NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

Valuation of Sio-Siteko Wetland Ecosystem Services as an Input for Conservation Investment

By: Philip Otieno

Contact: biosfera.research1@gmail.com

OUTLINE

- The overall goal and objectives of the Study
- The approach and methodology adopted for the study
- Ecosystem services-economic linkages and key stakeholders
- Estimate of the current value of the wetland ecosystem services
- Economic consequences of ecosystem change
- Distributional effects of the consequences ecosystem changes

Overall goal and specific objectives of the Study

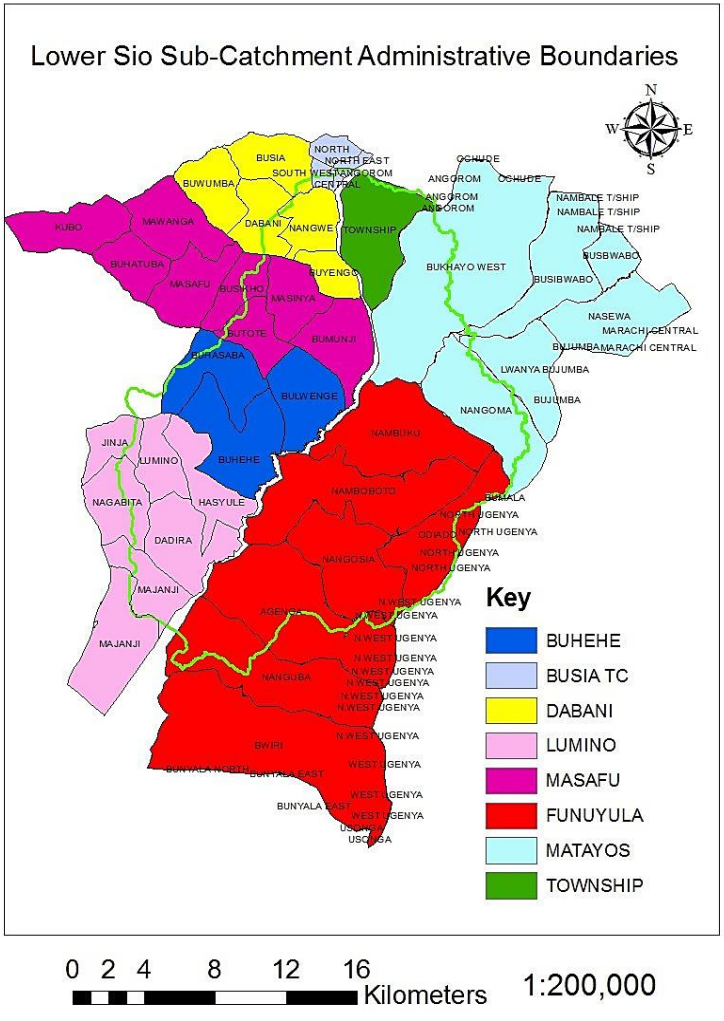
- To generate information on economic value of the wetland ecosystem services to inform the development of conservation investment plans for improved management of the wetland and trade-offs between different development trajectories

Specific Objectives

- Identification of Sio-siteko wetland ecosystem services and their beneficiaries
- Estimation of the current economic value of the wetland biodiversity and ecosystem services
- Identification of and economic assessment of the costs and benefits of potential management options
- Comparison of the costs and benefits of the potential wetland management options

The approach & methodology adopted for the study

Locational boundary



Study population

Parishes on the Ugandan side included;

South East, Central, South West, Nangwe, Buyengo, Buhehe, Bulwenge, Budimo, Lumino, Junge, Dadira, Bumunji, and Majanji

Sub locations on the Kenyan side;

Busijo, Agenga, Bujwang'a, Sigalame, Luchululo, Luanda, Buloma, Lugala, Ludacho,Mango, Sibinga, Nang'oma, Muyafwa, Mundika, Mayenje, and Mjini

Total population is 157thousand representing over 31 thousand households

Status of the wetland; 80% is reclaimed for crop farming

The Steps adopted for the study

Step1: Understanding of context: What is the ecosystem and its economic status. Drivers & management issues at Sio-Siteko wetland

Step 2: Identifying ecosystem services: What are the key provisioning, regulating, supporting and cultural services?

