Gatsby Africa

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Aquaculture in East Africa

Introduction

Purpose and Methodology of this Opportunity Brief

This Opportunity Brief has been created to provide a suite of information regarding East African aquaculture.

The information and data contained is based on extensive primary data collection as well as secondary sources.

An East African Industry Development Organization

Gatsby Africa has been working and investing in East African aquaculture for the past 5 years. Gatsby Africa works across Kenya, Rwanda, Tanzania, and Uganda to support increased innovation, competitiveness and growth in aquaculture. Gatsby Africa provides technical and financial assistance to firms to foster innovation and improved productivity, as well as working to support a more competitive enabling environment, for instance regarding environmental management, policy and inputs relating to aquaculture.

For further information on the contents of this report, East African aquaculture or Gatsby Africa, please contact: james.mwangi@gatsbyafrica.org.uk

Disclaimer and confidentiality:

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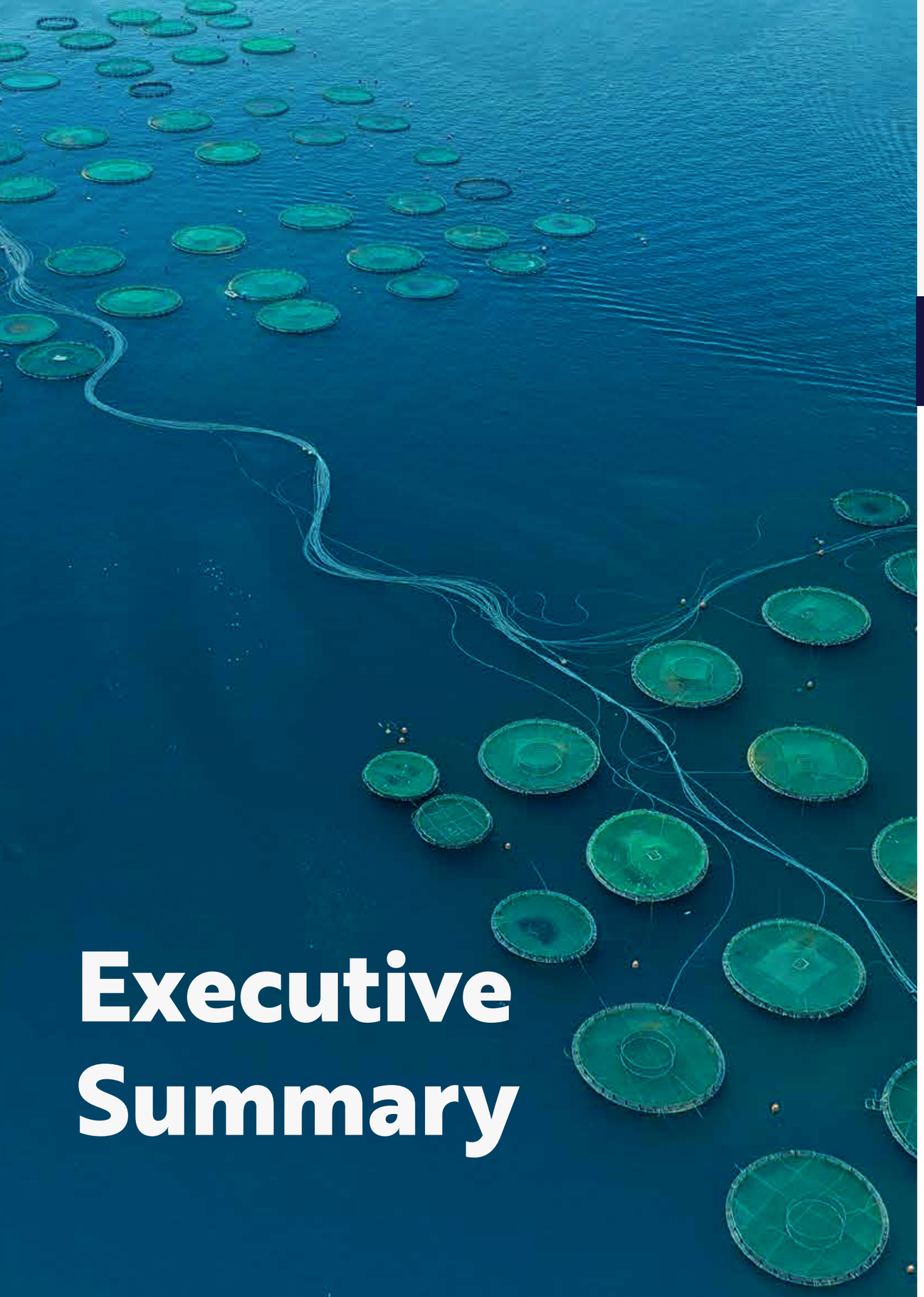


Executive Summary

A nascent but commercially attractive, high growth industry

East African aquaculture has huge market potential. The industry is early stage but growing rapidly and showing potential for excellent commercial performance.

Significant and Widening Supply-Demand Gap for Fresh Fish

- The population in East Africa (Kenya, Rwanda, Uganda, and Tanzania) will more than double from 175 million to 350 million in the next 30 years. This population will require huge volumes of additional protein supply.
- With the lowest achievable conversion ratios of feed to flesh compared to other traditional livestock categories, farmed fish has potential to supply protein more affordably and sustainably than other sources.
- Regional wild fish stocks are overfished and volumes have stagnated. This trend is expected to continue, which has led to a widening supply-demand gap and largely attractive fish prices across the region.
- 75% of East Africans regularly consume fish, 30% of whom consume it as their main source of protein.
- Both the current and future market opportunity in East Africa are therefore substantial.

