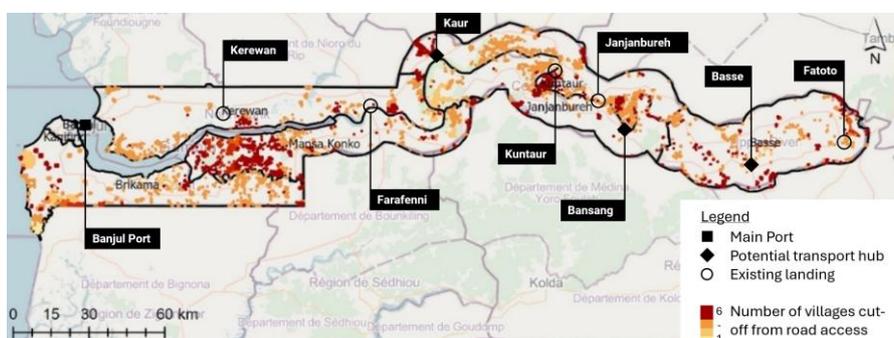


Figure 4. River landing areas as enablers of alternative access after flood events

### Institutional considerations for Water Transport in The Gambia

**Water transport is recognized as strategically important for The Gambia's economic resilience and connectivity. Policy documents like the National Transport Policy (2018–2027) and the Recovery Focused National Development Plan (2023–2027) call for strengthening river and coastal transport, reviving inland waterways, and upgrading the Port of Banjul to improve trade links with the North Bank and reduce dependence on road traffic.** These priorities frame water transport not just as a logistics asset, but as an essential public service for mobility, market access, and shock-responsive supply chains. Institutions like the Gambia Ports Authority and the Gambia Maritime Administration oversee port operations, vessel safety, and pollution control through instruments such as the Merchant Shipping Act (2013) and the Marine Pollution Act (2013), which aim to keep navigation safe and protect marine and estuarine ecosystems.

**At the same time, the assessment highlights serious gaps that limit the sector's resilience. Climate risks such as coastal erosion, flooding, and pollution threaten navigation channels and port infrastructure, but there is still no robust regulatory framework for inland river transport, and enforcement capacity on marine pollution and safety remains thin.** Urban planning strategies, including the Greater Banjul Area 2040 Plan, acknowledge the need to adapt coastal and river infrastructure to climate change, but implementation is lagging and roles are split across multiple agencies. The result is that river transport is politically prioritized as a low-carbon alternative to roads and an economic lifeline during climate shocks – but technically underregulated, financially under-resourced, and institutionally fragmented, especially on issues like dredging, drainage, and emergency access for remote riverbank communities.

**But in practice, the policy environment for inland water transport is still weak and fragmented.** There is no robust, up-to-date regulatory framework for river transport services along the Gambia river, roles are split across multiple ministries, and enforcement capacity (especially on safety, vessel standards, dredging, and pollution control) is thin. Climate risk is not yet systematically embedded: flooding, erosion, siltation, and saltwater intrusion threaten navigation channels and landing sites, but river transport policy does not currently require climate-resilient design, emergency access planning for remote riverbank communities, or integration with national disaster response. The result is a sector that is politically prioritized as a low-carbon alternative and a lifeline for connectivity during shocks, but still under-regulated, under-financed, and not climate-proofed in policy or practice.

## 4. SCALING NATURE-BASED SOLUTIONS FOR CLIMATE RESILIENT INFRASTRUCTURE IN THE GAMBIA

**Nature-based solutions (NbS) offer a cost-effective pathway to strengthen the climate resilience of Gambia's transport infrastructure, building on the country's existing expertise.** The Gambia has already piloted large-scale NbS interventions, including through Green Climate Fund-supported projects.

**Recent global analytics<sup>15</sup> highlights significant opportunities for mangrove and floodplain restoration nationwide,** suggesting that these interventions could deliver up to US\$3 billion in long-term resilience benefits by 2100, with every dollar invested in adaptation yielding more than two dollars in avoided damages and broader socio-economic gains.

**Mangrove ecosystems in The Gambia are particularly valuable in protecting high-risk transport assets.** At the Port of Banjul, the Tanbi Wetland Complex acts as a key natural buffer against storm

surges and tidal flooding. However, degradation of this wetland poses severe risks, undermining its capacity to protect cargo terminals, cranes, and access roads. Targeted restoration—through planting and monitoring of mangroves, combined with community awareness campaigns—has been estimated at a cost of €1.4 million, with potential risk reduction of €1.3–3.7 million, and unmonetized co-benefits for the environment and coastal communities<sup>16</sup>. Along the Senegambia Bridge, mangrove belts provide critical natural defenses against flooding and erosion, reducing maintenance needs for the bridge and its feeder roads while ensuring the reliability of this strategic north–south corridor.

**Scaling such ecosystem-based measures alongside hard infrastructure will be essential to secure transport assets and rural connectivity against intensifying climate hazards.** But also on urban roads, at a smaller scale, investing in green-blue infrastructure and nature-based drainage systems could yield sustained benefits while reducing risks of mal-adaptation.

