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REPORT

The Importance of a Healthy, Free-flowing Mara River to the Society and Economy of Kenya and Tanzania

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What makes the Mara River Basin so special?

The Mara River Basin is home to one of the most famous tourist destinations in the world: the great wildebeest migration. The globally unique spectacle is completely and utterly reliant on a variable and naturally functioning Mara River Basin. Without the ebb and flow of the Mara River, the great wildebeest migration would cease to exist as we know it. This is just one single example of how the Mara River Basin is the blue heart of Kenya and Tanzania, supporting their economy and society.

The figures below provide some context to the broader importance of the Mara River Basin to Kenya and Tanzania. For instance, although home to only 1.4% of the Kenyan population and 0.7% of the Tanzanian population, "the MRB supports some of the most profitable economic activities in Kenya and Tanzania including tourism, agriculture and mining which collectively contribute between 10-15% to both countries' Gross Domestic Product (GDP)." [1]

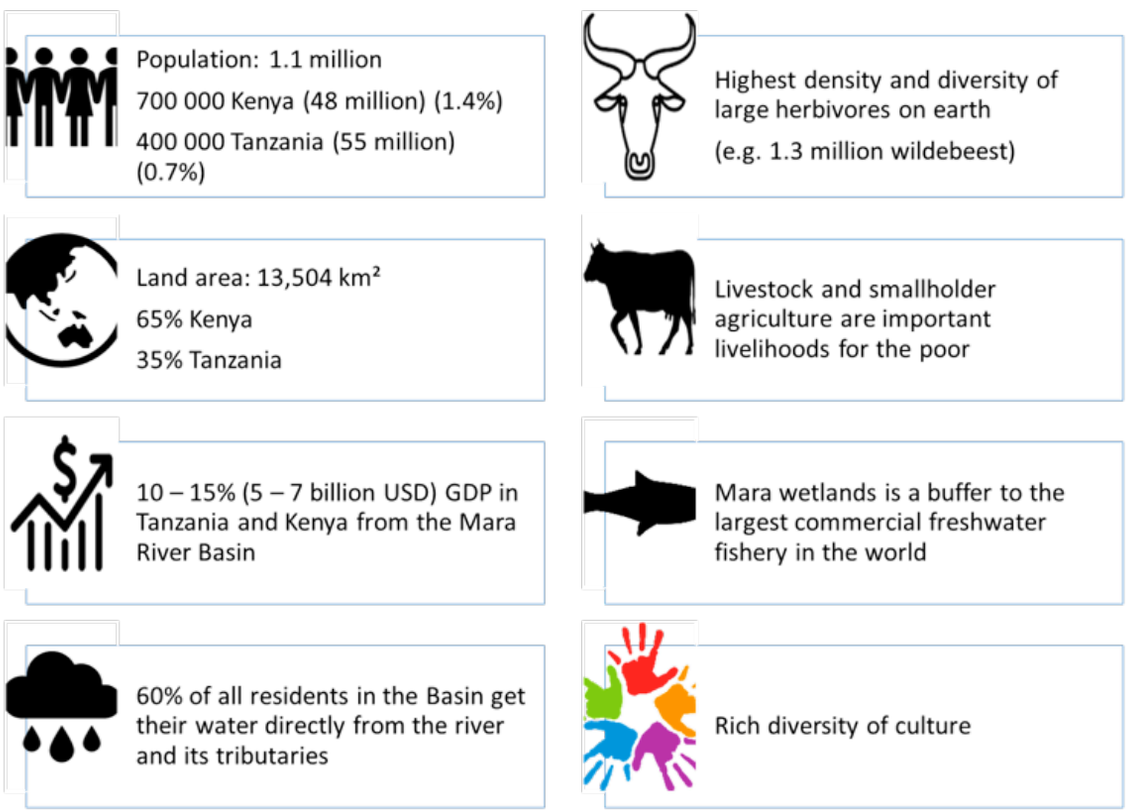


Figure 1: The Mara River Basin is the blue heart of Kenya and Tanzania

[1] Nelson, PJ, Nyarangi J, Maritim, Z, n.d. The Trans-boundary Mara River Basin Strategic Environmental Assessment. Prepared for: LVBC, WWF, USAID and the Governments of Tanzania and Kenya.