Sources:

"Overview of EAC." East African Community, https://bit.ly/34cbETm

"East Africa Fish Market Assessment." Ipsos Limited. Gatsby Africa, 2018. https://bit.ly/3oSsmyw

Proven Commercial Attractiveness of Aquaculture Production

- Margins achievable in East Africa are highly attractive.
- East Africa has vast water resources, especially in rivers and lakes such as Lake Victoria, with good water quality parameters for aquaculture.
- The region is the natural home of the Tilapia species, meaning environmental conditions for growth are excellent and there is a strong, diverse pool of wild genetic material to develop.

Nascent Industry with an Improving Support Ecosystem

- The past few years has seen significantly increasing investment in high quality local aquafeed production and new distribution networks for international feeds such as Skretting, Aller Aqua and Laguna.
- Investment to improve the inputs, including feed and fingerlings, available to East African fish farms is also now starting.
- Governments tend to be supportive, recognising the strategic importance of aquaculture.
- There are numerous concessions and licenses available from governments.

The Market Opportunity

East Africa presents a considerable market opportunity for aquaculture

- Demand for local fish is already significantly higher than supply and this gap is projected to widen in the coming years
- Actual consumption of fish in East Africa is roughly 1,300,000MT according to the FAO
- Demand will increase rapidly in-line with the break-neck population growth the region is projected to see over the coming decade

There is ample room for aquaculture to grow

- While wild caught fish is responsible for the vast majority of fish produced in the region, the figures have been stagnant and even decreasing in some areas. The tilapia component of wild caught fish has reduced while 'omena' (also known as the Lake Victoria Sardine) and lake shrimp, which largely serves a different market segment, has increased
- Import volumes have fluctuated in recent years, reaching at least 50,000 MT per year before dropping to a fraction of that in the first part of the COVID-19 pandemic
- The size of current farmed production is modest serving a small proportion of the total regional demand – estimates vary but the proportion is likely less than 10% of overall fish supply. Farmed fish production has however grown fast, having expanded 4 to 5-fold over the past five years. Regional and country level production data is available upon request.
- Fish farms are also able to access large markets outside the East Africa region, such as Eastern Congo. Data on this market is not presented in this document
- In addition, Gatsby Africa's research suggests there is unfulfilled demand of an additional 200,000 - 600,000 MT presently. This figure is an estimation of latent demand due to the following:

Per capita consumption in East Africa is relatively low by global standards (averaging 7.5KG vs 20KG in the United Kingdom or 38KG in China), suggesting considerable room for growth	Evidence across Africa and globally suggests per capita fish consumption generally increases rapidly if fish becomes more available and affordable	Rising incomes in the region will also continue to drive increased demand for protein

Actual consumption of fish in East Africa is roughly

1,300,000MT

Estimates of unfulfilled demand of an additional

200,000 - 600,000MT

Sources:

"Fish and Seafood Consumption per Capita." Our World in Data, University of Oxford, https://bit.ly/3r0vedX

Food and Agriculture Organization of the United Nations. FAOSTAT Statistical Database. FAO, 2018.

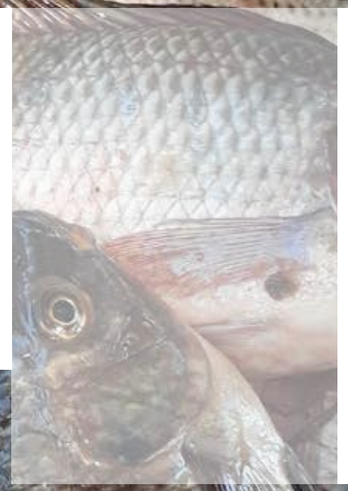
"East Africa Fish Market Assessment." Ipsos Limited. Gatsby Africa, 2018. https://bit.ly/3oSsmyw

Indicative Market Prices

Prices below reflect the average price for tilapia in each country*. Prices in Rwanda are the highest in the region, while prices in Uganda are lowest mostly due to the larger local supply of wild catch. Many farmers in Uganda find the most attractive prices by exporting to DRC or Rwanda. The DRC, specifically the towns of Goma & Bukavu around Lake Kivu, can absorb a significant volume of East Africa fish imports. Prices are stable at their current levels, with fish retailing at higher prices than at this point last year. These prices allow well managed fish farms to realize significant profits.

Indicative Farmed Tilapia Market Centre Wholesale Prices over the last 12 months

Country	Kenya	Uganda	Tanzania	Rwanda	DRC (Goma & Bukavu)
Price ($/KG) – Farmed Tilapia	2.9 - 3.3	2.7 - 2.8	3.4 - 3.7	3.7 - 4.1	3.1 - 3.2



