Restoration Insurance Service Company (RISCO)

LAB INSTRUMENT ANALYSIS

September 2019

DESCRIPTION & GOAL —

A first-of-its-kind social enterprise that conserves and restores mangrove forests by generating insurance-related revenue through property damage risk reduction and blue carbon revenue through the sale of credits

SECTOR —

Adaptation, mitigation, land use, forest conservation

PRIVATE FINANCE TARGET —

Impact investors and concessional capital providers in the short-term. Longer-term, insurance companies and/or associations of insurance companies, as well as organizations seeking to meet voluntary or regulatory climate targets through the purchase of blue carbon credits.

GEOGRAPHY —

For pilot phase: The Philippines

In the future: Indonesia, Mexico, Brazil, Malaysia and other countries with mangroves, high-value coastal assets, and risk of flooding.

The Lab identifies, develops, and launches sustainable finance instruments that can drive billions to a low-carbon economy. The 2019 Global Lab Cycle targets four specific sectors across mitigation and adaptation: blue carbon in marine & coastal ecosystems; sustainable agriculture for smallholders in West and Central Africa; sustainable energy access; and sustainable cities.

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1. CONTEXT

Mangroves are critical for climate adaptation and mitigation but continue to be converted to other uses.

Mangrove forests are woody vegetation located along tropical and subtropical coastlines in approximately 120 countries and territories around the world. These forests have important climate adaptation benefits, providing an effective natural defense against storms (e.g., typhoons and cyclones) by reducing flood depths and wave heights. Globally, mangroves protect more than 18 million people and lessen the flood damage to nearby properties and coastal assets by more than US$ 82 billion a year (Beck et al, 2018). At the same time, mangroves provide enormous mitigation benefits, storing up to 10 times more carbon on a per area basis than terrestrial forests (Kauffman, 2017).

Unfortunately, mangroves are in decline around the world. From 1950 to 2000, mangrove forest cover declined by 30-50% (Donato, 2011) due to their conversion to other uses such as shrimp ponds, or their clearance for coastal development. The rate of loss has slowed down in recent years, but continues; according to Global Forest Watch, mangrove cover declined by 1.38% from 2000 to 2012 (Strong, 2015). Mangrove deforestation generates nearly 10% of carbon emissions from deforestation globally (Donato, 2011), and leads to higher coastal property damage in the event of storms. However, mangrove protection remains a challenge due to a reliance on scarce government and philanthropic financing and a failure to prioritize these interventions. The coastal protection and mitigation benefits provided by mangroves are still underrecognized and often considered 'free' ecosystem services.

The Restoration Insurance Service Company (RISCO) is a first-of-its-kind social enterprise that invests in mangrove conservation and restoration in areas with high-value coastal assets, enabling property damage risk reduction and protecting blue carbon.[1] RISCO overcomes existing barriers to mangrove protection by connecting the adaptation and mitigation values of mangroves to the beneficiaries of these values, most of whom currently do not have the knowledge or resources needed to protect mangroves—including insurance companies.

CONCEPT

2. INSTRUMENT MECHANICS

RISCO invests in mangrove conservation and restoration, securing revenue from insurance companies who pay to lessen their risk exposure, and from the sale of blue carbon credits.

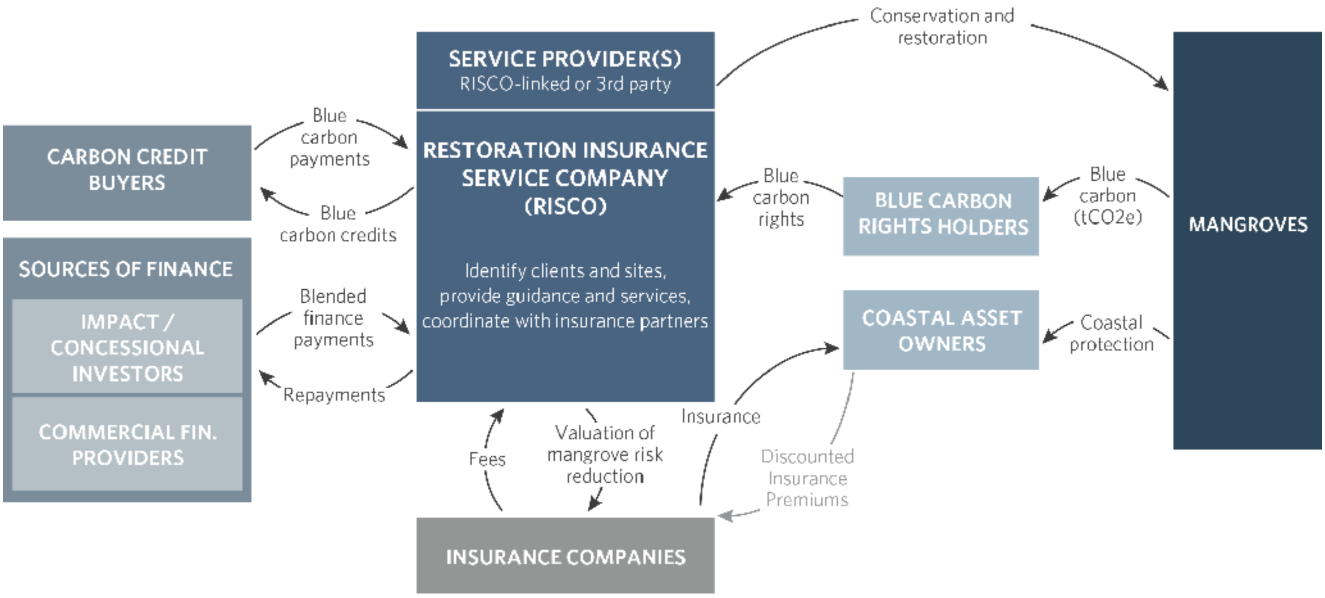
RISCO is a social enterprise that aims to conserve and restore mangrove ecosystems in emerging economies with blue carbon potential, high exposure to storms and flooding, and with people and assets located close to the coastline. The entity will prioritize areas with

[1] Blue carbon is the carbon captured by the world's coastal ocean ecosystems (e.g., mangroves, salt marshes and seagrasses).

recent loss and/or current threats to mangroves. Proposed to the Lab by Conservation International (CI), RISCO targets a reversal in the trend of mangrove deforestation and conversion, and a significant contribution to local and global adaptation and mitigation efforts.

The mechanism is in the late-stage conceptual phase. It will rely on a blended mix of grants, equity and loans in the short-term in order to pilot the approach and refine the business model, but the goal is for RISCO to become self-financing within 3-5 years via two revenue streams: one related to the insurance sector, and one related to blue carbon credits. Figure 1 illustrates key actors and financial flows.

Figure 1: RISCO mechanics



Sources of finance: In the short-term, RISCO will rely on a blended mix of grants, equity and loans. Longer term, RISCO aims to become self-financing with the insurance and blue carbon revenue streams.

- *Insurance:* In terms of insurance sector revenue, RISCO will contract directly with insurance companies or associations of insurance companies and will secure an annual payment for continued, verified conservation and/or restoration of mangroves. The annual payment to RISCO will be linked to a site-specific calculation of the annual flood reduction benefits provided by the mangroves.
- *Blue carbon credits:* On the blue carbon side, RISCO will utilize forthcoming Verra methodologies for Wetlands Restoration and Conservation (WRC)[2] to generate and sell blue carbon credits to organizations seeking to meet voluntary or regulatory climate mitigation targets.

