

## I BACKGROUND

The Chilean Common Hake (*Merluccius gayi gayi*) is a culturally and commercially important fish in Chile. Because the hake is sold at affordable prices, it is the most widely consumed fish in the country. Additionally, fishing hake provides a primary stream of income for many artisanal fishers in the central region of the nation. In the late 1990's and early 2000's, the stock was heavily overfished.

Biomass declined and the government classified the hake stock as depleted in 2014. Despite regulatory reforms, the biomass has been unable to recover.

The primary problems preventing the fishery from recovery were identified through a literature review and on-site interviews with stakeholders throughout Chile.

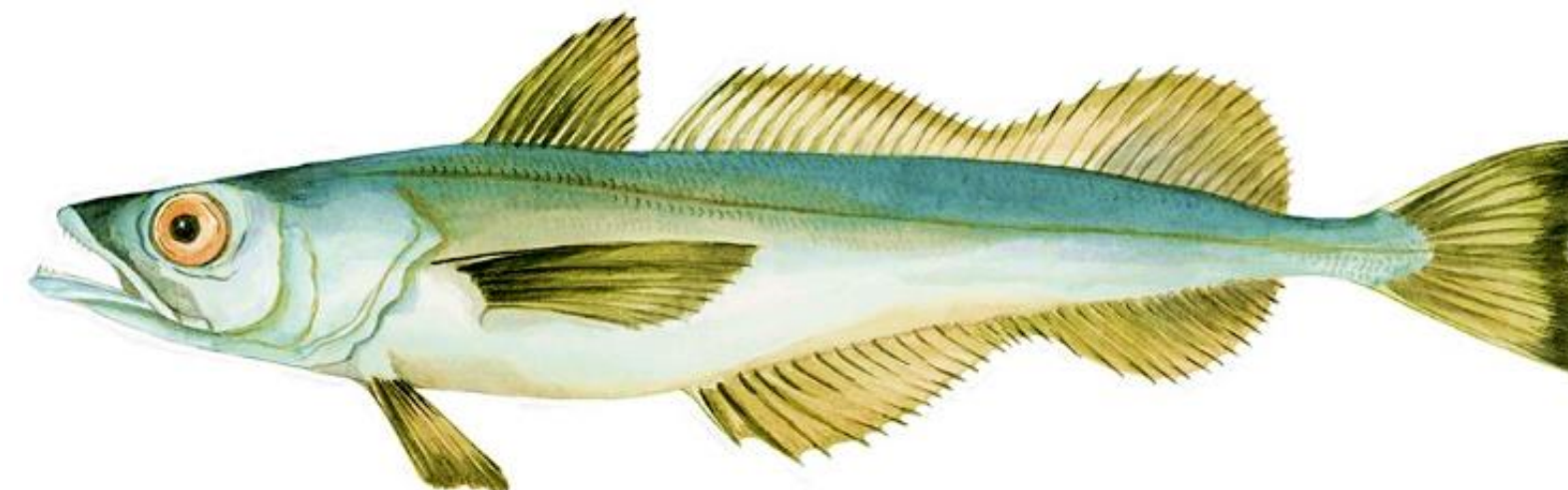


Figure 1. Chilean Common Hake. Source: WWF - SASSI

### Key problems in the hake fishery:

- High levels of unreported and illegal fishing estimated at 3-4 times the legal allocation
- Inefficient supply chain diminishes fishery value and weakens fishers' bargaining power
- Lack of traceability prevents enforcement officials from verifying the legality of catch
- Artisanal fishers often live at or near the poverty line, and policing this stakeholder group more heavily will have economic impacts
- Enforcing fishing laws is politically unpopular and done inconsistently