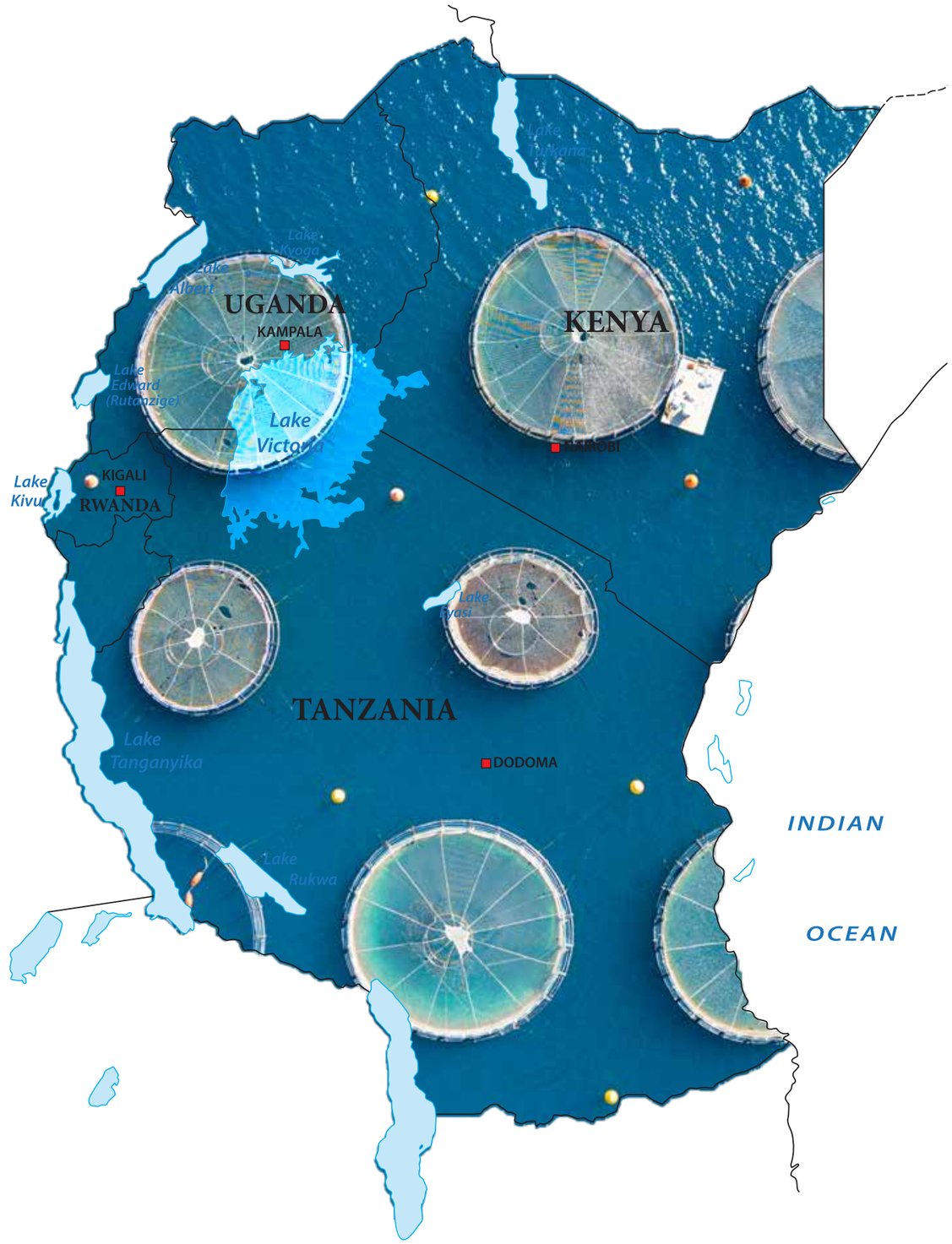
**Tanzania and Uganda import prices not available due to lack of sufficient reliable information*
**Prices depicted are market centre-based wholesale prices, post farm-gate and pre-end consumer*

The prices in each country can vary by as much as $0.5-$1 from the above based on location (for example within the Lake region compared to the capital city) as well as other prevailing market factors.

Sources:

Gatsby Africa regularly visits fish retailers, suppliers and markets in the region, which provides a balanced view on the market conditions for tilapia.

Aquaculture Production in East Africa



An emerging success story

Demonstrated commercial attractiveness

- Though the sector is early stage, some early investors are now showing that this business can offer excellent margins and scalability
- The efficient feed conversion ratios achievable for tilapia of 1.6 or lower influence attractive margins
- The cost of inputs (feed in particular) is expected to decrease significantly over the coming 3-4 years as investments in these areas come online and scale efficiencies improve, which will further improve the profit margins for farms

Rapid industry growth

- While still nascent, the East African aquaculture industry has shown strong growth, expanding between 4 to 5-fold over the past five years.
- There are now at least 8 cage fish farms producing over 1,000 MT/yr on Lake Victoria, and some considerably larger
- There are over 50 SME farms producing between 100 - 1000 MT/yr located throughout East Africa who are predominantly involved in cage farming on the various lakes. This segment is increasingly efficient and professional in its operations.
- The industry also has a significant smallholder segment in both cage and pond operations, producing less than 100MT/yr of which the vast majority produce less than 10MT/yr.

Profiles of cage fish farms in East Africa *(Estimated)*

Farm profile	Production	No of farms
Large/ High growth	>1000MT	~ 8
SME	100 - 1000MT	>50
Smallholder	<100MT	data not available

Sources: Gatsby Africa estimates based on close engagement with the industry over the past 5 years.
Van der Pijl, Willem. An Introduction to Tilapia in Sub-Saharan Africa. Aqua Spark, 2021.

Lake Victoria

- Lake Victoria is the world's second largest freshwater lake. The Lake has a surface area of over 60,000 square kilometers and an average depth of 41 meters. The Lake borders 3 countries; Kenya, Uganda and Tanzania.
- Lake Victoria is highly suitable for aquaculture while not yet being used to its full capacity. Research on carrying capacity is patchy, but most experts predict that the Lake has reached only a fraction of its maximum capacity in terms of aquaculture production.
- A high-resolution bathymetric model of Lake Victoria can be accessed here.
- Detailed information on the Lake, including depth, water quality, and chlorophyll concentration can be found in the Servir Global Geographic Information System.