RISCO services: In addition to securing initial financing, RISCO will (1) identify viable project sites; (2) coordinate and contract with insurance partners; (3) provide the mangrove conservation and restoration interventions directly or via a third-party, including stakeholder

[2] The WRC project category provides a framework for accounting for emission reductions in mangroves, tidal and coastal wetlands, marshes, seagrasses, floodplains, deltas, and peatlands, among others. This groundbreaking methodology is the first for crediting both restoration and conservation activities across wetland ecosystems.

engagement and valuation of the mangrove benefits; and (4) manage the process to generate and sell blue carbon credits.

1. **Site selection:** RISCO will identify countries and sites with sufficiently large mangrove cover and associated insured or insurable assets, as well as flood risk. Site selection also requires an understanding of mangrove tenure and the legality around carbon ownership,[3] as well as current threats to mangroves.
2. **Insurance company engagement:** RISCO will engage in site-specific economic valuation of the flood reduction benefits provided by the mangroves, contracting with risk modeling companies when necessary, and will help insurance partners to embed the mangrove risk reduction values into their models (e.g., natural catastrophe 'natcat' models).[4] RISCO will also negotiate contracts with insurance partners to pay for the risk reduction benefits. Depending on the presence and dynamics of the reinsurance market, RISCO may partner with reinsurance companies.
3. **Mangrove conservation and restoration:** RISCO will engage directly or via a third-party provider (e.g., local community-based organizations contracted via a conservation agreement) in necessary conservation and restoration activities. Conservation generally requires establishing agreements with adjacent communities to protect the mangroves, monitoring and enforcement, and development of alternative livelihoods to reduce the pressure on mangroves. Restoration is more time-consuming and expensive, requiring mangrove nurseries and labor to plant mangrove seedlings, and sometimes restoration of the beach profile or hydrology of a site to encourage natural propagation.
4. **Blue carbon:** RISCO will work with the blue carbon rights holders (e.g., project partners holding Foreshore Lease Agreements or other legal tenure, and/or the government) to secure the blue carbon rights. RISCO will also develop the Project Design Document, generate and sell the credits, and negotiate any needed benefits-sharing agreements for the credit revenue.

Key stakeholders: A number of stakeholders need to be mobilized to implement RISCO, each receiving a number of benefits from participation in RISCO projects:

- **Coastal communities** will benefit from the coastal protection of the mangroves themselves, the ongoing payments to protect mangroves (through conservation agreements), revenue sharing from the sale of blue carbon credits, and finally livelihood income derived from mangrove planting and maintenance, and improved fisheries.
- **Coastal asset owners** will benefit from the role that robust mangrove ecosystems play in erosion and flood control and fisheries support, and from access to insurance. Assets that are initially being considered are hotels, airports, ports, industrial estates, and high-value residential properties, some of which may not have insurance coverage (i.e., insurance penetration is currently low in the coastal areas of many of the countries under consideration for RISCO). Thus, coastal asset owners in areas currently deemed too risky for insurance could gain access to coverage and could receive a discounted insurance premium to account for the protection provided by the mangroves.

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[3] In the Philippines, for example, mangrove areas, and the carbon they sequester, are owned by the government. Depending on the country in question, certain legal mechanisms exist to secure the rights to mangrove areas (e.g., Foreshore Lease Agreements, Community-Based Forest Management, etc.).

[4] Natural catastrophe modeling allows insurers and reinsurers, financial institutions, corporations, and public agencies to evaluate and manage catastrophe risk from perils including earthquakes, hurricanes, tropical cyclones, flooding, wildfires, and storms.

- **Insurance companies** will benefit primarily from lower risk exposure profiles and payouts in the event of storms, typhoons, and cyclones. Partnering with RISCO would also bring CSR benefits, and may open up new business opportunities previously deemed too risky.
- **Carbon credit buyers** will benefit from the emission reductions provided, as well as the co-benefits associated with blue carbon projects.
- **Blue carbon right holders:** Often the local or national government, these actors will receive a fixed fee payment to secure the blue carbon rights and/or a negotiated portion of the blue carbon revenue while ceding a portion to RISCO for implementing the project.
- **Women and women's groups** will benefit from the coastal protection of the mangroves and alternative income streams associated with the mangroves, such as mangrove planting, fisheries and tourism. Experience in conservation and sustainable use of mangroves globally suggests that women and women's groups are disproportionately users of mangrove related resources and beneficiaries of conservation and restoration of these ecosystems.

3. INNOVATION

RISCO will advance the insurance industry's ability to accurately measure and value risk reduction through mangrove conservation and restoration.

3.1 BARRIERS ADDRESSED: CONNECTING MANGROVE ADAPTATION AND MITIGATION VALUES TO BENEFICIARES

RISCO overcomes the most challenging barriers to mangrove conservation and restoration by connecting the adaptation and mitigation values of mangroves to the beneficiaries of these values, most of whom currently do not have the knowledge or resources needed to protect mangroves – including insurance companies. Specifically, RISCO will address several barriers that currently prevent mangrove protection:

1. **Barrier: The role of mangroves in reducing coastal flooding risk has not been adequately valued or priced.** Between 2000 and 2010, insurers alone paid out more than US$ 300 billion for coastal damages from storms (UNISDR, 2011). There is growing evidence for the physical ability of mangroves to reduce wave height and storm surge, but few assessments demonstrate the costs and benefits of their role in reducing flood damage to properties (Narayan et al, 2016). If mangroves' coastal protection benefit is not appropriately valued, this ecosystem will continue to be lost, exposing up to 18 million more people to flooding and increasing damages to coastal properties by up to 16%, or US$ 82 billion annually (Beck et al, 2018).

   Response: RISCO, in partnership with risk modeling partners, will calculate the costs and benefits of mangrove conservation and restoration in potential sites and will make this information available to the public, thus building the global repository of available mangrove flood reduction data. RISCO will also make the modeling methodology available to help expedite replication.
2. **Barrier: Insurance providers do not yet incorporate the protective capacity of mangrove ecosystems into flood risk models.** While wetlands may be included in insurance models as land-cover estimates, it is not yet common for wetland

management scenarios to be incorporated into flood risk models (Narayan et al, 2016).

Response: RISCO, working with risk modeling partners, will determine the site-specific flood reduction benefits and work with insurance companies to embed the risk reduction values into flood risk models. Contracts will be structured whereby RISCO conserves and/or restores mangroves and the insurance companies pay an annual fee, likely calculated on a per hectare basis.

3. **Barrier: Mangroves store up to 10 times more carbon on a per area basis than the average terrestrial forest[5], but only a few projects that generate blue carbon credits exist to leverage this value.** Mangroves store on average 386 tC/ha in their biomass and soil; if the mangrove is destroyed, this carbon is released into the atmosphere as carbon dioxide (386 tC would turn into 1415tCO_2) (Howard et al, 2014). If mangrove forests are kept intact, the carbon sequestered in their coastal soils can be extensive and remain trapped for very long periods of time – hundreds or thousands of years – resulting in very large carbon stocks (Duarte et al, 2005). However, very few blue carbon projects have been developed, potentially due to the high costs to develop and implement these projects, and the relatively recent recognition of the climate mitigation potential of these ecosystems.