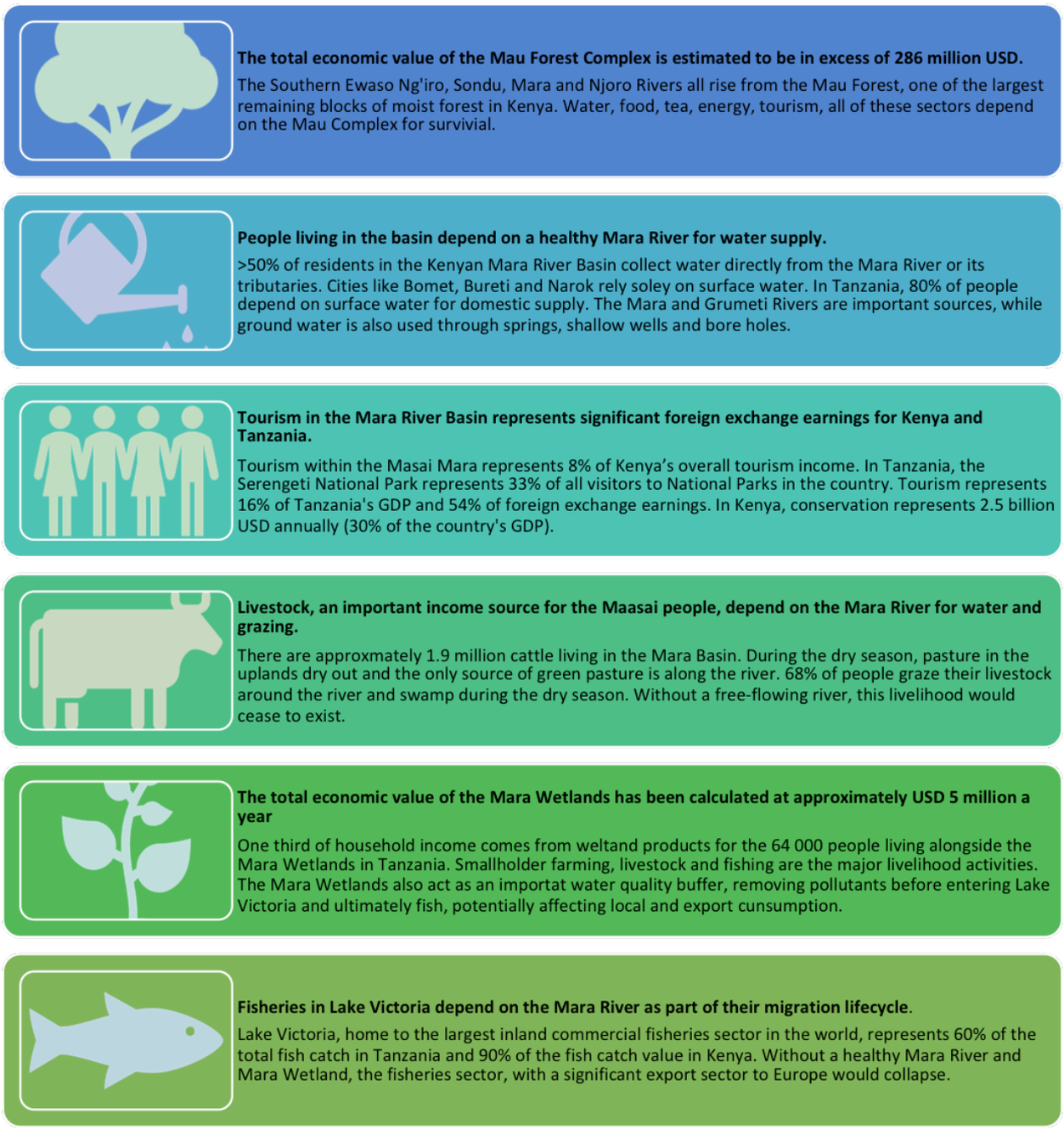


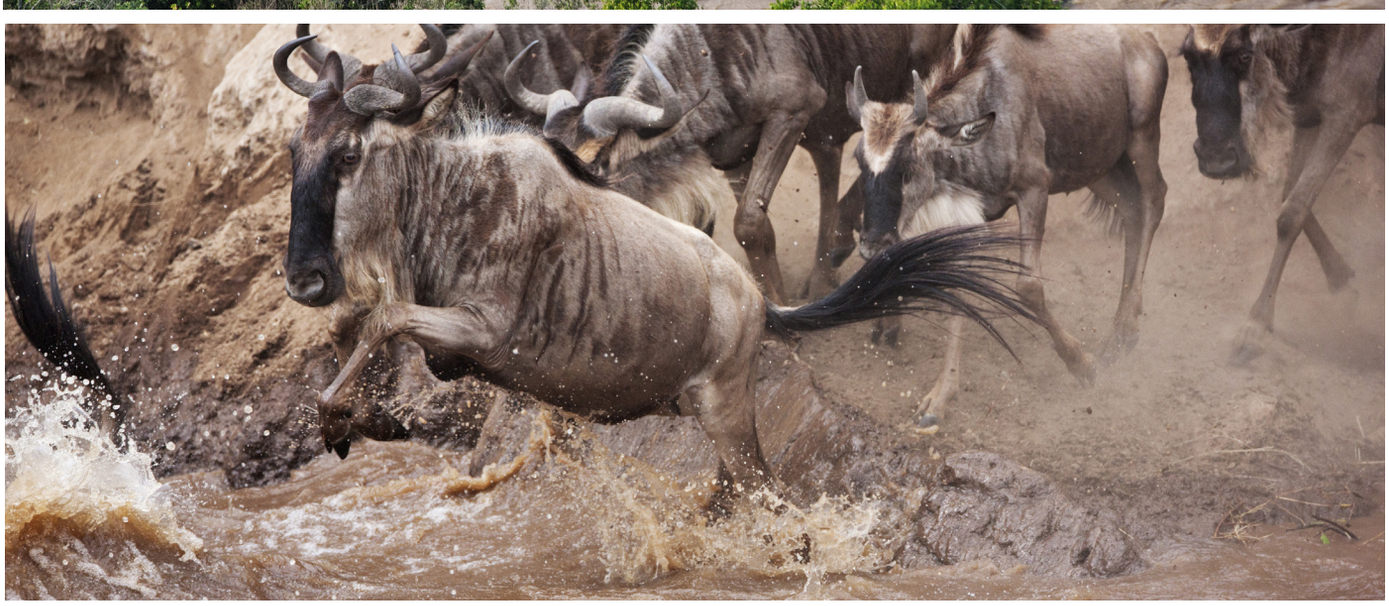
Figure 2: There are several sectors that are strongly linked to a healthy Mara River Basin [2]

[2] The data for the figure above were gathered from a range of sources including: KNBS-IHBS, 2007. Kenya Integrated Household Budget Survey (KIHBS)—2005/06. Kenya National Bureau of Statistics (KNBS).Ministry of Planning and National Development, Nairobi; http://tdsnfp.org/wp-content/uploads/2013/06/MARA-REGIONAL-PROFILE.pdf; WWF, 2013. Mau-Mara Serengeti Program Document, 2014 – 2018; Lake Victoria South Catchment Area Kericho Sub Regional Office, 2018. Water Allocation Plan, Mara River Basin, Kenya (2018 – 2022); Richard O. Abila, Konstantine O. Odongkara and Paul O. Onyango. Macro-economic assessment of Lake Victoria Fishing Industry in East Africa; Tanzania Ministry of Natural Resources and Conservation. 2017. Mara Wetland Conservation Investment Plan.
https://www.climatelinks.org/sites/default/files/asset/document/2018_USAID-PREPARED_Conservation-Plan-for-Mara-Wetlands.pdf; Role of Natural Capital in Narok, EcoFutures, 2017; https://www.researchgate.net/publication/284883982_Tourism_in_Tanzania_Serengeti_National_Park; Munishi, P. 2007. Biodiversity values of the Mara River (Masurura) Swamp, Mara Region, Northern Tanzania; Estimating the economic value of conservation in Kenya. https://files.constantcontact.com/977ac363701/3a703b22-8f45-4acf-bb12-8685e408bce3.pdf; Water demand simulation using WEAP 21: A case study of the Mara River Basin , Kenya http://article.sciencepublishinggroup.com/pdf/10.11648.j.ijnrem.20180301.12.pdf

How is the Mara River Basin at risk?

The delicate natural balance in the MRB that supports the society and economies of Kenya and Tanzania is facing a future that puts the river at risk. Risks range from land-use change in the upper catchment, pollution in the river system and development of infrastructure such as dams, hydropower, irrigation or water supply that may undermine the natural variation in the river flows. Other risks include extreme climate and variable hydrology in the Mara in the future, as a result of climate change is a major risk for the future of the ecosystems that support the economy and society of Tanzania and Kenya.