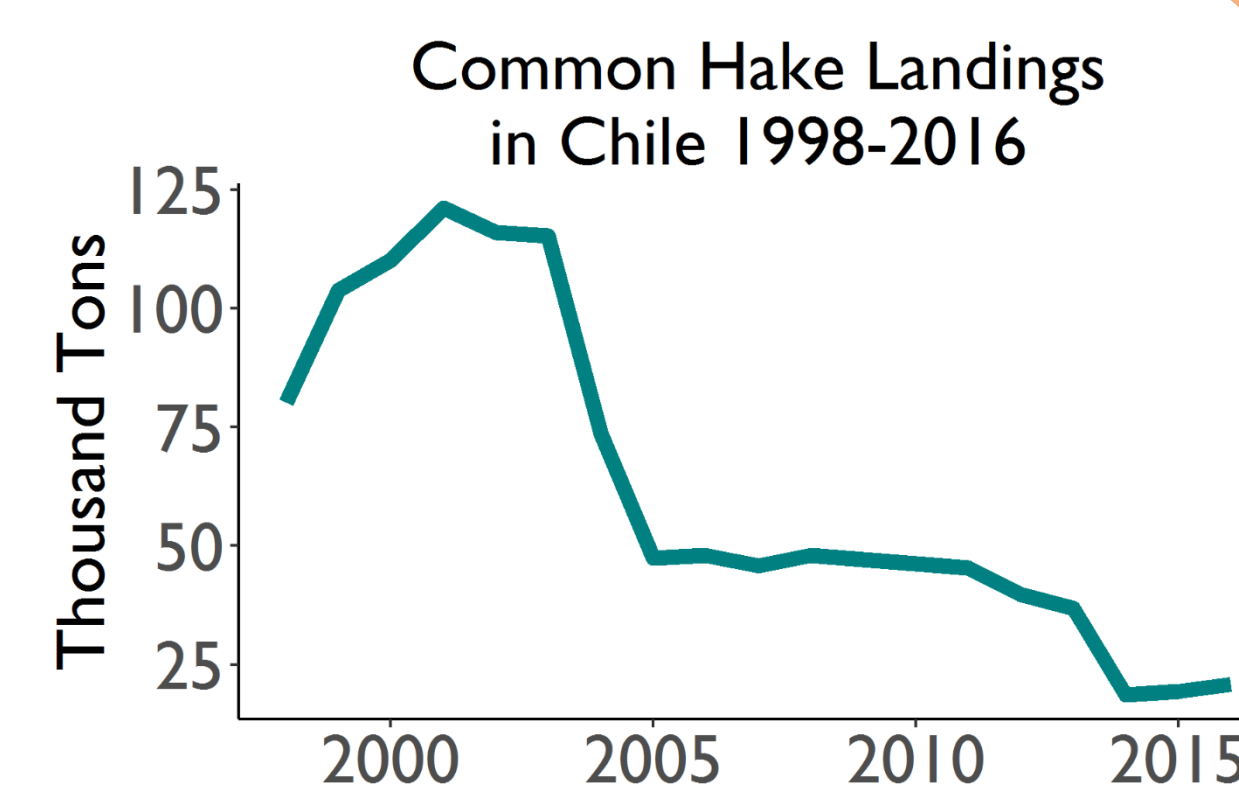


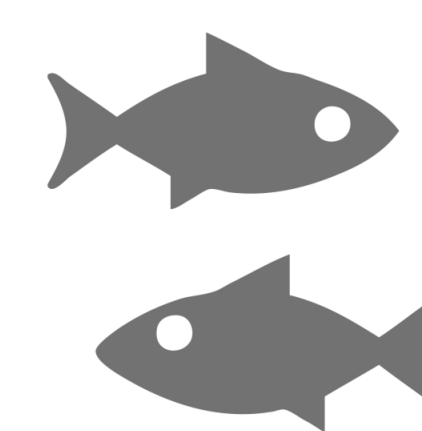
Figure 2. Reduction in Landings as result of overfishing. Data source: SERNAPESCA

### Addressing key problems using impact investing

Impact investing is a potential tool to catalyze recovery of the fishery. It is a new class of investment where investors willingly receive lower returns in order to generate beneficial social or environmental impacts. Our project explores how impact investing could be used to restructure incentives and recover the depleted Chilean hake fish stock.