   Response: RISCO will select site(s) that cover a large enough area to justify the creation of a blue carbon project. This may require, in some countries, bundling together of several smaller sites. The forthcoming Verra methodologies for Wetlands Restoration and Conservation should allow for this approach.[6]

3.2 INNOVATION: FIRST COMPANY TO LINK THE RISK-REDUCTION VALUES OF MANGROVES TO THE INSURANCE INDUSTRY

The global insurance market currently includes two products of relevance to disaster risk financing: indemnity and parametric:

- *Indemnity products* (e.g., property insurance including natural catastrophe cover) provide payouts (compensation) in accordance with the actual losses suffered by a policyholder. The damage assessments can be complex and time-consuming, resulting in payouts taking weeks, months, or even years.
- *Parametric payouts*, on the other hand, are determined based on the physical features of a natural hazard event, such as wind speed for typhoons, rather than on actual losses suffered by a policyholder. This allows for faster payouts, but may expose policyholders to basis risk.[7] Parametric products are generally used to complement broader indemnity coverage, and to ensure immediate liquidity following an event.

In theory, premium payments for these insurance products should be risk-based, meaning that they take into account three elements of risk: hazard, exposure, and vulnerability.[8] However, a study of insurance markets in 25 countries showed that premiums rarely take into account all three elements of risk (Atreya, 2015). The same study found little evidence of governments or insurance companies actively encouraging precautionary, risk mitigation

[5] Kauffman, 2017.

[6] The RISCO proponent, Conservation International, is currently piloting the WRC methodology in a project in Cispatá Bay on the Caribbean coast of Colombia.

[7] Basis risk is the difference between the actual loss experienced by a policyholder and the payouts received.

[8] Hazards are natural disturbances or stresses, such as storms; exposure refers to the extent to which people and assets are physically exposed to a hazard; and vulnerability is a measure of how susceptible a community is to the effect of a hazard.

measures by linking premium pricing to efforts. At the same time, the actuaries responsible for developing natural catastrophe ('natcat models') and calculating premiums based on available data have grown increasingly concerned with climate change, and ranked it as the top risk for 2019 (Rudolph, 2019). Despite the growing concerns, natcat models rely heavily on historical data and do not always capture future climate change scenarios (Lloyds, 2014).

RISCO will be the first company to incentivize insurance companies to capture a more comprehensive assessment of how mangroves influence risk, and to make the case for – and enable implementation of – risk mitigation measures in the form of mangrove conservation and restoration.

To achieve this paradigm shift, RISCO will partner with progressive insurance companies (or associations of insurance companies) interested in risk mitigation actions, and, working with risk modelers, will help them to embed the benefits of such actions into their catastrophe and flood risk models. RISCO will focus on indemnity insurance in the first instance. In the future, depending on the country context, RISCO may also focus on parametric insurance products.[9]

While this will be the first instance of such a model for reducing costs to insurance companies involved with disaster risk reduction, it is important to note that similar models have been applied in other insurance sectors. For example, many automobile insurers market lower premiums to customers who demonstrate good driving records and/or purchase additional safety features, and even partner directly with safety feature providers to offer these services and reduced premiums to their joint customers. Thus, while RISCO will be first-of-its-kind in disaster risk reduction, the general premise has precedent and thus potential for uptake within the insurance industry.

3.3 CHALLENGES TO INSTRUMENT SUCCESS

RISCO is a first-of-its-kind intervention, and as such, there are potential challenges relating to the instrument model and its application, particularly around project implementation and financial sustainability. These challenges, as well as RISCO's approach to mitigate them, are provided in Table 1.

Table 1: RISCO challenges and responses

	Challenge	Response
Project-level	RISCO will need to find potential sites that have sufficiently large mangrove cover to justify developing a blue carbon project, and also where mangroves are located near high-value coastal assets.	RISCO will use remote sensing and apply site selection criteria to narrow down potential sites. It will also bundle together several individual sites in order to achieve scale.
	There is uncertainty about how weather events will impact mangrove sites, and whether, how, and over what time horizon the mangroves could be restored. Accounting for sea level rise and the	RISCO will monitor and measure mangroves on a regular basis. In modeling, interactions between natcat models and climate models (e.g., HadGEM2) will be captured, if possible. RISCO will consider securing insurance

[9] See Annex III for an analysis of the potential for RISCO to focus on indemnity and/or parametric insurance products.

	effects of climate change is also important.	policies on the mangroves themselves to ensure sufficient capital to restore and continue servicing debt/financing obligations.
Insurance Revenue	In most places, there will be more than one insurance company providing coverage for coastal asset owners, so free-rider problems may arise.	RISCO will contract with associations or groups of insurance companies that include most of the private insurance companies operating in the country/area in question.
	Non-life insurance penetration remains low in most emerging economies, meaning that the majority of people and assets affected by floods do not yet have insurance coverage.	RISCO will educate insurance companies on the role that mangroves can play in reducing their risk exposures. They will also work with the Insurance Development Forum and others seeking to close the 'protection gap,' as well as government agencies responsible for insurance policy development.
	Initial and ongoing valuation of the risk reduction benefits provided by mangroves is multifaceted, not yet well documented, and are site-specific.	RISCO will utilize available models to minimize costs but adapt to local context. Establish partnerships with data providers and modeling experts and companies.
Blue Carbon Revenue	Securing the legal rights to blue carbon credits may be a challenge (i.e., mangroves and their blue carbon are often owned by the government).	RISCO will assess potential legal mechanisms to secure the blue carbon rights depending on the country context. This may involve understanding and addressing community and collective land rights.
	Blue carbon credits are currently only sellable in the voluntary markets since no compliance market yet accepts them.	RISCO will rely on voluntary markets, but also track development of compliance markets, such as the Carbon Offsetting Scheme for International Aviation (CORSIA).
	The blue carbon market is nascent, with a high degree of demand and price uncertainty for blue carbon credits.	Marketing of credits should highlight mangrove project co-benefits, and consider pursuing additional standards (e.g., Community, Conservation, Biodiversity (CCB) standards, Sustainable Development Verified Impact Standard)

In addition to the challenges listed in Table 1, an additional important challenge is how RISCO will secure insurance revenue. There are two approaches:

- **Contracting with insurance companies or associations of insurance companies:** this is preferable in situations where insurance premiums for flood cover are low (e.g., <0.20% of the asset value) and inflexible (e.g., are already set at or close to the government-mandated minimum rates).
- **Contracting with coastal asset owners:** this will work best in situations where insurance premium rates are higher and insurance markets and models are more developed (e.g., natcat models rely on granular and robust data to allow for incorporation of

healthy mangrove ecosystems into insurance premium pricing). This is also better in areas with a high insurable asset base (e.g., >US$ 500 million).

In both approaches, determining the RISCO payment amount will be challenging. For the first approach, this will require negotiations with insurance companies regarding their willingness to pay for some or all of the estimated flood reduction value of the mangroves. For the second, insurance companies will need to determine the premium payment reductions for coastal asset owners based on their adjusted risk profile, and then RISCO will need to negotiate with the coastal asset owners regarding the percentage of this savings that they're willing to pay to RISCO.

MARKET TEST AND BEYOND

4. IMPLEMENTATION PATHWAY AND REPLICATION

An initial pilot in the Philippines will demonstrate commercial viability and generate important lessons for replication at scale.