Step 3: Describing ecosystem-economic linkage & stakeholders: How and for whom do economic activities depend and impact on ecosystem services

Step 4: identifying study focus, boundaries & key questions: What are the key services, stakeholders, issues and questions to be investigated in the study

Step 5: selecting valuation methods, information needs & sources: Which are the most appropriate and feasible techniques, and how will data be sourced?

Step 6: Collecting & analyzing valuation data: How much are the selected components of biodiversity and ecosystem services worth?

Step 7: stating baseline values & stakeholders: What is the current value of the wetland's biodiversity and ecosystem services?

Step 8: demonstrating the economic consequences of ecosystem change: What are the likely gains from conservation and/or costs of ecosystem services loss, and for whom?

Data collection method

Stage of study	Data collection & valuation method	Ecosystem services valued
Scoping	Key informant interviews & FGDs	All ES
Actual data collection	Market price method thru household surveys & secondary data CVM thru household survey	All provisioning ecosystem services Biodiversity ecosystem function
	Replacement cost method & secondary data	Groundwater recharge & water purification
	Damage cost avoided with value transfer & secondary data	Flood attenuation

Ecosystem services-economic linkages and key stakeholders

Sio-Siteko wetland local community population	Over 31 thousand households or 157 thousand people	
Ecosystem services	Economic linkages	Key stakeholders
Crop farming	local subsistence & income, nutrition, costs saved on buying alternatives	Close to 15 thousand households (representing 47% of the households) carry crop farming in the wetland. Among the crops grown include; maize, arrow roots, chewing canes, vegetables, rice, and beans
Sand harvesting	Local income, employment , contribution to building and construction industry	More than 12% (or more than 3 thousand) households harvest sand from the wetland

Ecosystem services-economic linkages and key stakeholders

Ecosystem services	Economic linkages	Key stakeholders
Aquaculture	Income, employment	Around 1.4% of the households engage in aquaculture
Bricks making	Income, employment	More than 2 thousand (representing 8%) households engage in brick making
Herbal medicine	Local income, contribution to health maintenance	Slightly more than 5 thousand (representing 16%) households obtain herbal medicine from the wetland
Mat making	Local income, employment	Around 5 thousand (representing 16%) households make mats both for domestic use and selling from papyrus
Fuelwood collection	Cost of purchasing alternative, livelihood, nutrition enrichment	Over 6 thousand (representing 20%) of the households

Ecosystem services-economic linkages and key stakeholders

Ecosystem services	Economic linkages	Key stakeholders
Grass cutting	Cost of purchasing alternatives, income, livelihood	Slightly more than 24% households (representing more 7 thousand) harvest grass from the wetland for roof thatching, zero grazing, selling and making of brooms
Livestock grazing	Social security, nutrition, income, cost of alternative sources of cattle feedstock	More than 18 thousand (representing 57%) of the households graze over 127 thousand cattle in the wetland
Capture fisheries	Local subsistence, income, national economy. The wetland is considered to be among the top four most important fish breeding sites in Uganda	Over 8 thousand (representing 27%) households in the wetland obtain fish from the wetland for subsistence and sometimes for commercial use.
Domestic water supply	Input resource for cooking, washing; maintenance of health, costs saved from purchasing alternatives	More than 26 thousand (representing 83%) households access water from the wetland for domestic use on drinking, cooking and washing.

