

Investing in Guyana's Artisanal Finfish Sector

Prepared by Wilderness Markets, Conservation
International and the Food and Agriculture
Organization of the United Nations

A business case prepared in support of
implementation of the Strategic Action Programme for
the Sustainable Management of shared Living Marine
Resources in the Caribbean and the North Brazil Shelf
Large Marine Ecosystems (CLME+)

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Business Case for Investing of Guyana’s Artisanal Finfish Sector	
Area	Guyana’s Exclusive Economic Zone (EEZ) - 138,240 km ²
Fishery and Species Focus	Artisanal Finfish Sector - Groundfish
Core Private Sector Business Case Investments	<p>Supply chain interventions to achieve better operational efficiency and quality:</p> <ul style="list-style-type: none"> - Improvements in landing facilities - Improvements in cold-storage on-vessel and during post-harvest transport - Improvements in ice production <p>Improved commercialization that drives better market value:</p> <ul style="list-style-type: none"> - Processing (fillet) improvements - Market differentiation strategy design and implementation - Certification (MSC or other)
Proposed Return Generating Investment Amount	US \$ 450,000
Investment Term	5 years
Projected Financial Returns	Up to 8.7% internal rate of return (IRR) for investors in private sector investments assuming 10% cost of capital
Fishery Stakeholders Benefitted	If implemented in parallel with the recommendations of the Fishery Improvement Project (FIP) Scoping Document, up to 4,500 fishers and 5,000 processing workers would have more secure livelihoods.
Public Sector Interventions	Management and fishing gear improvements that drive fish stock protection and sustainability as documented in the FIP Scoping Document.
Targeted Environmental Returns: <i>Protecting and Restoring Fish Stocks</i>	<p>See <i>Guyana Rapid Assessment: Artisanal groundfish fisheries</i>.</p> <p>See the FIP Scoping Document.</p>

Executive Summary

Overview

The long-term financial viability of Guyana’s artisanal groundfish fishery is dependent on its environmental sustainability. This business case, developed in tandem with a rapid environmental assessment of the groundfish fishery¹ and a FIP Scoping Document, proposes a set of return-generating impact investments to improve the financial profitability of the Guyana artisanal groundfish fishery.

If this business case is implemented in parallel with the recommended environmental and social interventions,² the proposed investments, appropriately structured, should positively impact the incomes of small scale fishers participating in this fishery while ensuring the long term viability of the fishery. The return generating investments focus on improving operational efficiency and market value (see Table 1). If successfully executed, the combined strategies should result in the long-term viability of this fishery through fish stock and ecosystem protection, reductions in spoiled finfish, higher operational efficiencies and improved market pricing for Guyana’s finfish exports.

This document focuses on the business case for return generating investments, and consists of the following sections:

The Contextual Analysis in this document describes the key conditions in which these investments and interventions would be implemented, including considerations around “Fishery Status”, “Management System”, “Governance and Policy Frameworks”, “Organizational Capacity”, “Market Potential”, “Stakeholder Engagement” and “Investible Entities”.

The Value Proposition and Business Analysis sections of the business case describe the potential business solutions to the identified operational efficiency and market challenges of the fishery in more detail, including the potential financial, environmental and social outcomes.

The Financial and Risk Analysis section identifies the required investment and expected returns in more detail, while identifying and assessing potential risks and key assumptions. Based on an investment of \$450,000,³ the modeling presumes an increase in product margins from an industry average of 30% to 50% as a result of increased vertical integration, resulting in an estimated 8.7% internal rate of return (IRR) assuming a 10% interest rate over 10 years. If financed internally by a supply chain participant with no cost of debt, the return is projected to be 18.7% (Table 1).

The Guyana Rapid Assessment prepared by Ocean Outcomes and FIP Scoping Document should be considered an integral part of this report.

¹ Drugan, J. *Guyana Rapid Assessment*.

² FIP Scoping Document.

³ *All monetary figures are in US dollars, denoted simply as \$, unless otherwise noted.*

Table 1 Business case intervention strategy

BUSINESS CASE INTERVENTION SUMMARY

Investment Opportunity	Core Investment / Intervention	Why? (Pain-Point)	Funding Required	Financial Returns
Supply-chain interventions to achieve better operational efficiency	1. Improvements in landing facilities	<ul style="list-style-type: none"> Deficient facilities for vessel and product handling High level of refusals for fish products exported to the US and of reported "spoilt" landings Inadequate access to sanitary, high quality ice 	\$100,000	8.7% Interest Rate
	2. Improvements in cold-storage on-vessel and during post-harvest transport		+\$50,000	
	3. Improvements in ice production		+\$100,000	
Improved commercialization that drives better market value	4. Processing (fillet) improvements	<ul style="list-style-type: none"> Barriers to HACCP compliance in existing facilities 	\$100,000	
	5. Market differentiation strategy design and implementation	<ul style="list-style-type: none"> A lack of recognition and branding of the product, e.g., quality, origin, story 	+\$50,000	
	6. Certification (MSC or other)	<ul style="list-style-type: none"> Prices for Guyana's groundfish are the lowest in the region based in-part on a lack of differentiation 	+\$50,000	
Return-Seeking Investment Amount			\$450,000	\$39,150
Management and fishing gear improvements that drive fish stock protection	<ul style="list-style-type: none"> Fisheries Department capacity building to improve management, monitoring & enforcement Community Fisheries Management Plan development Triple-impact FIP development and launch Gear change assessment, including research on ecosystem impacts of chinese seine and gillnets Fisheries Management Information Systems. See the FIP Scoping Document: <i>Guyana Artisanal Finfish Fishery. September 2019.</i> 	<ul style="list-style-type: none"> Artisanal fisheries are not well assessed, monitored or enforced Management plan for artisanal sector, as defined in overall management plan, does not exist Uncertain ecosystem impacts of fishing practices See the Ocean Outcomes Rapid Assessment for additional environmental information 		None
				None

Contextual Analysis

Summary:

- *Target species and stock status:* Artisanal finfish catch, including bangamary, butterfish, sea trout, grey snapper, cuirass, and gilbacker. No recent robust stock assessment have been completed for these stocks, but target species are estimated to be overfished, with overfishing occurring, and significant ecosystem impacts of the fishery.⁴
- *Gear and Vessels:* 1315 vessels;⁵ using a variety of drifting gillnets, seines, and cadell lines⁶
- *Landings, 2016:* 17,876 mt, industrial and artisanal finfish ⁷
- *Exports, 2016:* 16,225 mt, industrial and artisanal finfish products (value \$ 39.7 million)^{8,9} Approximately 70 percent of the artisanal finfish landings are exported.¹⁰
- *Fishers:* 4,500 small-scale fishermen¹¹
- *Management:* Artisanal fishery is largely open access, with limited associated regulations other than requirements to have a fishing license. ^{12,13}
- *Monitoring and Enforcement:* Fishing license requirements are not enforced, with less than half of artisanal vessels (590 of 1315) being licensed in 2017.¹⁴

⁴ Drugan, *Rapid Assessment*.

⁵ *Fisheries Department Annual Report 2017*. Prepared by the Government of Guyana, Ministry of Agriculture, Fisheries Department.

Marine Fisheries Management Plan 2013-2020. Prepared by the Government of Guyana, Ministry of Agriculture, Fisheries Department.

Drugan, *Rapid Assessment*.

⁶ *Marine Fisheries Management Plan 2013-2020*.

⁷ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁸ Ibid.

⁹ Export volumes, as reported, are nearly 91 percent of landings volumes. This does not allow for domestic consumption, shrinkage due to processing or waste and discards. Please refer to the Landings section of this report for additional details.

¹⁰ *Fisheries Department Annual Report 2017*.

¹¹ Ibid.

¹² MacDonald, Jessica, Harper, Sarah, Booth, Shawn and Zeller, Dirk. 2015. *Guyana Fisheries Catches: 1950-2010*. University of British Columbia, Working Paper Series, Working Paper #2015-21.

¹³ *Fisheries Department Annual Report 2017*.

¹⁴ *Marine Fisheries Management Plan 2013-2020*.

- *Infrastructure*: Artisanal landing facilities and roads need upgrading, including ice facilities, and marketing structures.^{15,16} Three Door Koker for instance lacks docks, ice machines and numerous other items necessary to maintain good product quality (see “Infrastructure” section below for additional information about Regions 2, 5, and 6).
- *Enterprise*: A limited number of high capacity organizations exist in the value chain, with the Upper Corentyne Fishermen’s Cooperative Society (UCFCS) site in No. 66 village standing out as the highest performing cooperative. Pritipaul Singh Investments (PSI) and Noble House Seafoods accounted for at least 50 percent of the US imports from Guyana between 2010 and 2018.¹⁷ These vertically integrated companies not only process their own fish, but they also purchase finfish from the artisanal sector through middlemen/wholesalers in Guyana.^{18,19} Aside from these companies, the remaining artisanal sector finfish landings are processed by 8 large and 23 small processors.²⁰

The lack of sustainable harvests, robust monitoring and enforcement, secure tenure,²¹ and harvest strategies,²² compounded by the lack of accurate fisheries data²³ and the potentially high risk of IUU fishing, were documented in the recently completed Guyana Rapid Assessment prepared by Ocean Outcomes.²⁴ These highlight the full-range of opportunities for fishery improvement, and represent significant investment risks in this fishery.

¹⁵ Ibid.

¹⁶ FAO. 2016. *Report of the Workshop on Investing in Ecosystem-based shrimp and groundfish fisheries management of the Guianas -Brazil shelf, Barbados, 7-8 September 2015. Informe del Taller de inversión en el manejo eco-sistémico en la pesca de camarones y peces demersales en la Plataforma Guyana-Brasil, Barbados, 7-8 Septiembre 2015.* FAO Fisheries and Aquaculture Report/FAO Informe de Pesca y Acuicultura. No. 1125, Bridgetown, Barbados.

¹⁷ <https://tradingeconomics.com/guyana/exports/fish-crustaceans-molluscs-aquatics-invertebrate>

¹⁸ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment: Guyana seabob fishery. Public Comment Draft Report, May 2019.* Prepared for Guyana Association of Trawler Owners and Seafood Processors and by Vottunarfstofan Tún ehf.

¹⁹ *Marine Fisheries Management Plan 2013-2020.*

²⁰ *Fisheries Department Annual Report 2017.*

²¹ Holmes, L., Strauss, C. K., de Vos, K., and Bonzon, K. 2014. *Towards investment in sustainable fisheries: A framework for financing the transition.* Environmental Defense Fund and The Prince of Wales’s International Sustainability Unit.

²² <https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2016/07/harvest-control-rules>

²³ Data inconsistencies were a significant challenge in completing this document. Please refer to Appendix 2 for a list of data required vs available.

²⁴ Drugan, *Rapid Assessment.*

Value Proposition and Business Model

Among the fisheries of Guyana, the artisanal finfish sector is most likely to benefit from value creation.²⁵ Opportunities exist to improve stock health, increase operational efficiency and increase market value to secure triple-bottom line outcomes and potentially improve both short and long term values to fishers.

A number of different scenarios were modelled for this business case.²⁶ Analysis of the available value chain data, including landings and export data, identified two specific financial return generating strategies to improve the value of artisanal finfish landings:

- Supply chain interventions to achieve better operational efficiency
- Improvements in commercialization that drive better market value

Operational Efficiency

At the September 2019 workshop, representatives from PSI, Gopie Investments, and the Veterinary Public Health Unit (VPHU) agreed that improving quality was an opportunity to increase value and market reputation. For instance, from January 2010 to July 2019, there were 342 import shipments refused by the US Food and Drug Administration (FDA) from PSI, primarily for filth. Of these, seventeen occurred from July 2018 to July 2019; despite the relative sophistication of their processing facilities, there are still improvements needed to ensure quality.

Workshop participants reported that the fish processing lines need additional work to comply with the same level of standards as the seabob lines. Broadly, areas needing attention include ensuring the incoming product is of a reliably high standard; constantly training new processing workers; enforcing actions against smaller processor/exporters (those who use the individual licenses); and securing results of microbiological tests quickly. The stakeholders noted a dearth of capacity in the country for processing samples - results have to be sent abroad and take up to two weeks to process - increasing the likelihood that sanitary issues are unable to be identified and corrected quickly.

²⁵ See Appendix 1 - Fishery Selection Rationale, for more information about selection.

²⁶ See Appendix 6 - Additional Financial Modelling Results for additional scenarios modelled.

Furthermore, while fish are kept on ice on most vessels, they are not kept on ice when sold in local markets; one reason cited for the lack of ice when selling fresh fish is that the use of ice is connoted with poorer quality fish approaching the end of its useful shelf-life. Interestingly, prices paid to fishermen from local small vendors are reported to be twice that of wholesale, but the volumes purchased are much lower.

Market Value

There are significant differences in the value received for the six different target species, as well as for finfish of different sizes. This highlights important opportunities for gear changes, e.g., larger mesh sizes, and fishing practices that could increase the proportion of higher value and more sustainable finfish that are caught.

These dynamics indicate a strong potential to increase the value of Guyana artisanal finfish through supply chain interventions that achieve not only better operational efficiency but also higher value in the local and export markets. Implemented together, these two strategies should result in reductions in spoiled finfish, higher operational efficiency (i.e. lower costs) and improved market recognition of Guyana's finfish exports.

If implemented in parallel with the identified public sector interventions to improve management, address data gaps and fishing gear sustainability, the proposed investments should positively impact the small scale fishermen participating in this fishery while ensuring the long term viability of this fishery. This business case evaluates the return generating strategies from a financial perspective.

Business Model

The infrastructure section in the contextual analysis describes the individual supply chains for each region in greater detail, and provides guidance on potential priority sites for investment. Ultimately, the selection of sites for investment should be based in-part on whether fishery supply chain partners are willing to engage in the comprehensive improvements as identified in the FIP Scoping Document (i.e. compliance with licensing requirements, data collection efforts, and voluntary use of more sustainable gears and harvest strategies) and possess the operational capacity identified in the business case.

The financial analysis below does not explicitly account for the costs associated with some of the non-return generating interventions identified in the FIP Scoping Document; these should be determined and agreed to once the FIP is launched with confirmed project participants. Positive environmental benefits related to increased target species biomass and ecosystem protection are expected, and will be tracked as part of the FIP utilizing the existing FIP benchmarking tools. These interventions could also lead to additional financial returns, with fishers needing to spend less time and fuel to catch the same amount of fish once the target stocks have recovered, as well as landing larger-sized and higher-priced individuals. The full set of social benefits associated with the proposed investments are estimated in the social responsibility assessment, and progress towards these could also be tracked utilizing the benchmarking tools. These social benefits include improving food and livelihood security, as well as ensuring equality and equitable opportunity to benefit, including gender considerations.²⁷

²⁷ Kittinger, J. et al. 2017. Committing to Socially Responsible Seafood. Science 356:912-913. DOI: 10.1126/science.aam9969

Financial and Risk Analysis

Financial analysis focused on the two aforementioned financial return generating strategies to improve the value of artisanal finfish landings:

- Supply chain interventions to achieve better operational efficiency
- Improvements in commercialization that drive better market value

Projected investments to achieve better operational efficiency such as improved ice, cold chain, and landing sites, were estimated at \$ 250,000 for modeling purposes. An additional \$ 200,000 was projected to be invested in processing (filleting) improvements, certification and market differentiation. Thus a total investment of \$ 450,000 was considered in this business case and is assumed to be undertaken by one value chain participant at an enterprise or cooperative level. While this investment might be appropriate for one landing site, this decision is ultimately dependent on the ability of the investible entity to process a minimum volume of 1,200 MT per annum as the breakeven baseline, including infrastructure capacity.²⁸

Based on this investment, the modeling presumes an increase in product margins from an industry average of 30% to 50% as a result of the greater degree of vertical integration or explicit partnerships between supply chain partners. It is further assumed that the investment does not go into default.

Based on this analysis, the combination of both strategies proved to be the most viable from a financial perspective, resulting in an estimated 8.7% IRR assuming a 10% interest rate over 10 years. If financed internally by a supply chain participant with no cost of debt, the return is projected to be 18.7%. Equally important, the increases in product margins result in lower breakeven volumes being required - from an estimated 1,200 MT to 610 MT.

Table 2 Modelling results for Combined Strategy

Combined Strategy	<u>Investment</u>	<u>NPV</u>	<u>Net Return</u>	<u>IRR</u>
<i>Improve landing sites, improve ice production, provide additional cold storage, improve processing, implement market differentiation and certification</i>	\$ 450,000	\$ 49,459	\$ 137,411	8.70%

As with any wild capture fishery, there are a number of variables relevant to an evaluation which constitute risk. To the extent possible, these are summarized here and the risks are in the financial model. Key risks are further described in the risk section of this report, and include:

- **Environmental:** Finfish stock declines; disasters, including climate change
- **Governance:** Inadequate fishery management, poor data, high risk of IUU fishing
- **Social:** Increased costs of fishing without compensation for changes has the potential to impact up to 4,500 small scale fishers, including effects on food and jobs if prices of

²⁸ Landings data by location was not available, but Fisheries Department has this data. Fisheries Department reports that the highest volumes of landings occur at Greater Georgetown Fishermen Coop Wharf, Meadow Bank, Albion, # 66, Charity, Three Door Koker, and Rosignol.

- raw product for saltfish increase; fishers may refuse to change because premiums are late or below expectations
- *Enterprise*: Investable entity has not yet been confirmed; significant country political and business risk; business case requires effective operational capacity and quality control to meet break-even; price uncertainty.

Recommendation

A potential business case for impact investment in the Guyana groundfish fishery was identified, consisting of an initial investment of \$ 450,000 which could produce an 8.7% return on investment over a 5-year period. If structured appropriately and in parallel with the recommendations of the FIP Scoping Document, an investment in the identified business case could result in tangible, long term improvements in the financial and socio-economic performance of the Guyana groundfish fishery.

Adopting a combination of the two return generating strategies identified will improve the likelihood of profitability, assuming a suitable investable entity or partner is willing to lead in the implementation of a FIP. While improving operational efficiency alone to reduce the amount of spoilt fish does have a modest positive impact on financial performance,²⁹ combining operational efficiency and market value improvements increases the likelihood of significantly greater profitability. If paired with the identified improvements in fishery management, the combined approach is more likely to have a long term positive impact on Guyana's fisheries.

Next steps include the identification of a suitable local private firm as the "investable entity" with the capacity of absorbing the investment capital required to implement and the expertise to execute the identified strategies. In the event this is a cooperative, the investment cannot legally be structured as a loan due to current policy in Guyana. This will present structuring challenges to ensure investors are protected and repaid.

To ensure these investments do not drive overfishing, implementers should prioritize the recommendations identified in the Guyana Rapid Assessment prepared by Ocean Outcomes and further documented in the FIP Scoping Document. The task force currently being assembled can help ensure these risks are mitigated. These interventions, some of which are already fully or partially funded, should be carried out in parallel, if not prior to, developing and implementing private sector, return generating investments. These focus on harvest management (harvest strategy; harvest control rules; information and monitoring; assessment of stock status) and fishery specific management system (decision making processes and compliance and enforcement), all of which are categorized as non-return seeking interventions.^{30,31}

²⁹ Appendix 6 - Additional Financial Modelling Results

³⁰ Inamdar, N., Band, L. Jorge, M.A., Tullos Anderson, J, and Vakil, R. 2016. *Developing Impact Investment Opportunities for Return-Seeking Capital in Sustainable Marine Capture Fisheries*. Washington, DC: World Bank.

³¹ The potential for solar generation to displace generator use was also modelled. Please see the Appendices 5 and 6 for more information.

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Abbreviations and Acronyms

CI	Conservation International
CLME	Caribbean Large Marine Ecosystem [Project]
CNFO	Caribbean Network of Fisherfolk Organizations
CRFM	Caribbean Regional Fisheries Mechanism
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization [of the United Nations]
FDA	Food and Drug Administration [of the United States]
FIP	Fishery Improvement Project
IRR	Internal rate of return
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated [fishing]
kg(s)	Kilogram(s)
lb(s)	Pound(s)
MARAD	Maritime Administration Department, Government of Guyana
MSC	Marine Stewardship Council
MT	Metric ton
NGO	Non-governmental organisation
PSI	Pritipaul Singh Investments
RFMO	Regional fisheries management organization
SDG	United Nations Sustainable Development Goal
SIMP	[United States] Seafood Import Monitoring Program
TBL	Triple-bottom line (referring to a business or project with not just a financial “bottom line” but also accounting for social and environmental outcomes)
UN	United Nations
VPHU	Veterinary Public Health Unit, Ministry of Health, Government of Guyana
WECAFC	Western Central Atlantic Fishery Commission
WWF	World Wildlife Fund

All monetary figures are in US dollars, denoted simply as \$, unless otherwise noted

Introduction

Three potential value creation opportunities are relevant in determining possible financial opportunities for value chain participants in fisheries reform:³²

- Improving **stock health** - leads to a more abundant resource that supports higher long-term yields and makes fish less costly to find and to catch
- Increasing **operational efficiency** - reduces the cost of fishing and of delivering fish through the supply chain, improving profit margins and thus improving the returns from fishing as a whole
- Increasing **market value** - through improved market access, certification, branding and long-term partnerships returns more value to fishers

Among the fisheries of Guyana, the artisanal finfish sector is most likely to benefit from the above. Opportunities exist to improve stock health, increase operational efficiency and increase market value to secure triple-bottom line outcomes³³ and potentially improve values to fishers.

The viability of implementing a successful business case for triple-bottom line impacts is dependent upon addressing the key enablers of sustainable and profitable fisheries: secure tenure; sustainable harvests; and robust monitoring and enforcement.³⁴ Identifying a viable investable entity will improve implementation of this business case.