As it progresses toward implementation, RISCO will work in close collaboration with potential insurance partners to identify specific sites for the pilot. This will involve developing detailed criteria for project selection which will enable assessing the feasibility of replication in additional geographies.

4.1 PILOT PROJECT IN THE PHILIPPINES TO PAVE WAY FOR COMMERCIAL ROLLOUT AT SCALE

Currently, a pilot is envisaged for the Philippines, one of the most vulnerable countries to climate change impacts, and a country where the project proponent (Conservation International) has worked for decades. Typhoons, storms and floods account for around 80% of the total losses from disasters, with estimates of annual average losses totaling nearly US$ 3 billion (Menéndez, 2018; National Economic and Development Authority, 2017; UNISDR, 2015). Recent research values the flood reduction benefits of Philippines' mangroves at US$ 453 million per year; each hectare of mangroves provides on average more than US$ 3,200 per year in direct flood reduction benefits to built infrastructure such as residential and industrial properties (Losada, 2017).

The devastating Typhoon Haiyan in 2013 and subsequent storms in 2017 (Isang) and 2018 (Mangkuht) highlighted the protection that mangroves provided, since several areas with mangrove coverage experienced less damage than adjacent areas that had been deforested (Santos, 2014; Ladrido, 2018). Recent storms have also highlighted the Philippines' vulnerability as well as the potential for expanded insurance coverage: only US$ 1.5 billion of Haiyan's estimated US$ 12.5 billion in damages was insured (AP, 2014).

A total of 3,400ha of conservation and 600ha of restoration will be targeted for the pilot, with potential sites including resort areas in the Province of Palawan, and commercial or public properties (e.g., a planned international airport) near Manila Bay. From there, further replication is expected in other parts of the Philippines and in other countries. Specifically, RISCO will target countries and sites that fulfill a series of criteria. These are still under development, but include, critically:

- Sufficiently large mangrove cover or potential for large areas of mangrove restoration;
- High potential for developing blue carbon credits, including significant carbon content, additionality (i.e., threat), and legal structures that allow for crediting;
- Exposure to storms (e.g., cyclones) and flooding;
- Functioning and growing non-life insurance market; and
- People and assets located by the coast, protected by mangroves.

Based on a quantitative analysis of 15 countries along these variables and additional variables, the five countries that are best positioned for replicating the RISCO pilot are: Mexico, Malaysia, Indonesia, Philippines, and Brazil. Fiji, while ranking lower, is also believed to be a promising site given the structure of its insurance market (e.g., one insurance provider), so it is also included in the list. Four of six are located in Asia Pacific, where approximately 50-60% of worldwide catastrophic losses originate each year (RMS, 2014). Table 2 summarizes key features of these countries, and additional information on methodology and sources utilized can be found in Annex I.

Table 2: Overview of most promising countries for RISCO

Country	Mangrove Cover (ha)	Estimated Blue Carbon (tCO_2/ha)	People Protected by Mangroves (#)	Cyclone Hazard Risk
Mexico	974,353	1,431	298,300	High
Malaysia	468,599	2,624	32,000	Low
Philippines	270,822	2,102	745,200	High
Indonesia	2,703,410	2,677	401,600	Low
Brazil	1,096,412	1,706	54,200	Low
Fiji	50,968	1,931	11,200	Medium

4.2 IMPLEMENTATION PATHWAY AND BUDGET

RISCO will be implemented in three phases: Phase 1: Pre-Pilot, Phase 2: Pilot Implementation, and Phase 3: Replication. Each was modelled to determine financing needs and overall viability. Phase 1 will be financed with grant funding of approximately US$ 1.21 million. This will allow RISCO to secure necessary partnerships (e.g., insurance companies, risk modeling experts or companies, other local partners), engage in additional scoping and analysis, negotiate contracts with insurance companies, and prepare a project design document for generation of blue carbon credits.

Currently, the Phase 2 project costs are estimated at US$ 5.69 million, of which US$ 2.35 million is for restoration investments and US$ 3.34 million is for operating expenditures (OPEX), including ongoing conservation costs, over 10 years. This will be covered with a combination of debt and equity financing, both of which will be repaid by the insurance sector and blue carbon revenue streams. Assuming Phase 2 is successful, replication in Phase 3 will rely mainly on private domestic debt and equity finance. Figure 2 summarizes the implementation pathway. Additional information regarding the budget for Phases 1 and 2 can be found in Annex II.

Figure 2: RISCO implementation pathway

2019/2020	2020-2029	~2025+
Phase 1: Pre-Pilot	**Phase 2:** Pilot Implementation	**Phase 3:** Replication
• **Setup RISCO** and establish collaboration with **insurance partners** and **risk modeling partner(s)** • With partners: – develop list of **criteria for site selection,** – **identify pilot sites** – quantify their **mangrove flood reduction values** – Agree on annual payment for healthy mangroves (USD/ha) • Prepare **blue carbon project design document** • Finalize **business plan** and secure **financing**	• Implement necessary **conservation and restoration** activities in pilot sites, and coordinate with necessary partners (e.g., community-based organizations) • Work with risk modeling partners to **provide insurance companies with information on mangroves** • **Secure annual payment** from insurance companies • Manage process for **generating and selling blue carbon credits**	• Assuming the pilots are going well, **identify additional countries and sites** for replication, and insurance partner(s) • Follow **steps from pilot development and implementation**
Grant support ~ US$ 1.21 million	**Debt and equity** ~ US$ 2.35m investment ~ US$ 3.34m OPEX	**Debt and equity** Amount will vary

4.3 PILOT IMPLEMENTATION CHALLENGES

The timeline depicted will face near and long-term challenges. For Phases 1 and 2, the most relevant include:

- **Site selection:** Given high historical deforestation of mangroves in the Philippines, RISCO is unlikely to find a single site with enough mangrove cover and insurable assets, so is more likely to aggregate a series of sites, thus increasing transaction costs.
- **Local insurance market:** The government-mandated premiums for typhoons and flood are very low (0.05% of asset value) in the Philippines,[10] and due to market competition it is believed that insurance companies are setting premium rates at or near this rate. As a result, insurance companies will likely need to pay RISCO from other revenues, and be convinced that they sufficiently benefit from avoided losses.
- **Fundraising:** Grant financing will be needed for Phase 1, as well as equity and/or debt financing in Phase 2. Since there is little history of similar projects, fundraising may be a challenge, particularly for debt and equity investors who may see RISCO as a risky venture. RISCO will aim to have in place multi-year insurance sector contracts as well as identified blue carbon credit buyers to ensure that revenue streams can pay back the financiers.

5. IMPACT

The RISCO pilot will protect 4,000 hectares of mangroves in the Philippines and will provide a climate benefit of more than 600,000 tonnes of CO_2 through avoided emissions and sequestration while also sustaining a range of significant social benefits.

[10] Set by the Insurance Commission. See https://www.insurance.gov.ph/wp-content/uploads/2017/08/Schedule-Rates-for-Earthquake.pdf for more information.

5.1 QUANTITATIVE MODELING

The Lab Secretariat has undergone illustrative modeling for the target pilot in the Philippines. Fundamental assumptions taken to model the costs and revenues include:

- RISCO as a for-profit social enterprise subject to the Philippines' 30% corporate tax.
- Conservation of 3,400ha and restoration of 600ha.
- Two revenue streams:
  - Fixed, annual payments from insurance companies at US$ 112/ha in years 1-4 and US$ 160/ha in years 5 and beyond.
  - Fixed, annual sales of blue carbon credits at US$ 10/tCO_2.

