

Sustainable Asset Valuation (SAVi) of Senegal's Saloum Delta

An economic valuation
of the contribution of the
Saloum Delta to sustainable
development, focussing on
wetlands and mangroves

Analysis by Andrea M. Bassi, Liesbeth Casier, Georg Pallaske,
Oshani Perera, and Ronja Bechauf

Toward New Conservation Strategies for the Saloum Delta, Senegal

The International Institute for Sustainable Development (IISD) and the MAVA Foundation have supported policies and programs on sustainable development and nature conservation for a number of years. Since 2019, IISD has also collaborated with Wetlands International – Africa (WIA) on ideas and solutions for improved conservation of the Saloum Delta.

The Saloum Delta is a tropical mangrove ecosystem, rich in biodiversity, that provides livelihoods for more than 100,000 inhabitants. Its ecosystem is currently under pressure because of climate change and unsustainable use of the mangrove forests. This has led to coastal erosion and salination issues, threatening local development in the region. The Sine-Saloum Delta has been designated as a UNESCO Biosphere Reserve since 1980 and as a World Heritage Site since 2011.

In 2019, the MAVA Foundation, WIA, and IISD decided to collaborate and use the Sustainable Asset Valuation (SAVi) methodology to simulate the impact of different trends on the Saloum Delta, expressed in monetary terms. This includes a calculation of the economic value of the ecosystem services of the Delta, along with the multitude of co-benefits, such as additional income generation and GHG emissions reduction.

In this project, IISD provided a customized SAVi model, data validation, and research to complement project-specific data. WIA contributed primary data and provided the critical platform for stakeholder consultation.

After the simulations, IISD and WIA held consultations on the validation of the results with local stakeholders in the Saloum Delta. These included representatives of national ministries (agriculture, fisheries, environment, tourism), local government representatives, civil society organizations, the Global Green Growth Institute (GGGI), and tourism and agriculture associations active in the Delta.

Feedback from these discussions and new inputs provided were included in the final simulations.

Using the results of this assessment, the project partners are now working on improved conservation strategies. It is with great pleasure that we also welcome the GGGI, who will be joining us on the next steps of this project.

About SAVi

SAVi is a simulation service that helps governments and investors value the many risks and externalities that affect the performance of infrastructure projects.

The distinctive features of SAVi are:

- **Valuation:** SAVi values, in financial terms, the material environmental, social, and economic risks and externalities of infrastructure projects. These variables are ignored in traditional financial analyses.
- **Simulation:** SAVi combines the results of systems thinking and system dynamics simulation with project finance modelling. We engage with asset owners to identify the risks material to their infrastructure projects and then design appropriate simulation scenarios.
- **Customization:** SAVi is customized to individual infrastructure projects.

How Stakeholders Can Use This Analysis



Policy-makers can use it to make decisions on infrastructure planning, coastal conservation, sustainable agriculture, adaptation to changing climates, and economic development.



Non-government organizations can use the economic valuations of ecosystem services to fine-tune mangrove restoration and conduct more targeted advocacy for continued conservation of the Saloum Delta.



Project developers and sponsors of nature-based infrastructure can use the valuations to design conservation finance solutions, potentially raising capital from private investors.



Public donors and private investors can also use this analysis as a baseline to perform due diligence for grants, concessional lending, and organize “pay-for-performance” financing solutions.

The Design of This Analysis

We used the SAVi methodology to take a systemic approach to analyze the impacts of existing and planned development on the wetland ecosystems of the Saloum Delta. We designed the simulation to generate insight into how improved conservation will affect the local economy, create employment, and increase the delivery of ecosystem services.

We also designed the simulation to forecast risks and opportunities on key aspects that are material to stakeholders: coastal erosion, degradation, and deforestation of the mangrove area; plans for the extension of road networks; and ongoing offshore oil drilling. The simulations also include scenarios on expanded sustainable agriculture, continued mangrove restoration, and efforts to reduce mangrove deforestation by using solar cookstoves.

What Is the Current Economic Value of the Saloum Delta?

We use different methods to assess the monetary value of the different ecosystem services of the Saloum Delta:

- Peer-reviewed literature on the costing of ecosystem services (Figure 1)
- Income generated in the sectors dependent on the Delta: i.e., agriculture, fisheries, and tourism (Figure 2)
- The cost of grey-built infrastructure that can perform the function of an ecosystem service (e.g., the cost of infrastructure for flood protection) (Figure 3)
- A summary of the above is presented in Figure 4.