## II PROJECT OBJECTIVE

The objective of our project is to design and evaluate interventions using impact investment that will:



Recover hake biomass to sustainable levels



Mitigate loss of artisanal fishers income



Provide positive returns to investors

## III APPROACH

Identify key problems in the fishery and develop impact investment interventions. Build bioeconomic model to quantitatively evaluate interventions. Maintain a dialogue with stakeholders to ensure problems have been correctly identified and proposed solutions are realistic.



## IV INTERVENTION DESIGN & EVALUATION

Our group designed five impact investment interventions and presented them to fishers, government officials, and NGO representatives during a workshop in Chile in late 2017. Based on feedback from stakeholders, we decided to move forward with the three interventions stakeholders felt held the most promise. We built a bioeconomic model to conduct a quantitative analysis of these three interventions.

### Intervention 1: Develop a Quota Buyback and Leasing Mechanism

A distinct mismatch exists between northern and southern hake fishing quota allocations. Regions in the South account for up to 92% of the catch, yet only 67% of the quota. In recent years, the biomass of hake has shifted south, contributing to this disparity. This mismatch generates an opportunity to implement a Quota Buyback and Lease Program between the regions.

#### Investment Structure

- Investor purchases quota from fishers seeking to retire
- Investor leases a portion of the purchased quota to fishers in need of more quota to improve their legal income
- Investor retires a portion of the remaining quota to facilitate stock recovery
- After recovery investor sells quota back into the fishery