Data constraints necessitated other assumptions and estimates (See Annex II). Table 3 summarizes several financing approaches, and associated Net Present Value (NPV) and Internal Rate of Return (IRR) values.

Table 3: RISCO Pilot Financing

Scenario	NPV	IRR	Description	Potential Funders
100% Equity	(US$ 506.5k)	5.2%	• Initial equity investment of US$ 3.56m	• Grants: ○ Private Foundations ○ Bilateral Aid Organizations • Equity: ○ Impact Investors • Debt: ○ DFIs ○ MDBs
Grant for Phase 1, Equity for the rest	US$ 703.5k	13.1%	• Grant of US$ 1.21m • Initial equity investment of US$ 2.35m	
Grant for Phase 1, remaining Debt and Equity	US$ 781.9k	15.5%	• Grant of US$ 1.21m • Initial equity investment of US$ 1.62m • Loan of 725k fixed amortized 10yr @ 8%	

The outputs of the pilot modeling suggest that RISCO is viable in sites with large areas of healthy, conservable mangroves where restoration is possible but not required at scale (restoration costs are high, especially relative to conservation). The model findings also show that RISCO requires both blue carbon and insurance revenue for long-term financial viability. See Annex II for sensitivity analysis.

5.2 ENVIRONMENTAL AND SOCIAL IMPACT

RISCO has the potential for significant impact related to reduced and avoided emissions (mitigation) and coastal protection (adaptation). In terms of mitigation, over 10 years the pilot will provide a cumulative climate benefit of 631,788tCO_2 through avoided emissions and sequestration – the equivalent of the annual emissions from electricity use of nearly 100,000 homes. It will also provide important climate resilience benefits. Piloting in 3 sites in the Philippines, RISCO has the potential to contribute towards:

- Reducing flood risk for approximately 7,340 people living near project sites[11];
- Sustainable Development Goals (SDGs): 1 (no poverty), 8 (decent work and economic growth), 11 (sustainable cities and communities), 13 (climate action), 14 (life below water), 15 (life on land), and 17 (partnerships for the goals); and
- Livelihood benefits for local communities, particularly women and women's groups who account for the majority of users of mangrove related resources, as well as greater participation in conservation and protection of the coastal ecosystem.

[11] According to Losada et al (2017), 10ha of mangroves provide flood protection for 20 people. If mangroves were restored, each 10ha of restoration would reduce flooding for an additional 9 people.

5.3 PRIVATE FINANCE MOBILIZATION AND REPLICATION POTENTIAL

Assuming RISCO secures grant-based support for the pilot Phase 1, it will require roughly US$ 3.2 million in grant, debt and/or equity investment for the pilot to launch. Over the pilot's 10-year projection, it is expected to generate US$ 5.2 million in insurance revenue and US$ 5 million in blue carbon revenue.

In terms of longer-term private finance mobilization, if RISCO pursues projects[12] in the top five most promising countries, it is expected to generate nearly US$ 200-280 million in insurance sector and blue carbon revenue over a 10-year period, and achieve avoided emissions and sequestration of 16 million tCO2. This is equivalent to the annual electricity use of over 2 million homes. If it focuses instead on the top 10 most promising countries, it is expected to generate approximately US$ 360-500 million in revenue and to achieve avoided emissions and sequestration of 29.7 million tCO2. See Annex I for further information.

6. KEY TAKEAWAYS

6.1 2019 LAB FOCUS SECTOR: BLUE CARBON

The 2019 Lab cycles includes, for the first time, a focus on Blue Carbon. The goal of this thematic stream is to catalyze private sector investment in marine ecosystem conservation and restoration, while creating a viable market for blue carbon investment. Outcomes targeted include healthy marine ecosystems that support coastal water quality, healthy fisheries, and provide coastal protection against floods and storms. RISCO's focus on mangrove conservation and restoration, and monetizing the risk reduction and blue carbon value of mangroves, offers clear linkages with this year's focus on Blue Carbon.

6.2 LAB ENDORSEMENT CRITERIA

The RISCO is promising and clearly meets the Lab criteria for endorsement. Next steps include collaborating with insurance companies and other partners in the Philippines to move towards implementation – all of these steps would benefit from Lab endorsement.

Innovative: RISCO will be the first company to monetize the risk reduction and blue carbon benefits of mangroves, and to advance the insurance industry's ability to incorporate mangroves into their natural catastrophe and flood risk models.

Financially Sustainable: RISCO is likely to be commercially viable in places exposed to cyclones and flooding with sufficiently large, healthy mangrove ecosystems, and insured high-value coastal assets. Higher threat levels should boost the blue carbon revenue.

Catalytic: Once proven through the pilot in the Philippines, RISCO can be replicated in several countries, mobilizing millions in private finance while achieving significant CO2 avoided emissions and sequestration.

Actionable: The project proponent, CI, is a well-known organization with a long track record in the field. Implementation will require partnership with the insurance sector as well as risk modeling firms and other experts. Initial pilot projects are critical for refining the Mechanism's approach and value proposition before further replication.

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[12] See Annex I for more information.

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8. ANNEX I – COUNTRY SELECTION CRITERIA AND REPLICATION POTENTIAL

In order to assess the global replication potential for RISCO, a list of countries was identified by the RISCO proponent, Lab Secretariat, and the RISCO Working Group. The countries are listed in Table 1.

Table 1. List of Countries Considered for RISCO Replication

East Asia & Pacific	Latin America & Caribbean		Sub-Saharan Africa
1. Fiji 2. Indonesia 3. Malaysia 4. Philippines 5. Thailand 6. Vietnam	7. Brazil 8. Colombia 9. Costa Rica 10. Ecuador	11. Guyana 12. Mexico 13. Panama 14. Suriname	15. Kenya

8.1 CRITERIA AND SUB-CRITERIA

Table 2 summarizes the criteria and sub-criteria considered as part of the target market analysis.

Table 2. Replication Potential: Criteria and Sub-Criteria

Criteria	Sub-Criteria	Weight	Notes	Sources
Mangroves	Mangrove cover (ha)	50%	As of 2016.	• Ocean Wealth Mangrove Restoration- http://maps.oceanwealth.org/mangrove-restoration/#
	Mangrove restoration potential (ha)	50%	Calculated by taking the total area of loss and subtracting the area not possible to restore because it was converted to either an urbanized area, or it eroded.	
Blue Carbon Potential	Avoided Emissions	100%	Potential avoided emissions if deforestation were halted over 10 years (tCO_2). Calculated based on the historical deforestation rate in the country (1996-2016) and the average carbon content per hectare of mangroves. Assumed that initiated restoration activities would avoid soil carbon emissions of recently deforested areas.	• Ocean Wealth Mangrove Restoration- http://maps.oceanwealth.org/mangrove-restoration/#
Hazard Risk	Coastal flooding risk (ranking)	80% (30% coastal flooding risk, 70% tropical	Coastal flooding is inundation of land from coastal waters, due to high tidal levels or storm surge. Coastal flood is classified using onshore flood depth data, provided as	• Think Hazard[13] http://thinkhazard.org/en/report/CIA • https://www.cia.g