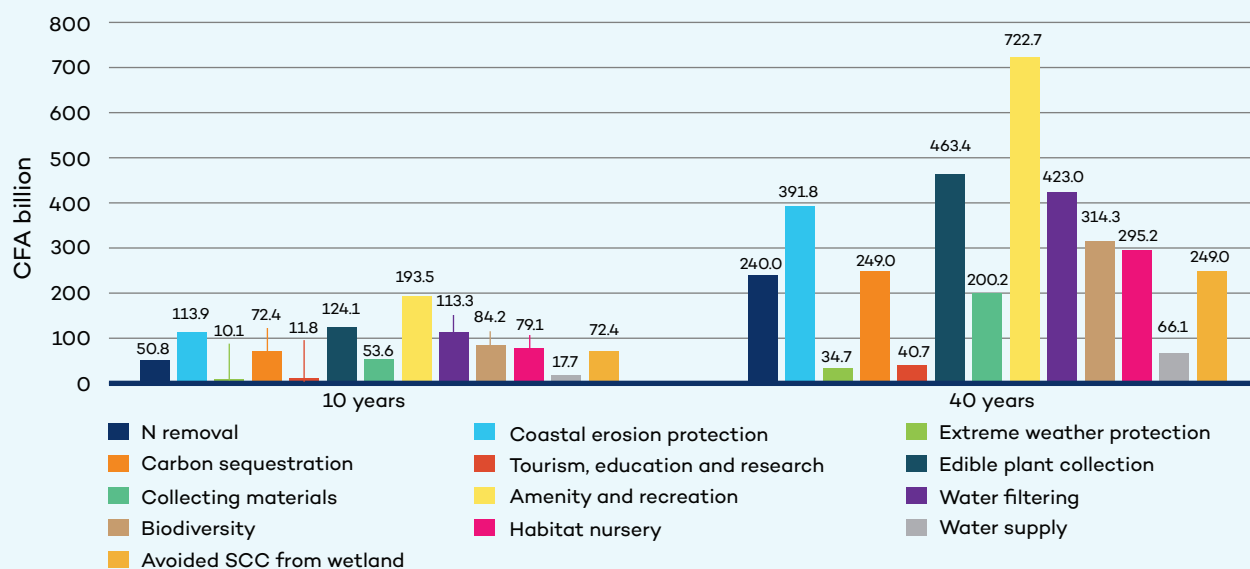


Figure 1. Value of ecosystem services based on peer-reviewed literature

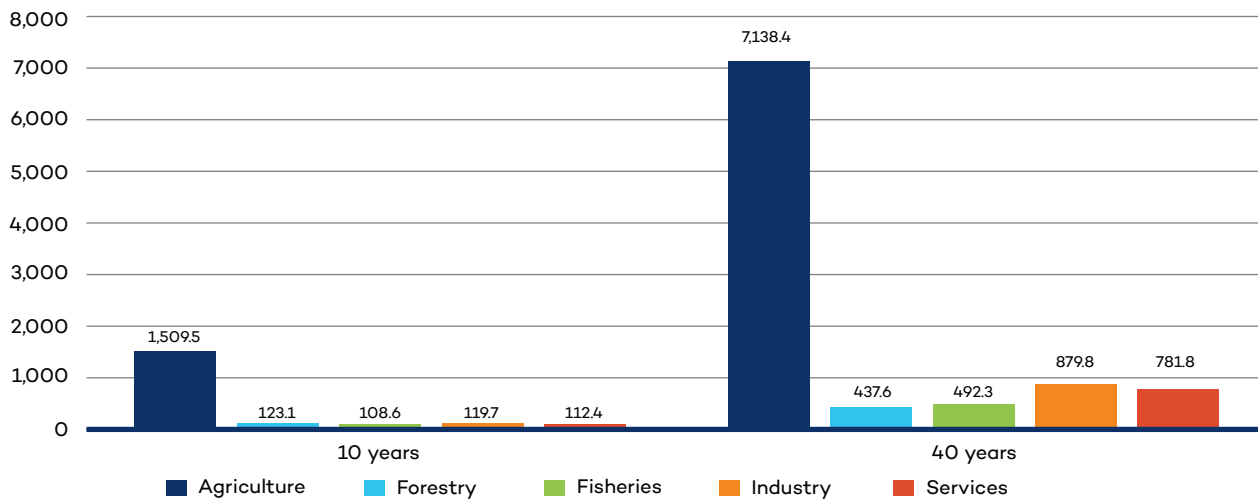


Figure 2. Income generated in agriculture, forestry, fisheries, industry, and services that depend on the Saloum Delta, CFA billion