*Please note, the datasets currently available as part of the GIS are MODIS 2002-2019, LANDSAT 2016-2018, and Sentinel 2019

General information about the Lake:

- Water surface temperature range: 24.5-28°C, the coldest time of year being May - September and the warmest being December - March
- pH: 7.2 – 8.6
- Average water temperature: 25.4C

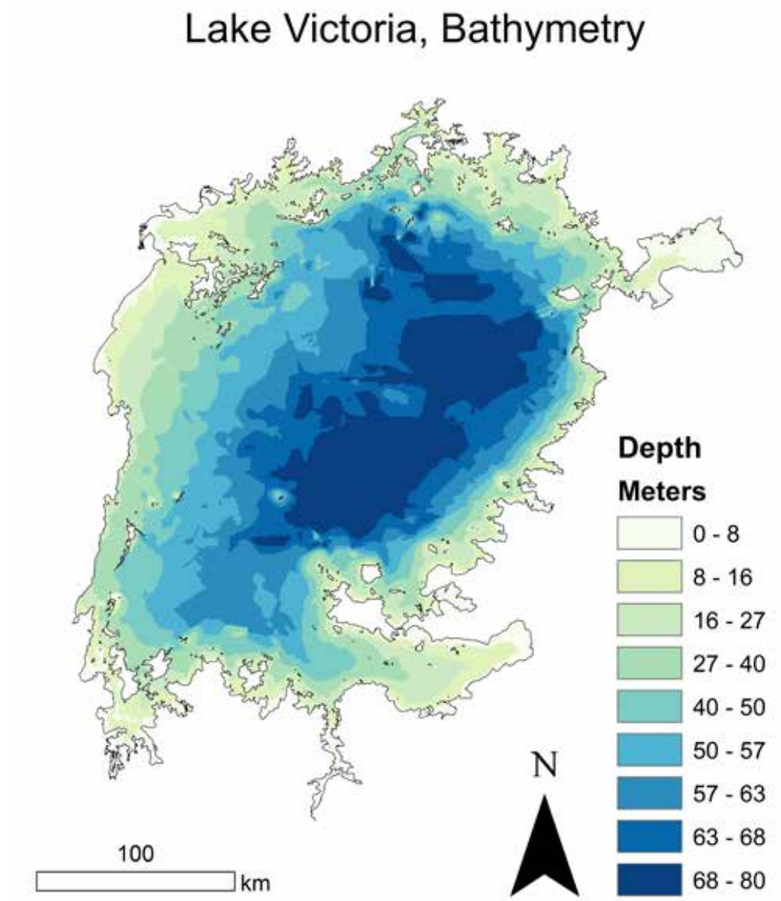
Sources:

Hamilton, Stuart, 2018, "Lake Victoria Statistics from this Dataverse", https://bit.ly/3ooPbtB Harvard Dataverse, V3

Lake Victoria Basin Environment Outlook: Environment and Development. UNEP, 2006. Nairobi.

Lake Victoria, African Great Lakes Information Platform, https://bit.ly/3r4ecvz

XUNGANG YIN & SHARON E. NICHOLSON (1998) The water balance of Lake Victoria, Hydrological Sciences Journal, 43:5, 789-811, https://bit.ly/347Ygzw



Other Important Lakes

Other major Lakes in the region which have already established aquaculture operations also have the potential for production to scale up alongside Lake Victoria. While each Lake inevitably has unique challenges and opportunities, there are indications of strong potential and some early success stories. Each of these Lakes has the capacity to produce significantly more fish than the current levels and to expand the reach of farmed fish to currently underserved markets.

Sources:

Britannica, The Editors of Encyclopaedia. "Lake Kivu". Encyclopedia Britannica, 6 Jan. 2020, https://bit.ly/3gi8ctf

Britannica, The Editors of Encyclopaedia. "Lake Tanganyika". Encyclopedia Britannica, 27 Apr. 2020, https://bit.ly/3fYrp2M

Usanzineza et al. (2011). Nutrient inflows and levels in lake: A case study of Lake Muhazi, Rwanda. International Journal of Ecology and Development. 19. 53-62.

Lake Tanganyika

Surface Area: 32,900 sq. km
Average Depth: 1,870 ft (570 m)
Average Water Temperature: 25C
pH: 8.4
Country: Tanzania, DRC, Burundi, Zambia
Total volume: 18,900 km3

Lake Kivu

Surface Area: 1,040 sq mi (2,700 sq km)
Average Depth: 787 ft (240 m)
Countries: Rwanda, DRC
Total volume of the lake is 500 km3
Average Water Temperature: 24C
pH: 8.6

An Improving Value-Chain and Enabling Environment

Aquaculture value-chain

Hatchery

End Consumer

Nursery

Feed

Grow Out

Market Channels

Feed is a critical driver of aquaculture productivity

- Feed is is responsible for up to 70% of the direct cost of production
- Small variances in cost and quality of feed can have major impacts on cost of production
- The most important consideration economically is the quantity and cost of the feed, which is measured through the economic feed conversion ratio (eFCR)
- Most commercial farms currently import feed. There are several distributors that have emerged in the region that import well-known fish feeds such as Aller Aqua, Laguna & Growel. Some large farms form supply partnerships with overseas manufacturers directly. The approximate cost of feed (to the farm) is below
- As the industry grows, local feed manufacturing is improving rapidly, with some significant recent and planned milling investments

Sources:

Gatsby Africa consistently engages with feed and fingerling suppliers and buyers in the region which provides a balanced view on the market. More information can be shared, as necessary.