Despite limitations identified, strategic interventions and investments were identified that would address the shortcomings identified. These are included in the recently completed FIP Scoping Document and Guyana Rapid Assessment. These documents begin to address the key enablers of sustainable fisheries, reduce investment risk, and pave the way for triple-bottom line investment opportunities. Furthermore, they provide the necessary background and framework around which to engage the private sector and address identified data gaps (see Appendix 2 for data gaps identified).

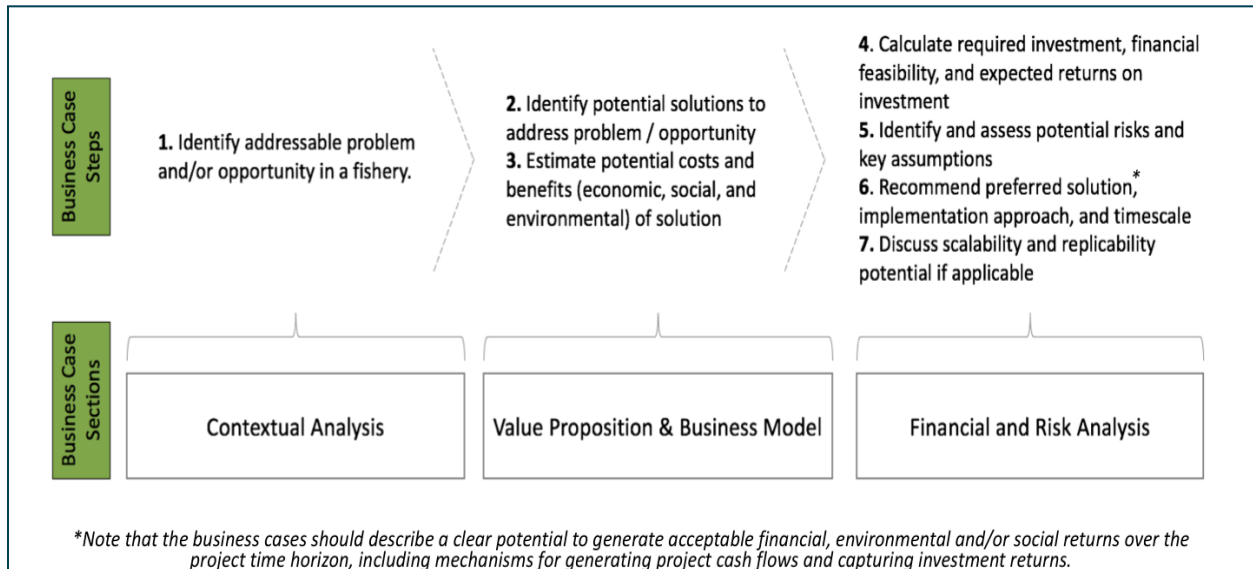
Investment and intervention opportunities for the Guyana artisanal groundfish fishery business case were identified using the criteria outlined below.

³² Holmes et al, *Towards investment in sustainable fisheries*.

³³ Triple-bottom line refers to accounting for social and environmental impacts, in addition to the traditional financial bottom line.

³⁴ Holmes et al, *Towards investment in sustainable fisheries*.

Figure 1 Sustainable Fishery Business Case Criteria, co-developed by Conservation International



Based on the available data, two potential investment strategies were identified for consideration in parallel with interventions that address stock health. These recommendations overlap with previously identified priority investments: ³⁵

- Supply chain interventions to achieve better operational efficiency and quality
- Improvements in commercialization that drive better market value

The financial modeling undertaken to evaluate these two strategies demonstrated that improving product quality to reduce the amount of spoiled fish does have a modest positive impact on financial performance. However, combining quality and market value improvements increases the likelihood of significantly greater impacts on profitability.

Contextual Analysis

Data and analysis provided herein delineate the basic environmental, social and management dynamics of the target fishery, as well as information about the market and potential investment opportunities.

In Guyana, the marine capture fisheries are commonly divided into four sectors with the following characteristics:

³⁵ FAO. 2016. *Bioeconomics of shrimp and groundfish fisheries of the Brazil-Guianas Shelf Background documents, Barbados, 7-8 September 2015*. FAO Fisheries and Aquaculture Report/FAO Informe de Pesca y Acuicultura. No. C1120, Bridgetown, Barbados.

Table 3 Characteristics of marine capture sectors³⁶

Sector	Active Vessels	Primary target species/landings	Gear
Industrial	81 seabob 27 large shrimp	Seabob, large shrimp	Trawl
Industrial	6	Yellowfin tuna	LL
Semi-industrial	~100	Red snapper	LL, Trap, HL
Artisanal	1,315	Bangamary, butterfish, sea trout, grey snapper, cuirass, and gilbacker	drifting gillnets, seines; other artisanal gears

LL = longline, HL = handline

Although this report focuses on the artisanal sector,³⁷ the companies that comprise the bulk of the industrial sector are important to review for context as they are also the major exporters. The industrial and semi-industrial vessels are owned by three main companies, Pritipaul Singh Investments (PSI), Noble House Seafoods, and Gopie Investments. Between them, they control 90% of the industrial seabob fleet with the remainder divided among seventeen trawl owners.^{38,39}

These companies are also the largest exporters, with PSI and Noble House accounting for at least 50 percent of the US imports from Guyana between 2010 and 2018.⁴⁰ These vertically integrated companies not only process their own fish, but they also purchase finfish from the artisanal sector through middlemen that are generally known as wholesalers or buyers in Guyana. Aside from these companies, the remaining artisanal sector finfish landings are processed by 8 large and 23 small processors.⁴¹ Approximately 70 percent of the artisanal finfish landings are exported, according to the Fisheries Department of Guyana.⁴²

The artisanal sector functions primarily independently and is not involved in transport, processing or marketing; they depend on the wholesalers to transport their products to the processing facilities in Georgetown and the processors and exporters to find end markets for the same. Local vendors also purchase fish directly from fishers, but this is reported to be a

³⁶ Fisheries Department Annual Report 2017.

³⁷ See Appendix 1 - Fishery Selection Rationale for more information about the fishery selection.

³⁸ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

³⁹ *Marine Fisheries Management Plan 2013-2020*.

⁴⁰ The US is the destination for nearly 50 percent of Guyana's seafood exports. Source: <https://tradingeconomics.com/guyana/exports/fish-crustaceans-molluscs-aquatics-invertebrate>

⁴¹ Fisheries Department Annual Report 2017.

⁴² Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

minority of the landings.⁴³ Given the number of fishers, vessels, and landings, the artisanal finfish sector has a high level of impact on livelihoods and the local ecosystems.

*Findings, in brief:*⁴⁴

- *Target species and stock status:* Artisanal finfish catch, including bangamary, butterfish, sea trout, grey snapper, cuirass, and gilbacker. Unassessed; target species are estimated to be overfished; overfishing occurring; significant ecosystem impacts on the fishery; no robust stock assessment has been completed.⁴⁵
- *Gear and Vessels:* 1315 vessels;⁴⁶ using a variety of drifting gillnets, seines, and cadell lines⁴⁷
- *Landings, 2016:* 17,876 mt, industrial and artisanal finfish⁴⁸
- *Exports, 2016:* 16,225 mt, industrial and artisanal finfish products (value \$ 39.7 million)^{49,50,51}
Approximately 70 percent of the artisanal finfish landings are exported.⁵²
- *Fishers:* 4,500 small-scale fishermen⁵³
- *Management:* Open access; fishing license required^{54,55}
- *Monitoring and Enforcement:* Not robust^{56,57}

⁴³ Exact numbers are unknown.

⁴⁴ Data inconsistencies were a significant challenge in completing this document. Please refer to Appendix 2 for a list of data required vs available.

⁴⁵ Drugan, *Rapid Assessment*.

⁴⁶ *Fisheries Department Annual Report 2017*.

⁴⁷ *Marine Fisheries Management Plan 2013-2020*.

⁴⁸ Ibid.

⁴⁹ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁵⁰ All monetary figures are in US dollars, denoted simply as \$, unless otherwise noted

⁵¹ Export volumes, as reported, are nearly 91 percent of landings volumes. This does not allow for domestic consumption, shrinkage due to processing or waste and discards. Please refer to the Landings section of this report for additional details.

⁵² *Fisheries Department Annual Report 2017*.

⁵³ Ibid.

⁵⁴ Ibid.

⁵⁵ *Marine Fisheries Management Plan 2013-2020*.

⁵⁶ Ibid.

⁵⁷ Only 590 of the 1315 artisanal vessels were licensed in 2017.

- *Infrastructure*: Artisanal landing facilities and roads need upgrading, including ice facilities, marketing structures, etc.^{58,59}
- *Enterprise*: A limited number of high capacity organizations exist in the value chain.

Fishery status

The artisanal fishing sector catches a wide variety of finfish using diverse gear types. Most finfish landings are comprised of the sciaenidae family⁶⁰ and there is overlap between the artisanal finfish landings and the secondary species landings from the industrial seabob and large shrimp (also known as prawns) fisheries. Around 90% of the retained fish bycatch from the industrial sector consists of bangamary, sea trout, and butterfish.⁶¹ Because of this overlap, this contextual analysis includes some discussion of the fleets and landings of the other sectors.

There are currently only limited stock assessments available for these fisheries; WWF-Guianas is concluding a year-long stock assessment of catch composition from twelve artisanal vessels in Guyana, which is scheduled to be formally presented at the end of 2019.⁶²

The rapid assessment for the fishery by Ocean Outcomes as part of this project concludes that the stock status is uncertain, and they are subject to substantial fishing pressure and may be overfished.⁶³ This report's summary findings state:

“Artisanal fisheries are not well monitored, and harvest management is minimal, which leads to deficiencies across numerous performance indicators. Stock status of the target species is uncertain, and they are subject to substantial fishing pressure and may be overfished. Ecosystem impacts are also uncertain due to lack of information and research. Some of the potentially more serious concerns are fishing mortality on endangered or threatened shark species, and effects of ghost fishing from lost or improperly discarded nets. Fisheries management is generally constrained by lack of capacity and weak enforcement. Although fishery objectives aligned with sustainability outcomes are described explicitly in policies and fishery management plans, implementation may not be effective.”

The species have varying levels of fecundity and time to maturity (see Appendix 3 - Differentiating by Species for additional information). Given the current gear and fishing methods used in the fishery, targeting one species to allow others more time to recover would be difficult.

⁵⁸ *Marine Fisheries Management Plan 2013-2020.*

⁵⁹ FAO. 2016. *Report of the Workshop on Investing in Ecosystem-based shrimp and groundfish fisheries management of the Guianas-Brazil shelf, Barbados.*

⁶⁰ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment.*

⁶¹ *Fisheries Department Annual Report 2017.*

⁶² Personal Communication. WWF Guianas. June 2019.

⁶³ *Drugan, Rapid Assessment.*

Table 4 Key artisanal finfish stocks of Guyana

LOCAL NAME	SCIENTIFIC NAME	OTHER NAMES AND COMMENTS
SEA TROUT	<i>Cynoscion virescens</i>	green weakfish
BANGAMARY	<i>Macrodon ancylodon</i>	king weakfish
CUIRASS	<i>Sciades (Arius) proops</i>	crucifix sea catfish
GREY SNAPPER	<i>Cynoscion acoupa</i>	acoupa weakfish
GILLBACKER	<i>Sciades parkeri</i>	sea catfish; IUCN 'vulnerable'
BUTTERFISH	<i>Nebris microps</i>	smalleye croaker

Other artisanal catch includes blacktip shark (*Carcharhinus limbatus*; IUCN status: near threatened)⁶⁴, Spanish mackerel, and kingfish.

Fleet

The artisanal fleet is comprised of an estimated 1,315 primarily wooden vessels that range in length from approximately 4.5 meters to nearly 20 meters (15 to 65 feet).⁶⁵ Less than half of these vessels were licensed in 2017. There are 81 licensed and operational seabob vessels and 27 licensed shrimp vessels that are considered to be part of the industrial fleet whose secondary catch species overlap with the primary catch of the artisanal fleet, i.e., bangamary, sea trout and butterfish.^{66,67}

Many of the artisanal vessels are owned by former fishers or families who have ties to the fishing industry. Gender analyses to be conducted in 2019 by FAO, WWF and others in coordination through the Task Force will shed light on the role of gender in the fisheries, including on the number of women-owned vessels and other contributions by women in the value-chain.^{68,69}

⁶⁴ <https://www.iucnredlist.org/species/3851/10124862>

⁶⁵ Note that the estimate provided in the ERM/EMC Environmental Impact Assessment dated June 2018 produced for Exxon Mobil (Esso Exploration and Production Guyana Limited) asserts there are less than 400 vessels. They listed one hundred persons in Region 6, a gross underestimate based on our discussions with the cooperatives in this area.

⁶⁶ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁶⁷ Fisheries Department Annual Report 2017.

⁶⁸ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁶⁹ Personal Communication. WWF Guianas. June 2019.

Table 5 Estimates of artisanal vessels by region and gear type^{70, 71}

Region	Gear type									Total vessels
	Gillnet			Chinese seine	Pin seine / tie seine	Cadel line	Catgut	Anchor seine	Circle Seine	
	Nylon 2-4"	Poly-ethylene 5-6"	Poly-ethylene 7-8"							
#1	10	8	0	10	0	0	0	0	0	28
#2	53	31	24	22	3	7	6	3	0	150
#3	44	45	5	70	4	37	0	36	0	241
#4	118	69	19	97	1	9	0	0	0	313
#5	130	6	1	64	2	4	33	3	0	243
#6	103	170	0	42	11	0	0	0	14	340
Total	458	329	49	305	21	57	39	42	14	1315
Est. landings (2006)	9242 MT	3201 MT	6925 MT	48 MT	48 MT	Not Available				
Primary species	Bangamary, sea trout, butterflyfish	Grey-snapper, seatrout, gill-backer, tarpon, Spanish-mackerel, croaker, snook, shark spp.	White-belly, seabob, immature fish, bangamary, butterflyfish, catfish	Mullet, snook, querimaa, catfish, croaker, bangamary	Catfish, sharks spp.	Not Available				

The artisanal fleet is primarily comprised of two types of vessels, both of which land fish fresh on ice:⁷²

- Outboard cabin cruisers

⁷⁰ Part of this table was published in the *Marine Fisheries Management Plan 2013-2020*, other data was provided by the *Fisheries Department Annual Report 2017*.

⁷¹ Maison, D. 2007. *Management of Inshore Artisanal Fisheries in Guyana: A Co-Management Approach*. Final Project Report to the United Nations University Fisheries Training Program. Reykjavik, Iceland.

⁷² *Marine Fisheries Management Plan 2013-2020*.

- Trip length: up to three days
 - Primary gear: smaller-mesh gillnets or Chinese seine
 - Landings: Approximately 80% of annual artisanal landings (60% smaller-mesh, 20% Chinese seine)
- Inboard cruisers
 - Trip length: up to 15 days
 - Primary gear: larger-mesh gillnets
 - Landings: Approximately 20% of annual artisanal landings

The artisanal fleet does not include the red snapper or tuna vessels; these are part of separate semi-industrial and industrial fleets that go farther offshore than is feasible for the artisanal vessels.

Landings

The marine shrimp and groundfish fisheries in Guyana target six species of shrimp and over thirty fish species, but also take a number of other species as saleable bycatch or “discards”, though typically there is reported to be very little fish that is not used.^{73, 74} Total annual landings, including crustaceans and fish in Guyana from 2007 to 2016 averaged approximately 45,000 metric tons (MT).

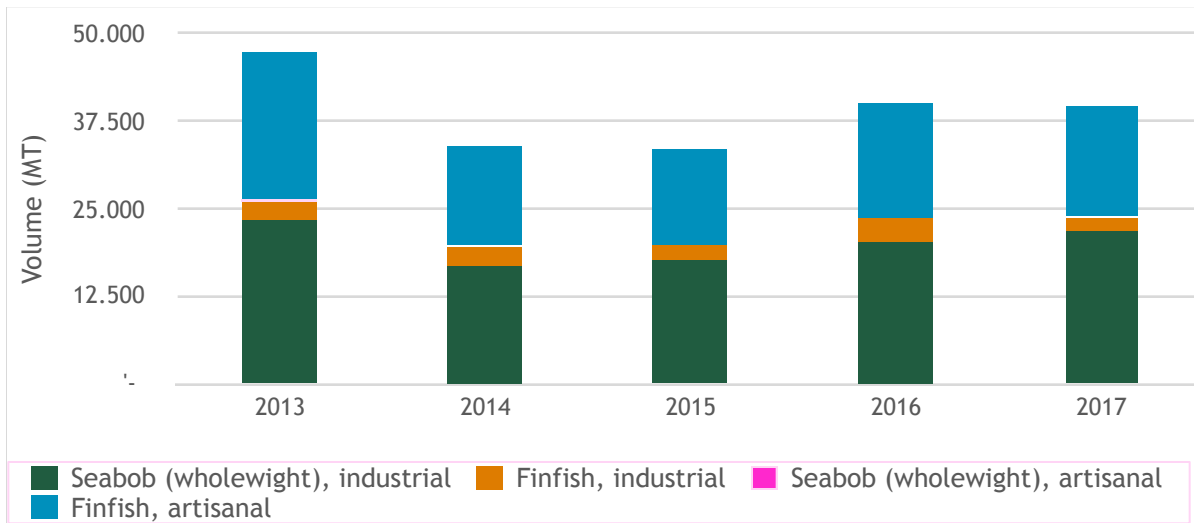
Seabob is primarily landed by the industrial fleet while the artisanal fleet lands the bulk of the finfish. Average finfish landings in the artisanal sector exceeded the industrial sector by a factor of seven in each of the past five years, as shown in the table with the production data for the marine sectors. Not shown in the table is prawns, whitebelly shrimp, red snapper and tunas. Landings for each of these was less than 2,000 MT in each of the years 2013 through 2017, with the exception of red snapper in 2014 which spiked to 2,106 MT, exceeding the 2013 through 2017 average of 1,215 MT for that time period.⁷⁵

⁷³ FAO. 2013. *Report of the National Consultation in Guyana. Case Study on Shared Stocks of the Shrimp and Groundfish Fishery of the Guianas-Brazil Shelf*. Assessment studies. *CLME Case Study on Shrimp and Groundfish - Report*. No. 9 -, Rome, FAO. 2013. 99 p.

⁷⁴ Personal Communication. Aaron Garstin. June 2019.

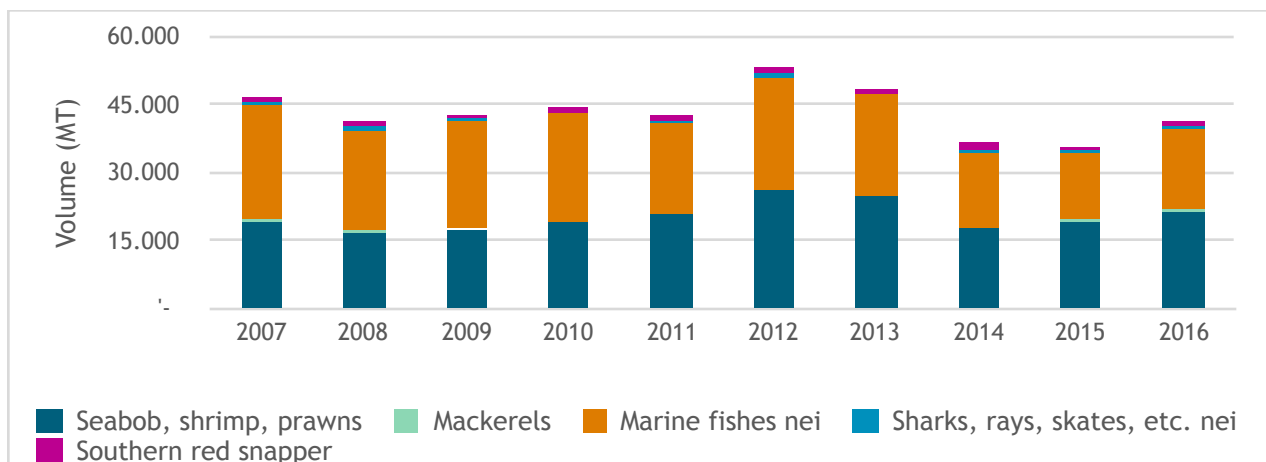
⁷⁵ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

Figure 2 Production data for marine sector: unprocessed weight: industrial, artisanal and semi-industrial ⁷⁶



The data does not indicate an obvious trend, but the finfish landings in the most recent five-year time period in the series from 2007 to 2016 were approximately 3,000 MT lower than the preceding five-year interval. There is also anecdotal evidence from fishermen that to catch the same amount of fish as they had in the past, their trips last longer, are more frequent, and the size of the fish are smaller.

Figure 3 Guyana marine capture production, 2007-2016 ^{77, 78}



⁷⁶ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁷⁷ FAO. 2018. Fishery and Aquaculture Statistics. Global Fisheries commodities production and trade 1976-2016 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2018. www.fao.org/fishery/statistics/software/fishstatj/en

⁷⁸ While landings are recorded by the Fisheries Department in Guyana by species, the datasets from the FAO are not well-distinguished by species - most are reported as the aggregated “Marine fishes NEI” which means that any more detailed datasets must be obtained from the government by request.

Sharks, rays, and skates average less than two percent of the total landings in Guyana between 2007 and 2016; however, of the sharks sampled in a market-based study in 2016, endangered sharks were almost 30% of the sample. According to this sampling exercise, 55% of sample was for local market and 45% international.⁷⁹ In 2017, 81 MT of salted shark or shark fin were exported, valued at approximately \$ 1.15 million.⁸⁰

Approximately 155 vessels (25%) of fishermen in region 6 bordering Suriname report obtaining Surinamese licenses to fish in the waters of Suriname. Region 6 fishers noted that the license requires them to land fish caught in Suriname's waters in Suriname, which they do. Any unsold fish is then brought back to Guyana to be sold into the market. Fisher representatives from this region reported that fish caught under this arrangement is 30 to 50 percent of the catch for the UCFCs fishers.⁸¹

Infrastructure

Infrastructure relevant to the artisanal finfish value chain includes the fishing complexes where fish is landed, roads connecting to the local markets and to processors in Georgetown, processing facilities and export facilities. The Fisheries Department reports there is no current infrastructure assessment for either public or private facilities, though most are thought to perform at least at minimum levels of functionality, if not higher since they are able to land fish which are sent to Georgetown.

