Assessment of Opportunities to Mobilise Private Finance into Climate Adaptation in Southeast Asia

Report

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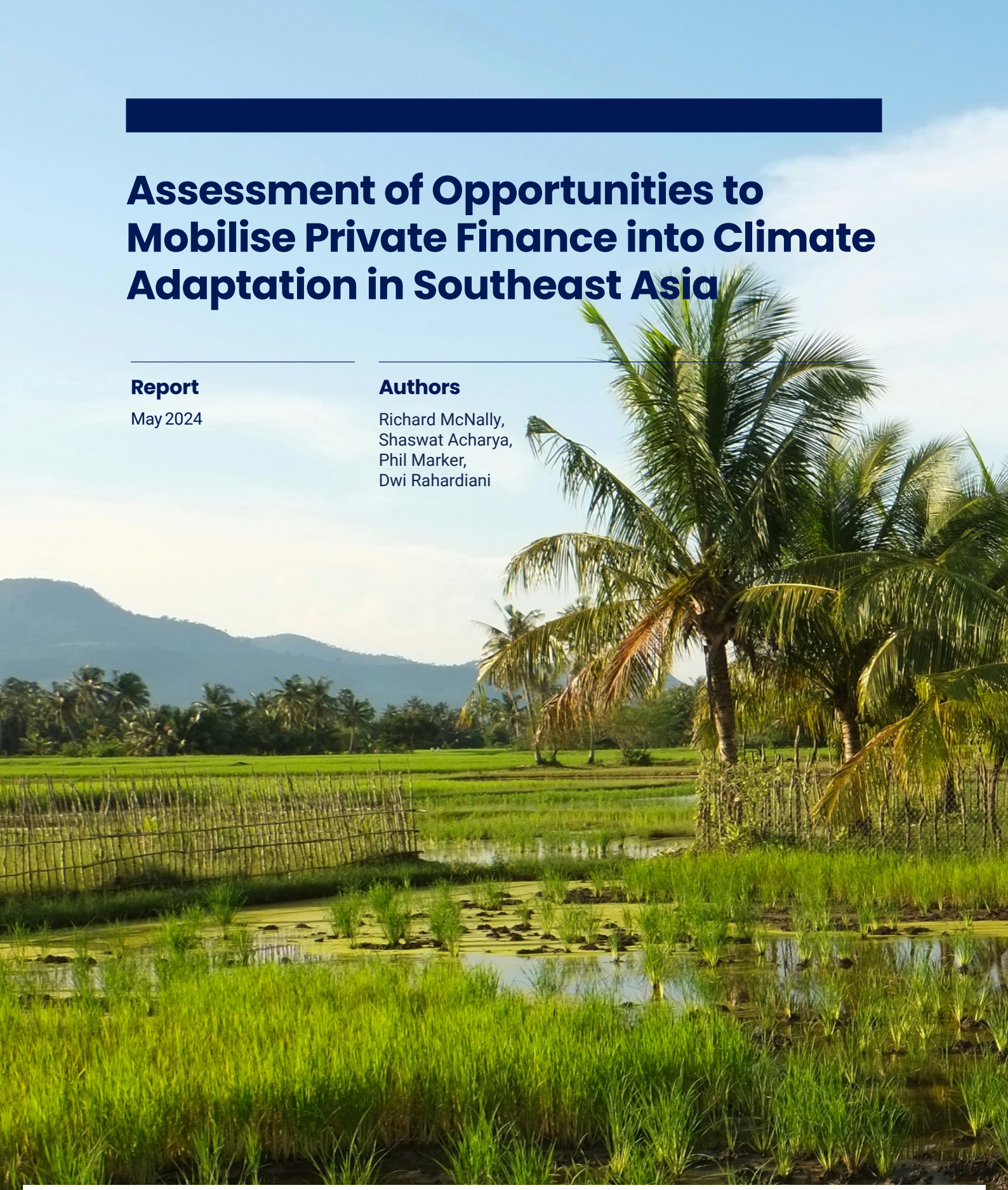

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Cover photo: Rainfed rice farming in Cambodia.

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List of abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CCFF	Cambodia Climate Finance Facility
CDKN	Climate and Development Knowledge Network
DAI	Development Alternatives Inc.
ESG	Environmental, Social, and Governance
EU	European Union
FCDO	Foreign, Commonwealth & Development Office
FMO	Dutch Entrepreneurial Development Bank
GCF	Green Climate Fund
GEF	Global Environment Facility
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least Developed Countries
MFI	Microfinance Institution
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
OPM	Oxford Policy Management
SARH	South Asia Research Hub
ToR	Terms of reference
UK	United Kingdom of Great Britain and Northern Ireland
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WB	World Bank

Chapter 1: Introduction

Southeast Asia is vulnerable to the impacts of climate change, including rising sea levels, increased frequency of extreme weather events, and changing precipitation patterns. In response, many countries have built their resilience through public policy and expenditure. However, significant gaps remain in the region's capacity to effectively adapt to climate change, due to limited financial resources, inadequate institutional frameworks, and lack of comprehensive data about risks. Mobilising private finance is a priority to alleviate the pressure on insufficient public and donor budgets in this context. But in contrast to projects that focus on climate mitigation and can generate predictable revenue streams, adaptation and resilience markets are less developed.