Country	Feed ($/MT) *(2021 prices)*
Kenya	$850-950
Rwanda	$1100-1200
Uganda	$850-950

**Tanzania omitted due to inconsistent and unreliable feed data*

**Feed prices have increased by up to 20% over 2022, owing to the ongoing Russia-Ukraine war, as well as the continued effects of the COVID-19 economic fallout.*

Nile Tilapia (Oreochromis Nilotichus) and East Africa

- Nile Tilapia, the most commonly farmed fish species globally, is native to the Nile Basin
- The fish is well suited to the waters of East Africa and is extremely well accepted by the local market
- Extensive wild populations of Tilapia genetics in the lakes and rivers of East Africa provide a powerful pool of wild genetics

Research into genetic improvement is increasing

- Breeding efforts are at an early stage, but growth rates are on par with most benchmarks in Africa. The growth timeframe from 0g to 500g (an average harvest size in many cases) is approximately 9 months
- Research and early investment into selective breeding is now initiating in the region

Hatcheries

- There are several hatcheries in each country which are already producing high-quality fingerlings
- Most large-farms have integrated their own hatcheries to reduce costs and ensure consistency of supply in their products
- The relatively affordable price of land means that a lakeside hatchery and cage grow-out is feasible for most farms

Fingerlings (1 gram) across the region sell for between $0.04-$0.07, but prices vary both by country and by region within respective countries.

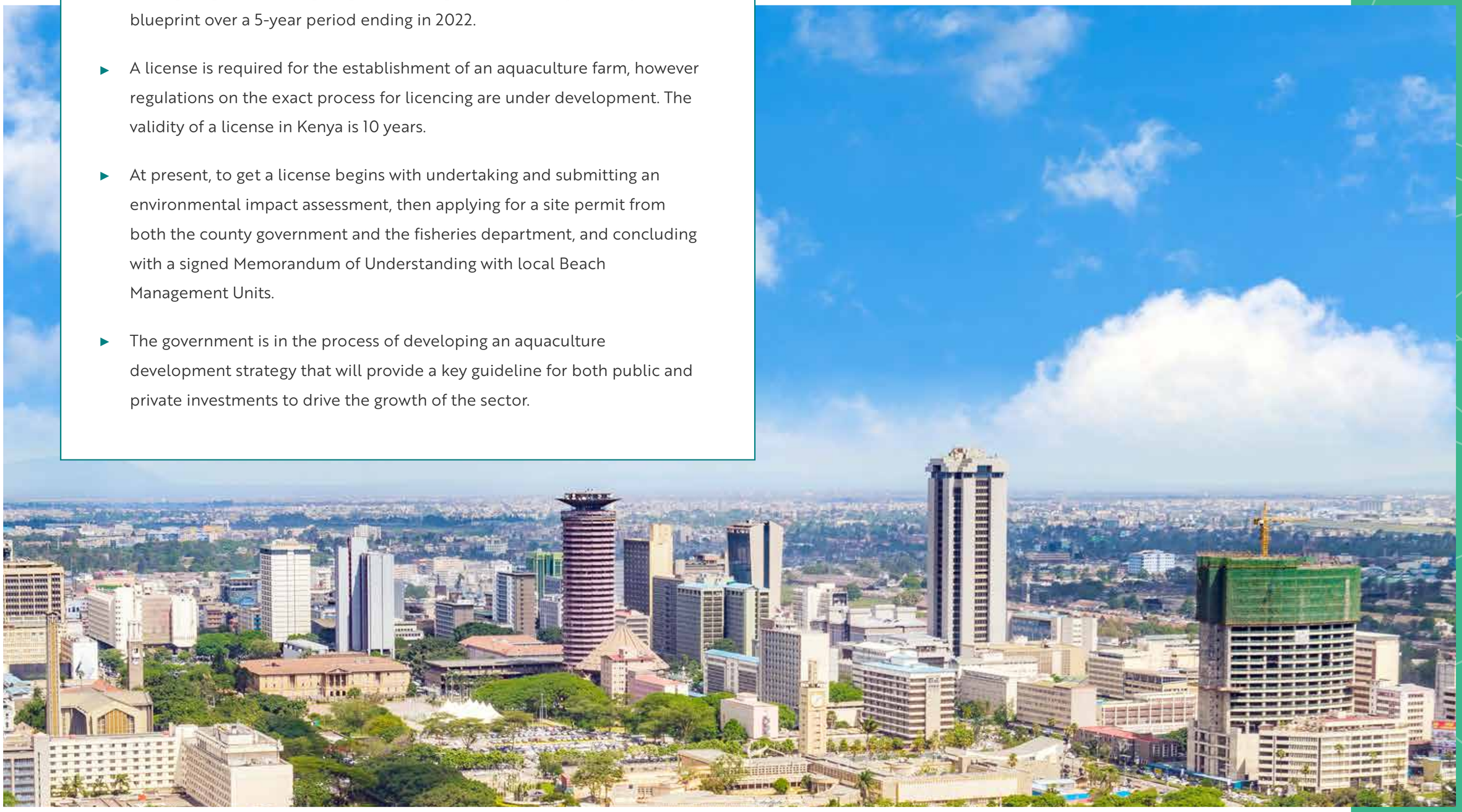
GOVERNMENT VIEW

Governments throughout the region understand the importance of aquaculture and are looking to promote the development of the industry

Aquaculture is a nascent industry, so there are inevitably areas where regulations are evolving and improving. For instance, there are regulatory update processes ongoing in Kenya and Uganda, and updates in the last few years in Tanzania also.