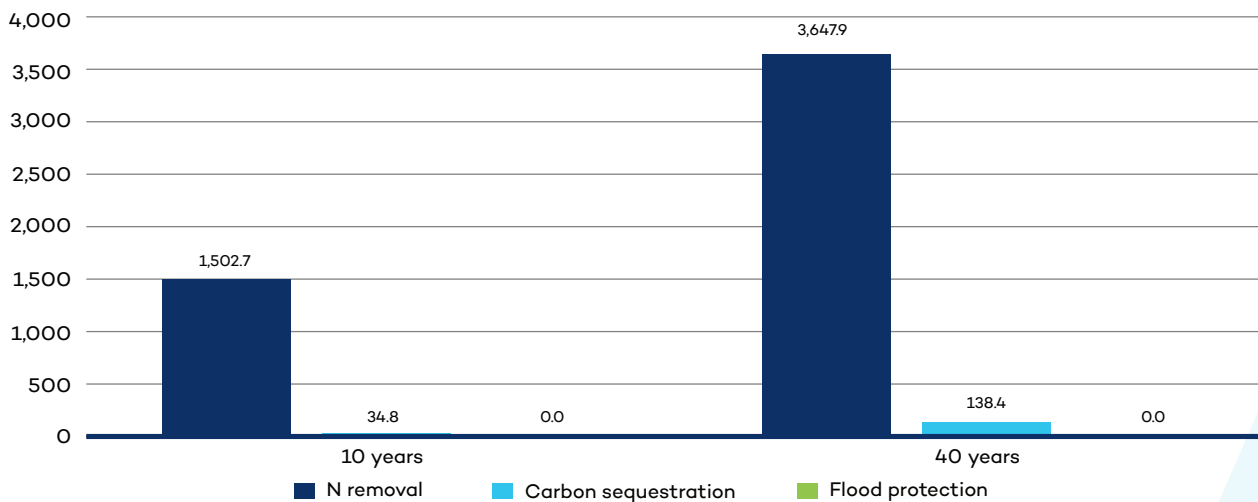


Figure 3. The cost of replacing selected ecosystem services with grey-built infrastructure, CFA billion

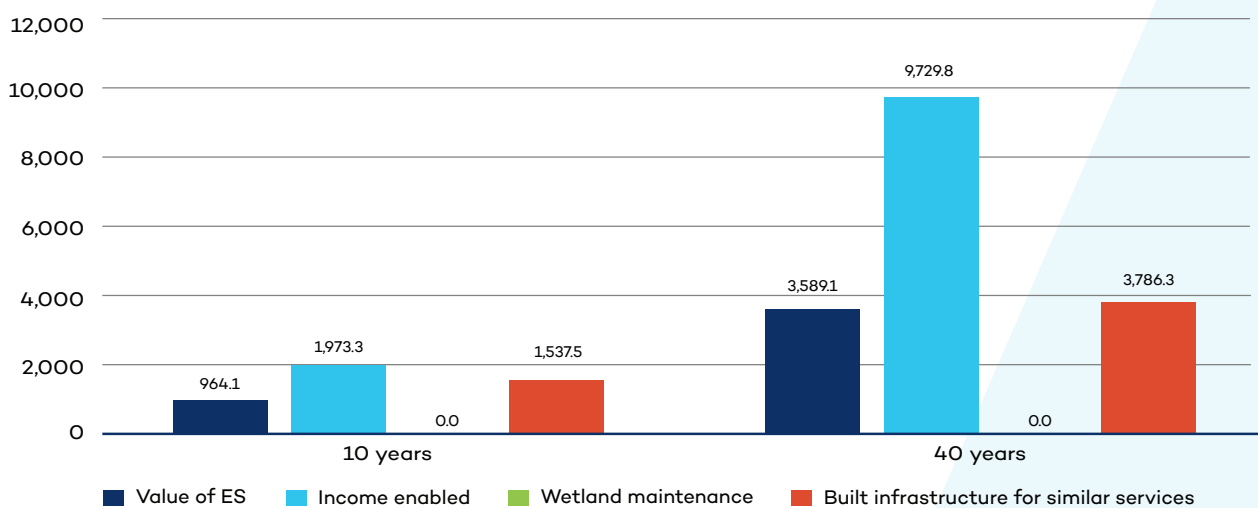


Figure 4. Summary of the different valuation methods, CFA billion

These graphs indicate several important aspects:

- The value of the ecosystem services totals CFA 964 billion (EUR 1.5 billion), and the value of labour income directly generated from the ecosystem reaches CFA 1,973 billion (EUR 3 billion) over a period of 10 years.
- The value of ecosystem services increases to CFA 3,589 billion (EUR 5.4 billion), and the labour income generated further increases to CFA 9,729 billion (EUR 14.8 billion) over a period of 40 years.
- The potential to avoid spending on built infrastructure is significant in the longer term.

Simulating the Impacts of Future Economic Development and Conservation Projects on the Saloum Delta

The different scenarios (projects and policies) that were simulated in the assessment were identified based on the Regional Development Plan of the Foundiougne Department and consultations with WIA.

Scenario	Assumptions
Sustainable agriculture	This scenario converts 20% of the land currently used for agriculture into organic agriculture over a period of 10 years. The implementation of organic agriculture increases production and employment while contributing to increased sectoral growth. The use of organic management practices reduces the total amount of chemical fertilizers applied, which benefits both farmers and the environment. Reducing fertilizer loads helps reduce soil erosion, improving soil quality and contributing to improved productivity.
Mangrove reforestation	This scenario implements 1,000 hectares per year of mangrove reforestation over a period of 10 years. The reforestation of mangroves leads to an increase in the total mangrove stock and maintaining ecosystem services. Increased soil cover from reforestation activities contributes to reducing soil erosion both on land and at the coast. Furthermore, the increase in mangrove area contributes to an increase in the area providing ecosystem services.
Road construction	This scenario implements the construction of 50 km of road to expand the road network in the Fatick region over a period of 10 years. The expansion of the road network leads to improvements in total factor productivity and contributes to employment and income generation. Road construction also causes accelerated deforestation, which increases the pressure on natural capital.
Solar cookstoves	This scenario foresees that 30% of households will replace fuelwood for cooking with solar-powered cookstoves by 2030. Fuelwood collection is a driver of environmental degradation and loss of mangrove forest.
Oil extraction	This scenario simulates the average impact of two oil spills over a period of 40 years. This leads to a reduction in the stock of healthy mangroves and a corresponding loss of ecosystem services. This scenario was included because there are currently licences granted for offshore oil extraction at the level of the Saloum Delta.

Details on the assumptions behind the scenarios are available [in the technical report](#).

Results of the SAVi Assessment: The Wetland Quality Index

Figure 5 shows the Wetland Quality Index and the impact of the different scenarios on the index. Under prevailing trends, the index demonstrates that the quality of the wetland will decrease over time (business-as-usual [BAU] line) if no action is taken.

Interventions such as organic agriculture and mangrove reforestation reduce the overall degradation of wetland quality but do not prevent the long-term trend of the degradation of the ecosystem. The oil extraction scenario has a significant impact on the index, but the figure also illustrates that some natural regeneration takes place after the oil spills.

The figure also shows that solar cookstoves and road construction have little to no effect on the degradation of the wetland; however, both are important. Without a viable alternative for cooking, communities will keep cutting mangroves, as fuelwood is essential for their livelihoods.