The Serengeti-Mara ecosystem lies just south of the Equator. It receives close to the maximum amount of the sun's energy possible. The pattern of rainfall can be erratic, with both extreme wet and dry years. Climate change is beginning to affect both flood and drought frequency and intensity. Currently, high temperatures lead to evaporation and transpiration of up to 71% of available water in the savannah region. Going forward, that number may increase. The forest cover in the upper catchment plays a crucial role in trapping and absorbing rainwater in the undergrowth and soils from where it percolates as ground water to provide the sustaining year-round base flow in the Mara River. Climate change studies suggest the basin will experience an increase in annual river volume and rainfall amounts with wetter rainy seasons and drier dry seasons. This variability will result in higher peak flows in the wet period and lower flows in the drier months.[3] The delicate balance of rainfall and river flow is what dictates the movement of the wildebeest migration. As this balance shifts, the migration may be fundamentally changed.



[2] Osoro George Marcellus Metobwa, Khaldoon Abdalah Mourad, Lars Ribbe. Water Demand Simulation Using WEAP 21: A Case Study of the Mara River Basin, Kenya. International Journal of Natural Resource Ecology and Management. Vol. 3, No. 1, 2018, pp. 9-18. doi: 10.11648/j.ijnrem.20180301.12

Deforestation and land use change in the upper catchment negatively affect all water users downstream in the catchment. As a result, livelihoods and sectors that depend on the healthy catchment are at risk.

The Mara Basin has undergone large changes in land cover, particularly in the upper basin covered by the Mau Forest where forests and savannah grasslands have been cleared and turned into land for agriculture and human settlement. In the Amala sub-catchment, the area under cultivation increased from less than 20% in 1960 to more than 51% in 1991[4]. The expansion of agricultural land and therefore subsequent loss of forest has caused increased siltation in the basin (alongside other drivers). This has reputedly caused an increase in the area of the Mara Wetland (387%), causing flooding.[5] Erosion is also a challenge in the upper catchment of the Mara Basin, where agricultural expansion plans are continuing and growing (tea plantations, irrigated wheat, maize, French beans, cotton). Furthermore, there has been progressive sub-division of land holdings, creating less economic units and reducing small holder farmers to subsistence level[6].

Without an intact watershed, the river flow will be higher during the wet season, causing flooding. During the dry, low-flow season, the base flow less as there is little natural forest acting as a regulating sponge for the river. This has a negative impact on all water users downstream including the 50% of people in Kenya who depend on surface water for their water supply. Water shortages in the Masai Mara and Serengeti may also result in the failure of the wildebeest migration, or perhaps the death of wildlife. This might have a detrimental impact on tourism, a major source of income and employment in the Mara Basin. A significantly low flow in the Mara may result in the water level being too low for the migration of fish into the Mara Wetland, creating challenges for the fisheries sector.

[4] Lake Victoria South Catchment Area Kericho Sub Regional Office, 2018. Water Allocation Plan, Mara River Basin, Kenya (2018 – 2022).
[5] Mati, B.M., Mutie, S., Gadain, H., Home, P. and Mtalo, F., 2008. Impacts of land-use/cover changes on the hydrology of the transboundary Mara River, Kenya/Tanzania. Lakes & Reservoirs: Research & Management, 13(2), pp.169-177.
[6] Nelson, PJ, Nyarangi J, Maritim, Z, n.d. The Trans-boundary Mara River Basin Strategic Environmental Assessment. Prepared for: LVBC, WWF, USAID and the Governments of Tanzania and Kenya.

There are several dams, of varying sizes and situations that are being planned within the Mara catchment. Alteration to the flow regime of the Mara River could fundamentally impact the nature of the economy and society in the region

Currently, the Mara River is a "free-flowing" river, devoid of infrastructure that would control its natural, variable flows. Dams built in the catchment run the risk of regulating the natural variation, putting ecosystem phenomena including the wildebeest migration at risk. Dams on the Mara mainstem would be detrimental to fish migrating from Lake Victoria and/or the Mara Wetland into the Mara River. A failure to ensure wetland conservation would put local livelihoods and development at risk. There may also be far-reaching economic costs and losses due to transboundary effects arising from changes in Lake Victoria's biodiversity, water flow, and water quality. [7]

The Kenyan National Water Master Plan 2030[8] is the official plan for infrastructure development. It lists the Amala, Norera, and Naikara dams as future development options. Silibwet and Mugango have also been mentioned as possible options. In Tanzania, the Borenga dam, planned for just upstream of the Mara Swamps is the only one on the Mara main-stem.