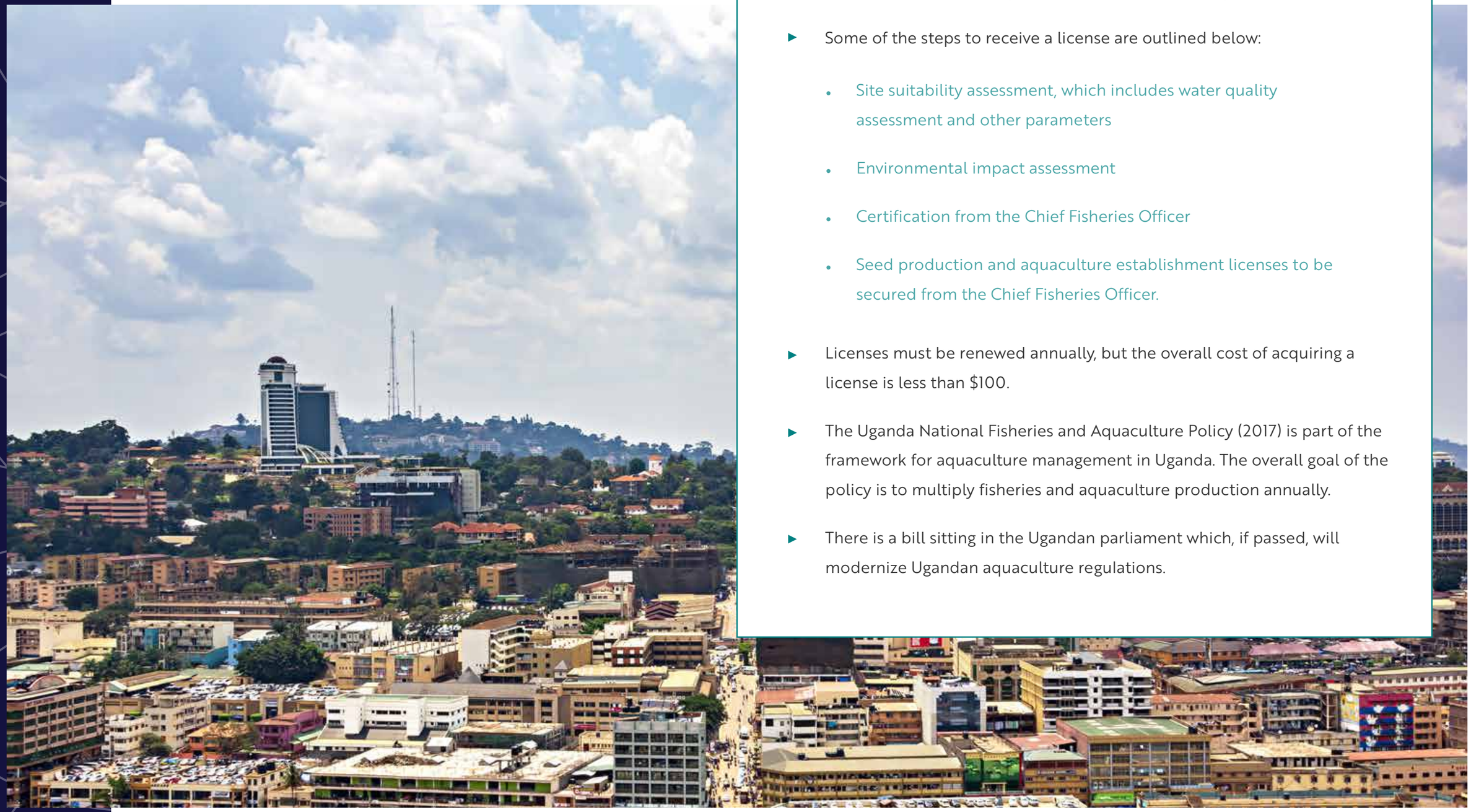
Kenya -

- Aquaculture is seen as a key sector to address food security as described in the Big 4 Agenda. The Big 4 Agenda is the government's key development blueprint over a 5-year period ending in 2022.
- A license is required for the establishment of an aquaculture farm, however regulations on the exact process for licencing are under development. The validity of a license in Kenya is 10 years.
- At present, to get a license begins with undertaking and submitting an environmental impact assessment, then applying for a site permit from both the county government and the fisheries department, and concluding with a signed Memorandum of Understanding with local Beach Management Units.
- The government is in the process of developing an aquaculture development strategy that will provide a key guideline for both public and private investments to drive the growth of the sector.