There are currently seven fishing complexes in Guyana in various states of functionality. These complexes include wharf space, market infrastructure, ice facilities, lockers for storage of gear used on vessels, etc.⁸² All but two were built in the late 1980s or early 1990s through a project led by Canadian International Development Agency (CIDA).⁸³ The intention was that these complexes would be managed by cooperatives, but at this time, five are noted to be managed by members of cooperatives, one by the government and two by private companies. None of the groups are reported to pay fees to the government and it is unclear which parties are responsible for providing services and repairs at the complexes. Noted in multiple documents is the need for upgrades to the facilities, including docks (wharves), ice, market structures, and more.⁸⁴

There are other informal landing sites than the fishing complexes. The amount of fish being landed at these sites versus the complexes was not provided by the Fisheries Department. A complete list of landing sites or a list of available infrastructures for the coastal regions was not made available. This uncertainty constitutes a risk that could be resolved by analyzing data from the Fisheries Department.

⁷⁹ Liverpool, E. *Sharks and Rays Scoping Study for the Artisanal Fisheries Guyana*. Presentation. 2016.

⁸⁰ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

⁸¹ Personal Communication. Pamashwar Jainarine, UCFCs Chairman and National Fisherfolk Organization President. June 2019.

⁸² Maison, D., *Management of Inshore Artisanal Fisheries in Guyana*.

⁸³ An eighth facility at No. 43 village has since been demolished.

⁸⁴ FAO. 2016. *Bioeconomics of shrimp and groundfish fisheries of the Brazil-Guianas Shelf*.

Artisanal fishers land their fish at various times of day at the landing sites and complexes, where it is offloaded and sold to buyers that either sell it at the local markets or consolidate catches and use a refrigerated truck filled with ice to transport it to the processors in Georgetown.

Region 6 has four main landing sites identified by fishers at the project workshop. The UCFCs site in No. 66 village is the only one in the country that uses an auction system to sell their fish. The auction starts at 6 a.m. and generally concludes before 8 a.m. The cooperative operates the facility, which is well-equipped.

Their main limitation is dock space; their facilities are located on the banks of a river that is approximately 10-20 meters wide at that point, which naturally limits their space for docking vessels at their facility. They have an ice machine that was purchased within the last three years, a dry goods shop, a covered landing and auction area, concrete parking and unloading area, locker space for gear, a generator capable of supplying electricity to the entire complex and repair shop areas. A large amount of plastic debris was noted in the ditches around the cooperative, indicating a possible lack of handling for waste or a low awareness of the need to responsibly dispose of plastics.

Region 5 has three main landing sites identified by fishers at the project workshop. Three Door Koker and the CIDA built complex at Rosignol in June lack many of these items the UCFCs has been able to purchase and install at their site. Infrastructure information about the other site was not available. Rosignol has ice machines, but may need additional machines to meet demand. The docks are in various states of repair, and only part of the unloading area is covered. The parking and unloading area is a mix of broken concrete and exposed soil. The co-op at Three Door Koker has been negotiating for at least the past 6 months with the local government agricultural agency to lease the building at their landing site, but has yet to sign a contract due to delays. Three Door Koker lacks docks, ice machines and numerous other items.

Figure 4 UCFCs landing and auction area, June 2019. Photo credit: Annalise Bayney



Figure 5 Vessel loading and unloading area at Three Door Koker. Photo credit: Annalise Bayney



Figure 6 Vessel put-in at Three Door Koker. Photo credit: Annalise Bayney



Figure 7 Refrigerated, insulated trucks used for fish transportation at Three Door Koker. Left photo is the interior of the vehicle with fish iced in a forward hold. Photo Credit: Annalise Bayney



Region 2 representatives reported having 10 landing sites. Fisheries department identifies two of these, at Charity and Lima, as being built in 1994 and 1995, respectively, by CIDA. There are reported to be 6 ice machines in the region. Approximately 30% of volume of finfish in this region is reported to be landed by fishers that go out for daylong trips and the remaining 70% by those that go out for longer trips of 10 to 12 days, as in regions 5 and 6. The dayboats sell to the local markets at prices that are 20% higher than the prices paid by the 3 local middlemen who sell to PSI and R & S in Georgetown.

Other Infrastructure

Industrial finfish from the seabob trawlers is landed at processing facilities on the Demerara River.⁸⁵ One of the industrial processors recently closed,⁸⁶ leaving seven large processing facilities, and 23 smaller processors.⁸⁷

At the time of the 1996 National Development Strategy, about 80 percent of the finfish landed by the artisanal fishery was sold fresh or fresh on ice. Of the remainder, three-quarters was processed by industrial processing plants into frozen products and what was left was processed into dried or smoked products by cottage industries.

Management and governance

Fisheries management in Guyana is governed by international, regional, and national frameworks. Guyana has ratified United Nations Convention on the Law of the Sea (UNCLOS) in 1993 and Port State Measures as of 2016. Guyana and neighbor Suriname are non-

⁸⁵ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

⁸⁶ <https://www.stabroeknews.com/2018/news/guyana/06/06/b-e-v-to-close-seafood-processing-plant/>

⁸⁷ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

contracting cooperators to International Commission for the Conservation of Atlantic Tunas (ICCAT).⁸⁸

In terms of regional frameworks, Guyana is a member of the Caribbean Community (CARICOM) and the Western Central Atlantic Fishery Commission (WECAFC). The Caribbean Regional Fisheries Mechanism (CRFM) is an institution of CARICOM. As a CARICOM member, they are part of the CRFM, which has agreed to Caribbean Community Common Fisheries Policy. The Ministerial Council is the highest decision making body of the CRFM, and is responsible for formulating fisheries policies. In May 2018, the Ministerial Council approved the Protocol on Securing Sustainable Small-Scale Fisheries for Caribbean Community fisherfolk and societies.^{89,90} These are based on FAO's *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*.^{91,92}

Another regional body, the Caribbean Network of Fisherfolk Organisations (CNFO) is relevant to artisanal fisheries, especially if fisheries cooperatives become more active in co-management. Guyana has selected a representative for CNFO.

Guyana actively participates in these regional frameworks. However, the management system lacks the capacity to cooperate effectively with other countries with regard to some aspects of fisheries management, such collection and sharing of data for shared fish stocks.^{93,94}

The Fisheries Act (2002) is the primary law governing fisheries management in Guyana. Please refer to the Rapid Assessment for a more detailed review of the management and governance of Guyana's fisheries. There are plans and/or rules in place to address stock health and move the fisheries of Guyana towards the key enablers of increased value in sustainable fisheries (secure tenure, sustainable harvests and robust monitoring and enforcement).⁹⁵ Presently, however, the fisheries are largely open access, operate without harvest control rules, and lack a robust monitoring and enforcement program. Because of these latter conditions, there is little framework to prevent illegal, unregulated or underreported (IUU) fishing.

Guyana's fisheries are managed by the Fishery Department of the Ministry of Agriculture. There is overlap with the Maritime Administration Department (MARAD) who is responsible for

⁸⁸ <https://iccat.int/en/contracting.html>

⁸⁹ FAO. 2016. *Caribbean Fisheries Legal and Institutional Study: Findings of the comparative assessment and country reports*, by Cristina Leria. FAO Fisheries and Aquaculture Circular No. 1124. Bridgetown, Barbados.

⁹⁰ <https://today.caricom.org/2018/10/15/fisheries-ministers-approve-climate-change-protocol-for-crfm-member-states/>

⁹¹ https://www.cavehill.uwi.edu/cermes/getdoc/6260bf59-7f92-4cd4-bd39-3df9bb6b3d3d/draft_ssf_protocol_15jan18.aspx

⁹² <http://www.fao.org/3/i4356en/I4356EN.pdf>

⁹³ Drugan, *Rapid Assessment*.

⁹⁴ FAO. 2013. *Case Study on the Shared Stocks of the Shrimp and Groundfish Fishery of the Guianas-Brazil Shelf. Stakeholder and institutional analysis*. CLME Case Study on shrimp and groundfish. Report No.3, Rome, FAO. 2013. 74p.

⁹⁵ Holmes et al, *Towards investment in sustainable fisheries*.

inspections and survey of vessels, among other duties;⁹⁶ the VPHU of the Ministry of Public Health who has responsibility for human health through minimization of the risk of zoonoses;⁹⁷ and the Coast Guard who has responsibility for enforcing safety and legality of vessels navigating the coast of Guyana.

There is a fisheries management plan for the time period 2013 to 2020 which contains more detailed plans for management of seabob, prawn, red snapper, sharks and artisanal fisheries at large. Participatory management exists in the seabob fishery through the Seabob Working Group (SWG) and inland fishery for arapaima.⁹⁸ To facilitate stakeholder involvement in decision-making, a Fisheries Advisory Committee (FAC) with representation from government institutions and fishers' groups was established in 1986.⁹⁹ Other than these, management is hierarchical.

The seabob fishery is recommended for certification against the Marine Stewardship Council (MSC) standard as of May 2019.¹⁰⁰ As a result of the efforts to attain MSC certification, the industrial seabob fishery has moved towards adopting the key enablers and drivers of sustainable fisheries.¹⁰¹ For example, Guyana has applied harvest control rules in seabob industrial trawl fishery and has a no-trawl rule for inshore areas and seabob trawlers operate from 8 to 18 fathoms.^{102,103} Additionally, there are limits to the number of licenses for the seabob fleet (87 per the management plan) and harvest control rules pertaining to seabob.¹⁰⁴ These measures are not in place for artisanal fishers, but the concepts are familiar to artisanal fishers and the Fisheries Department has experience with defining, implementing and enforcing management rules.

Fishing licenses are required to legally access the marine fisheries of Guyana. Vessel licensing is carried out on an annual basis and requires the fisher to pay a fee of GYD\$ 400 per foot of vessel length (approximately USD\$ 35 for a 20 foot vessel and USD\$ 95 for a 50 foot vessel), complete a form and provide their national i.d. ^{105, 106} Fisheries officials perform limited field visits for the purpose of licensing that are advertised locally, otherwise, license seekers must visit Georgetown to obtain a license. Field visit frequency varies by region. Captain licenses

⁹⁶ <https://marad.gov.gy>

⁹⁷ <http://health.gov.gy/index.php/programmes/dct/vpht>

⁹⁸ FAO. 2016. *Caribbean Fisheries Legal and Institutional Study*.

⁹⁹ Drugan, *Rapid Assessment*.

¹⁰⁰ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

¹⁰¹ Holmes et al, *Towards investment in sustainable fisheries*.

¹⁰² FAO. 2016. *Report of the Workshop on Investing in Ecosystem-based shrimp and groundfish fisheries management of the Guianas-Brazil shelf*.

¹⁰³ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

¹⁰⁴ FAO. 2016. *Caribbean Fisheries Legal and Institutional Study*.

¹⁰⁵ Ibid.

¹⁰⁶ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

can only be obtained in Georgetown.¹⁰⁷ Monitoring and enforcement are limited.¹⁰⁸ Approximately half of existing vessels were licensed as of 2017.¹⁰⁹

Organizational capacity

Ensuring that fishing enterprises have adequate recordkeeping for business purposes, access to good logistics and infrastructure for market access, and strong partnerships with local businesses will contribute to the durability of improvements associated with operational efficiencies and markets.

Organizational capacity of entities within the fisheries supply chains in Guyana varies. Of the three active and robust fishery cooperatives (see below), one of them has high organizational capacity. Given the level of exports, their time in business, and the nature of the operations, the organizational capacity of the major exporters, PSI and Noble House, is considered to be at least medium to high capacity, with some potential operational issues related to quality. Though there are insufficiencies of organizational capacity, there are potential investible entities with sufficient capacity and that could be strong candidates for a lead firm¹¹⁰ approach to improving the fisheries.

Aside from the aforementioned entities, an industry group, the Guyana Association of Trawler Owners and Seafood Processors (GATOSP) was formed on 15th September 1999. The Association is made up of Noble House Seafoods, PSI and Gopie Investments, and smaller companies and individuals.¹¹¹

Supporting the value chain, some Fisheries Department staff have deep knowledge of the fishery. However, much of the staff is reported to have less than ten years' experience and little to no training in fisheries; therefore, the current organizational capacity of the Fisheries Department is not sufficient to ensure sustainable harvests and robust monitoring and enforcement.^{112,113, 114}

Please see Appendix 4 - Value Chain for additional information.

¹⁰⁷ FAO. 2013. *Report of the National Consultation in Guyana*.

¹⁰⁸ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

¹⁰⁹ *Fisheries Department Annual Report 2017*.

¹¹⁰ <https://www.marketlinks.org/good-practice-center/value-chain-wiki/leverage-through-lead-firms>

¹¹¹ Southall, T., Addison, J., and Keus, B. 2019. *Marine Stewardship Council Fisheries Assessment*.

¹¹² Maison, D., *Management of Inshore Artisanal Fisheries in Guyana*.

¹¹³ *Marine Fisheries Management Plan 2013-2020*.

¹¹⁴ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

Cooperatives

There are five legally incorporated fishing cooperatives reported to be active in Guyana.¹¹⁵ Of these, one was formally interviewed during the field visit for this project - the Upper Corentyne Fishermen's Cooperative Society. This cooperative operates the fishing complex in No. 66 Village in region 6, bordering Suriname and is considered a high capacity cooperative, functioning as a successful business with an active board for at least the past three years. The cooperative actively records landings data which it reports to the Fisheries Department; however, they report that they do not see the analytical results of their submissions.¹¹⁶ They are also the only landing site that is reported to have an auction process for fish sales.

Cooperatives in Rosignol and Parika are reported to be active.¹¹⁷ A newer cooperative at Three Door Koker in region 5 is working to improve their landing site and increase their capacity, but as yet they do not have a functioning board of directors or regular meetings.¹¹⁸

Under Guyana law, cooperatives are not allowed to take loans. UCFCS recently completed upgrading to their vehicle loading area and parking lot, which was funded by members of the cooperative, as was their nearly \$ 50,000 match for the ice machine purchased through the Global Environmental Facility (GEF) Small Grants Program.¹¹⁹ The data reporting mentioned above is part of this same grant programs as is funding for onboard GPS systems.

¹¹⁵ Personal Communication. Pamashwar Jainarine.

¹¹⁶ Ibid.

¹¹⁷ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

¹¹⁸ Personal Communication. Three Door Koker Cooperative Representative. June 2019.

¹¹⁹ <https://sgp.undp.org/spacial-itemid-projects-landing-page/spacial-itemid-project-search-results/spacial-itemid-project-detailpage.html?view=projectdetail&id=23736>

Cooperatives have been legally recognized in Guyana since 1834. Their capacity has varied over time, with more recent efforts to build their capacity being undertaken by the government.^{120,121} Some cooperatives in the fisheries sector have reportedly become accustomed to government contributions, while others operate at a high level of capacity and are capable of generating profits.¹²²

The 1996 National Development Plan notes, “A main limitation for their [cooperatives] involvement in marketing is that the complexes do not have cold storage and freezing facilities. This is a major hindrance and, among other things, results in lower prices for fish in the outlying coastal areas, because of the difficulty of storing the fish and transporting it to Georgetown.”¹²³

The StewardFish project will implement the Civil Society Action Programme for the Sustainable Management the Shared Living Marine Resources of the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+ C-SAP) “by empowering fisherfolk throughout fisheries value chains to engage in resource management, decision-making processes and sustainable livelihoods, with strengthened institutional support at all levels.” The project will be working to improve the capacity of fisherfolk organizations, such as the fisheries cooperatives in Guyana, starting in 2019 and lasting through 2021.¹²⁴

Part of the push for improving the capacity of cooperatives is to move towards community-based fisheries management, which may help partially address the lack of capacity of the Fisheries Department and progress towards the drivers of increased fishery value. The other facet is improved livelihoods.

Given the history of the fishing cooperatives in Guyana, especially the years-long project by CIDA in the late 1980s and early 1990s, the current push towards increasing the capacity of the fisherfolk organizations will benefit from the inclusion of other value chain participants in the process. Since improvements will likely require considerable upfront and ongoing effort to build cooperative capacity, the inclusion of reputable processors, distributors and exports will be beneficial to ensure the long-term viability of the cooperatives and the sector.

¹²⁰ https://www.un.int/guyana/statements_speeches/presentation-cooperative-movement-guyana-commission-social-development-side

¹²¹ <https://www.stabroeknews.com/2018/business/06/22/guyana-and-the-cooperative-movement/>

¹²² Maison, D., *Management of Inshore Artisanal Fisheries in Guyana*.

¹²³ <http://www.guyana.org/NDS/chap31.htm>

¹²⁴ FAO. Western Central Atlantic Fishery Commission. 2018. *Inception Workshop for the Developing Organizational Capacity for Ecosystem Stewardship and Livelihoods in Caribbean Small-Scale Fisheries (StewardFish) project*, Bridgetown, Barbados, 13-14 September 2018. FAO Fisheries and Aquaculture Report. (no number assigned) Bridgetown, Barbados. 89 pp.

Private enterprises

In 2017, seven large processing plants and twenty-three smaller plants were supplied by a diverse set of middlemen.¹²⁵ Eight “annual” export licenses, valid for one exporter for an unlimited amount of shipments during the year, and 837 “individual” export licenses were issued in 2017 (individual licenses are good for a period of one month). Per the 2015 schedule, export licenses cost GYD\$ 44,000 annually or GYD\$ 2,500 for an individual license. Note that some of the 837 “individual” licenses may be issued to the same individual or business, so the number of exporters is expected to be less than 837.¹²⁶

There are two large processors, Noble House Seafoods and PSI, who along with Gopie Investments control ninety percent of the industrial seabob fleet and process much of the finfish.¹²⁷ From the time period 2010 through 2018, they accounted for half of US imports from Guyana by volume.¹²⁸ PSI also owns all six of the tuna vessels and all large shrimp or prawn vessels. Both of these horizontally integrated exporters follow Hazard Analysis And Critical Control Points (HACCP) and PSI reports that their seabob line is certified by the EU and British Retail Consortium (BRC).^{129, 130} Gopie Investments is currently undergoing BRC certification for their seabob line.¹³¹ Noble House performs preliminary processing and freezing of their seabob before sending it to the Netherlands for additional processing.¹³² A third large processor, BEV, closed in 2018, after more than thirty years of operation. The owner cited market pressure in the EU and US for sustainability credentials and the dynamics of pricing and demand as reasons for their closure.¹³³

PSI’s exports to the US accounted for nearly a quarter of the reported exports in 2016.^{134,135} Not only does PSI process fish and seabob from their own vessels, but they also purchase from artisanal fishers.¹³⁶ Fish make a reported 30 percent of the company’s sales per a 2019 news

¹²⁵ *Fisheries Department Annual Report 2017.*

¹²⁶ *Ibid.*

¹²⁷ Southall, T., Addison, J., and Keus, B. *Marine Stewardship Council Fisheries Assessment.*

¹²⁸ Urner Barry’s Foreign Trade Data. June 2019. <https://www.foreigntradedata.com/CustomsData/Product>

¹²⁹ <https://www.psigyinvest.com/about>

¹³⁰ Personal Communication. Sueellen Ewing-Chow. PSI. September 2019.

¹³¹ Personal Communication. Mahendra Ram, Gopie Investments. September 2019.

¹³² <https://www.heiploeggroup.com/en-us/company/heiploeg-companies/noble-house-seafoods>

¹³³ <https://www.seafoodsource.com/features/dark-clouds-on-horizon-for-guyana-s-flourishing-seafood-sector>

¹³⁴ FAO. 2018. *Fishery and Aquaculture Statistics.* (FishstatJ).

¹³⁵ <https://www.foreigntradedata.com/CustomsData/BasicSearch>

¹³⁶ Personal Communication. Fishers and suppliers at Three Door Koker and Rosignol. June 2019.

article.¹³⁷ From January 2010 to July 2019, there were 342 import refusals by the US Food and Drug Administration (FDA) for shipments from PSI, primarily for filth. Of these, seventeen occurred from July 2018 to July 2019; despite the relative sophistication of their processing facilities, there are still improvements needed to ensure quality.

At the September workshop, representatives from PSI, Gopie Investments, and the VPHU agreed that improving quality was an opportunity to increase value and market reputation. They reported that the fish processing lines need additional work to comply with the same level of standards as their seabob lines. Broadly, areas needing attention include ensuring the incoming product is of a reliably high standard; constantly training new processing workers; enforcing actions against smaller processors and exporters;¹³⁸ and securing results of microbiological tests quickly. The stakeholders noted a dearth of capacity in the country for processing microbiological samples - results have to be sent abroad and take up to two weeks to process - increasing the likelihood that sanitary issues are unable to be identified and corrected quickly.

Amongst the remaining processors, Guyana Seafood Distributors (GSD) is a growing enterprise with a seemingly high capacity. Currently they are the exclusive seafood suppliers for Aurora Gold Mines, a Canadian owned firm, and the Guyana Defense Force. They have previously worked with USAID's SKYE program for youth workforce development¹³⁹ and would consider joining some sort of certification program such as Fair Trade. Their current facilities can process up to 3,500 kilograms per day into frozen, packaged product. They expect to have new facilities online in late 2019 that can process twice this amount. They also have a solar-drying facility with an output of approximately 2,500 pounds (lbs) of saltfish every two to three days.¹⁴⁰

Market potential

As global populations continue to grow, demand for high quality, healthy sources of protein like seafood is expected to increase. Despite sustained or increasing global demand, increased competition from farmed substitutes has continued to depress global prices, particularly with commodity products like shrimp and whitefish (which much of the finfish landings of Guyana would be considered). Sustainability standards, which were a source of differentiation and

¹³⁷ <https://www.seafoodsource.com/news/supply-trade/with-msc-certification-near-guyanese-seabob-firm-looks-to-european-markets-for-growth>

¹³⁸ Small exporters referenced here are those who use the individual licenses as opposed to annual licenses.