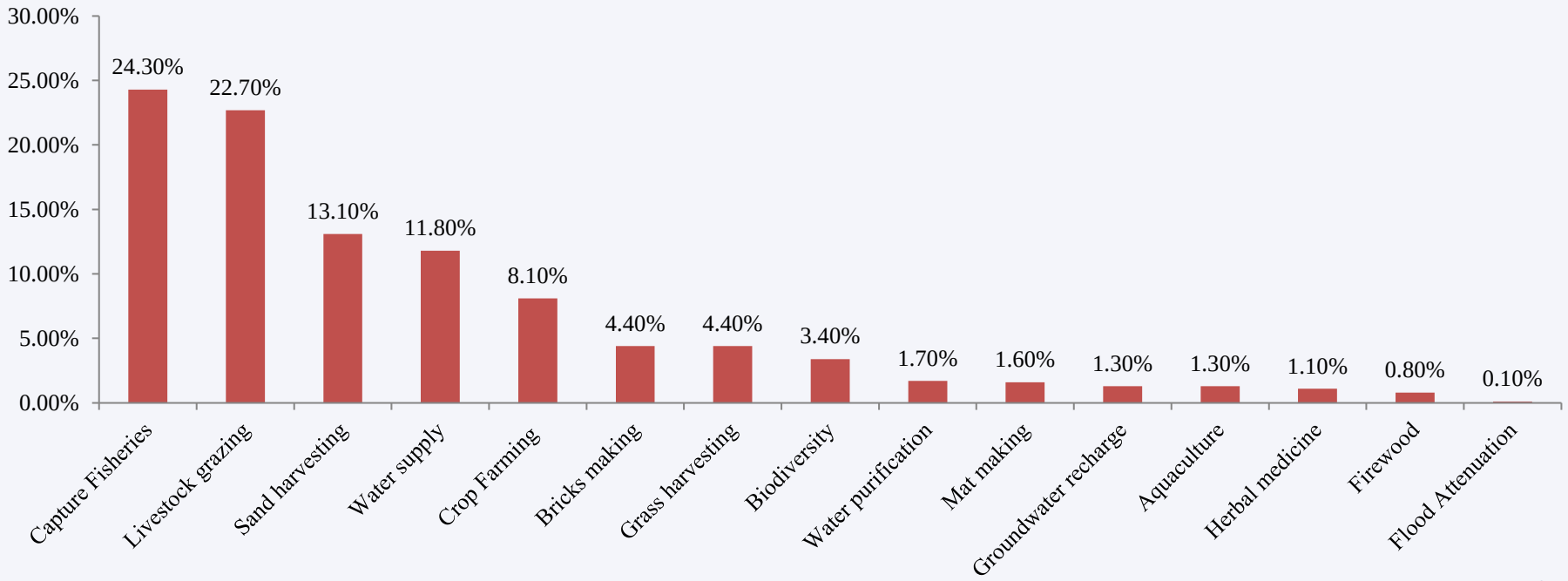
Ecosystem services-economic linkages and key stakeholders

Ecosystem services	Economic linkages	Key stakeholders
Flood attenuation	Helps prevent economic loss from destruction of crops by flood.	Close to 2 thousand households could benefit from flood attenuation services of the wetland
Groundwater recharge	Raises water table hence helps in reducing costs of sinking boreholes and shallow-wells	More than 4 thousand households benefits directly from ground water recharge
Biodiversity maintenance	Provides habitat to diverse plants and animals including global threatened species	Over 27 thousand households are willing to pay for the conservation of the wetland to support maintenance of biodiversity
Water purification	Removes turbidity of water hence saves domestic water users cost of alternative sources of turbidity removal	More than 26 thousand households who draw water from the wetland benefit from the wetland's water turbidity removal

The economic values of ecosystem services

- The baseline year was 2019
- Economic value was estimated for the flow of 15 ecosystem services
- The estimated value for the local community was worth more than USD 28 million in a year.

Contribution of each ecosystem service to the overall economic value



Baseline economic values continued

Ecosystem service	Aggregate Gross Value (US$)	Community Households beneficiaries	Acreage in use	Gross value per household	Net economic value / household
Capture Fisheries	6,984,000	8554	2654	816	545
Livestock grazing	6,530,093	18062	467	362	-22
Sand harvesting	3,765,178	3961	-	951	951
Water supply	3,374,640	26301	2654	128	-291
Crop Farming	2,323,509	14860	11888	156	14
Bricks making	1,254,485	2535	2.3	495	-106
Grass harvesting	1,249,118	7795	156	160	143
Biodiversity	965,878	27010	2432	36	36
Water purification	477,326	26301	2432	18	18
Mat making	459,103	5070	165	91	-213
Groundwater recharge	373,218	4436	2654	84	84
Aquaculture	370,576	432	104	858	410
Herbal medicine	326,340	5070	2432	64	40
Firewood	221,426	6338	1644	35	7
Flood Attenuation	37,812	1902	2432	20	20
Total	28,763,082				