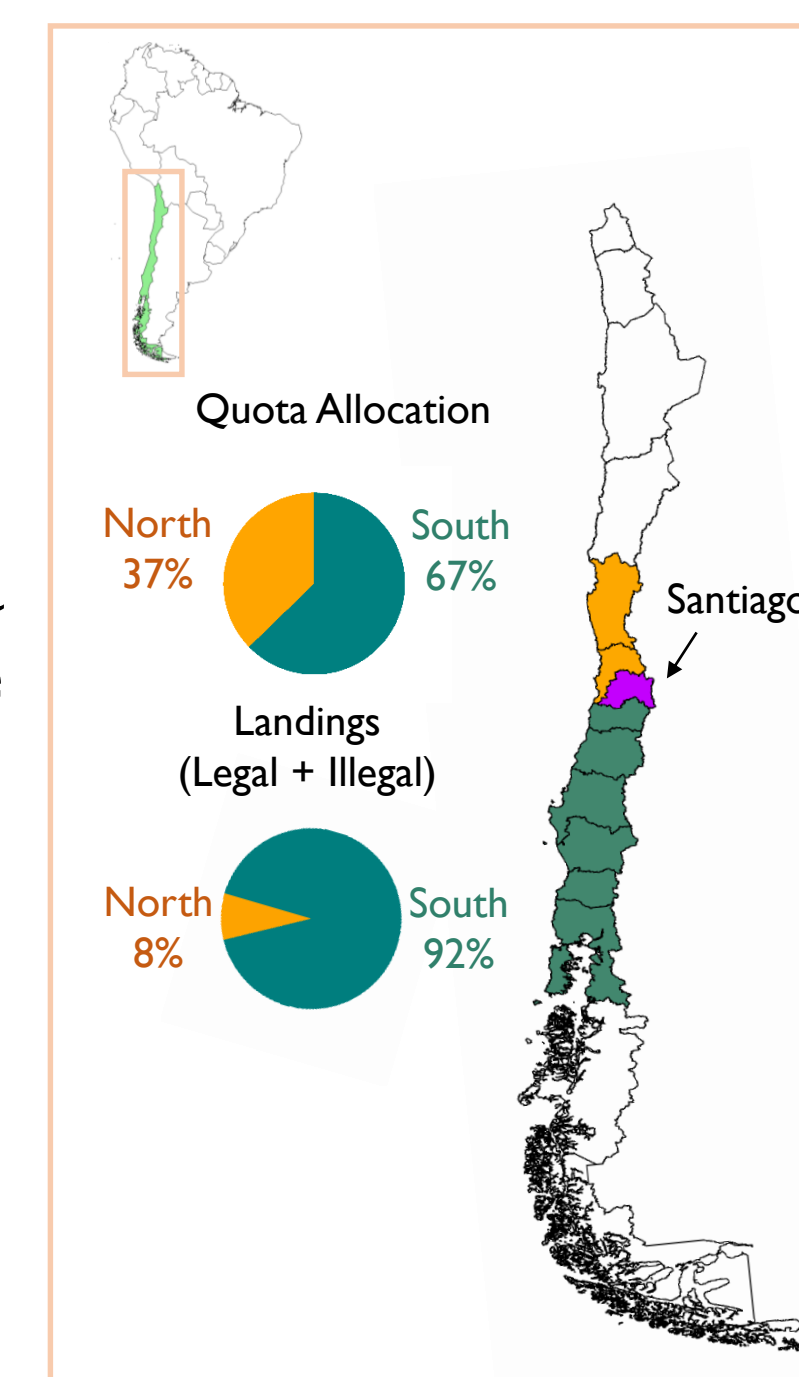


Figure 3. Quota & total landing percentages in the northern (orange) and southern (teal) regions of the artisanal hake fishery