¹³⁹ <https://www.kaieteurnewsonline.com/2017/12/15/usaids-celebrates-50-years-of-partnership-with-guyana/>

¹⁴⁰ Personal Communication. Lindel Harlequin. Global Seafood Distributors. June 2019.

increased prices a few years ago, have now become necessary for market access for commodity seafood in US and EU markets.^{141, 142, 143, 144}

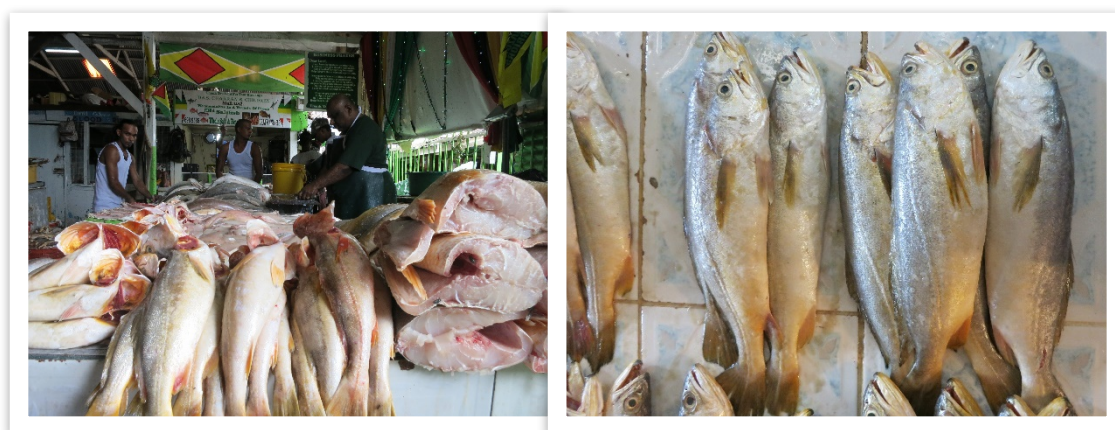
To receive a competitive price in the marketplace, Guyana will have to distinguish their finfish. Strategies for doing so should be formally evaluated and may potentially include targeted sales to the Guyanese diaspora who place a high value on food from their home country and/or a certification such as Fair Trade which is unique for whitefish products. Indeed, now that seabob has undergone MSC assessment, PSI has stated they may consider MSC certification for their fish.¹⁴⁵

Currently, Guyana is reported to export 75 and 70 percent of their industrial and artisanal finfish products, respectively. Ostensibly, the remainder of production stays local, though the composition of final forms in the local market (whole, fresh, frozen) is unknown. Fisheries Department reports they have this information, but it has not been shared with us at the time of this report.

Local markets

Local sales markets include fresh fish markets where local fish is sold whole or cut on demand, retail shops with pre-packaged frozen products such as fillets and nuggets, as well as door-to-door fish sales via truck, bicycle or similar. The local market for dried or salted fish is also important in Guyana, with consumers reporting to prefer marine finfish. Despite efforts to boost aquaculture production in the country, there has not been significant uptake to-date, further highlighting the importance of wild-capture fisheries in Guyana.

Figure 8 Fish vendor displays at the Stabroek Market, Georgetown, Guyana, June 2019



¹⁴¹ Changing Tastes, Wilderness Markets & Walker Bernardo. 2018 *Commodity Sector Activation Strategies and Recommendations for the West Coast Groundfishery*. <http://www.wildernessmarkets.com/wp-content/uploads/Commodity-Sector-Activation-White-Paper-E-Publication-Final.pdf>

¹⁴² <http://www.fao.org/in-action/globefish/market-reports/groundfish/en/>

¹⁴³ <http://www.fao.org/in-action/globefish/market-reports/shrimp/en/>

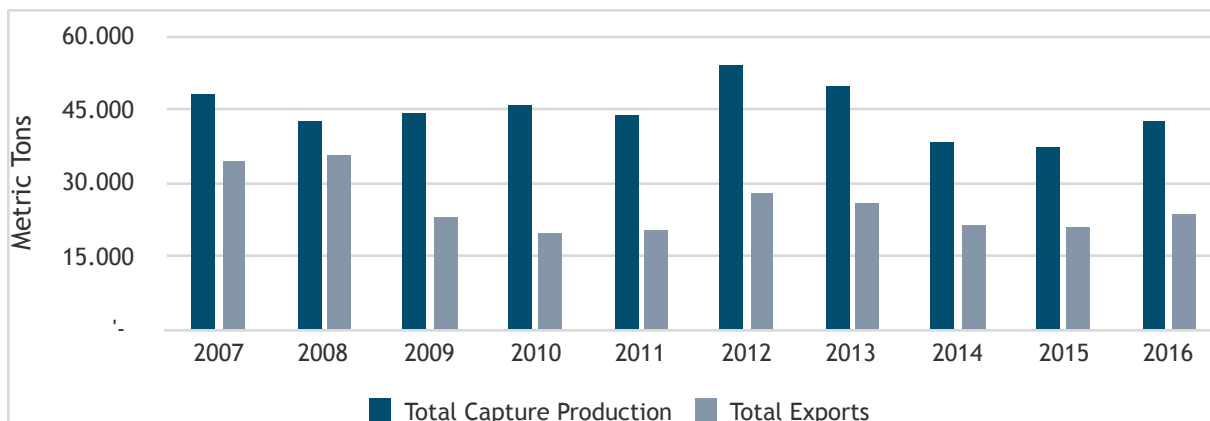
¹⁴⁴ <https://guyanatimesgy.com/300-bev-shrimp-processing-workers-on-the-breadline/>

¹⁴⁵ <https://www.seafoodsource.com/news/supply-trade/with-msc-certification-near-guyanese-seabob-firm-looks-to-european-markets-for-growth>

According to the latest information available, the 1996 National Development Strategy, at that time, about 80 percent of the finfish landed by the inshore artisanal fishery is sold fresh or fresh on ice, while of the remaining 20 percent, three-quarters is converted into frozen products by industrial processing plants. The remainder is processed into dried or smoked products by cottage industries.¹⁴⁶ From discussions with various fishery stakeholders, the poorer quality fish is generally the fish that is dried, smoked or salted. The percentage of total landings that are destined for this method of processing is reported by stakeholders to be less than 10 percent of landings by volume in regions 2, 5, and 6. The FAO plans to conduct a Fish Loss Field Test sometime in 2019 should help further delineate the amount of losses.¹⁴⁷

The estimated per capita consumption cited in the 2013-2020 Fisheries Management Plan is 54 kg per person, although FAO data for 2013 indicates approximately 15.9 kg per person of marine fish plus 12.77 kg per person of crustaceans.¹⁴⁸ Using the 2012 census numbers and the 2013 annual per capita consumption of marine finfish would amount to an annual consumption of approximately 11,800 MT, approximately 10,000 MT less than the 2013 artisanal finfish landings. This indicates there would be a surplus of fish. Using the value reported in the Fisheries Management Plan yields an annual consumption figure nearly equal to the total marine capture annual landings, much of which is exported, which would appear to indicate a deficit in the total amount of seafood available in Guyana for export and local consumption. The actual amount available for local consumption is unclear.

Figure 9 Guyana total capture production (including species other than finfish) compared to exports¹⁴⁹



Other possibilities that may help explain the possible deficit include an overestimated per capita consumption of seafood in Guyana per the management plan, underreported national landings, or perhaps a combination of both. In any case, local consumption of fish is reported to be high and important as a source of protein and part of local culture. Any attempts to increase exports should consider the effects on local supply, which will be further evaluated as part of the social assessment of the Guyana artisanal fishery in November 2019.

¹⁴⁶ <http://www.guyana.org/NDS/chap31.htm>

¹⁴⁷ Personal Communication. Addevi Persaud. Programme Consultant, FAO Guyana. July 2019.

¹⁴⁸ <http://www.fao.org/faostat/en/#data/CL>

¹⁴⁹ FAO. 2018. Fishery and Aquaculture Statistics. (FishstatJ).

Figure 10 Fish vendor displays at the Stabroek Market, Georgetown, Guyana, June 2019



Interestingly, though fish are kept on ice on most vessels, they are not kept on ice when sold; one reason cited for the lack of ice when selling fresh fish is that the use of ice is connoted with poorer quality fish approaching the end of its useful shelf-life.

Table 6 Comparison of reported pricing for wholesale and retail prices.¹⁵⁰

SPECIES	ANNUAL WHOLESALE PRICES \$/LB			RETAIL PRICES \$/LB		
	2016	2017	2018	2016	2017	2018
BANGAMARY	0.53	0.57	0.56	0.88	1.10	1.15
BUTTERFISH	0.70	0.75	0.66	1.15	1.54	1.53
CATFISH	0.31	0.33	0.42	0.60	0.74	0.67
GILLBACKER	NA	2.77	2.06	5.07	5.13	4.98
GREY SNAPPER (SMALL)	NA	NA	0.57	NA	NA	NA
GREY SNAPPER (LARGE)	1.55	1.78	1.70	2.62	2.70	3.21
KING FISH	0.82	0.85	0.70	1.45	1.45	1.44
SEA TROUT (SMALL)	NA	0.87	1.13	NA	NA	NA
SEA TROUT (LARGE)	1.09	1.12	1.29	1.21	1.82	1.58

¹⁵⁰ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

The table of prices compares the reported wholesale prices as compared to retail prices. The retail price represents the price to the consumer for whole fish. The wholesale price is the price paid to the fishermen by wholesale buyers, also known as middlemen. Following conversations with the Fisheries Department, it was noted that retail prices are gathered once per month in each of the regions by going to retail outlets such as the fresh markets and asking vendors for pricing information. In general, the pricing differential aligns with what was reported during the field visit.

Prices paid to fishermen from local small vendors are reported to be twice that of wholesale, but the volumes purchased are much lower. In general, wholesalers are purchasing enough fish to fill their trucks, anywhere from a few thousand up to 15,000 kg, compared to local vendors who purchase enough to fill the back of their vehicles, generally 50 to 100 kg. Poorer quality, or spoilt, fish is sold by the piece, with a 10 to 15 lb fish in region 6 sold for \$ 0.32 to 0.71/lb or about half the wholesale price. In this same region, spoilt fish was about 10 percent of landings for the previous month. This was said to be higher than normal due to much of the catch being first taken to Suriname because it was caught using a Surinamese license.

Fishermen reportedly will sell to whomever has the highest price, with a preference for a buyer who can purchase their entire lot and pay immediately, in cash. The UCFC is reported to be the only landing site in the country with an auction process for their landings.¹⁵¹

The latter dynamics highlight the tremendous potential to streamline the sale of finfish in local markets where fishers receive higher prices, particularly through formal commercial agreements with local buyers. Guyana Seafood Distributors (GSD) has already capitalized on this model by exclusively supplying to Aurora Gold Mines.

As Guyana develops, particularly in light of the potential increases in GDP due to the development of oil and gas in the EEZ of Guyana, there may be opportunity to increase the monetary value of Guyana's finfish through sales to local end buyers like hotels and food service groups willing to pay a premium price for locally produced seafood. This strategy aligns with aforementioned contracts GSD has with in-country providers. Guyana Tourism Authority indicated they are willing to help support these connections and provided contacts with the local hotel groups.

Export markets

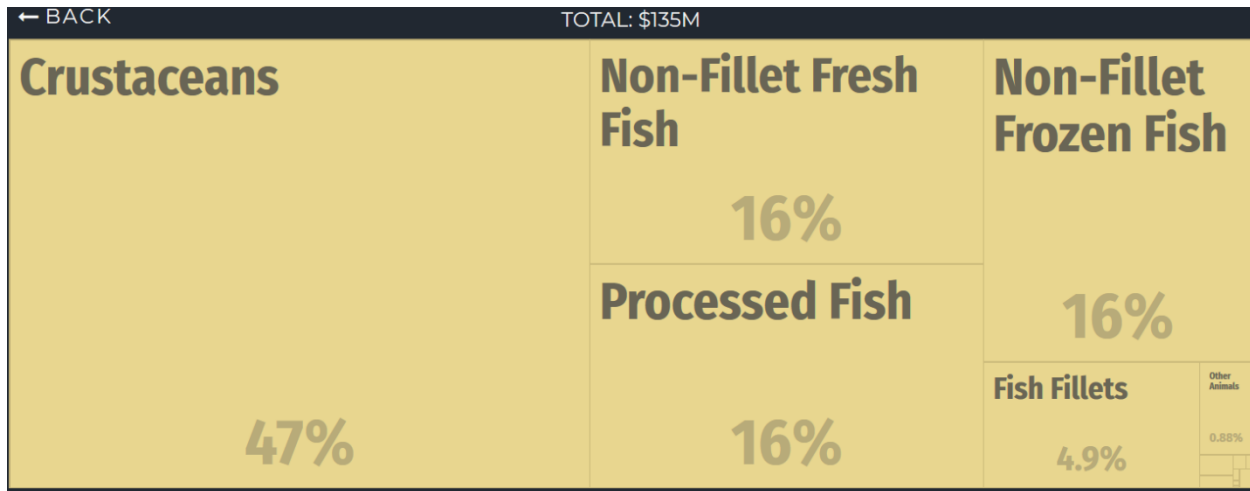
In 2017, nearly 90 percent of finfish exports were in the form of frozen, either whole or headed and gutted with a reported value of \$ 1.04 per pound.¹⁵² Exports of seafood, including seabob, represented more than five percent (\$ 135 million) of the value of all exports (\$ 2.05 billion) in 2017.¹⁵³ Per the 2015 fisheries annual report, the majority of fish exported that year by individual licensees was identified as grey snapper (approximately 300 MT).

¹⁵¹ Personal Communication. Fishers and suppliers at UCFC, Three Door Koker and Rosignol. June 2019.

¹⁵² Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

¹⁵³ <http://atlas.media.mit.edu/2aajt3>

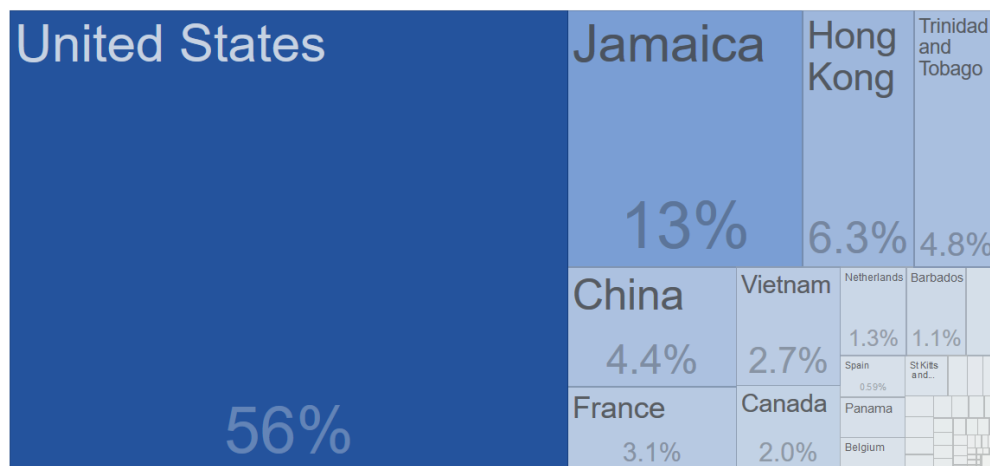
Figure 11 Animal product exports from Guyana, 2017¹⁵⁴



The reliance on the export market for domestic fishery profitability is high. In both region 2 and 6, they report that 90% of landings from multi-day gillnet or seine vessels are bought by local middlemen (three in region 2 and three in region 6) that take finfish to processors in Georgetown, primarily PSI, R & S Shipping and numerous small buyers that use individual export licenses and ship one container at a time.

In 2017, Guyana’s seafood exports, by value, were primarily destined for the Americas (79 percent), Asia (15 percent) and Europe (6.2 percent), according to the United Nations COMTRADE database on international trade. Of these, the US and Jamaica were the main trade partners. Crustaceans, primarily seabob, was the primary export by value, followed by non-filleted fresh and frozen fish.

Figure 12 Guyana exports of fish, crustaceans, molluscs, aquatics¹⁵⁵



¹⁵⁴ <http://atlas.media.mit.edu/2aajt3>

¹⁵⁵ <https://tradingeconomics.com/guyana/exports/fish-crustaceans-molluscs-aquatics-invertebrate>

The US is the primary destination for Guyana’s seafood exports; in 2018 Guyana ranked 33rd and 39th for volume and value, respectively, among countries the US imports from. The simple unit value of all 2018 US seafood imports from Guyana (total volume divided by total value) lags neighboring Suriname, Venezuela and Brazil by about a dollar per pound, ranging from a difference of \$ 0.77 to \$ 1.35. The causes of the fish value differential between countries in the region were discussed at length at the stakeholder engagement workshop in September 2019, and are summarized in the Value Proposition Section below, under “Strategy 2: Improve Market Value”. This may be a function of the mix of species exported by each country although the causes are unclear. Fisheries Department has export data by species that could help identify the differences.¹⁵⁶

Guyana’s primary exports to the US are seabob and shrimp, followed by the US import category of “Marine Fish Not Specified” (Marine Fish NSPF). Bangamary, sea trout, grey snapper, and others are all included in the Marine Fish NSPF category. Guyana is the 14th ranked supplier of non-specified marine fish to the US, a category that includes whole and filleted fish both frozen and fresh. The overall trend of lower value for Guyana fish compared to its neighbors is also reflected in the unit values for Marine Fish NSPF.¹⁵⁷

This lower ranking will present significant pricing challenges for Guyanese seafood exports which will have to compete against other countries with higher volumes of seafood exports to the US in order to escape the commodity trap. In addition, the US banned imports of siluriformes from Guyana and other countries to the US, which includes gillbacker and other catfish.¹⁵⁸ Though the motivation for the ban on siluriformes is debated (safety vs. protectionism);¹⁵⁹ the US Seafood Import Monitoring Program (SIMP) is aimed specifically at decreasing IUU for products commonly imported into the US.¹⁶⁰ SIMP currently does not currently apply to the artisanal finfish evaluated here, but it does apply to shrimp, red snapper, and tunas, including yellowfin, from vessels over 12 meters in length or 20 gross tons.¹⁶¹ It requires value chain traceability from the vessel to the importer. The SIMP program is expected to expand to include other species in the future.¹⁶² Exporters that can comply with SIMP requirements will be at a market advantage.

Butterfish was the highest value, non-pelagic, finfish individually identified in US imports from Guyana. Unlike the nebulous marine fish NSPF which can include a range of species, this

¹⁵⁶ See the FIP Scoping Document for more discussion of solutions to identify the causes.

¹⁵⁷ National Marine Fisheries Service (NMFS). Commercial Fisheries Statistics. United States National Oceanic and Atmospheric Administration. June 2019. <https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/index>

¹⁵⁸ <https://www.kaieteurnewsonline.com/2018/03/11/us-bans-gilbacker-other-fish/>

¹⁵⁹ <https://newfoodeconomy.org/battle-bottom-feeders-paul-ryan-catfished/>

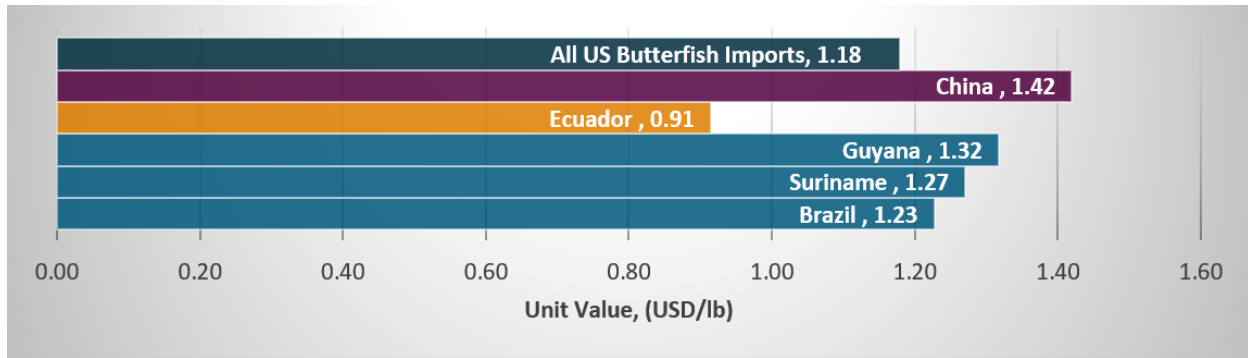
¹⁶⁰ <https://www.iuufishing.noaa.gov/RecommendationsandActions/RECOMMENDATION1415/FinalRuleTraceability.aspx>

¹⁶¹ https://www.iuufishing.noaa.gov/Portals/33/SIMPComplianceGuide_June2019.pdf?ver=2019-05-28-134131-697

¹⁶² <https://www.iuufishing.noaa.gov/Portals/33/SIMP.FactSheet.Rev2018.pdf?ver=2019-02-07-204941-770>

category allowed a more direct comparison, although did not allow for comparison by form, i.e., frozen, fillet, etc. For butterfish imports from 2007 to 2018, Guyana’s values exceed both of its neighbors (see Figure 13 below) as well as the average of all imports. In this category, it ranked 3rd in both volume and value (1,281 MT and \$3.72 million), following Ecuador and China (8,471 MT and \$ 17 million; 2,664 MT and \$ 8.3 million, respectively).

Figure 13 Comparison of US imports of butterfish reported unit values (\$/lb), 2007-2018¹⁶³



A comparison of frozen and fillet import prices to the United States by source indicate, it may be possible to improve Guyana frozen fillet from \$ 2.12/lb to a point more comparable to Brazilian or Venezuelan Frozen fillet (see Figure 14 below). This would indicate an additional \$ 1.44 per lb in export value that may be realized by competing more effectively.