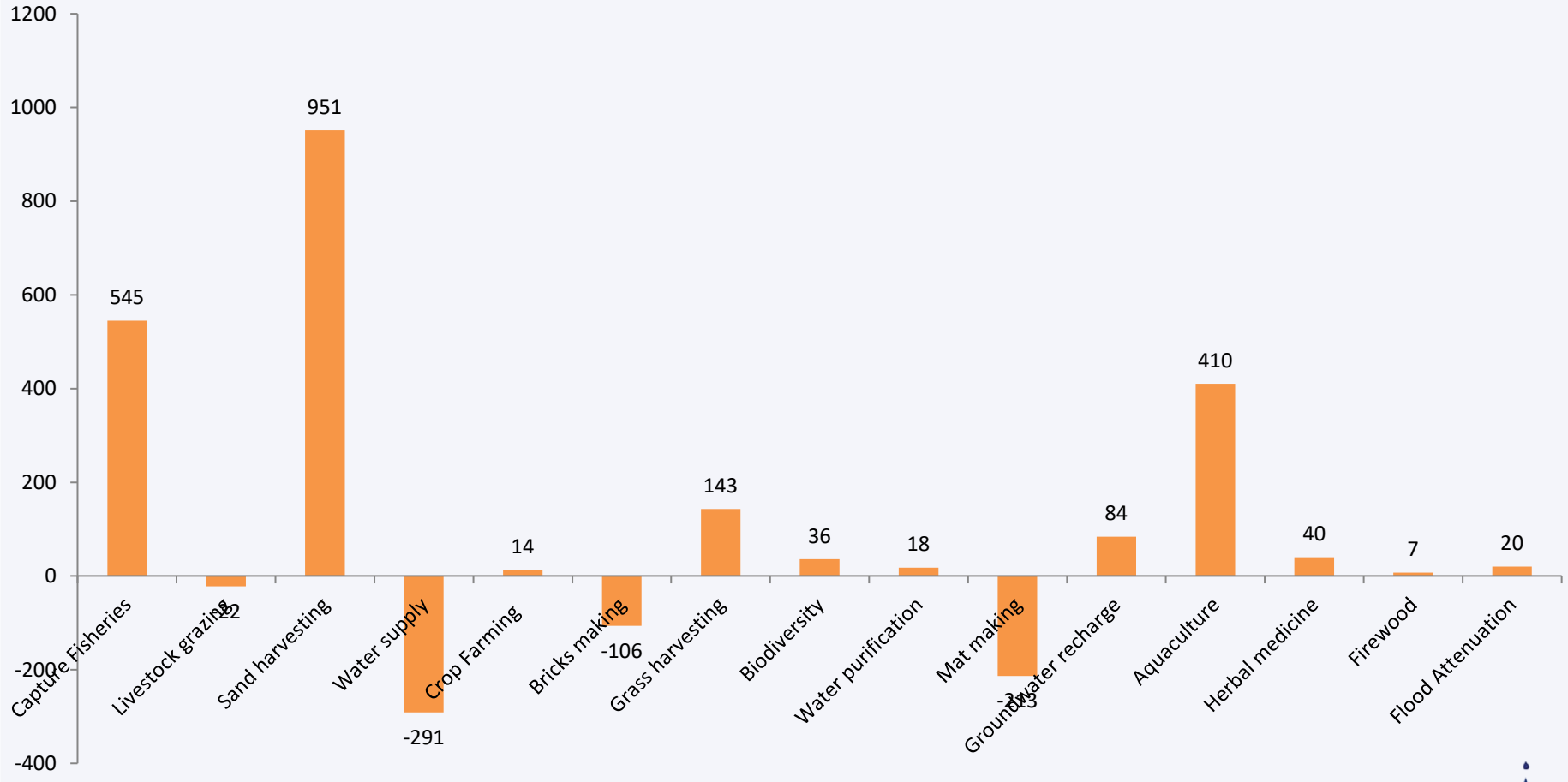
Baseline economic value

❖There are some ecosystem services which even though provide vital livelihoods to the local community, are not economically desirable

1) growing of maize and beans in the wetland
2) livestock grazing
3) access of water from the wetland for domestic use
4) bricks making, and
5) mat making.