[13] The ThinkHazard! project was initiated in 2015 to facilitate greater access to hazard information and risk management guidance for development sector professionals. Users of ThinkHazard! can quickly and robustly assess the level of river flood, earthquake, drought, cyclone, coastal flood, tsunami, volcano, and landslide hazard within their project area to assist with project planning and design.

		cyclone risk)	frequency-severity data in raster format.	ov/library/publications/the-world-factbook/fields/282.html • Willis Towers Watson (WTW) analysis of historical cyclone tracks using NOAA database
	Tropical cyclone risk (ranking)		Tropical cyclone is classified using wind speed. Tropical cyclones are dangerous because they produce destructive winds, heavy rainfall with flooding and damaging storm surges that can cause inundation of low-lying coastal areas.	
	Coastline length (km)	20%	Country coastline length was incorporated since countries with longer coastlines would inherently be more at-risk.	
Insurance	Non-life insurance (NLI) penetration (%)	40%	NLI penetration rate indicates the level of development of insurance sector in a country and is measured as the ratio of NLI premiums underwritten in a particular year to the GDP.	• Ocean Wealth Mangrove Restoration- http://maps.oceanwealth.org/mangrove-restoration/# • Axco Insurance Market Reports (2018) • Internal analysis
	People protected by mangroves (#)	40%	Derived from the dataset produced by Beck et al. (2018). The data were provided as point values at 20km resolution.	
	Compulsory cession (yes/no)	20%	If there is a compulsory cession in a particular class of business in the country, then all insurance companies writing that class of business have to cede a portion of it to one or several pre-determined reinsurers (i.e., buy reinsurance). For RISCO purposes, this means that the reinsurer(s) receiving the compulsory cession has some leverage in compelling insurers to act in a certain way (e.g., ask them to provide a premium discount if the property risk has been reduced through mangrove restoration.)	

8.2 COUNTRY SCORING

Overall country scores are based on a weighted average of the mangrove score (20%), the blue carbon score (20%), the hazard score (30%), and the insurance score (30%). The latter two criteria receive a slightly higher weighting than the preceding two to capture the critical importance that hazard risk and the presence of a robust insurance industry play in the viability of RISCO. The individual criteria scores as well as total score are provided in Table 4.

Table 3. Scoring – Country Ranking

Country	Mangrove Score	Blue Carbon Score	Hazards Score	Insurance Score	Total Score
1. Mexico	6.5	10.0	9.8	6.4	**8.16**
2. Malaysia	9.0	9.0	6.8	6.6	**7.62**
3. Philippines	5.5	7.0	10.0	6.6	**7.48**
4. Indonesia	8.0	10.0	7.2	5.4	**7.38**
5. Brazil	7.0	9.0	7.0	5.4	**6.92**
6. Colombia	7.0	8.0	6.4	5.6	**6.60**
7. Vietnam	3.5	6.0	9.4	5.2	**6.28**
8. Thailand	6.0	7.0	5.2	5.6	**5.84**
9. Kenya	5.0	3.0	4.2	7.0	**4.96**
10. Panama	6.0	4.0	6.2	3.6	**4.94**
11. Ecuador	2.5	5.0	4.6	6.2	**4.74**
12. Costa Rica	5.5	1.0	7.4	2.8	**4.36**
13. Fiji	2.0	1.0	7.2	4.8	**4.20**
14. Suriname	7.0	4.0	4.0	1.6	**3.88**
15. Guyana	5.0	2.0	4.0	3.2	**3.56**

8.3 REPLICATION PROJECTIONS

In addition to producing an overall score and ranking for each of the 15 countries considered, projections were made regarding 10-year blue carbon and insurance revenue, as well as cumulative CO2 mitigation benefits. In order to make these projections, the following assumptions were taken for each country:

- **Conservation and restoration:** 1 new RISCO project site added per year over 10 years. Each project site consists of 3,400ha of conservation and 600ha of restoration, with the restoration activities implemented at a rate of 150ha/year for the first four years, for a total of 4,000 ha per site.
- **Blue carbon revenue:** Based on conservation and restoration priced at US$ 5/tCO_2 or US$ 10/tCO_2. Also considers: Annual deforestation rate (based on %, avoided CO_2/ha/year plus 8.29 tCO_2 for avoided lost annual sequestration (tCO_2)), and potential annual avoided loss of soil carbon/ha due to restoration.
- **Insurance revenue:** Derived from conservation in year 1-4 and conservation and restoration in years 5+, assuming it would take 5 years for restored areas to provide the coastal protection benefit. The damage reduction benefit in the Philippines (US$ 3,200/ha[14]) is used as baseline and scaled to the other countries based on (1) the hazard score, assuming lower mangrove protection values in countries with lower hazards and (2) an assumption that insurers would pay 3.5-5% of the total per-ha mangrove value to RISCO.

Based on the above, Table 5 summarizes the 10-year revenue benefits for the top 5, top 10, and all counties assuming carbon prices of US$ 5 and US$ 10 per tCO2. Table 6 summarizes the avoided emissions over 10-years.

[14] Losada et al. (2017).

Table 4. Replication Revenue Projections (10-years)

Countries	Total 10-year Revenue Assuming US$ 5/tCO$_2$ (million US$)	Total 10-year Revenue Assuming US$ 10/tCO$_2$ (million US$)
Top 5	198.6	278.5
Top 10	359.0	507.6
All countries	509.7	730.0

Table 5. Replication Avoided Emissions Projections (10-years)

Countries	Total Avoided Emissions (million tCO$_2$)
Top 5	16.0
Top 10	29.7
All countries	44.0

9. ANNEX II – FINANCIAL MODELING

9.1 OVERVIEW AND GENERAL ASSUMPTIONS

Table 1 outlines the general assumptions made for the RISCO pilot model planned for the Philippines.

Table 1. General Assumptions

Assumption	Value	Notes and Source
Discount rate (%)	8%	Equity and debt impact investors assumed.
Tax rate (%)	30%	Philippines corporate tax rate. https://www.aseanbriefing.com/news/2018/05/18/corporate-taxes-philippines.html
Exchange rate (PHP/US$)	51.15	Exchange rate on July 22, 2019.
Inflation – Philippines (%)	3.1%	Inflation outlook as of March 2019. https://www.pna.gov.ph/articles/1069411
Inflation – U.S. (%)	2.0%	Inflation outlook as of March 2019. https://knoema.com/kyaewad/us-inflation-forecast-2019-2024-and-up-to-2060-data-and-charts
Number of sites	3	Based on Conservation International (CI) input.
Number of community-based organizations/site	5	Based on CI input.
Mangroves to conserve (ha)	3,400ha	Based on CI input.
Mangroves to restore (ha)	600ha	Based on CI input.
Restoration planting spacing	1m x 1m	Based on CI input: The most common spacing being used in the Philippines is 1m x 1m. Inner sites along the seafront and in abandoned ponds with little wave action can be planted at 1.5-2 m intervals. Seaward sites exposed to frequent wave action and debris brought by the incoming tide need to be planted at closer intervals of 0.5-1m and/or in clusters of 2-3 seedlings each.

9.2 PRE-PILOT INVESTMENT ASSUMPTIONS

Table 2 provides an overview of the assumptions regarding the short-term, Phase 1 investment needs. These are expected to occur in the next 6-12 months. These estimates are based on input from CI.