The records for import refusals from Guyana, plus discussions with US seafood importers indicates there is likely a need improve the safety and sanitation of exports originating in Guyana.¹⁶⁴ Suriname and Venezuela had a far lower refusal rate US FDA from 2007 to 2018.¹⁶⁵ For every 24 MT imported, Guyana had one refusal compared to 57 MT and over 1,000 MT for Venezuela and Suriname, respectively. Only Brazil fared poorer, with 20 MT imported per refusal.

¹⁶³ National Marine Fisheries Service (NMFS). Commercial Fisheries Statistics.

¹⁶⁴ Personal Communication. US Seafood Importer. May 2019.

¹⁶⁵ Urner Barry Foreign Trade Data. June 2019. <https://www.foreigntradedata.com/ImportRefusals>

Table 7 Comparison of US imports and refusal actions by FDA as recorded in OASIS for 16 fishery/seafood products from January 1, 2007 through December 31, 2018 ^{166,167}

COUNTRY	US IMPORTS (MT)	REFUSALS	MT/REFUSAL
GUYANA	9,637	408	24
SURINAME	6,053	5	1,210
VENEZUELA	12,517	219	57
BRAZIL	18,736	923	20

Stakeholder engagement

The most recent Fisheries Management Plan for 2013 to 2020 and a 2007 report outlining a new framework for management of inshore artisanal fisheries both identify a lack of engagement at the fisher level, as well as a lack of trust.¹⁶⁸ Each of these documents proposes pursuing community based management. From our interviews with various fishery stakeholders in June 2019, the Fisheries Department could address the trust challenge by developing a communication strategy with fishers and cooperatives around current and historical landings data. This can also serve as the basis for a data driven community based management efforts.

The SWG and the national Fishery Advisory Committee (FAC) provide routine meetings that allow for diverse stakeholder engagement and guidance. SWG members meet at least once per quarter, and include representatives from the artisanal fishing sector, GATOSP members and Fisheries Department officers. Members of the FAC meet once per month and include Amerindian Affairs; Defense forces; the Chief Fisheries Officer; Agriculture Permanent Secretary and someone from Wildlife.

Despite this laudable engagement, there is a dearth of engagement within the artisanal fisheries value chain beyond the level of large processors. While the industrial trawl owners and seafood processors are highly engaged in management through the SWG, there is very little formalized engagement of any fishers, artisanal vessel owners, wholesale suppliers and buyers, market vendors, small processors or exporters. If Guyana is to shift their regulations or management frameworks, engaging these stakeholders will be important. Fishers and vessel owners can play a key role in securing stock health and transitioning to more profitable and environmentally sustainable fisheries in Guyana and should be meaningfully incorporated into fishery management as envisioned in the FIP Scoping Document.

Stakeholder roles in Guyana relevant to the artisanal finfish value chain, but not direct participants, include:

¹⁶⁶ National Marine Fisheries Service (NMFS). Commercial Fisheries Statistics.

¹⁶⁷ Urner Barry Foreign Trade Data. June 2019. <https://www.foreigntradedata.com/ImportRefusals>

¹⁶⁸ Maison, D., *Management of Inshore Artisanal Fisheries in Guyana*.

Table 8 Indirect artisanal finfish value chain stakeholders

ENTITY	ARTISANAL FINFISH-RELATED ROLES
<i>Fisheries Department</i>	Manage, regulate and promote fisheries.
<i>GATOSP</i>	Industry group representing the interests of trawl owners and processors (processors are likely directly involved in the artisanal value chain).
<i>SWG</i>	Stakeholder group focused on attaining and retaining MSC certification for the seabob.
<i>World Wildlife Fund - Guianas</i>	Ongoing role with the SWG, including stock assessments and bycatch analyses. They are also initiating marine spatial planning and gender analyses.
<i>Conservation International - Guyana</i>	Over the next ten years, CI will be investing via the “Guyana: Resilient and One (GRO) program”, in: (1) investments in education and training programs that will produce the next generation of Guyanese business, government and civil society leaders, and (2) investments in maintenance of Guyana’s critical natural heritage, with special focus on the Rupununi Wetlands, coastal mangroves, near-coastal fisheries and opportunities around the government’s commitment to establish an additional 2M ha of Protected Areas.
<i>StewardFish</i>	See box in organizational capacity section. Will be conducting training and capacity building for FFOs beginning in 2019.
<i>Veterinary and Public Health Unit (VPHU)</i>	Conducts safety inspections of processing facilities and may be able to assist with training for HACCP and other best practices.
<i>MARAD</i>	Responsible for vessel registration and should be involved with streamlining the licensing and vessel registration.
<i>Coast Guard</i>	Provide ongoing monitoring at sea.
<i>Environmental Protection Agency (EPA)</i>	Starting a unit to help manage coastal protected areas. Currently they are responsible for permits for building, operating and waste.
<i>Police</i>	Enforces the laws and legislations; violators identified by the Coast Guard are handed over to the police.
<i>FAO</i>	Providing support to revise the fisheries act and the fishery management plan. Working on gender analysis in fisheries with Dawn Maison and UWI-CERMES.
<i>WECAFC Shrimp and Groundfish Working Group</i>	Working to provide a coordinated regional management plan, including a coordinated stock assessment for the shared stocks of the North Brazil Shelf, which include groundfish. Also working on IUU.

ENTITY	ARTISANAL FINFISH-RELATED ROLES
<i>CRFM</i>	Also contributing to fisheries policy.
<i>British High Commission</i>	Working on Marine Economies Plan.

Investable entities

Investible entities are a requirement to receive funding and execute a particular business case. As noted in the organizational capacity section, a number of investable entities in the value chain do exist in Guyana, some of which may possess the capacity to implement the business case strategies identified in this document; however, their participation should be engaged through the FIP process. The FIP Scoping Document provides a valuable and relevant framework around which the private sector may be engaged. Based on this engagement and a lead firm strategy,¹⁶⁹ participants may identify firms with the capacity and interest to implement the business case. Progress toward the “confirmation of project participants” and eventual “FIP Launch” will be coordinated through the newly created task-force for Guyana’s artisanal fisheries.

The following table summarizes the existing entities in Guyana that could potentially execute the investments and interventions described herein; including whether they meet the key requirements of a viable investible entity.^{170,171}

¹⁶⁹ <https://www.marketlinks.org/good-practice-center/value-chain-wiki/leverage-through-lead-firms>

¹⁷⁰ Inamdar, N. and Tullos Anderson, J. 2016. *Guide for Return Seeking Capital Investors in Sustainable Marine Capture Fisheries*. Written for the World Bank.

¹⁷¹ While this business case has identified these as potential implementers of the described strategy and business case, no formal due diligence, credit or risk assessment of these entities has been formally undertaken. This business case is intended to provide the necessary inputs to permit one or all of these entities to collaborate across the supply chain to improve market access and address value chain inefficiencies. Should an investor determine they will proceed with an investment of this nature, appropriate due diligence and credit reviews should be undertaken.



Table 9 Basic requirements of investible entities referenced to existing Guyanese entities¹⁷²

¹⁷² Inamdar et al, *Developing Impact Investment Opportunities*.



Requirement

**UCFCS
(No. 66
Coop)** **Other
Fisher
y
Coop
s** **Guyana
Seafood
Distributo
rs** **Other
Large
Produce
rs**

<i>Legally recognized by the country of Guyana</i>	Yes	Yes	Yes	Yes
<i>Experienced management (at least two years of operations)</i>	Yes	Some	Yes	Yes
<i>At least two years of profitable operations</i>	Yes	Unsure	Yes	Unsure
<i>Business plan, including: Strategic plan, funding needs, financial analysis and projections (profit and loss/balance sheet)</i>	Yes	Unsure	Yes	Unsure
<i>Operational plan, including: strong market relationships, clear value proposition, risk mitigation strategies, scalability, firm-level and market-level upgrading strategies and premiums, and market analysis</i>	Unsure	Unsure	Likely	Unsure
<i>Activities will have measurable and meaningful environmental and socioeconomic outcomes for the local community</i>	Unsure	Unsure	Unsure	Unsure
<i>Clear opportunities to create value through impact investments</i>	Unsure	Unsure	Unsure	Unsure
<i>Meaningful engagement of local fishers in influencing management and fishery access</i>	No	No	No	No
<i>Strong recognized leader or leaders in the fishing community who influence management and stakeholders</i>	Yes	Some	Yes	Yes
<i>Financial model based on the biology and fishing efforts that shows returns</i>	No	No	No	No

Value Proposition and Business Model

In the following sections, “investments” refers to potentially return-seeking activities unless otherwise indicated.

Proposed approach and investments

A number of different scenarios were modelled as part of the development of this business case.¹⁷³ Two potential strategies were identified that could be implemented by and with existing participants in the fishery, in parallel with addressing the drivers of sustainable fisheries:

- Supply chain interventions to achieve better operational efficiency and quality
- Improvements in commercialization that drive better market value

Strategy 1: Improve Operational Efficiency and Quality

The high level of US import refusals coupled with information gathered during interviews during the field evaluations indicate product quality challenges. In addition to the comparatively high level of import refusals documented in Table 7, between 10 to 15% of landings were reported as “spoilt” by stakeholders in one region. Assuming annual landings of 29 million lbs (13,150 MT) of artisanal finfish (the lowest amount reported between 2013 to 2017),¹⁷⁴ approximately 2.9 million to 4.5 million lbs (approximately 1,315 to 2,000 MT) of fish would be considered “spoilt” and disposed of in the domestic market at approximately \$ 0.48/lb (\$ 1.05/kg).

Stakeholders advised that the main reason for the poor quality of the fish in region 6 was due to the excess time in the vessel hold, as the catch is first landed in Suriname and then the unsold catch is brought to Guyana. This is unlikely to be the case in all regions. Other causes for spoilage at the fisher level include time spent at sea, as well as unhygienic holds. Both of these would need to be verified. Throughout the supply chain, conditions affecting quality include access to ice, quality of ice, icing practices, fish handling practices, and poor understanding and enforcement of quality control at processing facilities, particularly the smaller ones. High staff turnover at processing facilities and language barriers with processing workers from Venezuela are all challenges to maintaining high quality standards.

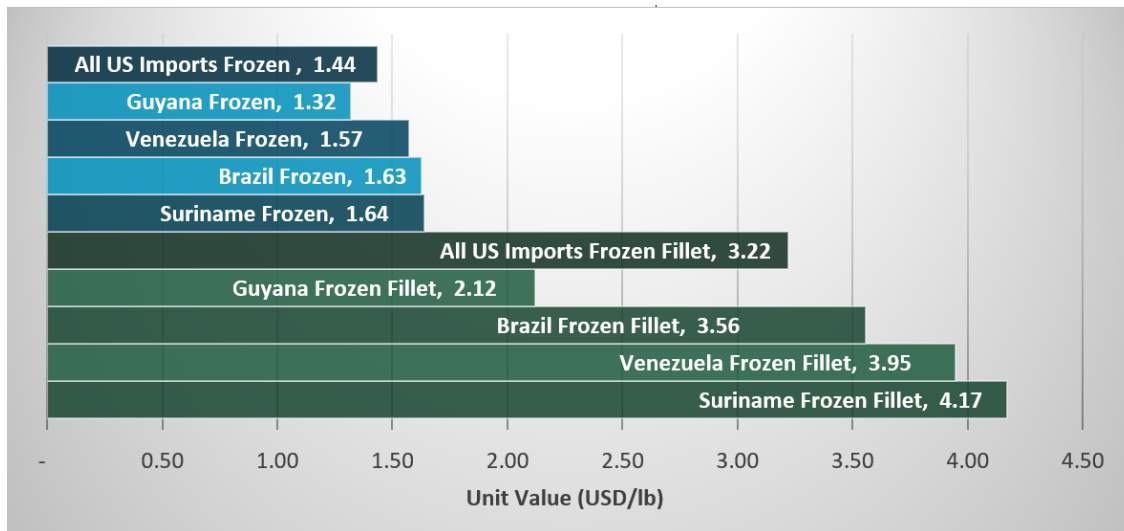
Strategy 2: Improve market value

The comparison of US import data related to frozen fillet imports indicated a discrepancy between the prices realized by Guyana in comparison to other regional exporters. While the average US frozen fillet import price was reported at \$ 3.22/lb (see figure 14 below), imports of frozen fillet from Guyana were reported at \$ 2.12/lb.

¹⁷³ Appendix 6 - Additional Financial Modelling Results

¹⁷⁴ Personal Communication. Government of Guyana, Fisheries Department. June 2019.

Figure 14 Reported unit values of Marine Fish NSPF Frozen and Fillet, 2007-2018



This difference in value, amounting to \$ 1.10/lb or a little over 50%, may present an opportunity for generating additional value for exports.

Unfortunately, it is unclear why and how frozen fillet from Brazil, Venezuela and Suriname attracts a higher price than Guyana’s frozen fillet. Industry interviews indicated that the fish species exported from these other countries were in greater demand because they are considered more appealing, i.e., the stock or species of fish is better from these other countries. It was unclear if there were other factors related to quality. Further analysis into understanding the drivers of this price difference would be necessary prior to further investment into this strategy.

The financial modeling developed as part of this business case clearly indicated that both strategies should be implemented together to optimize financial outcomes.

Differentiating landings by species would ordinarily represent a potential opportunity to escape the “commodity trap” associated with undifferentiated stocks and commodity prices.¹⁷⁵ For various reasons, that approach is not suitable in this fishery. See Appendix 3 - Differentiating by Species for further discussion.

Financial and Risk Analysis

Investment assumptions

In light of the findings of the Guyana Rapid Assessment prepared by Ocean Outcomes, and the significant risk this presents to the long term viability of this fishery, it is our recommendation to prioritize the investments that address the drivers of sustainability as identified in that document and in the FIP Scoping Document. These include a particular focus on harvest management (harvest strategy; harvest control rules; information and monitoring; assessment of stock status) and fishery specific management system (decision making processes and

¹⁷⁵ <http://www.wildernessmarkets.com/wp-content/uploads/Commodity-Sector-Activation-White-Paper-E-Publication-Final.pdf>

compliance and enforcement), all of which are considered non-return seeking interventions.¹⁷⁶ These costs are not the subject of this business case.

Note that the business case assumes one enterprise or cooperative will make the proposed return generating investments. The investment location will be dependent upon the investment entity, access to adequate volumes of fish (noting a minimum of 1,200 MT/year) and associated relevant infrastructure.

Infrastructure Investments (return seeking)

The following return generating investment opportunities for one private enterprise, cooperative or similar working in one or more landing site were identified and are included in the modeling and analysis in the following section. These improvement costs are estimated for one processor, potentially at one landing facility; depending on the needs and number of facilities, these numbers may be higher or lower.

Not included in the recommendations, but available in the appendices, is a solar generator alternative for the ice machines. See Appendices 5 and 6 for the report from GEA and modelling.

Costs were estimated based on local interviews, previous experience, reports from local stakeholders and from the internet site Alibaba.com and would need to be refined based on specific site assessments. See Appendix 7 for a full discussion and estimate of costs.

- **Improvements in Landing Facilities** - \$ 100,000 - Estimated for identified needs at sites, including unloading site improvements such as jetties, fences, reliable electricity sources, sanitary water and sewer, roofs, concrete flooring, hoists, gear storage, etc. There are needs for facility improvements in at least Rosignol and Three Door Koker; other sites may also have facility upgrading needs.
- **Improvements in Cold Storage** - \$ 50,000 - High levels of product refusals from the United States, the amount of landings reported as spoilt, and local interviews indicate a need for improvements in cold storage or freezing capacity to ensure they are HACCP compliant. The recommended assessments will provide more insight, but these investments may be needed on vessels, vehicles, and at processing facilities. VPHU indicated that many of the smaller processors do not follow HACCP procedures.
- **Ice Improvements** - \$ 100,000 - The use of sanitary, high quality ice both on vessel and during transport on shore is a critical component of ensuring that fish maintain quality prior to and during processing and export. This budget is anticipated to cover the cost of a 5-ton commercial ice maker, water intake systems and associated storage. It should be noted that reliable electricity is an issue in Guyana, and therefore this includes up to \$ 25,000 for a 250kw diesel generator to support ice production.¹⁷⁷

¹⁷⁶ Inamdar et al, *Developing Impact Investment Opportunities*.

¹⁷⁷ UCFCS recently used approximately \$ 50,000 of their own capital to purchase an icemaker for their facility with a matching grant from the GEF. Source: <https://sgp.undp.org/spacial-itemid-projects-landing-page/spacial-itemid-project-search-results/spacial-itemid-project-detailpage.html?view=projectdetail&id=23736>

- **Filleting Improvements** - \$ 100,000 - Estimated budget to purchase and install a filleting line and make necessary HACCP compliant upgrades to existing processing facilities to ensure HACCP compliant production facilities. Processing facilities buildings will need to be HACCP compliant in and of themselves, separate to the landing, ice and cold storage requirements.
- **Market Differentiation** - \$ 50,000 - Estimated budget for the implementation of the market differentiation strategies necessary to build market recognition for Guyana seafood production and to break out of the “commodity trap”. Estimates are based on our previous experience.
- **Certification** - \$ 50,000 - Based on the findings of the market differentiation strategies identified in the market demand assessment, participants may find it beneficial to adopt certification in order to effectively differentiate their products in the global marketplace.¹⁷⁸ Estimate based on recommendations for FIP implementers and Fair Trade staff. This is only the cost of certification and does include cost of improvements require to meet the standard.

Financial analysis

Model assumptions

The analysis assumes an investment in one private enterprise, cooperative or similar entity capable of implementing the strategies identified over a 5 year term and thereby serving as the “investable entity”.

Utilizing pricing information obtained in June 2019, the model includes the following assumptions:

¹⁷⁸ This investment already has interest from at least two stakeholders: PSI has indicated they may consider MSC certification for their finfish as well as trying to boost sales to the European market; Global Seafoods indicated a desire to explore certification options as well. Sources: <https://www.seafoodsource.com/news/supply-trade/with-msc-certification-near-guyanese-seabob-firm-looks-to-european-markets-for-growth> and personal communication. GSD, June 2019.

Table 10 Price paid to the fisher

CATEGORY	DESCRIPTION	EST. PRICE TO FISHER	EST. PROPORTION
WHOLESALE	Product sold to higher volume buyers and processors, some of which is exported; some of which is sold domestically	\$ 0.88/lb	80%
SMALL BATCH	Product sold to low volume middle buyers for domestic sales	\$ 1.71/lb	10%
SPOILT	Product classified as spoilt and not suitable for domestic or export sales	\$ 0.48/lb	10%

Table 11 Costs associated with operations and administration

ITEM	DESCRIPTION	COST
COLD STORAGE	Variable cost of cold storage facilities	\$ 0.10/lb
PACKAGING AND TRANSPORTATION	Variable cost of packaging and transportation	\$ 0.04/lb
OVERHEAD	Variable cost of maintaining, operating and depreciating equipment and facilities	5%
PERSONNEL	Estimated fixed annual costs for labor and personnel	\$ 100,000
RENT AND PROPERTY	Estimated fixed annual costs for rent and property	\$ 100,000
TAX	Tax on profits	20%

Financing cost assumptions integrated into the model

The assumptions include a 10% debt interest rate for lending due to Guyana's poor investment rating and country risk¹⁷⁹ and a 5% discount rate. The loans are made to cover the initial investment costs and not operating expense.

¹⁷⁹ <https://www.coface.com/Economic-Studies-and-Country-Risks/Guyana>

Revenue assumptions

For the **Conservative scenario**, a marked-up margin on the fish of 30% above what is paid to the fishers is assumed.¹⁸⁰

Spoilt	\$ 0.62
Wholesale	\$ 1.14
Small Batch	\$ 2.22

For the **Optimistic Scenario** a mark-up margin of 50% above what is paid to the fishers is assumed:

Spoilt	\$ 0.72
Wholesale	\$ 1.32
Small Batch	\$ 2.57

The **product mix** is assumed as follows:

Spoilt	10%
Wholesale	80%
Small Batch	10%

Please refer to the accompanying Excel file for a complete list of these assumptions and variables.

Scenario results

Two strategies were analysed:

- Supply chain interventions to achieve better operational efficiency and quality
- Improvements in commercialization that drive better market value

These strategies included the following potential investments:

- **Improve operational efficiency and quality**
 - o Improve landing sites
 - o Improve ice production
 - o Improve cold storage
 - o Add solar electric generation
- **Improve market value**
 - o Processing improvements to improve filleting

¹⁸⁰ The term “spoilt” is used for continuity and clarity, however; after upgrading the fish may simply be fish of poorer quality and not “spoilt”. As prices and demand for the higher quality product rise, availability of poorer quality fish is expected to decrease and prices to also rise.

- Market differentiation
- Certification

While improvements in the supply chain to improve operational efficiency are beneficial, the adoption of both strategies optimizes investor returns.

As a baseline, without any new investment and based on the assumptions above, it would take the investable entity 1,200 MT (2.4 million lbs) to breakeven. It is therefore assumed that the investable entity possesses the capacity to safely and efficiently handle this volume of fish (approximately 8.5% of reported artisanal finfish landings). If spoilt product were reduced by 5% at this baseline, that figure would be reduced to 2.25 million lbs needed to breakeven. Additional modelling and analysis is included in Appendix 7.

Improvements in quality and market value

In order to improve market value, it is assumed that the identified improvements for quality - ice, cold chain, and landing sites, totaling \$ 250,000 - are included in the proposed investment package. In addition to this, an additional \$ 200,000 is invested in processing (filleting) improvements, certification and market differentiation, which are projected to result in an increase in the product margins from 30% to 50% for the investment entity which would ideally include the fishers.

Improving landing sites is estimated to cost \$ 100,000 per site. Assuming one site, this has the impact of raising the break-even sales by 304,000 lbs (138 MT) per year to cover the investment. The breakeven volume will decline by 30,338 lbs for every 1% of spoilt product converted to a saleable product.