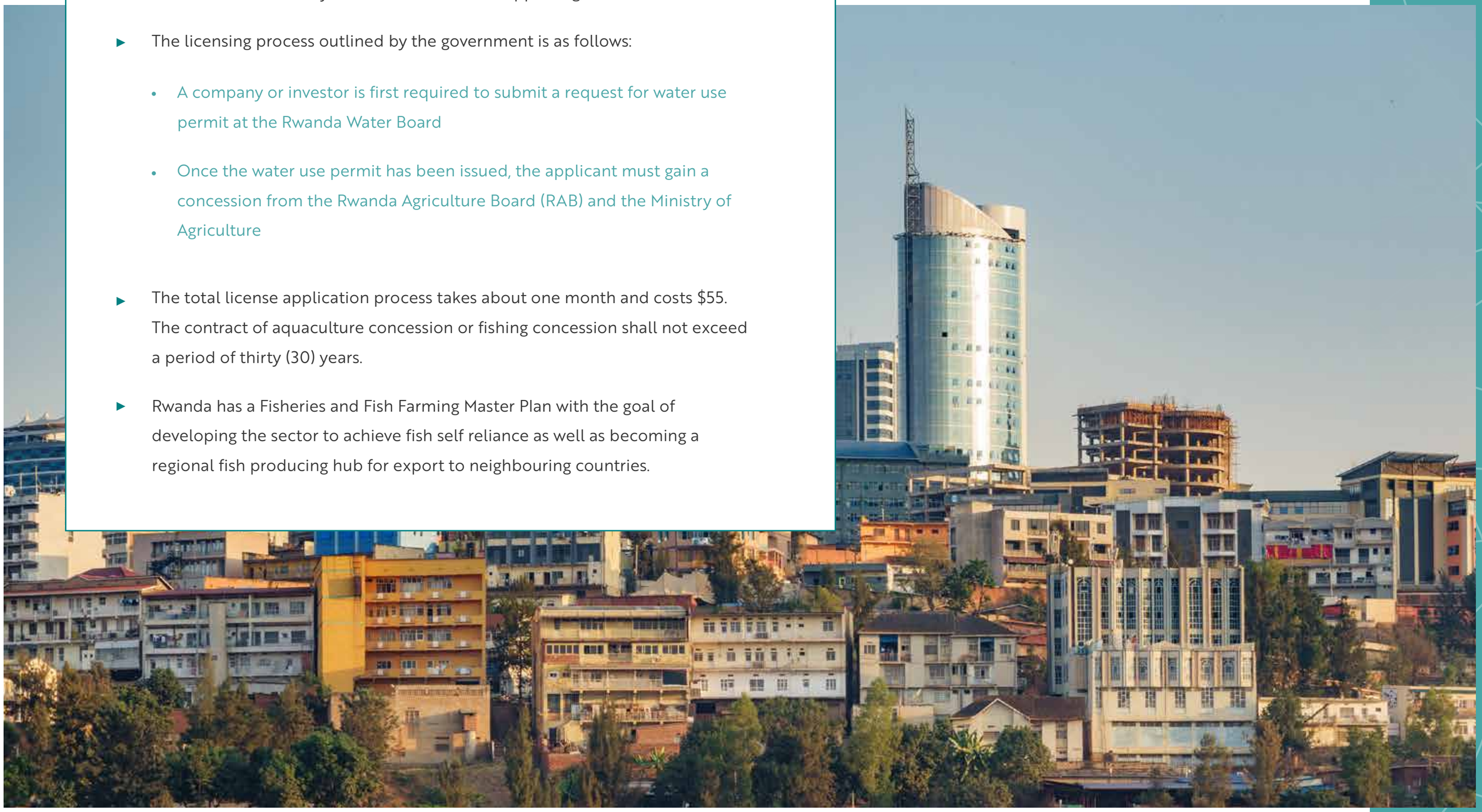
Uganda -

- The Uganda government understands that aquaculture is a critical sector for the nation's food security and developments in policy reflect this.
- Some of the steps to receive a license are outlined below:
  - Site suitability assessment, which includes water quality assessment and other parameters
  - Environmental impact assessment
  - Certification from the Chief Fisheries Officer
  - Seed production and aquaculture establishment licenses to be secured from the Chief Fisheries Officer.
- Licenses must be renewed annually, but the overall cost of acquiring a license is less than $100.
- The Uganda National Fisheries and Aquaculture Policy (2017) is part of the framework for aquaculture management in Uganda. The overall goal of the policy is to multiply fisheries and aquaculture production annually.
- There is a bill sitting in the Ugandan parliament which, if passed, will modernize Ugandan aquaculture regulations.