❖This is due to the uncompensated labour (time used in making or collecting the resources) supplied by family which when considered as a cost in production then the returns from harnessing these ecosystem services leads to negative productivity making them non-viable from an economic perspective.

Net economic value of each ecosystem service per household



Economic consequences of Ecosystem Change

❖More than 80% of the wetland has been reclaimed.

❖Consultation with key stakeholders revealed that the main drivers of change in Sio-Siteko wetland include,

- encroachment,
- over exploitation of the resources,
- population growth,
- urbanization,
- poverty, and
- pollution.

❖Three scenarios (i.e. potential wetland management strategies) were framed out of the consultations with stakeholders.

- business as usual scenario,
- conservation and wise use scenario,
- and an agricultural intensification scenario.

Economic consequences of Ecosystem Change

❖Under business as usual scenario, the current drivers of land use and land use change in the wetland will persist, they for instance include:

- a general trend in degradation of wetlands around the Lake Victoria which is said to be at an annual rate of 4%;
- population growth which is assumed to be directly proportional to demand for certain wetland ecosystem services such as firewood, and domestic water supply; aquaculture;
- housing demand/ urbanisation which places demand on building materials among others.

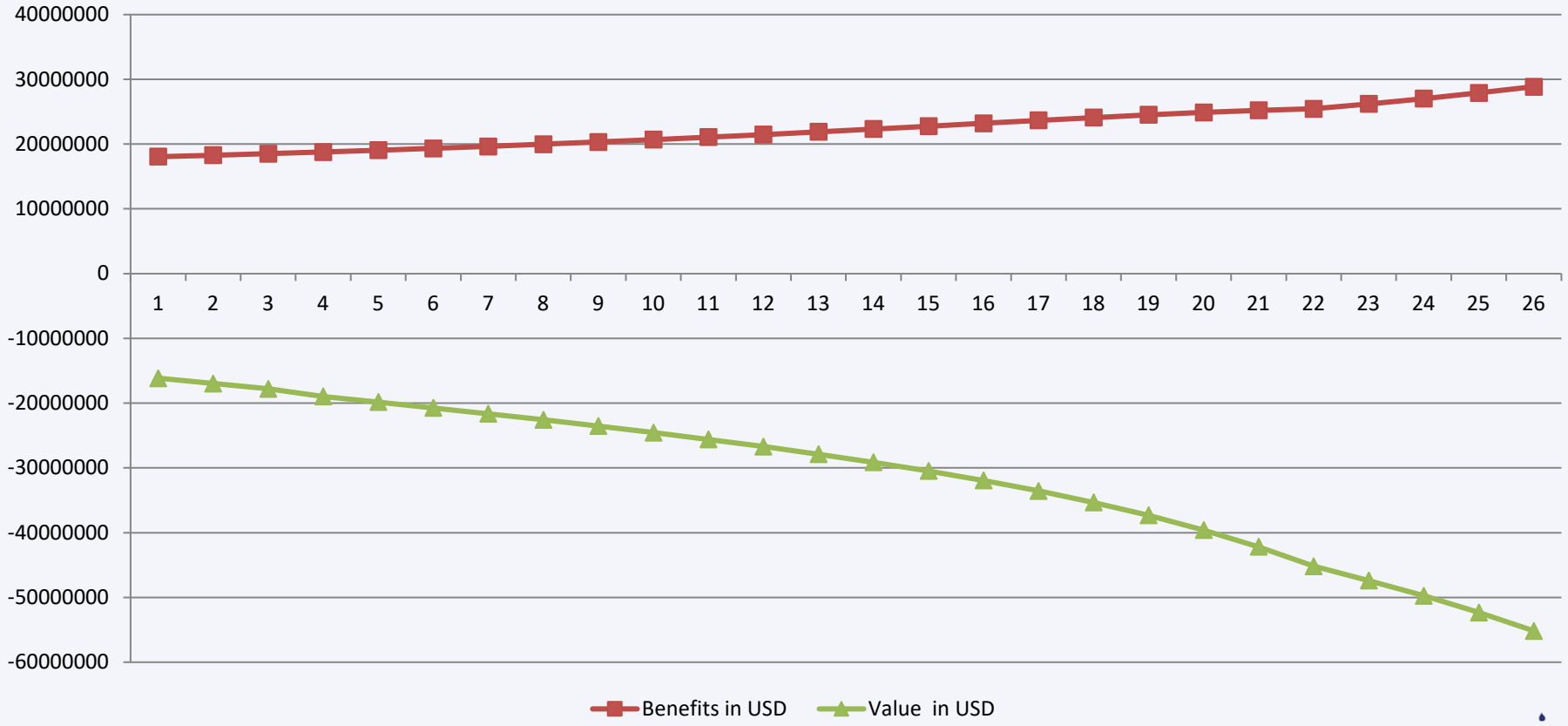
❖Under a 25 year planning horizon and at 10% discount rate, the net present value of the economic benefit of business as usual scenario is USD **193,408,880** and at the same time the total value of lost benefits (costs) as a result of the continued degradation will be USD **359,602,810**.