## 5. INSTITUTIONAL CONSIDERATIONS TO BOLSTER INLAND WATER TRANSPORT

**Institutional gaps continue to limit The Gambia’s ability to mainstream climate resilience into the transport sector.** While frameworks such as the NCCP, SPCR, and LTS 2050 provide a strong foundation, they often overlap and lack clear prioritization, measurable targets, or long-term national anchoring. Implementation has progressed more slowly than planned, with bodies like the National Climate Change Council and Inter-ministerial Climate Committee requiring further support to realize their full potential, and dedicated funds still to be fully operationalized. Capacity and data systems also need reinforcement, including stronger technical staffing, upgraded monitoring networks, and more consistent enforcement of land-use regulations. Financing remains heavily dependent on donor-driven projects, but growing interest in resilience provides an opportunity to strengthen country-led programs. Updating sectoral frameworks—such as the water policy and forthcoming Transport Bill—to explicitly include climate risks, combined with improved coordination and the strategic use of climate data, can help translate existing strategies into effective and actionable resilience measures.

**Several institutional levers can accelerate climate adaptation in The Gambia’s transport and infrastructure sectors, primarily:**

- **Policy and legal reforms:** Fast-track approval of the Draft Water Bill (2020), enforce the National Land Policy (2025), and update sectoral frameworks to embed climate adaptation, including explicit provisions in the forthcoming Transport Bill.
- **Institutional strengthening:** Operationalize the National Climate Change Council, Inter-ministerial Climate Committee, and Climate Change Secretariat with adequate staffing and funding; establish a central coordination unit and database for adaptation finance; build sub-national capacity for implementation and enforcement.
- **Climate data and monitoring:** Rehabilitate tidal, rainfall, and river monitoring stations; develop a national open-access climate data repository to guide planning and accountability.
- **Financing and donor alignment:** Shift from fragmented, project-based approaches to coordinated, country-owned programs; capitalize a National Climate Fund with contributions from all ministries and leverage international finance; strengthen public finance management to improve donor trust.
- **Nature-based and social levers:** Expand mangrove restoration, ecosystem-based adaptation, and catchment management; integrate gender, youth, and community-based adaptation into legal frameworks; use transparency and accountability laws to strengthen participation in adaptation governance.



## REFERENCES

1. Koks, E. E., Rozenberg, J., & Zorn, C. (2023). Network analysis of road infrastructure vulnerability
2. Global Center on Adaptation, Climate Risk Assessment and Network Analysis for the Transport Sector of The Gambia, 2025.
3. Global Center on Adaptation, Climate Change Assessment of The Gambia, 2025.
4. Global Center on Adaptation, Climate Risk Assessment and Identification and Appraisal of Adaptation Solutions for the World Bank Gambia Infrastructure Project, 2025.
5. Global Center on Adaptation (2025). Senegambia Bridge climate risk assessment and adaptation options report [for African Development Bank].
6. Global Center on Adaptation, Climate Risk Assessment of the Water Resources of The Gambia, 2025. Partnerships: World Bank Group. Consulting firms: Royal Haskoning DHV, Lobelia Earth. Developed under the AAAP.
7. The World Bank. (2022). The Gambia: Improving Transport Connectivity – InfraSAP Diagnostic (Report No. P177963). Washington, DC: The World Bank.
8. United Nations World Water Assessment Programme. (2014). The United Nations World Water Development Report 2014: Water and energy. Paris, UNESCO.  
<http://unesdoc.unesco.org/images/0022/002257/225741E.pdf>
9. Sène, S. M. K., Faye, C., & Pande, C. B. (2024). Assessment of current and future trends in water resources in the Gambia River Basin in a context of climate change. *Environmental Sciences Europe*, 36, Article 32. <https://doi.org/10.1186/s12302-024-00848-2>
10. Ceesay, A., Wolff, M., Njie, E., Kah, M., & Koné, T. (2016). Adapting to the inevitable: The case of Tanbi Wetland National Park, The Gambia. In W. Leal Filho, H. Musa, G. Cavan, P. O'Hare, & J. Seixas (Eds.), *Climate change adaptation, resilience and hazards* (pp. 257–274). Springer International Publishing. [https://doi.org/10.1007/978-3-319-39880-8\\_16](https://doi.org/10.1007/978-3-319-39880-8_16)
11. International Chamber of Shipping. (2024, May 24). *Ports need to adapt to US \$67 bn climate-change threat*. Retrieved November 4, 2025, from <https://www.ics-shipping.org/news-item/ports-need-to-adapt-to-us-67bn-climate-change-threat/>
12. Hansen Bros. Moving & Storage. (n.d.). The effects of climate change on U.S. ports and shipping. Retrieved November 4, 2025, from <https://www.hansenbros.com/blog/the-effects-of-climate-change-on-u-s-ports-and-shipping/>
13. PLATINA3. (n.d.). *Climate change adaptation strategies*. Retrieved November 4, 2025, from <https://platina3.eu/climate-change-adaptation-strategies/>
14. Heyndrickx, C., & Breemersch, T. (2012). *The effect of climate change on inland waterway transport*. *Procedia – Social and Behavioral Sciences*, 48, 1837-1847.  
<https://doi.org/10.1016/j.sbspro.2012.06.1158>
15. Global Center on Adaptation & University of Oxford. (n.d.). Global tools for nature-based solutions. Retrieved from <https://gca.org/news/gca-launches-pioneering-tool-to-scale-investments-in-nature-based-solutions/>
16. Global Center on Adaptation (2023). Climate risk assessment: Port of Banjul [for African Development Bank].