#### Evaluation

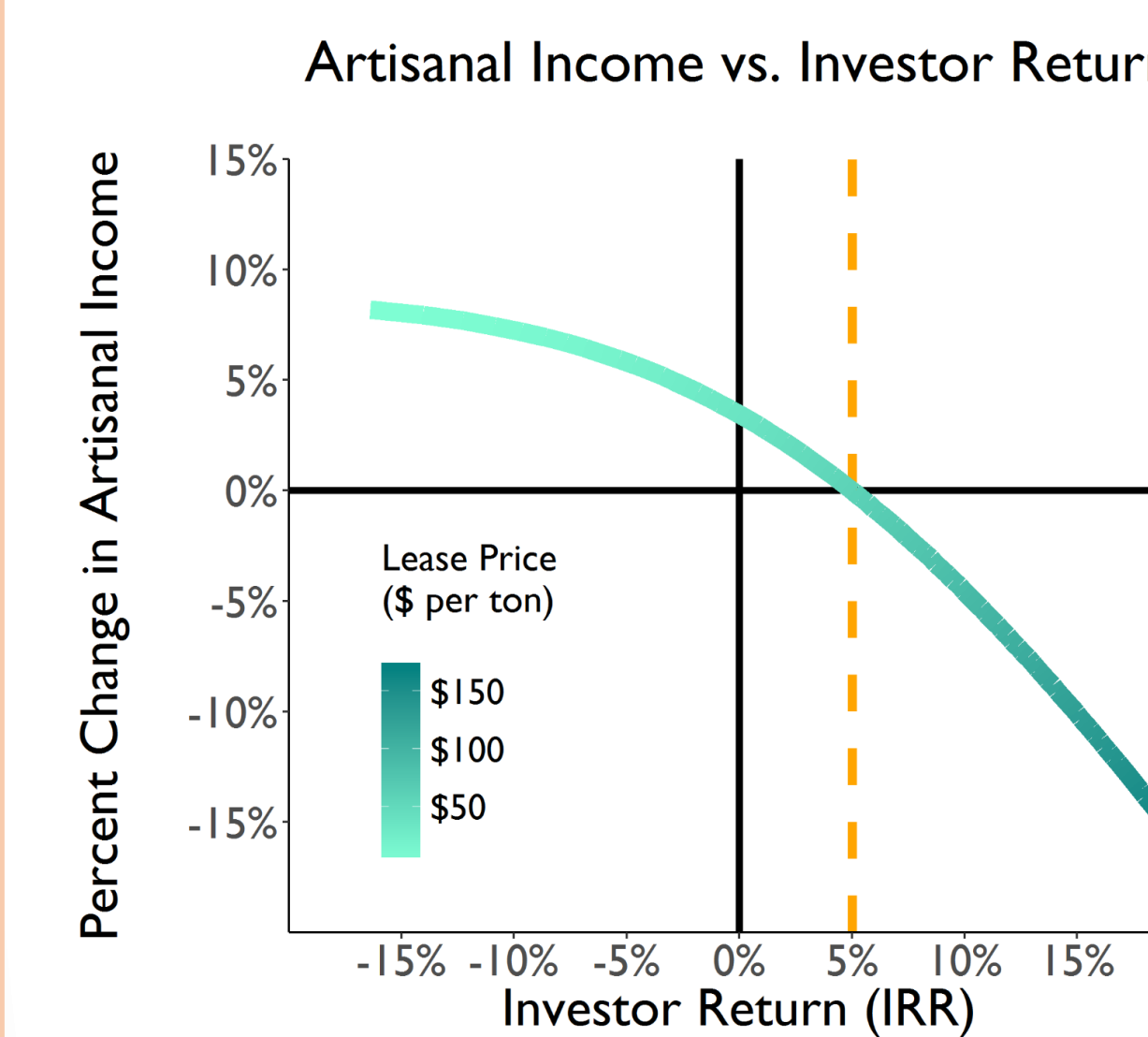


Figure 4. Impact of change in quota lease price on investor returns and artisanal fisher income. Orange dashed line indicates lease price at which the target investor return is achieved (5%). Note the top quadrant contains lease prices at which both investor return and change to artisanal income are positive.

### Intervention 2: Implementation of a Caleta Certification Program

Artisanal fishers live in fishing communities called caletas. Organized fishing cooperatives exist in caletas and influence fishers' actions. This intervention empowers cooperatives by rewarding caletas that adopt strict standards targeted at eliminating illegal fishing and mandating traceability in the fishery.

#### Investment Structure

- Investor funds the creation of a Certifying agency
- Caletas adopt standards in order to receive price supplement paid by the investor
- Agency sends auditors to ensure compliance
- Market demand for legally caught certified hake grows, inducing a market price premium
- After initial start up period, fishers pay for certification status to differentiate their catch
- Certifying agency transfers profits back to investor