Economic consequences of Ecosystem Change

❖Overall, business as usual scenario will yield a net present value economic loss of USD **166,193,930** in the next 25 years.

❖The benefit cost ratio of allowing the business as usual scenario to prevail is 0.54.

Figure 4: Benefits and Costs under Business as Usual



Economic consequences of Ecosystem Change

❖Under conservation and wise use scenario; there is a proposed wetland management plan.

❖The management plan has the overall objective of seeking to restore the wetland and ensure retention of ecosystem services for the benefit of the people.'

❖It has three strategic objectives which include;

(1) promoting conservation of the wetland ecosystem and its catchment,
(2) promoting and supporting adoption of sustainable sources of livelihoods for the local population, and
(3) supporting the establishment and strengthening of governance structures for the management of the transboundary wetland.

❖The total present value of the benefits will be USD **209,930,255,** while the present value of costs would be USD **44,185,915**.

❖The net present value of the benefit of investing in conservation of the wetland is USD **165,744,340**

❖With a benefit-cost ratio of 4.75 per dollar spent.

Economic consequences of Ecosystem Change

- Likely agricultural intensification programmes are aquaculture and rice farming on the Kenyan and Ugandan sides of the wetland respectively.
- This management strategy will in the next 25 years, and at a 10% annual discount rate yield;
  - a present value benefits of USD **430,398,537**
  - a present value costs of USD **134,918,968**
  - hence a total net present benefit of USD **295,946,803**.
  - It has a benefit-cost ratio of 3.19 per value of dollar invested.
- N/B:
  - Due to insufficient data, the only externalities valued in this study are climate change and domestic water supply, others that could have been considered include,
    - changes on landscape and hydrological patterns,
    - salinization/acidification of soils, pollution of water for human consumption,
    - eutrophication and nitrification of effluent receiving ecosystems among others

Source: (Martinez-Porchas & Martinez-Cordova, 2012).

- Not all opportunity costs (ecosystem services) have been factored e.g. the contribution to breeding ground for fish especially to Tilapia was not assessed.
- Based on the limitations of capturing all the costs, users of the information are reminded to bear in mind the costs in this option are lower bound estimates.

Distributional Effects of the management options

- spatial distribution
- temporal distribution
- Distributional effects among user groups

1. Spatial distribution effects

Conservation management strategy will enhance ecosystem services of global importance such as carbon sequestration

Agricultural intensification will contribute to regional and national output of rice and farm fish as important services

Distributional effects

Temporal distributional effects

❖Agricultural intensification will decimate nearly all the ecosystem services except crop farming and aquaculture by the fifth year of introduction and also lead to greenhouse gas emissions.

❖Business as usual scenario will accommodate availability of all provisioning ecosystems but at declining rate and eventual collapse by 2041 except aquaculture, crop farming, bricks making, and minimal sand harvesting and capture fisheries will remain but in a plateau state.

Actionable Recommendations

1. There are inefficient benefits that need to be demoted to allow productivity of the local community, they include: Direct access of domestic water from the wetland, growing maize and beans; bricks making, and mat making
2. Status quo will lead to loss of major ecosystem services by 2041, therefore a new management strategy is needed
3. Investment in the proposed conservation management plan has best value for money and will safeguard the ecosystem services compared to BAU and agricultural intensification


NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL
THANK YOU!