Table 2. Pre-pilot Investment Assumptions

Assumption	Estimate (US$)	Notes
Initial staffing & setup	950,000	• Staff (2 in the U.S. and 3 in Manila) • Office space, equipment, travel • Consulting support for risk modeling and business planning
Site scoping & workshops	55,000	• US$ 8,000/site x 3 sites • 2 workshops
Nursery setup	45,000	• 3 sites x 5 nursery's/site x US$ 3,000/nursery
Blue carbon project setup	160,000	• US$ 150,000 for the Project Design Document • US$ 10,000 for the validation

9.3 RESTORATION ASSUMPTIONS

Restoration is planned for a total of 600ha split equally over four years (i.e., 150ha/year during years one through four). During Phase 1, year 0, five nurseries will be established in each of the sites, with each nursery costing US$ 3,000. Based on previous experience by CI, planting will be done in the seaward and middle intertidal zone at a spacing of 1m x 1m. This spacing requires 10,000 seedlings/ha at a fixed cost of PHP 20/seedling (approximately US$ 0.40/seedling). The seedling cost includes labor for collecting and planting. The total four-year restoration cost is US$ 2.3 million, equal to US$ 3,910/ha. Restoration costs may vary based on the site conditions. In some cases, the beach profile or hydrology of the site may need to be restored to create the conditions for seedling survival. In other cases, the site conditions may already be good for natural propagation and, as long as threats to the area are reduced, less active planting could be required.

9.4 OPERATING EXPENDITURE ASSUMPTIONS

Table 3 summarizes the assumptions related to ongoing operational expenses (OPEX). The bulk of the OPEX is for the Manila-based team. The other primary cost category is conservation. In the Philippines, all mangrove conservation and restoration efforts are done in partnership with local communities. This is typically achieved through conservation agreements, which include payments to households based on environmental outcomes, to incentivize mangrove conservation. The agreements can also fund discrete activities such as monitoring and the creation of alternative livelihoods (e.g., income-generating alternatives to aquaculture or other activities that threaten mangroves).

Table 3. Operating Expenditure Assumptions

Assumption	10-year Estimate (US$)	Notes
U.S. Team	292,634	• 2 half-time staff; office space; travel; misc. • Through year 4
Manila Team	2,061,454	• 3 full-time staff; office space; travel; misc.
Professional Services	337,737	• Legal and accounting services
Conservation	600,000	• US$ 20,000/site Conservation Agreement (including livelihoods, monitoring, etc.)

Blue Carbon Verra Credit Issuance	50,542	• US$ 0.10 fee/credit

9.5 REVENUE ASSUMPTIONS

Revenue will be derived from two sources: insurance and blue carbon. The assumptions utilized to estimate the 10-year revenues are included in Table 4.

Table 4. Revenue Assumptions

Assumption	10-year Estimate (US$ millions)	Notes and Source
Insurance	5.22	• US$ 3,200/ha annual mangrove flood reduction benefit (i.e., prevented damages) • Payments at 3.5% of this value in years 1-4 and 5% in 5+ (takes ~5 years for restored mangroves to mature)
Blue Carbon	5.05	• 0.32% annual historical deforestation rate in the Philippines (1996-2016) • 1,583 tCO_2/ha avg. avoided emissions of threatened mangroves saved • 8.3 tCO_2/ha/yr avg. sequestration • Assumption that areas to be restored were deforested 5 years ago and that soil carbon emissions occur over 20 years. Therefore 15 years of soil carbon emissions can be avoided once restoration is initiated. • 20% buffer – average set aside for Verra land-use projects • Credits sold annually • Credit price of US$ 10/tCO_2

9.6 BUDGET SUMMARY

Figure 1 summarizes the budget needs for Phases 1 and 2.

Figure 1. RISCO Budget (Phase 1 and 2)

Project Implementation Budget Overview	Budget Estimate (USD)	Notes
Phase 1: Pilot Development (2019/2020)		
Site scoping/mangrove assessment and workshops	55,000	3 sites x USD 8,000/site plus 2 workshops
U.S. and Philippines support	950,000	5 Staff, office, equipment, travel, consultants, legal and accounting support
Blue carbon project setup	160,000	Project Design Doc, validation
Restoration nursery setup	45,000	Nursery construction
Phase 1 Total	**1,210,000**	
Phase 2: Pilot Implementation (2020-2029)		
Investment		
Restoration costs	**2,346,041**	600 hectares (150/year for 4 years)
OPEX		
U.S. - Corporate level	292,634	2 staff (1/3 time) year 2, 3, 4
Manila - Corporate level staff and other support	2,061,454	3 staff; office space in Manila; travel
Manila - Professional services	337,737	Legal and accounting support
Conservation costs	600,000	3,400 hectares
Blue carbon credit issuance	50,542	Credit issuance
	3,342,367	
Phase 2 Total	**5,688,408**	

9.7 CASHFLOW WITH FINANCING

Based on the general, cost and revenue assumptions, a number of financing scenarios were developed to explore the implications of relying on equity only, a grant for Phase 1 and equity for the rest, of a combination of grant, equity and debt. The details of each scenario, as well as resulting NPV and IRR values, are provided in Table 5.

Table 5. RISCO Pilot Financing Scenarios

Scenario	NPV (US$)	IRR	Description
100% Equity	(506.5k)	5.2%	• Initial equity investment of US$ 3.56m
Grant for Phase 1, Equity for the rest	703.5k	13.1%	• Grant of US$ 1.21m • Initial equity investment of US$ 2.35m
Grant for Phase 1, remaining Debt and Equity	781.9k	15.5%	• Grant of US$ 1.21m • Initial equity investment of US$ 1.62m • Loan of 725k fixed amortized 10yr @ 8%

9.8 SENSITIVITY ANALYSIS: REVENUE

The financial viability of RISCO depends, critically, on its two revenue streams.

For insurance, we ran sensitivity analyses for insurance companies paying US$ 25-800 /ha (i.e., <1%-25% of the estimated mangrove protection value of US$ 3,200/ha) to RISCO.

For blue carbon credits, we ran sensitivity analyses for prices of US$ 0.50-16 per tonne. The average price for forestry and land-use credits was US$ 5.1/tonne on the voluntary carbon market as of 2017 though prices for credits range from US$ 0.05/tonne to more than US$ 50/tonne.[15] New project types with significant co-benefits often yield higher prices. If blue carbon credits were accepted in compliance markets, regulation could also drive higher prices.

Additional assumptions:

- Hectares = 4,000
- Average credits to sell = 50,542tCO_2
- Average OPEX = US$ 334,237

Table 6 shows the average annual earnings before interest and taxes (EBIT), and Table 7 shows the average annual net profit, with different insurance and blue carbon price assumptions.