#### Evaluation

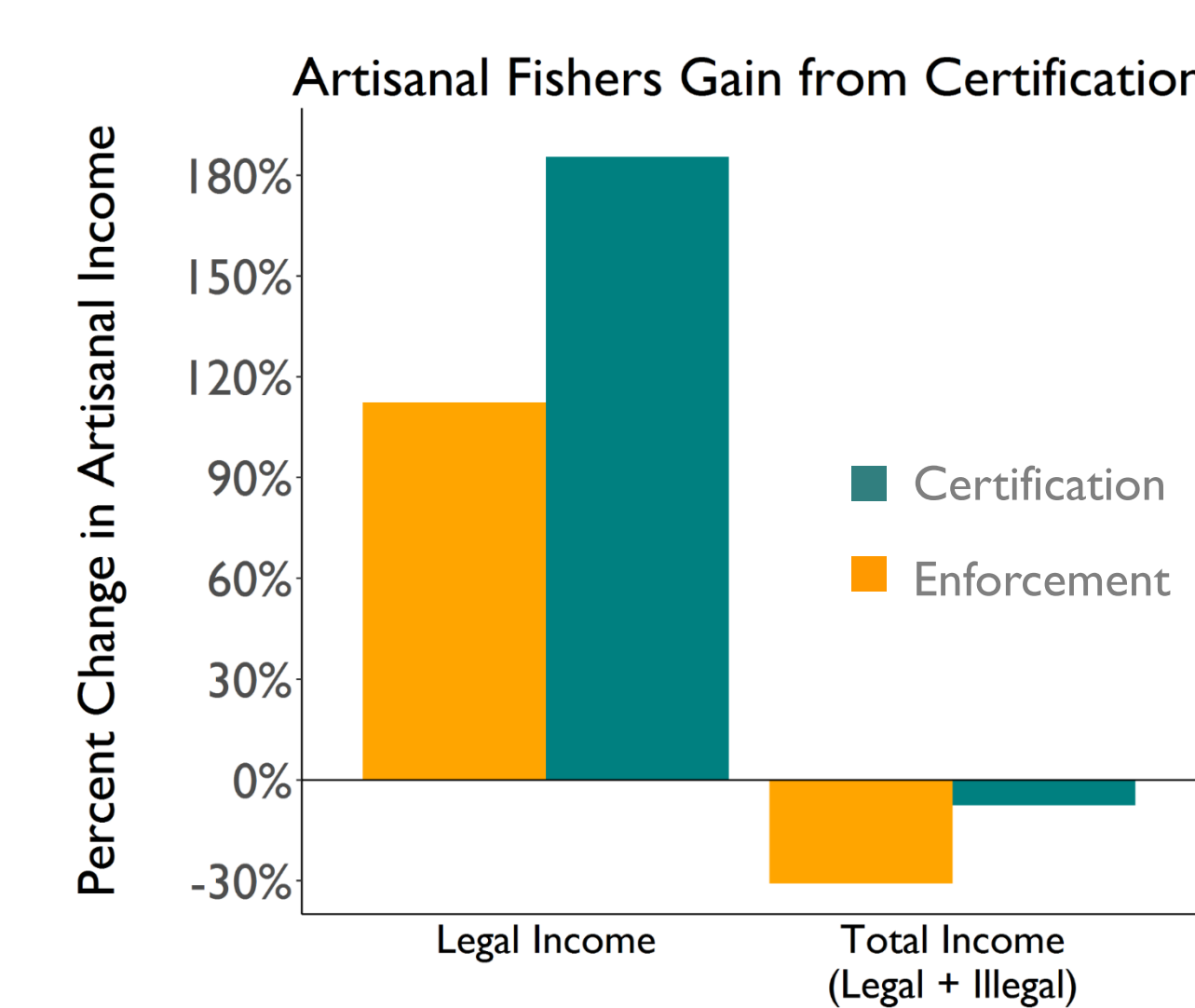


Figure 5. Caleta certification improves fishers' income more than only enforcing heavily. Percent change is relative to a business as usual scenario. Investors are unable to achieve positive return (IRR = -18.2%).

### Intervention 3: Development of Clean Alternative Market

Nearly 80% of all domestic hake flows through the National Fish Market in Santiago. Decaying infrastructure leads to poor health conditions in the market, diminishing product quality. Corruption and illegal activities contribute to a lack of enforcement at this chokepoint. An extensive supply chain makes traceability difficult. All these problems at the current market exacerbate recovery efforts.

#### Investment Structure

- Investor finances the construction of new Clean Alternative Market and receives equity
- New market provides a clean and sanitary alternative for buying legal hake
- Streamlined transportation of fish to new market stimulates higher efficiency in the supply chain
- Fishers wanting to sell at new market catch more of their fish legally and receive a higher price
- Consumers seeking higher quality, legally caught product choose the alternative market over old one, generating revenue that enables market to be self-sustaining
- Investor receives dividends and/or sells equity