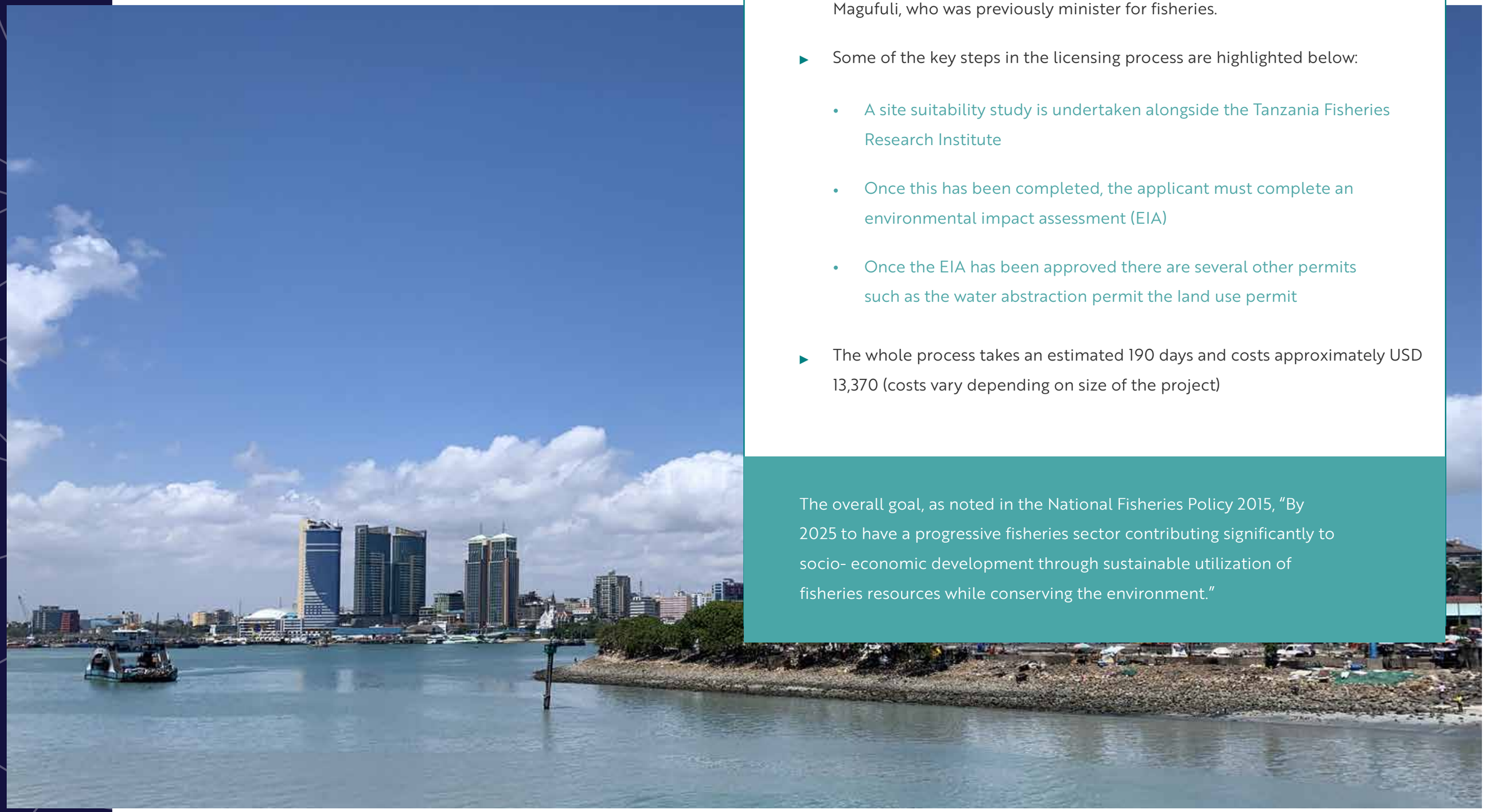


Rwanda -

- The Rwandese government sees aquaculture as an indispensable part of their plan to ensure food security in the nation and are supporting the sector as such.
- The licensing process outlined by the government is as follows:
  - A company or investor is first required to submit a request for water use permit at the Rwanda Water Board
  - Once the water use permit has been issued, the applicant must gain a concession from the Rwanda Agriculture Board (RAB) and the Ministry of Agriculture
- The total license application process takes about one month and costs $55. The contract of aquaculture concession or fishing concession shall not exceed a period of thirty (30) years.
- Rwanda has a Fisheries and Fish Farming Master Plan with the goal of developing the sector to achieve fish self reliance as well as becoming a regional fish producing hub for export to neighbouring countries.



Tanzania -



- The Government has prioritized development of the aquaculture sector, with new policy structures implemented under the former president, John Magufuli, who was previously minister for fisheries.
- Some of the key steps in the licensing process are highlighted below:
  - A site suitability study is undertaken alongside the Tanzania Fisheries Research Institute
  - Once this has been completed, the applicant must complete an environmental impact assessment (EIA)
  - Once the EIA has been approved there are several other permits such as the water abstraction permit the land use permit
- The whole process takes an estimated 190 days and costs approximately USD 13,370 (costs vary depending on size of the project)

The overall goal, as noted in the National Fisheries Policy 2015, "By 2025 to have a progressive fisheries sector contributing significantly to socio- economic development through sustainable utilization of fisheries resources while conserving the environment."

Annex

The Region

Aquaculture in East Africa is clustered around Lake Victoria, and Kenya & Uganda are responsible for the majority of the production

Uganda

Population: 44,700,000
Inflation: 2.8%
GDP per Capita: $2,200
Ease of Doing Business Score: 60.0, #12 in SSA
Fish Consumption per Capita: 11.3KG
Aquaculture: Lake Victoria
Corporate Tax Rate: 30%

Kenya

Population: 54,700,000
Inflation: 5.1%
GDP per Capita: $4,200
Ease of Doing Business Score: 73.2, #3 in SSA
Fish Consumption per Capita: 4KG
Aquaculture Areas: Lake Victoria
Corporate Tax Rate: 37.5% foreign, 30% local

Rwanda

Population: 12,900,000
Inflation: 3.3%
GDP per Capita: $2,100
Ease of Doing Business: 76.5, #2 in SSA
Fish Consumption per Capita: 7.6KG
Aquaculture Areas: Lake Kivu, Lake Muhazi
Corporate Tax Rate: 30%

Tanzania

Population: 62,000,000
Inflation: 3.4%
GDP per Capita: $2,600
Ease of Doing Business Score: 54.5, #22 in SSA
Fish Consumption per Capita: 6.8KG
Aquaculture Areas: Lake Tanganyika, Lake Victoria
Corporate Tax Rate: 30%

Sources: *Central Intelligence Agency. "The World Factbook" cia.gov. 2021 "Fish and Seafood Consumption per Capita." Our World in Data, University of Oxford, https://bit.ly/3ACnZMB World Bank Group. "Doing Business". doingbusiness.org. 2021*

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