Improvements in Ice Production - In addition to improving landing sites, this scenario adds improvements to ice production, estimated at \$ 100,000 per site for a total of \$ 200,000. It would take an additional 609,000 lbs (276 MT) sold per year to cover this investment.

Improvements in Cold Storage - In addition to improving landing sites and improving ice, improving cold storage is included in this scenario, at a cost of an additional \$ 50,000; this total scenario would require a total \$ 250,000. Based on the above, it would require an additional 761,000 lbs (345 MT) sold per year to cover this investment.

Processing, Market differentiation and Certification - These improvements, totaling \$ 450,000 would require 1.2 million total lbs (610 MT) per year of fish sold to breakeven, the lower breakeven being a function of the higher projected margin.

Pounds to cover investment	(1,167,705)
Pounds per 1% IRR	14,789
Pounds to break-even per 1% spoilt converted	(7,920)

Table 12 Scenario - Fillet improvements, market differentiation, certification

SCENARIO	POUNDS REQUIRED	MT
BREAK-EVEN	1,220,355	610
IRR 10%	1,368,240	680
-5% SPOILT BREAK-EVEN	1,180,755	590

Analysis of Combined Approach

Introducing market oriented improvements that increase the sales prices and product margins is financially advantageous given the low value of the fishery. Judging by the significantly higher regional prices of similar seafood products, it is likely that these increases are possible.

The improved margin has the effect of reducing breakeven requirements, potentially reducing demand for product.

Gross Margin per Unit

<u>Strategy 1</u>	<u>Strategy 2</u>	<u>Gains</u>
0.08375	0.26835	220%

Gross margin per unit identifies the contribution margin each unit of production would generate after variable costs are met. In this case, the adoption of the two strategies results in a 19 cent increase in the sales margin per unit. This represents the addition dollars available to meet fixed costs and flow to profitability.

Investment model results

In each scenario, it is assumed that the investment does not go into default, for any of the reasons identified in the risk section below. With a 10% interest rate over ten years, the investor is projected to make an IRR of 8.7%.

Table 13 Modelling results for Combined Strategy

Combined Strategy	<u>Investment</u> <u>t</u>	<u>NPV</u>	<u>Net</u> <u>Return</u>	<u>IRR</u>
Improve landing sites, improve ice production, provide additional cold storage, improve processing, implement market differentiation and certification	\$ 450,000	\$ 49,459	\$ 137,411	8.70%

Potential risks and assumptions

As with any wild capture fishery, the inherent risks to resources wholly within a natural system are potentially the largest challenge to not only financial but environmental and social returns. In Guyana, the poor current status of the drivers of sustainability (stock health, sustainable harvests, and robust monitoring and enforcement) is a particular risk for this business case. The high social dependence and the limited data associated with this fishery present additional challenges as does the low value of the fishery. Finally, the political uncertainty in Guyana is not conducive to long term investments by the private sector. Additional assessment, particularly around the value chain strategies identified, would be needed to define next steps.

The risk of addressing operational efficiency and market value outside of the drivers of sustainability and a framework of fishery-wide interventions may be significant, as improvements will likely result in increased mortality. Declining catches are likely to negatively impact food security and employment, as well as incomes, livelihoods and export earnings in the long term.

Identifiable, realistic risks, plus key assumptions and mitigation are outlined in Appendix 8 - Risk Analysis. The implementation of this business case should occur in parallel with the recommendations of the FIP Scoping Document, which should create the appropriate conditions to address many of the identified risks.

Economic, social, and environmental costs and benefits

The United Nations Sustainable Development Goals (SDGs) provide a ready framework for assessing the potential intrinsic costs and benefits of the proposed interventions. Addressing export value and reducing waste and spoilage along with the proposed interventions should have some high-level benefits.

SDG alignment

The primary relevant goals are SDG 12 - Sustainable Consumption and Production and SDG 14 - Life Below Water.

SDG 12 – Sustainable Consumption and Production

Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for



all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty.¹⁸¹

Key targets include the sustainable management and efficient use of natural resources; the reduction of food waste; encouraging companies to adopt sustainable practices and to integrate sustainability information into their reporting cycles as well as support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.¹⁸²

SDG 14 – Life Below Water

As the FAO states, “ Fisheries . . . offer ample opportunities to reduce hunger and improve nutrition, alleviate poverty, generate economic growth and ensure better use of natural resources.”¹⁸³

SDG 14 specifically calls for improving access for small scale artisanal fisheries to marine resources and markets. Under this SDG, the FAO is addressing the following relevant indicators:¹⁸⁴

- **Proportion of fish stocks within biologically sustainable levels**
 - Taking proper account of fishing effort and mortality through improved data collection and traceability and then using that to advocate for appropriate fishing effort and methods in all fisheries, would reduce mortality of this depleted stocks. In the short-term, this would be an indirect effect. In the long-term, assuming appropriate management and governance, this would be directly affected.
- **Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing**
 - Implementing a data collection and traceability system, would provide a basis to reduce IUU, improve compliance with international requirements and US and EU seafood import monitoring requirements.
- **Progress by countries in adopting and implementing a legal, regulatory, policy, or institutional framework which recognizes and protects access rights for small-scale fisheries**
 - By improving data aggregation and strengthening the capacity of domestic fisher organizations, the proposed initiatives builds local capacity to recognize and protect access rights for fishers and for the relevant nations, like Guyana, to comply with relevant international requirements



¹⁸¹ <https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>

¹⁸² <https://www.un.org/development/desa/disabilities/envision2030-goal12.html>

¹⁸³ <http://www.fao.org/sustainable-development-goals/goals/goal-14/en/>

¹⁸⁴ <http://www.fao.org/sustainable-development-goals/goals/goal-14/en/>

Implementation approach

The assessed nature of the artisanal finfish fishery in Guyana lends itself to one of two potential implementation approaches:¹⁸⁵

- **Consolidated approach:** Governments negotiate agreements with a single private sector entity or cooperative to delegate fishery management responsibilities. The private firm or cooperative then simultaneously invests in fishery data, management, infrastructure, and triple bottom line enterprises.
- **Parallel approach:** A range of investors and other stakeholders (for example, governments, nonprofit organizations, fishing collectives) develop coordinated investments to improve fisheries data, management, infrastructure, and triple bottom line enterprises. Efforts can be separately funded, but they work in tandem and share the ultimate goal of achieving sustainable catch with an appropriately capitalized and profitable fishing sector.

A parallel approach is potentially more socially and politically acceptable to stakeholders. A FIP process as documented in the Scoping Document can be used, under the proposed community based fisheries management approach envisioned in the Fisheries Management Plan for 2013 to 2020. This FIP should address the drivers of sustainability as identified in the Guyana Rapid Assessment.

The proactive identification of a suitable local private firm as the “**investable entity**” with the capacity to absorb the investment capital required to implement and execute the improvements in quality and market value is a priority. The investable entity should include management capable of securing the minimum prices and margins identified in the modeling and engaging with harvesters to secure their active participation in the sustainability measures. If these are not achieved, it is unlikely that the investment will be repaid or that the business case will be viable.

The investable entity should possess the operational capacity to handle a minimum of between 600 - 1,000 MT (1.5 and 2.3 million lbs) and a secure price margins of 50% in order to ensure a reasonable breakeven. If the margin is not attainable, higher volumes of finfish will be required, jeopardizing stock health. In the event this is not achieved, either due to operational, management, social or environmental reasons, the investment in the strategy will likely not be repaid and will not be financially viable.

A range of different value chain strategies may be considered in identifying, nurturing, and engaging potential lead firms to adopt the role of the investable entity in this fishery. Parallel efforts to support cooperative development, capacity building and participation may also be beneficial. In the event this is a cooperative, the investment cannot legally be structured as a loan due to current policy in Guyana. This will present structuring challenges to ensure investors are protected and repaid.

Recommended timescale

The appropriate timescale would be defined during the development and implementation of a FIP and under the proposed community based fisheries management approach. Assuming that progress is made to address the drivers of sustainability and the risks identified in this

¹⁸⁵ Inamdar et al, *Developing Impact Investment Opportunities*.

document, the investments in operational efficiency and market value may be considered soon thereafter.

If stakeholders work in concert, it would be possible to have most interventions to improve of the drivers of sustainability in place or underway - though not necessarily achieved - within five years.¹⁸⁶

Replicability and scalability

The process used to assess the artisanal finfish fishery in Guyana is both replicable and scalable. Assessing the fishery based on the Rapid Assessment developed by Ocean Outcomes, along with the assessment of the investment opportunities developed by Wilderness Markets, provides a cost effective and rapid methodology to identify opportunities and constraints, both of which would benefit from some form of investment.

Prioritizing investments to first address the drivers of sustainability before addressing operational efficiency or market value provides the foundation to ensure long-term viability (ecological, financial and social). Coordinating the investments and interventions through a FIP provides a framework for private sector inclusion through a defined process. Importantly, this also provides market linkages, a key factor in successful value chain interventions.

The constraints, opportunities and interventions identified here are likely to be consistent across the region. The 2018 desk review of the four shared stocks of the Western Central Atlantic Fishery Commission (WECAFC; shrimp and seabob, dolphinfish, queen conch, and spiny lobster) are consistent with these findings. Although much work has been done over the years in the WECAFC region and there are promising fisheries for impact investing, many regional knowledge gaps still exist that hinder the development of sustainable fisheries. Attracting impact capital, which seeks to realize not only financial, but also social and environmental gains, requires addressing these gaps in a strategic manner in order to accelerate the region towards sustainably managed fisheries that balance livelihoods, well-being and a healthy natural environment.¹⁸⁷

Recommended solution

A number of addressable problems and potential solutions for this fishery were identified. These include public sector interventions to improve management, data and fishing gear - improvements that drive fish stock protection. If these interventions are implemented in parallel with the identified supply chain investments, the strategies identified should result in reductions in spoiled finfish, higher operational efficiencies and improved market recognition for Guyana's finfish exports.

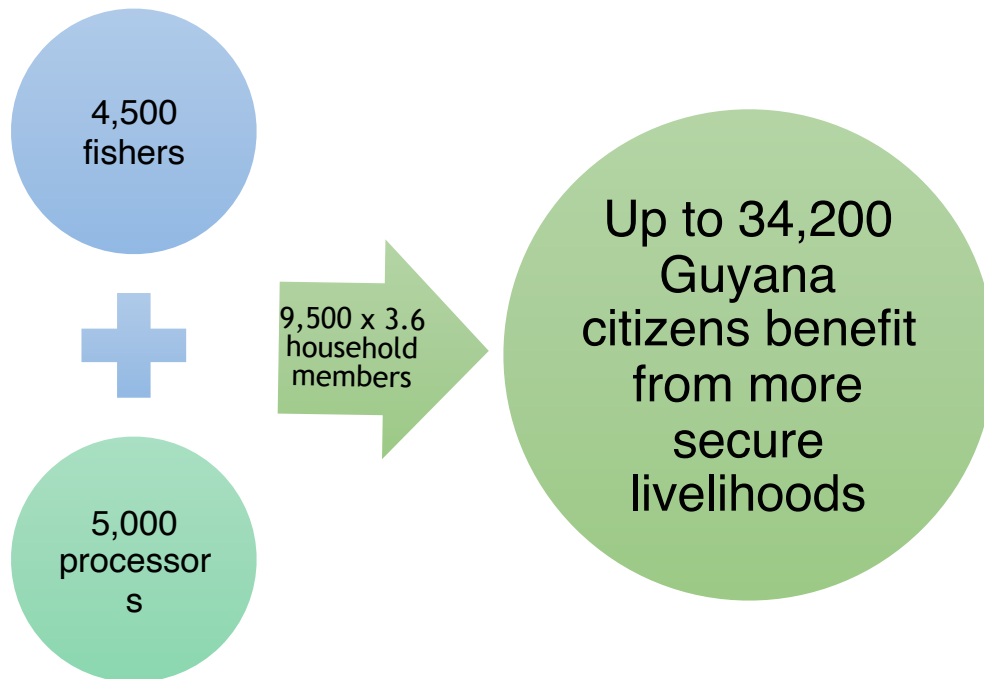
Appropriately structured, and subject to the suitable resolution of the risks identified in this document, adopting a combination of the two strategies identified will improve the likelihood of profitability, assuming a suitable investable entity or partner can be identified. Improving operational efficiency to reduce the amount of spoilt fish does have a modest positive impact

¹⁸⁶ Note that the seabob fishery, which received MSC certification in August 2019, began improvements aimed at MSC certification in May 2012.

¹⁸⁷ Wilderness Markets. 2018. *Investing in WECAFC: Considerations for the Development of RFMO Investments*. Produced for Conservation International in support of the business case development efforts in the Caribbean led by the Food and Agriculture Organization.

on financial performance. However, combining operational efficiency improvements and market value investments totaling \$450,000, combined with the public sector interventions increases the likelihood of significantly greater long term impacts for Guyana’s finfish fishery, the 4,500 fishers and 5,000 processors dependent upon it.

Figure 15 High end, inclusive estimate of potential impact.¹⁸⁸



¹⁸⁸ <https://www.paho.org/salud-en-las-americas-2017/?p=2635>

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Appendix 1 – Fishery Selection Rationale

As part of the “Technical advisory services in support of the development of scalable fisheries business cases under the CLME+ Shrimp and Groundfish sub-project”, Wilderness Markets and Ocean Outcomes were charged with identifying and developing a viable sustainable fisheries business case. The first step of this process was to identify and agree on an appropriate fishery to assess in Guyana for the business case. The terms of reference for the project provided that the “expected project impact is the improvement of fisheries governance efficiency and sustainable maximization of the contribution of fisheries resources to human well-being and socio-economic development while conserving the structure, diversity and functioning of the ecosystems with a focus on the Northern Brazil continental Shelf.”

Based on the expected impact and the focus fisheries off the larger the project, i.e., shrimp and groundfish, identification targeted a fishery that was either directly part of the shrimp and groundfish complexes or impacted them and had a meaningful socio-economic component on fishers and supporting actors, e.g., jobs, subsistence, etc. In discussions with Jeremy Mendoza, the FAO Regional Project Coordinator for CLME+ Shrimp and Groundfish Sub-Project, he reinforced the emphasis on the shrimp and groundfish fishery.

Four fisheries of a size large enough to consider for assessment are present in Guyana: seabob and shrimp, snapper, tuna, and artisanal finfish. These are summarized below.

<i>Sector</i>	<i># Active Vessels</i>	<i>Type</i>	<i>Gear</i>	<i>Reported Catch (MT) (2017)</i>
Industrial Seabob & Penaeid	81 seabob 27 large shrimp	Industrial	Trawl	21,659 (seabob) 600 (large shrimp)
Red Snapper (LL)	65	Semi-industrial	Hook & line ?	950
Red Snapper (trap/HL)	38*	Semi-industrial	Trap/HL	
Pelagics	6	Industrial	LL	417
Multi-species, aka Artisanal	1,315	Artisanal	drifting gillnets, seines; other artisanal gears	16,880 MT (finfish, seabob and shrimp)

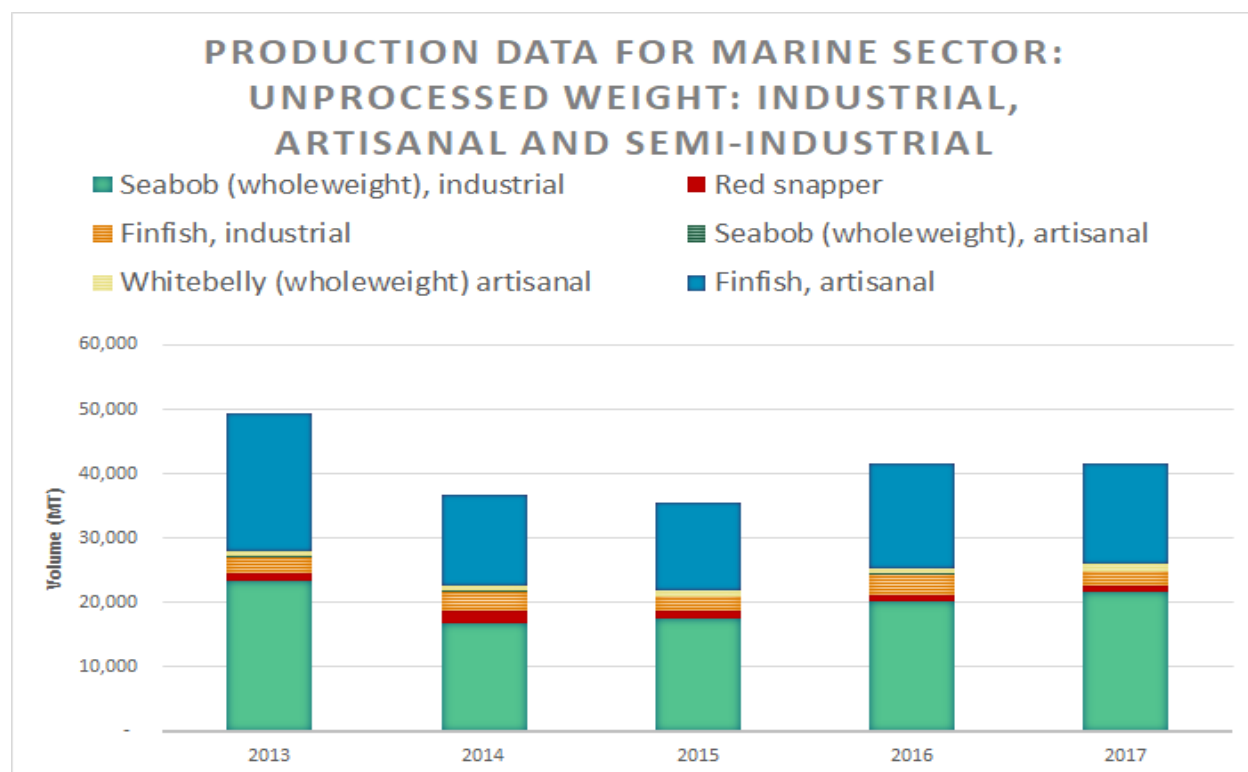
The seabob and shrimp fishery was excluded from consideration as the seabob fishery was in the process of attaining Marine Stewardship Council certification, which was confirmed as of 7 August 2019.¹⁸⁹ MSC certification is currently considered to be the highest level of verifiable environmental sustainability and thus there would be little room for measurable

¹⁸⁹ <https://www.undercurrentnews.com/2019/08/07/guyanas-first-fishery-joins-msc-program/>

environmental improvement. In addition, the fishery seems to be well-connected to end markets in North America and Europe with limited possibilities to realize more value.

The tuna fishery was also discounted as there are only six industrial vessels that currently exploit the fishery that are owned by one processor; and the tuna fishery is located one hundred miles offshore. As it is, the fishery value chain is narrow and short, with a limited number of fishers and others employed in the fishery. To expand this fishery would likely require shifting more vessels into the fishery, thus increasing pressure on the stock. Given the limited reported catch, it is unlikely that the additional investment would be justified. Overall, this is considered an expensive proposition and one with a potentially high carbon footprint and limited impact on “human well-being and socio-economic development”.

The third fishery considered but not chosen was the red snapper fishery. Mr. Mendoza and Mr. Denzil Roberts, Chief Fisheries Officer, both emphasized that the snapper fishery is relatively small (average landings from 2013-2017 were 1,215 MT); most of the catch is landed by foreign-flagged vessels, primarily from Venezuela; and sent whole to the US. The preferred form of this product is whole, gutted; thus the opportunities for upgrading in Guyana are limited. As with tuna, the supply chain is narrow and short, with few opportunities for socio-economic impact. In addition, snapper is not a subsistence fishery nor is it known to have significant overlap with the shrimp or groundfish fisheries. Thus, for reasons similar to tuna, this fishery was also discounted.



The fourth fishery considered, and ultimately selected, is the artisanal finfish fishery. It reported landings of high volumes of fish and has significant socio-economic impacts in Guyana. While the lack of licensed vessels and inconsistent data was a deterrent to selecting the artisanal sector, it was identified as the sector with the highest opportunity for impact. The six species chosen for the assessment are the most frequently landed fish in the fishery

based on 2016 catch data provided in the Marine Fisheries Management Plan¹⁹⁰ and are also the species that being assessed in a WWF-Guianas project

¹⁹⁰ Fisheries Department (MOA, Guyana). 2018b. Marine Fisheries Management Plan 2013-2020.

Appendix 2 – Data

Some of the priority data requirements needed to assemble an investment case are summarized below. Ideally, these would be available for multiple years. They were not available for review for this analysis.

Table 14 Data Points Needed for Investment Cases

Artisanal Finfish Data Point	Availability
1. Domestic consumption	Conflicted
2. Domestic consumption by species and product type	No
3. Domestic consumption by high, medium and low quality	No
4. Value of exports by species	Very Limited
5. Value of species by size/quality	Limited
6. Numbers of full-time artisanal fishers or vessels	Yes
7. Numbers of part-time artisanal fishers or vessels	No
8. Location of catch	No
9. Volume of landings by gear type and species	No
10. Value of landings by gear type and species	No
11. Discards	No
12. Bycatch rate by species	No
13. Waste and spoilage due to poor onboard conditions	No
14. Waste and spoilage due to poor shore-based infrastructure	No
15. Numbers of shore-based aggregators	No
16. Number of plants, services provided, locations, volumes processed, etc.	No

To effectively assess business businesses and investors need to be able to realistically assess risk and return. Unfortunately, fisheries rarely have robust data, especially in fisheries with limited management. This is true in Guyana, where poor data extends throughout the value chain.

The Fisheries Department, NGOs, and fishing organizations like UCFCS, the GATOSP and GSD recognize the importance of good data; the issue seems to be a combination of an

acknowledged lack of organizational capacity at Fisheries Department and a lack of a plan for implementing improved data collection.