The economic and development benefits of additional infrastructure in the Mara River Basin need to be weighed against the benefits of a natural, free-flowing river. These benefits might include tourism from viewing wildlife, food from croplands, fuelwood harvested from forests and shrub lands, grazing from grasslands and shrub lands, water collected from rivers and sewage treatment by rivers. In Bomet for example, the natural capital benefits from the Mara River is estimated to be KES 102 billion per year. This amount pales in significance compared to the total county budget in 2017/18 which was KES 5.6 billion. In Narok, the situation is no different. Narok natural capital benefits from the river is estimated to be KES 129 billion per year, while the Narok county budget in 2016 was KES 9.8 billion.

Figure 3: The Mara River is one of the few free-flowing rivers that flow into Lake Victoria

There are many causes of both point source and non-point source pollution in the Mara River Basin. This not only has negative consequences for the ecosystem in the basin, but also for the majority people depending on the basin for their livelihoods.

High sediment due to erosion is non-point source of pollution causing challenges across the basin. Soil erosion prone areas within the basin include the upper catchment due to forest clearing, intensification of agricultural activities and cultivation along the river banks and in the grassland zone of the lower reaches due to overstocking of livestock . In addition to soil erosion, pollution from high fertilizer is a challenge in the tea-producing region as indicated by total dissolved Nitrogen (TDN), dissolved organic nitrogen (DON), ammonium (NH4+)and phosphates (PO43-) being all much higher at Silibewet, a site on the Nyangores River.[10]

Urban settlements within the upper Mara catchment including Bomet town, Tenwek Missionary Hospital Community, and Mulot Trading Centre are sources of point source pollution due to lack proper sewerage systems and well organised solid waste collection and disposal practices.[10]

[7]Tanzania Ministry of Natural Resources and Conservation. 2017. Mara Wetland Conservation Investment Plan. https://www.climatelinks.org/sites/default/files/asset/document/2018_USAID-PREPARED_Conservation-Plan-for-Mara-Wetlands.pdf
[8] Kenyan National Water Master Plan 2030, https://wasreb.go.ke/national-water-master-plan-2030/
[9]Mara River Basin Transboundary Integrated Natural Resources Management Plan: 2016 - 2026
[10] LVBC & WWF-ESARPO, 2010. Assessing Reserve Flows for the Mara River. Nairobi and Kisumu, Kenya.

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Another source of point pollution is mining. On the Tanzania side small- and large-scale gold mining activities rely on toxic chemicals, such as cyanide, arsenic and mercury which can end up in the Mara River. Water used in the operations of the North Mara Mine is pumped directly out of the Mara River to be used in the mining process. While the Mine recycles the resulting waste water back into the mining process, the waste water is not sufficient for all processes as there needs to be a continuous supply of clean water to aid in the gold washing cycle, as well as a supply of water used in the operation of the facility. [11] In 2009 the mine was threatened to close following the death of eighteen villagers from Nyamongo who had been using water from the mine-contaminated Tigithe River[12]. Tanzanian President John Magufuli on September 7 (2018) ordered an investigation into pollution allegations against Acacia Mining's North Mara Gold Mine, saying a previous report that cleared the mine was tampered with[13]. Another risk of pollution from the mines is in the local and EU fisheries export market, supporting many livelihoods along Lake Victoria. A 2006 report on the value of fisheries in Lake Victoria found an estimated total of 1,042,868 tons (371 million USD) were landed between Tanzania (47%), Uganda (33%) and Kenya (20%). About 15% of this catch (mostly Nile Perch) was processed, mostly for export to the EU. Although the fisheries contribution to GDP in each country is relatively low (0.5 – 2% range), the fisheries are critical in terms of employment and foreign exchange earnings [15]. Any risks to these fisheries as a result of mercury poisoning also pose a risk to the entire market value and society dependent on the fisheries (this is without considering the potential tourism impacts from a reputational perspective). Furthermore, Lake Victoria represents 60% of the total fish catch in Tanzania and 90% of the fish catch value in Kenya, making the risk of fisheries failure a potential national-level food security risk . [15]

[11] Hoffman, Christina & Melesse, Assefa & McClain, Michael. (2015). Geospatial Mapping and Analysis of Water Availability, Demand, and Use Within the Mara River Basin.
[12] https://www.pambazuka.org/land-environment/report-reveals-north-mara-gold-mine-pollution
[13] https://www.ooskanews.com/story/2018/09/tanzania-prez-orders-investigation-acacia-mining-water-pollution_176979
[14] Richard O. Abila, Konstantine O. Odongkara and Paul O. Onyango. Macro-economic assessment of Lake Victoria Fishing Industry in East Africa
[15] Richard O. Abila, Konstantine O. Odongkara and Paul O. Onyango. Macro-economic assessment of Lake Victoria Fishing Industry in East Africa

What do these risks mean for the economy and society of the Mara River Basin?