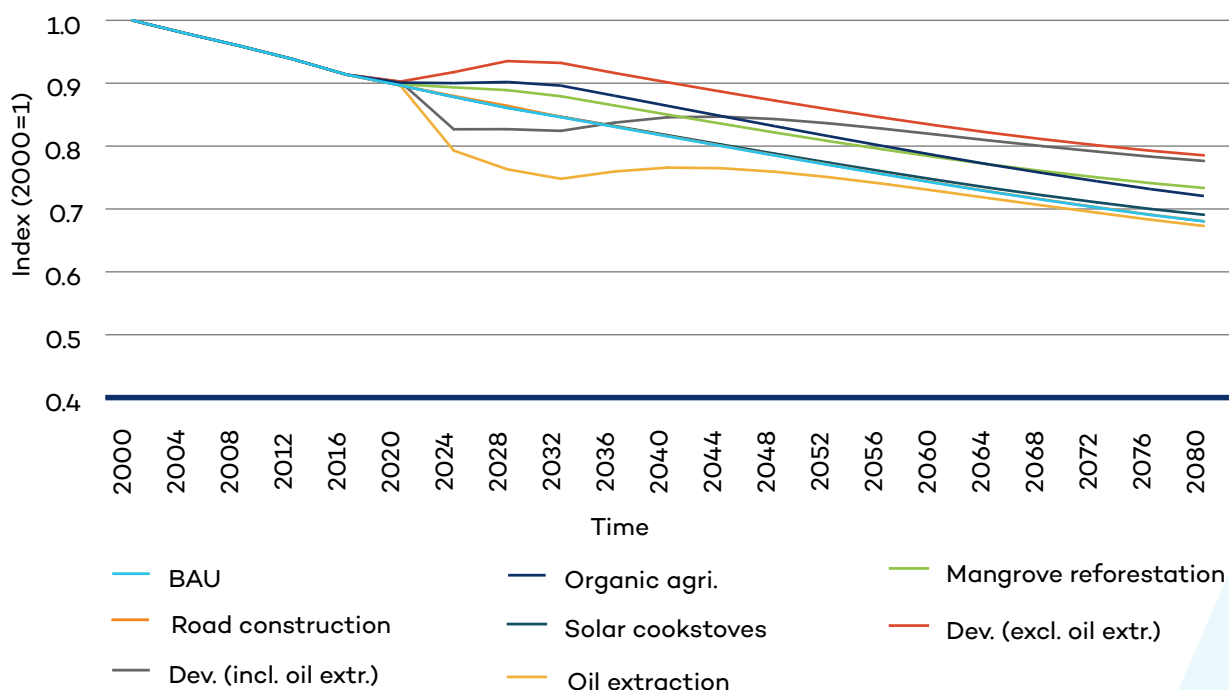


Figure 5. Wetland quality index



Results of the SAVi Assessment: An integrated cost-benefit analysis

For each scenario, we simulated a range of costs and benefits based on the best available data.¹ These include the value of the ecosystem services, but also the investment and operational costs, the avoided social cost of carbon, avoided cost of fertilizers, avoided cost of fuelwood, the value of additional labour income, and revenues from oil extraction.

Integrated cost-benefit analysis (mn CFA)	Organic agriculture	Mangrove reforestation	Road construction	Solar cookstoves	Oil extraction
Total investment and operation and management (O&M) (1)	951	10	19,625	2,758	0
Avoided costs					
Social cost of carbon	18,033	12,986	-18,737	33,620	-15,038
Cost of fertilizers	12,671	-10	259	0	-1,602
Avoided fuelwood	0	0	0	33	0
Subtotal (2)	30,704	12,976	-18,478	33,653	-16,640
Added benefits					
Labour income	269,442	10,076	297,258	261	64,643
Value of ecosystem services provided	118,687	257,148	2,298	11,789	-297,112
Oil revenues	0	0	0	0	554,586,209
Subtotal (3)	388,129	267,224	299,556	12,051	554,353,740
Net result (2) + (3) - (1)	417,883	280,190	261,453	42,946	554,337,101

The results show that oil extraction generates significant revenues, but also has a high negative impact on the ecosystem services that the wetland and mangrove area of the Saloum Delta provide. Organic agriculture leads to additional labour income in various sectors while enhancing the performance of the ecosystem services. Mangrove restoration leads to an increased performance of ecosystem services of more than CFA 257,000 million (EUR 391 million). Road construction has a substantial impact on labour income in different economic sectors. Solar cookstoves are very effective in reducing greenhouse gas emissions, as is evidenced by an avoided social cost of carbon of more than CFA 33,000 million (EUR 50 million).

¹ Details of data sources for the simulation and on the SAVi methodology can be found in [the technical report](#).

Emerging Ideas on Conservation Finance for the Saloum Delta

Upon completion of the technical report and generation of the results of the SAVi analysis, IISD held brainstorming sessions with the MAVA Foundation, the GGGI, and WIA. This discussion focused on identifying ideas on blended finance for conservation projects in the Saloum Delta and how the results of the analysis can inform the implementation of these ideas.

- Carbon offsets
- Pay-for-performance instruments
- Mitigation banks
- Natural asset inventories
- Pay-as-you-go community-based financing

The idea of carbon offsets for mangrove restoration projects is currently being explored with the dredging industry, in collaboration with the GGGI, WIA, and the MAVA Foundation.

More detail on each idea is provided in [the technical report](#).