#### Evaluation

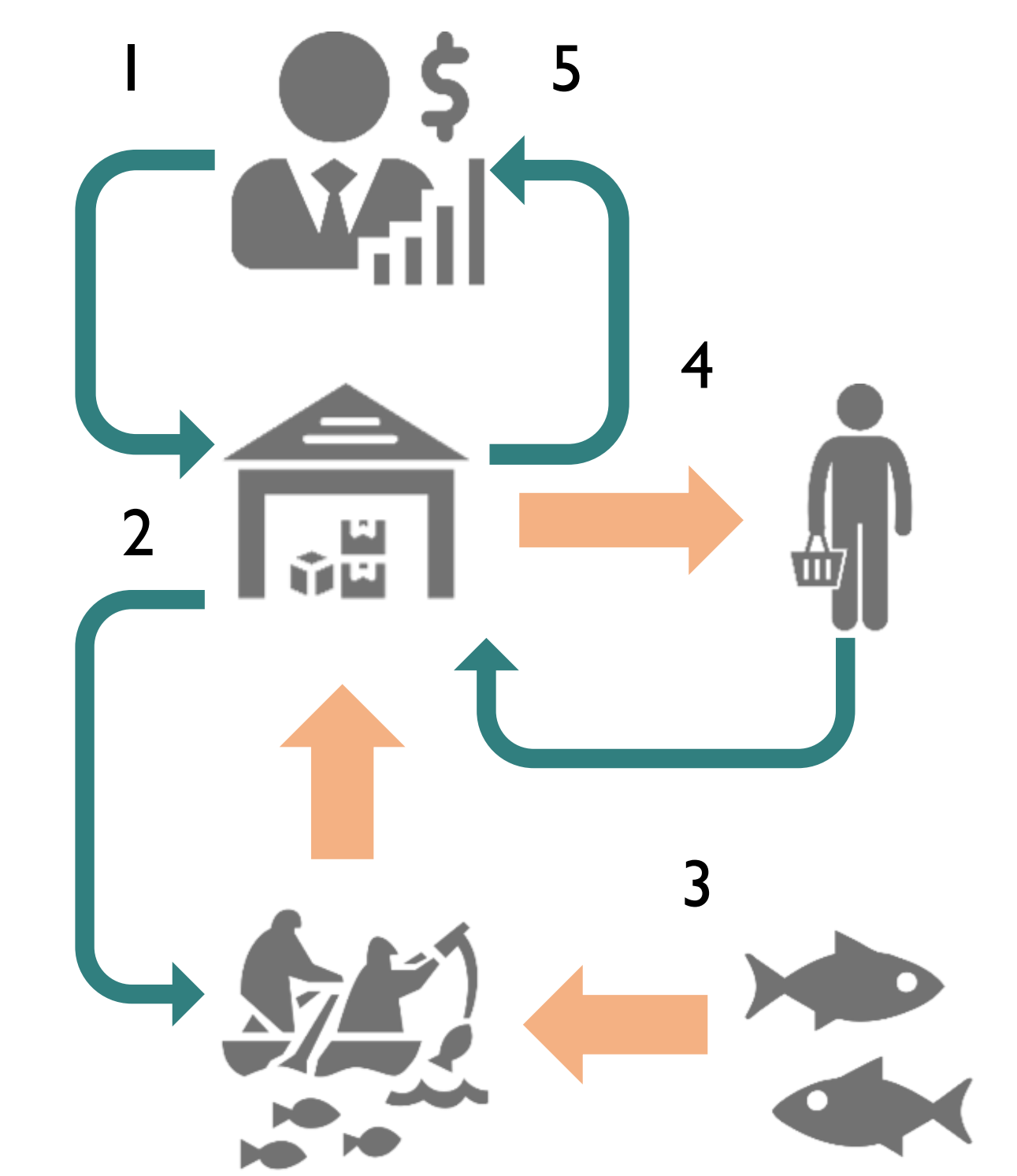


Figure 6. Conceptual model of the Clean Alternative Market intervention. Teal arrows represent biomass flows. Orange arrows represent financial flows.

## V RECOMMENDATIONS

While none of our interventions achieve all three goals, we envision a combination of interventions could enable investors to meet all environmental, social, and economic goals. Inspired by our design and workshop, business leaders, NGOs, and government officials have begun to develop a pilot caleta certification program to provide artisanal supply to a proposed new alternative fish market in Santiago.

Clean Alternative Market	?	✓	✓
Caleta Certification	✓	✓	X
Quota Buyback	✓	X	✓
Combination of Interventions	✓	✓	✓

Figure 7. All interventions were evaluated to determine whether they met quantitative environmental, social, and economic metrics. Check marks indicate metrics were met or exceeded and X's indicate metrics were not met. The question mark indicates there is uncertainty around how the intervention would impact the metric.

## A ACKNOWLEDGMENTS

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## STANDARDS:

common hake not south pacific hake

use caletas, not coves

illegal fishing not IUU

No capitalizing hake

We are using investor NOT investors

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