In addition to the risks mentioned beforehand, average population growth in the MRB continues at approximately 3%, with associated demands on the natural resources in the basin. This has been accompanied by an increase in agricultural lands at the expense of the basin's forests and grasslands. In addition to the associated effects of deforestation, water abstraction for livestock, agricultural irrigation and other industries are on the rise. The Mara is not a large river, and ever-increasing abstractions will, eventually, severely degrade the riverine ecosystem and even impinge upon the most basic needs of people living along the river. The effects of such a dry down would be profound, both for people, livestock, wildlife and the basin's economy. For example, it could very likely cause a crash in the wildebeest populations, leading to a breakdown in the entire migration cycle that sustains the Masai Mara – Serengeti ecosystem. The implications of a disruption to such a significant nature process are far-reaching, including not only devastation for the tourism industry that supports so much of Kenya's and Tanzania's economies but also a change in the entire structure of the ecosystem[16].

One way to ensure a healthy Mara is through ensuring environmental flows. However, environmental flows are already at risk in the Mara River Basin. "The underlying concept of the reserve flow is that providing minimum standards are met in each month any surplus water is potentially available for abstraction for other uses. However the results of the study show that in drought years the reserve flows are not being met even in the upper and middle reaches of the river from which the study concludes this 'may be the first clear evidence of a trend towards unacceptable alterations of the Mara River's flow regime' (arising from poor catchment management, loss of forest and other vegetation cover, over grazing and excessive abstraction for livestock and irrigation)." [17]

[16] LVBC & WWF-ESARPO, 2010. Assessing Reserve Flows for the Mara River. Nairobi and Kisumu, Kenya.
[17] Nelson, PJ, Nyarangi J, Maritim, Z, n.d. The Trans-boundary Mara River Basin Strategic Environmental Assessment. Prepared for: LVBC, WWF, USAID and the Governments of Tanzania and Kenya.

A call to action

Conservation of a healthy, free-flowing Mara River is important for every aspect of Kenya and Tanzania, whether economically, socially, culturally or environmentally. Future development plans in the basin needs to be conscious that without the natural flow of the Mara River, the Blue Heart of the economy and society would cease to exist in Kenya and Tanzania.

By all working together, the future of the Mara may be able to balance all its competing needs. We all have a role to play. Each sector has a responsibility and a series of actions that may bring about sustainable development in the basin.

Civil society

- Identify and highlight how developments in the basin create unintended risks to the people and nature living in the basin. Potential jobs and GDP through development may overshadow the long-term benefits of a healthy and river system. Natural capital benefits of the basin must be highlighted at every opportunity.
- Coordinate and collaborate with other institutions or sectors that share a common interest in a healthy, free-flowing Mara River Basin.

Government

- **Implement** a meaningful water allocation plan to secure environmental flows since the delicate natural balance of ecosystem services support the economy and society of both Kenya and Tanzania.
- Consider the entire system of the basin as a whole when evaluating development decisions as there may be unintended consequences for other sectors.

Academia

- Research how sectors are dependent on a healthy and free-flowing Mara River. This will help government in making better development decisions in the future.
- Consider applied research to support decision-making in the basin. This helps ensure that decisions are evidence-based in the interests of the entire basin, rather than a few.

Private Sector

- Ensure your internal house is in order with regards to water-related risks.
- Work with others in the basin (including civil society, government and academia) to ensure that the Mara River remains free-flowing, for the benefit of the economy and society of Kenya and Tanzania.

Transboundary institutions

- Since the Mara River Basin falls under the Nile Basin Initiative, it is important that the member countries engage in the management of a glocally relevalt river.
- As members of the East Africa Community, both Kenya and Tanzania have an international obligation to engage costructively on how best to optimise the Mara River Basin without detriment.