A key concern at the resource level was lack of a reliable, trusted and robust mechanism to share stock health data with all value chain participants. This drives fisher distrust, which makes them less willing to work collaboratively with the Fisheries Department. This, in turn, makes gathering good quality data even more challenging.

A mission was completed in February 2019 to assess the current fisheries data system and the possibility of implementing a new system developed by FAO.¹⁹¹

¹⁹¹ Laurent, “Fisheries data and system assessment mission report”.

Appendix 3 – Differentiating by Species

Differentiating landings by species would ordinarily represents a potential opportunity to escape the “commodity trap” associated with undifferentiated stocks and commodity prices.

¹⁹² Of the six species identified in the complex evaluated for this project (see table below), only butterfish (*Nebris microps*) appears to meet some of the criteria identified for consideration.¹⁹³ It has a relatively short recovery period, modest fecundity and an average maximum age of 6.8 years. Unfortunately, this fish is small - averaging 23 cm at maturity. While the cuirass (*Sciades proops*) might also be potentially viable and culturally attractive, it has a very low level of fecundity, comparatively.

Other stocks included in the complex do achieve greater sizes at maturity, but take longer to achieve that maturity. They would require longer periods of limited or restricted access to recover.

Practical considerations related to this approach would also need to be addressed prior to adopting this approach:

- Available stock assessments do not provide detailed guidance on the maximum sustainable yield for this species
- Current gear and catch methods do not allow for the selective harvesting of species. The primary gear types - drift gillnet and Chinese seine - used for these species is non-selective.
- Time series data related to the location, volumes and values associated with the individual species is limited or nonexistent.

US import of frozen butterfish over the period 2007 to 2018 range from a high of 298 MT in 2007 to a low of 23 MT in 2018. Data for the same 12-year period indicate an average annual volume of exports of 106 MT, with an average value of \$ 1.32/lb for the time period. These numbers are very low and would not justify investment.

Domestic consumption figures of this species are not available.

The lack of stock data, use of selective gear, the relatively modest levels of exports, along the uncertainty regarding domestic consumption of this stock, make it challenging to provide a definitive evaluation of the viability of cost effectively differentiating this stock and rewarding value chain participants in doing so. From a financial perspective, given the low value and the low volumes, the current position would be negative. Project organizers may wish to address the issues identified prior to ruling out or adopting a differentiated stock approach.

¹⁹² <http://www.wildernessmarkets.com/wp-content/uploads/Commodity-Sector-Activation-White-Paper-E-Publication-Final.pdf>

¹⁹³ McCay, B. J., Micheli, F., Ponce-Díaz, G., Murray, G., Shester, G., Ramirez-Sanchez, S., and Weisman, W. (2014). *Cooperatives, concessions, and co-management on the Pacific coast of Mexico*. Marine Policy, 44, 49-59. doi:10.1016/j.marpol.2013.08.001. Retrieved from: <http://micheli.stanford.edu/pdf/cooperatives%20concessions%20and%20comanagement.pdf>

UoA	Species, stock	Method of capture	Age at Maturity	Average Maximum age	Fecundity	Avg size at maturity (cm)
1	Bangamary (<i>Macrodon ancylodon</i>)	Drift gillnet and Chinese seine	2.7	10.6	> 20000	23.7
	Western Atlantic from Colombia to Argentina					
2	Sea trout (<i>Cynoscion virescens</i>)	Drift gillnet and Chinese seine	3.8	18	> 20000	60.5
	Western Atlantic from Nicaragua to Brazil					
3	Grey snapper (<i>Cynoscion acoupa</i>)	Drift gillnet and Chinese seine	4	28	>20000	42
	Western Atlantic from Panama to Argentina					
4	Butterfish (<i>Nebriis microps</i>)	Drift gillnet and Chinese seine	1.7	6.8	100- 20,000	23.8
	Western Atlantic from Colombia to Brazil					
5	Gillbacker (<i>Sciades parkeri</i>)	Drift gillnet and Chinese seine	2	17	<100	60
	Western Atlantic from Venezuela to northern Brazil					
6	Cuirass (<i>Sciades proops</i>)	Drift gillnet and Chinese seine	2	4	<100	45
	Western Atlantic from Colombia to Brazil					

Appendix 4 – Value Chain Background

Information was available from various sources for the fisheries of Guyana that included some basic value chain information. Some value chain information is included below that may be helpful to readers or implementers going forward.

Table 15 List of fisheries complexes and characteristics^{194,195}

Region	Name	N	Leased to Society	Status	Project Funded
Region # 1	Morawhanna	1	Na	Government	CIDA
Region # 2	Charity	2	1994	Private companies	CIDA
	Lima		1995		
Region # 3	Parika	1	1992	Manage by members	CIDA
Region # 4	Greater Georgetown Fishermen Coop	1	1987	Mange by members	EEC
Region #5	Rosignol Fishermen Coop	1	1988	Manage by members	CIDA
	Three Door Fishermen Coop Society (Reg # 2097)		2015	Manage by members	Control by MMA
Region # 6	#66 Inshore Fishermen Coop	2	1988	Managed by members	CIDA
	# 43 Inshore Complex		NA	Structure demolished	

Other sites without complexes:

- Better Hope
- Zeeburg
- Unity/Lancaster¹⁹⁶

¹⁹⁵ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

¹⁹⁶ <http://www.fao.org/fi/oldsite/FCP/en/GUY/BODY.HTM>

Cooperatives with active membership as of June 2019 (meaning having meetings, election and books audited):¹⁹⁷

- # 66
- Rosignol
- Parika

The following information is somewhat dated - it is from 1996 - but still useful as background information for previous interventions. The source is the National Development Strategy for Guyana.¹⁹⁸

“Artisanal Fisheries Infrastructure Complexes

The Artisanal Fisheries Infrastructure Project (AFIP) was implemented from 1984 to 1993 with assistance from CIDA and the EEC. The EEC and the Government of Guyana funded the establishment of the inshore fishport complex at Meadowbank in Georgetown in 1987, while CIDA and the Government funded inshore fishport complexes at #66 and #43 on the Corentyne, and at Rosignol, Parika, Lima, Charity and Morawhanna. Of the eight complexes constructed, six have been leased to Fishermen's Cooperative Societies for management and operations, of which by far the largest is the Greater Georgetown Fishermen's Cooperative Society Limited (GGFCSL).

The objectives of the AFI Project were to:

- a) Reduce post-harvest losses and thereby increase the supply of fish to the local market and for export.
- b) Increase the productivity and incomes of artisanal fishermen.
- c) Move the existing Fishermen's Cooperatives toward the role of local organisation of producers and marketers.

These Cooperatives' complexes have to varying extents made progress toward achieving objectives a) and b), but unfortunately none of them have made any headway toward objective c).⁽³⁾

The Societies have remained uninvolved in the marketing of their members' catch. Their main roles are to supply their members with ice and equipment at cost. They also suffer from insufficient skilled and experienced management personnel and lack of working capital. (GGFCSL is somewhat of an exception to these statements.) A main limitation for their involvement in marketing is that the complexes do not have cold storage and freezing facilities. This is a major hindrance and, among other things, results in lower prices for fish in the outlying coastal areas, because of the difficulty of storing the fish and transporting it to Georgetown.”

“The development of onshore infrastructure (wharves, ramps, workshops, fuel depots, requisite shops, ice machines, and fish storage bins) at eight sites along the coast, financed by the Government with assistance from CIDA and the EEC, has been completed. Six of these

¹⁹⁷ Personal Communication. Government of Guyana, Ministry of Agriculture, Fisheries Department. June 2019.

¹⁹⁸ <http://www.guyana.org/NDS/chap31.htm>

complexes have been leased to the fishermen's cooperatives within whose boundaries they fall for management and operations. Poor management, narrow vision, and lack of capital hinder the operations of most of these complexes. Joint-venture arrangements are proposed for the remaining complexes.”¹⁹⁹

¹⁹⁹ Though this asserts a difference in price for areas outside Georgetown, Fisheries Department did not provide disaggregated price by region, a step that would be enlightening and helpful for future decision-making.

List of fishing licence fees from 2015 draft regulations:²⁰⁰

1. Annual Export Licence Fees (Large Processing Plant Fish)	G \$ 44,000.00
2. Annual Export Licence Fees (Large Processing Plant Shrimp)	G \$ 44,000.00
3. Annual Processing Plant Licence (Fish or Shrimp)	G \$ 44,000.00
4. Annual Processing Plant Licence (Small)	G \$ 34,000.00
5. Individual Export Licence	G \$ 2,500.00
6. Artisanal Fishing Licence	G \$ 400.00 per foot
7. Licence for Trawlers	G \$ 56,000.00
8. Trawler Licence EEZ (Territorial Sea)	G \$ 12,000.00
9. Red Snapper Fish Licence	G \$ 40,000.00
10. Red Snapper Fish Licence EEZ (Territorial Sea)	G \$ 12,000.00
11. Licence for a person to fish (Workman permit)	G \$ 500.00
12. Fish Pen Permit	G \$ 750.00
13. Individual Export Permit	G \$ 1,000.00

²⁰⁰ DRAFT - Fisheries Regulations 2015 - Schedule and Forms. Prepared by the Government of Guyana, Ministry of Agriculture, Fisheries Department. No date.

Appendix 5 – GEA Report on Solar Generation

Report on Renewable Energy System for the East Berbice- Corentyne Fisherman’s Association Ice Machines



Report prepared by the Guyana Energy Agency

August 2019

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Date of visit: 4th July 2019

Visit facilitated by: Andrew (Technician)

Purpose of Visit:

To inspect the existing Ice-making machines and determine the possibility of using a Solar Photovoltaic (PV) System to supply electricity to these machines.

Source of Information:

The technical specifications used in the calculations and analyses in the report were all collected from the installed equipment. Information on usage patterns and other relevant inputs were collected from the technician that facilitated the site visit.

Special thanks to Mr. Andrew for facilitating the site visit as well as providing background information and answering follow-up questions relevant to the successful completion of the report.

Equipment under consideration

Equipment	Year installed	Rated Current (Amps)	Rated Voltage (Volts)	Daily Operation (Hours)	Daily Production (pounds/ice)
Ice Machine #1 – Plate Cooling	2018	90	440	18	11,520
Ice Machine #2 – Tube Cooling	1989	70	440	18	12,960
Ice Machine #3 – Plate Cooling	1989	70	440	18	12,240
Total		230		54	36,720

Table 16 Daily Ice Production based on capacities and usage

Operating Hours/Production Schedule

The three ice-making machines are operated simultaneously under normal conditions. The machines have a 15 minutes ice-making cycle. The daily operation of the machines is as follows:

Run-Hours: 18 Off-Hours: 6

Electricity Supply to the machines

The machines are powered by a 250kVA; 3P, 60Hz Caterpillar diesel-fuel generator. The power supply equipment (diesel generator) was down for maintenance at the time of the visit and as such it was not possible to record the operating voltage and current of the machines. A more accurate assessment of the equipment operation will only be possible once the equipment is functional and the energy analyser can be connected to the supply. The energy analyzer would have allowed the acquisition of the following data:

- ✚ Operating load/Power demand in kW
- ✚ Voltage (V) and current (I) measurements at the supply circuit
- ✚ Energy consumption pattern & Energy consumption in kWh

Generator maintenance schedule

Preventive Maintenance: After 250 Hours of operation

Maintenance Required (Estimated Costs):

1. Change lubrication oil – 10 gallons (\$34,170.00)
2. Change oil filter – 2 (\$8,400.00)
3. Change fuel filter – 2 (\$11,000.00)

Total Cost of Repairs and Maintenance: \$53,570.00 per 250Hr.

Annual Maintenance Cost: \$1,392,820.00 (This value was computed for reference purposes but not used in any other considerations or computations in the report)

Equipment Energy Consumption

Equipment	Rated Current (Amps)	Rated Voltage (Volts)	Daily Operation (Hours)	Daily Energy Consumption (kWh)
Ice Machine #1 – Plate Cooling	90	3P, 440	18	987.7
Ice Machine #2 – Tube Cooling	70	3P, 440	18	768.2
Ice Machine #3 – Plate Cooling	70	3P, 440	18	768.2
Total	230			2,524.1

Table 17 Daily Energy Consumption based on capacity and usage

From the table above, the daily energy consumption was derived by multiplying the rated current, rated voltage ($\sqrt{3} \times 440V$), power factor (0.8) and daily operation hours of each equipment. The following table provides an insight into the performance of each machine.

Production vs. Energy Consumption

Equipment	Daily Energy Consumption (kWh)	Daily Ice Production (pound_ice)	Energy Intensity (kWh/pound_ice)
Ice Machine #1 – Plate Cooling	987.7	11,520	0.0857
Ice Machine #2 – Tube Cooling	768.2	12,960	0.0593
Ice Machine #3 – Plate Cooling	768.2	12,240	0.0628
Total	2,524.1		

Table 18 Energy Use Intensity of the Equipment

The energy intensity computed above was found by dividing the daily energy consumption by the daily ice production. This metric hereby shows how much energy each machine consumes to produce one (1) pound of ice. From the figures derived above, Ice Machine #2 uses about 0.06kWh to produce one pound of ice, thus making it the most efficient unit.

Based on the above table the three ice-making machines combine for an approximate daily total energy consumption of 2524.1kWh based on a combined operation of 54 hours.

The Caterpillar Generator is reported to consume eight (8) gallons of diesel per hour. This equals a daily fuel consumption of 144 gallons.

Daily fuel costs for generator operation is \$149,645; which produces a total of 36,720 pounds of ice.

Calculated Annual Fuel Costs: **\$54,620,425**

Calculated Annual Operation and Maintenance Cost: **\$56,013,245**

Estimated Annual Consumption of ice machines: 921,296.5kWh

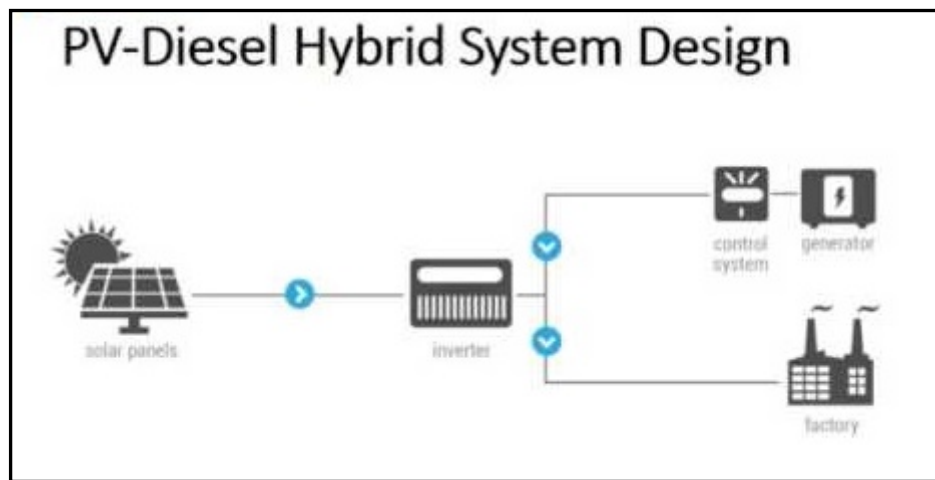
Cost per kWh: **\$60.8/kWh**

Note:

1. The monthly costs reported by the association for ice production is GY\$4,000,000.00 resulting in an annual cost of \$48,000,000.00.
2. The three (3) Ice Machines are the only loads supplied by the 250kW Diesel Generator. The other loads are supplied by the existing GPL Mains.

Solar PV System Configuration to meet electricity demand of the Ice Machines

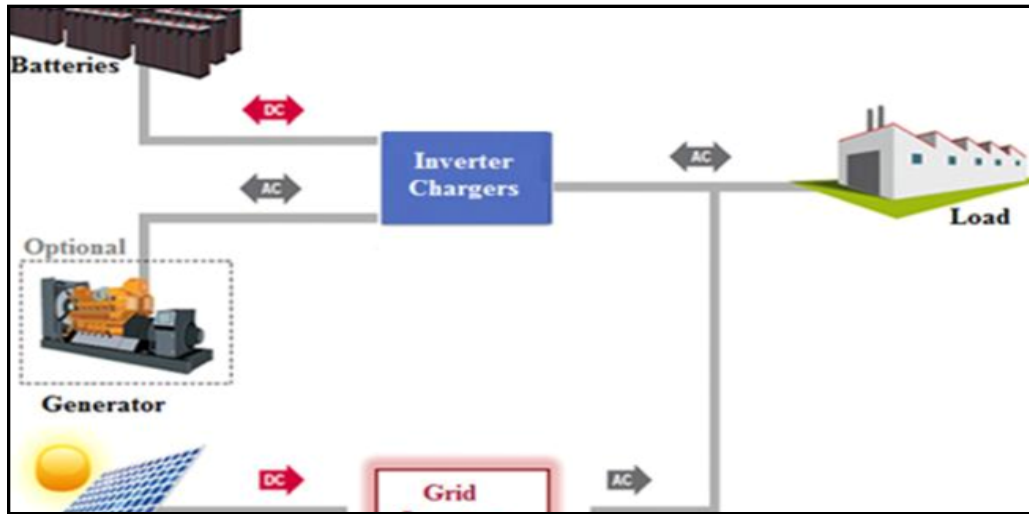
Configuration 1: Solar PV / Diesel Micro-grid



Picture 1 Integrating a Solar PV System into existing, diesel generator, supply infrastructure

The above Supply System will utilise the Solar PV generated electricity as the main supply and generator as a back-up during low-lighting conditions or when sunlight is no longer available. The key component in this design configuration is the system controller which must have the capability of monitoring the operation of the PV and diesel generators as well as the load requirements.

Configuration 2: Solar PV / Diesel and Battery Energy Storage Micro-grid



Picture 2 Integrating a Solar PV System and Battery Storage into existing, diesel generator, supply infrastructure

The above Supply System will utilise the Solar PV generated electricity as the main supply as well as to charge the Batteries. This will limit the requirement of the Diesel Generator and therefore further reduce the usage of diesel fuel in the generation of electricity. The system controller for this design configuration must have the capability of monitoring the operation of the PV and Battery Storage System as well as control the function of the diesel generator based on preset inputs such as critical battery state of charge in order to ensure effective system operation.

Solar PV System to offset 100% of electricity requirement:

Total daily consumption: **2,524.1 kWh**

Total annual consumption: **921,296.5 kWh**

Estimated Design Considerations:

Parameter	System 1	System 2	System 3
Percentage of Total Demand_%	15.6	32	79.5
Solar Array_kWp	97.242	199.886	497.013
Inverter_kW	80	180	460
Annual PV Generated Energy_kWh	143,360	294,464	731,997
Annual Energy Cost Savings \$60.8/kWh	8,716,288.00	17,903,411.20	44,505,417.60
Annual Energy Consumption_kWh	921,296.5	921,296.5	921,296.5
Area Required_m²	586.8	1206.2	2999.2
Capacity Factor_%	16.8	16.8	16.8
Estimated Net Capital_GY\$	39,034,700.00	79,953,100.00	188,954,550.00
Simple Payback	4.79	4.47	4.24

Table 19 Estimated System Design Capacities and Parameters

The above Solar PV Systems consider varying levels of renewable energy (solar PV inputs) to the electrical system at the East-Berbice Corentyne Fisherman’s Association. No amount of energy storage system/battery storage was considered in the above analysis.

The calculations are estimates of the energy production based on design simulations. The use of simulation software, namely PVSOL 2017 and SAM (System Advisory Model) was employed in the derivation of the various solar array sizes based on the demand percentage (%) and estimated PV energy

production. Final system output and costs will depend on the equipment selected and values presented by selected contractors/system designers.

The Percentage of Total Demand, offsets diesel consumption, but does not cover 100% of the energy demand. Hence the diesel generator will be required to meet the shortfall in RE generation by the Solar PV System.

As shown above, because of the size of the demand of approx. 230A, 415V, 3Ø; any system required to offset the generator usage and fuel consumption could be costly. In order to reduce the amount of diesel fuel utilized, an investment geared towards a cheaper means of electricity production should be considered. This option should also consider the optimization of use of the amount of space available. The Solar PV System capacity provided above shows both the area required for the Solar PV Array as well as the capital investment needed. The corresponding energy production for the various systems provided, savings to be derived and the Payback Period are also provided.