Table 6. Average Annual Earnings Before Interest and Taxes

		Insurance (USD/ha)						
		$ 25.00	$ 50.00	$ 75.00	$ 100.00	$ 200.00	$ 400.00	$ 800.00
Blue carbon credit price (USD/tCO2)	$ 0.50	(208,965)	(108,965)	(8,965)	91,035	491,035	1,291,035	2,891,035
	$ 1.00	(183,694)	(83,694)	16,306	116,306	516,306	1,316,306	2,916,306
	$ 2.00	(133,152)	(33,152)	66,848	166,848	566,848	1,366,848	2,966,848
	$ 4.00	(32,067)	67,933	167,933	267,933	667,933	1,467,933	3,067,933
	$ 8.00	170,103	270,103	370,103	470,103	870,103	1,670,103	3,270,103
	$ 10.00	271,187	371,187	471,187	571,187	971,187	1,771,187	3,371,187
	$ 12.00	372,272	472,272	572,272	672,272	1,072,272	1,872,272	3,472,272
	$ 14.00	473,357	573,357	673,357	773,357	1,173,357	1,973,357	3,573,357
	$ 16.00	574,442	674,442	774,442	874,442	1,274,442	2,074,442	3,674,442

15 See Ecosystem Marketplace (2017).

Looking at EBIT, the sensitivity analysis shows that RISCO would become cash flow positive (pre-tax) with insurance sector payments of US$ 25/ha and a blue carbon credit price of US$ 8, but could accept lower blue carbon credit prices given higher insurance payments.

Table 7. Average Annual Net Profit

		Insurance (USD/ha)						
		$ 25.00	$ 50.00	$ 75.00	$ 100.00	$ 200.00	$ 400.00	$ 800.00
Blue carbon credit price (USD/tCO2)	$ 0.50	(418,414)	(318,414)	(218,414)	(118,414)	281,586	1,081,586	2,681,586
	$ 1.00	(393,143)	(293,143)	(193,143)	(93,143)	306,857	1,106,857	2,706,857
	$ 2.00	(342,600)	(242,600)	(142,600)	(42,600)	357,400	1,157,400	2,757,400
	$ 4.00	(241,516)	(141,516)	(41,516)	58,484	458,484	1,258,484	2,858,484
	$ 8.00	(39,346)	60,654	160,654	260,654	660,654	1,460,654	3,060,654
	$ 10.00	61,739	161,739	261,739	361,739	761,739	1,561,739	3,161,739
	$ 12.00	162,824	262,824	362,824	462,824	862,824	1,662,824	3,262,824
	$ 14.00	263,908	363,908	463,908	563,908	963,908	1,763,908	3,363,908
	$ 16.00	364,993	464,993	564,993	664,993	1,064,993	1,864,993	3,464,993

The sensitivity analysis shows that RISCO would generate a net profit assuming insurance payments of US$ 25/ha and a blue carbon credit price of US$ 10. It could still achieve a net profit with a lower blue carbon credit price, all the way to US$ 0.50 assuming insurance payments reach US$ 200/ha.

9.9 SENSITIVITY ANALYSIS: PROJECT SIZE

RISCO's overall financial viability depends on costs as well as revenues. On the cost side, the overall project size and the breakdown of conservation versus restoration are of critical importance. The pilot currently assumes a total of 4,000ha: 3,400ha of conservation and 600ha of restoration. Table 8 highlights the expected IRR assuming different levels of restoration within a 4,000ha project financed with a grant in Phase 1 and equity in Phase 2. Restoration is assumed to happen at a rate of 200ha/year (e.g., 400ha is assumed to take place in two installments of 200ha over two years; 800ha is assumed to take place in four installments of 200ha over four years). Table 9 summarizes the expected IRR assuming different project sizes with 85% conservation and 15% restoration. Restoration is assumed to take place in equal installments over the first 3 years.

Table 8. IRR for a 4,000ha 10-year project with varying levels of restoration

Restoration Scenario	IRR
200ha (5%)	37.2%
600ha (15%)	14.2%
1,000ha (25%)	6.9%
1,200ha (30%)	4.5%
1,400ha (35%)	2.4%
1,600ha (40%)	0.6%

Table 9. IRR for a 10-year project of various sizes assuming 85% conservation and 15% restoration

Project Size Scenario	IRR
2,000ha	2.3%
4,000ha	14.2%
8,000ha	19.6%
16,000ha	22.2%

Generally speaking, more conservation and less restoration results in higher IRRs, as do larger projects assuming an 85% conservation and 15% restoration split. Determining both project size and the split between conservation and restoration requires financial analysis as well as an understanding of what is feasible on the ground.

10. ANNEX III – INSURANCE CONSIDERATIONS

10.1 OVERVIEW

The global insurance market currently includes two products of relevance to disaster risk financing: indemnity and parametric. These are summarized in Table 1.

Table 1. Insurance Product Considerations

	Indemnity insurance (e.g., property)	Parametric insurance
Covered risks	Multiple risks	Only risk(s) specified
Underwriting information	Asset characteristics, risks involved	Historical weather data and damage history, methods for data collection
Criteria for claim pay	Actual loss amount	Data related to the parametric trigger
Payout timing	Assessment and payout can take months/years	Generally within days/weeks
Moral hazard*	Mid to high	Low
Basis risk**	Nothing to low	Mid to high
Philippines context	All public assets insured; most private industrial	Philippines City Disaster Insurance Pool (PCDIP) will be first

* If the insured changes behavior and becomes less diligent in maintenance knowing potential losses are covered. (Monitoring can be expensive). Note, there's another layer of potential moral hazard risk related to RISCO if ongoing mangrove conservation/restoration assumed within premium payments.

** Difference between actual loss amount and paid amount.

10.2 PHILIPPINES CONTEXT

In the Philippines, there are a number of existing instruments, or instruments under development, that span indemnity and parametric insurance. Several are highlighted in Table 2.

Table 2. Existing instruments

Instrument	Overview	What's lacking to overcome barriers?
Property Insurance	Normal property insurance with option for natural catastrophe cover.	Premium payments do not reflect the value that healthy mangroves play in risk reduction.
Philippine City Disaster Insurance Pool (PCDIP)	Will provide parametric insurance cover against typhoons and earthquakes (not floods). *In development stage.*	Targets cities and national governments, not private coastal asset owners. Doesn't value mangroves or embed risk reduction measures, and doesn't cover floods.
Philippine Crop Insurance Co. Fisheries Insurance	Provides insurance protection against losses in unharvested crop or stock in fisheries farms.	Targets aquaculture farmers, not broader coastal asset owners. Inclusive of mangrove areas, but doesn't incorporate value of mangroves. Not financially sustainable; relies on government-subsidized premiums.
Philippines Parametric Insurance	Provides parametric insurance cover for 25 disaster-prone provinces. World Bank supported.	Only covers national government assets and local governments. Doesn't value mangroves or embed risk reduction measures.

10.3 RISCO OUTLOOK

In addition to the issues summarized in Table 1, there are other considerations to bear in mind when assessing the feasibility of indemnity and parametric insurance. For example:

- Whether the insurance companies insure private property and/or public property;
- State of existing coverage (e.g., penetration of property insurance market); and
- Whether it makes sense for RISCO to embed into existing products or to work with the insurance companies to create new products to complement.

With the Philippines context in mind, it was determined that RISCO should focus on indemnity insurance. The rationale for excluding parametric, at least in the short-term and in the Philippines, includes:

- Parametric products are fairly low-cost already so there's little room to reduce client payments, and little incentive for programs to pay for risk mitigation;
- Mangroves will reduce flooding in the event of a storm, but few parametric schemes use flooding as a trigger due to data constraints, and even if they did, it's unclear whether mangroves would be sufficient to adjust the trigger level/point; and
- Parametric payout triggers usually include wind speed or rainfall or earthquakes, which aren't influenced by mangroves.