Limitations/Key Considerations

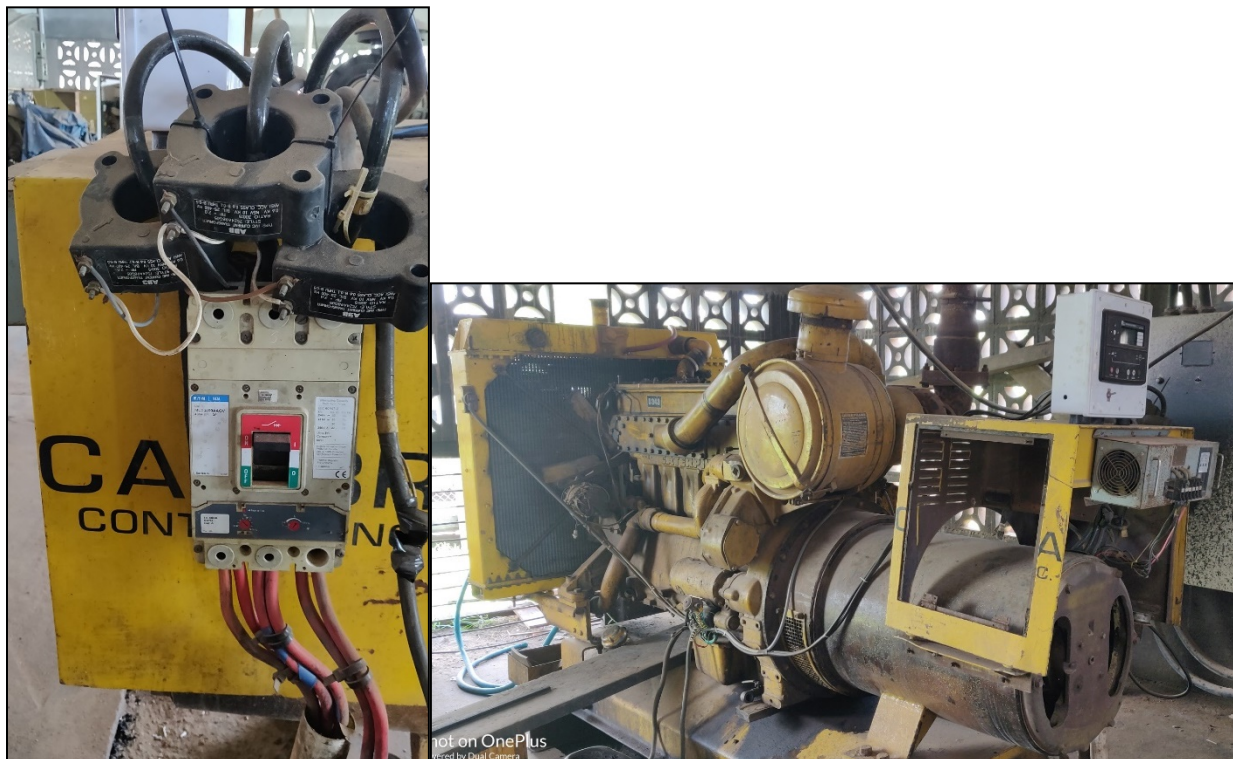
1. Space availability – this is a major consideration for this project since space availability for mounting of the Solar PV Array is limited at the present location. As shown in the table above the space requirement varies as the system installed capacity increases and as such could be a key determinant in the final decision on the Solar PV System
2. Required system upgrades before Solar PV System installation – the existing electricity supply for the Ice Machines is 250kW diesel generator. In order to integrate the use of a proposed Solar PV System, the PV System and the generator will be required to communicate in meeting the energy consumption requirement of the Ice Machines. This will require upgrading of the existing generator controls and the implementation of an energy management system which will operate as a micro-grid with two sources of supply.
3. The generator usage will be still be required unless a Battery Energy Storage System is implemented along with the Solar PV System. Based on the current operation of the Ice Machines, electricity will be required during periods of no/low sunlight when the Solar PV System will not be able to meet the demand. As such a Battery Energy Storage

System or the standby generator will be required to meet the shortfall in PV generated electricity.

Recommendations

1. Upgrade the knife-switch to circuit breakers so that the #1 and #2 Ice Machines can be fitted with star-delta soft start circuits.
2. Install soft starter to the machines to reduce the start-up current draw during the cycling in of the machines. The use of soft starter currently exists only on the #3 Ice machine and the same should be applied to the #1 and #2 Ice Machines to help to reduce the overall electrical load.
 - a. The star-delta soft starter mechanism reduces the load and torque in the power train and electric current surge of the motor during start-up.
 - b. This high motor start-up current can be 7-10 times the running current and results in increased costs of operating the equipment and can reduce the useful life of the machine.
3. Service the generator to enable more efficient operation and optimal fuel consumption
4. Ensure that the insulation on the equipment is always in place to reduce loss of cooling energy which would place more burden on the ice-making machine compressor and motors
5. Another method for reducing the overall system demand would be to shift the system operation so that all three machines are not required operational at the same time. This would reduce the system load and the capacity of the PV System required to meet the demand. This approach should however consider optimal loading of the diesel generator to prevent the generator set from operating at low loads for long durations.

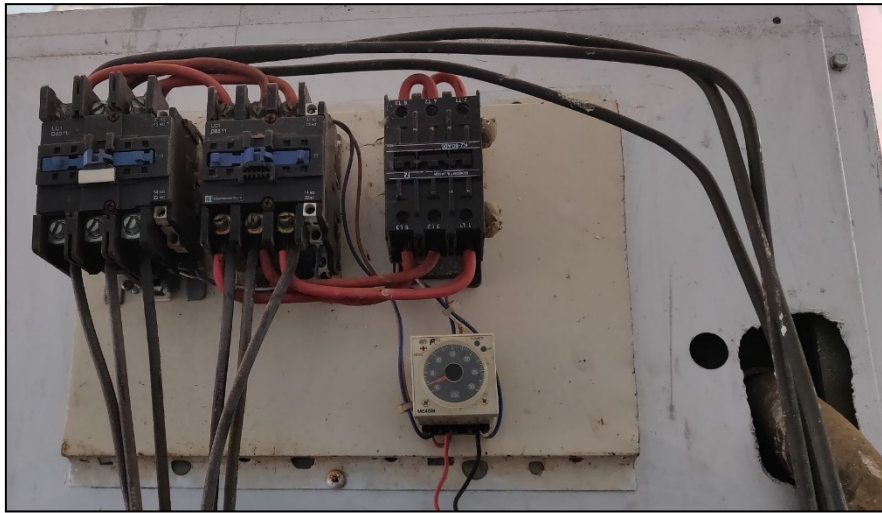
Photographs of Equipment installed at the Fisherman's Association Facility



Picture 3 250kW Caterpillar Generator powering the Ice Machines



Picture 4 The #3 Ice Machine



Picture 5 Motor Soft-Start Circuit on #2 Machine

Appendix 6 – Additional Financial Modelling Results

Table 20 Results from both strategies and all scenarios

	<u>Investment</u>	<u>NPV</u>	<u>Net Return</u>	<u>IRR</u>
Strategy 1				
<i>Scenario 1.1 Improve landing sites</i>	\$ 100,000	\$ 9,892	\$ 27,482	8.70%
<i>Scenario 1.2. Improve landing sites and improve ice production</i>	\$ 200,000	\$ 19,783	\$ 54,965	8.70%
<i>Scenario 1.3. Improve landing sites, improve ice production, and provide additional cold storage</i>	\$ 250,000	\$ 24,729	\$ 68,706	8.70%
<i>Scenario 1.4. Improve landing sites, improve ice production, provide additional cold storage, and solar energy</i>	\$ 1,250,000	\$ 123,646	\$ 343,528	8.70%
Strategy 2				
<i>Scenario 2.1. Improve landing sites, improve ice production provide additional cold storage, processing improvements, market differentiation and certification</i>	\$ 450,000	\$ 49,459	\$ 137,411	8.70%
<i>Scenario 2.2 Fillet Improvements, market differentiation, certification, and solar energy</i>	\$ 1,450,000	\$ 148,376	\$ 412,234	8.70%

Modelling of approach strategy 1: Improve quality

In order to assess this proposed strategy, the following scenarios are considered:

Improving landing sites is estimated to cost \$ 100,000 per site. Assuming one site, this has the impact of raising the break-even sales by 304,000 lbs per year to cover the investment. The breakeven volume will decline by 30,338 lbs for every 1% of spoilt product converted to a saleable product.

Pounds to cover investment	304,435
Pounds per 1% IRR	9,507
Pounds to break-even per 1% spoilt converted	(30,338)

Table 21 Scenario 1.1. Improve landing sites

SCENARIO	POUNDS REQUIRED
S1.1 BREAK-EVEN	2,692,495
S1.1 IRR 10%	2,787,569
S1.1 -5% SPOILT BREAK-EVEN	2,540,805

Improvements in Ice Production - In addition to improving landing sites, this scenario adds improvements to ice production, estimated at \$ 100,000 per site for a total of \$ 200,000. It would take an additional 609,000 lbs sold per year to cover this investment.

Pounds to cover investment	608,871
Pounds per 1% IRR	19,002
Pounds to breakeven per 1% spoilt converted	(33,768)

Table 22 Scenario 1.2. Improve landing sites and improve ice production

SCENARIO	POUNDS REQUIRED
S1.2 BREAK-EVEN	2,996,930
S1.2 IRR 10%	3,186,955
S1.2 -5% SPOILT BREAK-EVEN	2,828,089

Improvements in Cold Storage - In addition to improving landing sites and improving ice, improving cold storage is included in this scenario, at a cost of an additional \$ 50,000; it would require a total \$ 250,000. Based on the above, it would require an additional 761,000 pounds sold per year to cover this investment.

Pounds to cover investment	761,088
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Pounds per 1% IRR	23,776
Pounds to break-even per 1% spoilt converted	(35,483)

Table 23 Scenario 1.3. Improve landing sites, improve ice production and provide additional cold storage

SCENARIO	POUNDS REQUIRED
S1.3 BREAK-EVEN	3,149,148
S1.3 IRR 10%	3,386,906
S1.3 -5% SPOILT BREAK-EVEN	2,971,731

Solar Power - Challenges associated with electricity generation were widely reported by stakeholders. A low carbon solution to this problem would be to replace diesel generators with a solar system, which would have the added benefit of reducing the maintenance and operating costs of generating ice. A back-up generator will likely still be necessary to ensure HACCP compliance. This price comes directly from the report provided by Guyana Energy Agency (GEA) included as Appendix 5.

The addition of solar power generation would add an extra \$ 1 million. This scenario includes all options, at a cost of \$ 1.25 million and would require an additional 3.8 million pounds sold per year to recuperate the cost of investment.

Pounds to cover investment	3,805,441
Pounds per 1% IRR	118,406
Pounds to break-even per 1% spoilt converted	(69,786)

Table 24 Scenario 1.4. Improve landing sites, improve ice production, provide additional cold storage, and solar energy

SCENARIO	POUNDS REQUIRED
S1.4 BREAK-EVEN	6,193,501
S1.4 IRR 10%	7,377,564
S1.4 -5% SPOILT BREAK-EVEN	5,844,571

Analysis of approach strategy 1 modelling

Scenario 3 (all investments for strategy 1, excluding solar) is the most likely to provide the optimum outcome with a modest investment risk (\$ 250,000). While the solar system would be beneficial, the cost of installing such a system given the significant risks identified is high.

It will be beneficial for the investment to be taken on if the 10% IRR target volumes can be reached and the reductions in spoilt product achieved.

Appendix 7 – Budget Estimate Details

A breakdown of the anticipated budget amounts for the proposed investments is provided below.

The implementing partner may choose to vary the specifications, configuration or location of the proposed investments as identified. They may also choose to exclude line items or improve upon this budget by undertaking the investments “in-house”. Examples include choosing between diesel or electrical lifting equipment; sizing of electrical generation units, water storage units for ice makers as well as storage capacity for ice. All these variables will likely impact the budget either upwards or downwards, and should be addressed with the implementing partner at the appropriate time.

Guidance for these amounts was obtained via interviews with fishery experts in Guyana and the US. HACCP is a food safety standard that has been adopted by the food service industry as the required standard for human consumption²⁰¹. It is used by the FDA as part of its inspection protocol and has been demonstrated to reduce food borne bacteria and infection. Information regarding seafood transportation and safety²⁰² along with sizing guidance related to ice use and production was obtained from FAO guidelines.²⁰³ Experience in fisheries in Indonesia, Mexico, United States, Grenada and Kenya was also used to identify the potential investment. Relevant examples of price estimates are included in this appendix. Additional input was obtained from www.alibaba.com. These prices do not include shipping, import duty or installation, which was estimated.

Budget estimates regarding market differentiation strategies and certifications are based on discussions with relevant firms, specifically Changing Tastes, Fair Trade, WWF-US, and Ocean Outcomes. These numbers are provided for guidance purposes only as these organizations have not completed formal assessments.

Budgets indicated are assumed to include labor, taxes (including shipping and import duty for imported equipment) and contractor expenses.

They include a contingency amounting to 6% of the total investment amount.

While best efforts were undertaken to scope these items, this document does not pretend to include all the relevant data the required upgrades and investments.

²⁰¹ <https://www.fda.gov/food/seafood-guidance-documents-regulatory-information/fish-and-fishery-products-hazards-and-controls-guidance>

²⁰² <http://www.fao.org/3/r1263e/R1263E00.HTM#Contents>

²⁰³ <http://www.fao.org/3/r1263e/R1263E08.HTM>

Table 25 Budget estimates

Landing Site Improvements

- Site Improvements (roofs; flooring; water; electricity; fencing)	30,000	
- Hoist, winch, or crane	30,000	
- Dock or ramp improvements	20,000	
- Storage	10,000	
- Contingency	10,000	
Total		100,000

Cold Storage Improvements



- Cold storage facilities	20,000	
- Supporting electrical improvements	5,000	
- Vessel cold storage	5,000	
- Cold storage vehicle / truck	20,000	
Total		50,000

Ice Improvements


- Ice Production (10 Ton)	30,000	
- Water storage / intake / filtration	15,000	
- Ice Storage	15,000	

- Diesel Generator (25 Kwh)	30,000	
- Contingency	10,000	
Total		100,000
Fileting Improvements		
- Site improvements (flooring; water; electricity)	50,000	
- Production line improvements (stainless steel)	40,000	
- Contingency	10,000	
Total		100,000
Market Differentiation Strategy	50,000	
		50,000
Certification	50,000	
		50,000
Total		450,000

Figure 16 Example ice maker

[View larger image](#)



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#SUPERSEPTEMBER Koller 10 Tons Industrial Flake Ice Making Machine for Fishery Concrete Cooling

FOB Reference Price: [Get Latest Price](#)

\$30,000.00 - \$50,000.00 / Sets | 1 Set/Sets (Min. Order)

Model Number:


Output:

Trade Assurance
protect your orders from payment to delivery


Payments: [VISA](#) [Online Bank Payment](#) [T/T](#) [Pay Late](#)
[WesternUnion WU](#)

Alibaba.com Logistics • Inspection Solutions
• Production View


Figure 17 Winch estimates



Henan Santo Crane Co., Ltd.



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Add to Compare Share

Jm Series Electric Steel Rope Port Dock Pulling 5 Ton Winch

FOB Reference Price: [Get Latest Price](#)


\$1,000.00 - \$20,000.00 / Sets | 1 Set/Sets (Min. Order)

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protect your orders from payment to delivery

Payments: [VISA](#) [Online Bank Payment](#) [T/T](#) [Pay Late](#)
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Figure 18 Crane estimate









Year-end promotion light duty jib crane specification


FOB Reference Price: [Get Latest Price](#)


\$1,000.00 - \$10,000.00 / Sets | 1
Set/Sets jib crane specification (Min. Order)

 **Trade Assurance**
protect your orders from payment to delivery

Payments:   [Online Bank Payment](#) [T/T](#) [Pay Later](#)
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Appendix 8 – Risk Analysis

Several characteristics have been documented to be conducive to successful community-based management of fisheries.²⁰⁴ These include: high value products with a quick reproduction cycle; access to good infrastructure; a geographically small and culturally homogenous fisher community; and a short supply chain.

The stocks in the artisanal finfish fishery of Guyana are not considered to be of high value on the international or domestic markets (unlike species such as tuna, lobster, etc.) and reproductive cycles are uncertain for some species, and over two years for known species. The current condition of the fishery is poor. The current nature of cold storage, landing infrastructure and electricity is also poor and only the domestic value chain may be considered “short”. High variation within the region of infrastructure, fisher communities, and supply chains are expected. These factors increase the risk profile of this fishery

Environmental

- **Stock health** - The repayment of the investment in the value chain identified are based on current estimates of volume. This business case assumes that artisanal finfish stocks remain stable and do not suffer increased or sudden mortality. In the event these estimates are incorrect, or there are increases in demand for target stocks, this is likely to increase effort which will negatively impact overfished stocks

Should the stock decline for any reason, such as IUU, overharvesting by other fleets, negative effects of climate change, etc., the ability of participating fishers and organizations to align and secure financial incentives and participate in the opportunity will be negatively impacted. The case as proposed assumes that the investments in the drivers of sustainability are coordinated with investments in operational efficiency and market value, and that the results of the Guyana Rapid Assessment are acted upon. Mitigation measures centered around achieving minimum scores of at least 60, and preferably 80, in future Assessments are assumed to have been undertaken.

- **Natural disasters** - Earthquakes and tropical storms are a normal part of this fishery’s ecosystem. Most of these challenges are increasingly impacted by climate change which is exacerbating ocean temperature and acidification. Natural disasters may negatively affect fish stocks and infrastructure.
- **Oil and gas development** - Guyana’s recent off-shore discovery of oil and gas reserves are transformational for the nation. Oil and chemical leaks present a particular threat to fisheries and stock health. Effective monitoring and remediation practices are assumed.

Governance

- **Fishery management** - Because this is an open access fishery, free riders, i.e., additional fishers and traders, may increase as fishery value increases. These potential additional actors, while likely limited to the existing population of Guyana and possibly neighboring areas of Venezuela and Suriname, may negatively affect stocks. Consequently, Guyana’s reputation may be associated with IUU for international buyers.

²⁰⁴ McCay et al, *Cooperatives, concessions, and co-management*.

- **Policy and legal framework** - While “a national legal system is in place, and bodies such as the CRFM and CNFO can potentially facilitate cooperation with other Caribbean nations fishing the same stocks . . . stakeholders and analysts have repeatedly observed that institutional frameworks could be strengthened.”²⁰⁵ Based on the Rapid Assessment, the fishery scores well on Long Term Objectives and Fishery Specific Objectives. Unfortunately, it does not score well on Decision Making Processes, Compliance and Enforcement or on Monitoring and Management Performance Evaluation. Some improvements are being made, but no complete and reliable framework can be expected shortly that could reduce uncertainty for businesses in the sector.
- **Monitoring and enforcement** - The poor scores associated with monitoring and enforcement reported in the Rapid Assessment present significant challenges and risks. The business case presented assumes investments in the drivers of sustainability are prioritized in order to effectively address this risk.

Social

- **Subsistence fisheries** - The artisanal fishery for groundfish is not considered a subsistence fishery. Local demand for seafood is reportedly high and the consumption of fish and fisheries products has been reported at approximately 30 kg per capita per year in recent years²⁰⁶ (note that this may be over or underestimated - see discussion in the market potential section). Traditionally, finfish species plus shrimp and seabob are preferred for consumption. Because of this, the risk of negative impacts from increasing exports on fish available for local consumption may be high as would increasing domestic values. With the interventions outlined - particularly community based management that effectively address the drivers of sustainability - the likelihood of accurately accounting for negative impacts improves.
- **Social norms** - The impacts on social norms from potential interventions and investments are unknown should be monitored to ensure there are not unintended negative consequences such as changes in power dynamics of domestic relationships.²⁰⁷
- **Incentives** - If premiums attained from the strategies identified are not equitably passed on to fishers in a transparent manner, they may refuse to comply with future requests for changes in behavior. There is a high risk that fishers will absorb the costs of improved fisheries practices, while operational or market incentives are captured by processors and middle of the supply chain participants. Effective participation of fisher groups is assumed.
- **Child labor** - The draft findings from Conservation International’s Social Responsibility Scorecard preliminary assessment identified reported to be children and young teens employed in the fishing industry in Guyana, which is against the statutory minimum

²⁰⁵ Drugan, *Rapid Assessment*.

²⁰⁶ <http://www.fao.org/faostat/en/#data/FBS>

²⁰⁷ Kabeer, N. and Natali, L. “Gender Equality and Economic Growth: Is there a Win-Win?” IDS Working Paper 417 Institute of Development Studies. February 2013. ISSN: 2040-0209 ISBN: 978-1-78118-108-9. Retrieved from <http://www.lse.ac.uk/gender/assets/documents/research/choice-constraints-and-the-gender-dynamics-of-lab/Gender-Equality-and-Economic-Growth.pdf>

age of employment in Guyana (15 years). Per the report: “The government has not enforced child labor laws effectively. Fines are low and do not deter violations.”²⁰⁸

Enterprise

- **Country** - Recent political uncertainty regarding the outcome of elections in Guyana may impact the private sector’s willingness to invest for the long term. Coface reports the country risk rating of a “D”, representing high political and economic risk factors.²⁰⁹ Guyana’s Business Climate was rated a “C” representing a difficult business environment where financial information is not readily available, debt collection can be unpredictable, and some institutional frameworks are weak. Guyana ranks 134 among 190 economies in the ease of doing business according to the 2019 World Bank annual ratings, a deterioration from 126 in 2017. The score fell by 1.21 to 55.57 primarily due to a decrease in their scores for “Getting Electricity”. Guyana ranks the lowest in the region - below Haiti - for this category, owing to the high number of procedures and time needed to obtain a connection, the cost of electricity relative to income (30 cents per kWh) and the reliability of supply. Default risk insurance is highly recommended.
- **Delivery** - The ability of the implementing firms to implement the strategies are driven in large part by the capacity of the firms and their ability to both secure value chain efficiencies and access higher value markets. The strategies proposed are dependent upon strong leadership and accountability both in achieving the identified improvements, and in reliably, consistently and effectively meeting the demands of the global and domestic supply chain, particularly around product quality and safety. Should this not be possible, the business case will be unlikely to succeed.
- **Management** - A business model based on the strategies proposed presupposes extensive management experience in the industry. Management should possess capacity to adaptively manage the proposed strategies.
- **Operational** - Strong operational skills will be required of management to address the proposed strategies.
- **Economic** - Export demand is driven by economic conditions and trade relations with the principal buying nations, primarily the US. Should the US be impacted by an economic or financial downturn, or impose tariffs or bans in an effort to protect US white fish producers, demand for the product and the willingness of industry to participate in this strategy will be negatively impacted. Management should have extensive experience managing during economic downturns.
- **Price** - As a globally traded product, white meat finfish products are considered a commodity product and prices will be impacted by product availability and pricing in other producing countries which may produce significantly greater quantities at a competitive price. There is also a risk that prices will decline as finfish stocks recover, resulting in a market oversupply. This will negatively impact the model. The strategy proposed seeks to address this through differentiating the product once quality considerations have been resolved.

²⁰⁸ Lout, G. “Preliminary findings - Social issues in Guyana’s small-scale shrimp and groundfish fisheries” June 2019. Produced on behalf of Conservation International.

²⁰⁹ <https://www.coface.com/Economic-Studies-and-Country-Risks/Guyana>