The UK White Paper on international development highlights the potential of UK finance and influence to unlock and leverage significant sums of private investment to support the most climate vulnerable countries and communities. UK's relationship with the Association of Southeast Asian Nations (ASEAN) is also evolving and a partnership approach which recognises respective learning and expertise should be at the forefront of any new intervention. This assessment will provide an evidence base on opportunities for private investment in adaptation in the region.

The opportunity presented by private investment in adaptation in Southeast Asia has received relatively little attention, particularly as compared to mitigation solutions. The public sector alone cannot provide the scale of adaptation finance that is needed. However, there are a range of conceptual, methodological, market and political economy challenges related to mobilising private investment in adaptation.

The emergence of innovative financial mechanisms, such as green bonds and climate risk insurance, has facilitated the mobilisation of private finance into climate adaptation and resilience projects. These mechanisms provide avenues for investors to allocate funds toward environmentally sustainable and climate-resilient initiatives, thereby promoting the development of resilient infrastructure, sustainable agriculture, and disaster risk reduction measures. The implementation of these financial instruments has not only attracted private sector investment but has also helped build a more robust financial ecosystem that supports climate-related projects and initiatives in Southeast Asia. Moreover, the promotion of knowledge sharing platforms and capacity building initiatives has played a crucial role in fostering a better understanding of climate finance among various stakeholders. These initiatives have enhanced the capacity of financial institutions, government agencies, and private sector entities to effectively assess, manage, and finance climate-related risks.

1.1 Methodology

The overall research question was framed as: ***What good practices can we identify from specific case studies of private investment in adaptation in Southeast Asia that can be applied to scale up private investment in adaptation elsewhere in the region?*** Based on the overall research question, specific investment opportunities and key actions required to strengthen the enabling environment were drawn.

The following steps were taken to ensure practical sequencing of activities with each step informing the next. At each stage of the study, the ethical guidelines as given in Foreign,

Commonwealth & Development Office (FCDO) Ethical Guidance for Research, Evaluation and Monitoring Activities were respected.

Step 1: Identifying long-list of case studies

A long-list of case studies were identified (see Annex A) by conducting in-depth desk-based review using specialised key terms comprising climate adaptation, private sector investment, adaptation financing, etc from online databases to search for published reports, peer-reviewed and grey literatures. The list also drew on the deep knowledge and experience of the consultant team in the Southeast Asia region.

Source of desk-based review included but was not limited to donor websites e.g., FCDO DevTracker, as well as from online databases such as Google Scholar, Web of Science, Climate and Development Knowledge Network (CDKN), Asian Development Bank (ADB) portal, United States Agency for International Development's (USAID) Climatelinks, United Nations Development Programme (UNDP) Climate Change Adaptation Portal, United Nations Environment Programme (UNEP) Climate Adaptation Project List, Global Center on Adaptation Knowledge Portal, Reliefweb, Development Alternatives Inc. (DAI) portals, Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation Fund, and Climate Resilience and Adaptation Finance & Technology Facility. In addition, various investment funds within the ASEAN region were also reviewed.

Step 2: Shortlisting ten case studies

Ten case studies were selected from the long list of case studies based on the following shortlisting criteria.

- **Diversity** to ensure sample covers a range of countries, types of adaptation categories (adaptation interventions including ecosystem-based, community-based, or risk-based adaptation, etc.), types of adaptation investments, sectors, current size/ maturity of the market as well as diversity of financial instruments (parametric risk insurance, green bonds, blended finance, etc.)
- **Data availability** to ensure we have sufficient information to assess the case study.
- **Scale of adaptation benefits** to ensure that we capture projects with high development impact and socio-economic benefits as well as projects with focus on reducing the adverse impact of the current and expected future climate hazards on people, nature, or assets.

Based on following components, an analysis through market reports and academic literature was conducted to identify the most important enabling factors for each case study and to identify transferable learnings.

- **Outcomes oriented:** Consider outcomes such as sustainability and amount of finance mobilised, incorporating environmental and socio-economic benefits achieved in each case study.
- **Context oriented:** Focus on the country context; current volume of private investment, the current market size/maturity and number and type of private sector players involved; the enabling environment including the success and limiting factors to identify the institutional, regulatory, technical, financial, policy and political economy settings in the implementation locations that have led to current volumes of investment and any remaining barriers that hold back further investment.

- **Mechanism oriented (design and delivery**): Carefully consider implementation model and funding structure (including mobilisation rate and other financial indicators) for each case study. For this component, the focus was on the general profitability or whether the funds generated sufficient returns that could attract investors for replication or scale up.

For each case study, the key factors that have contributed to the mobilisation of private investment are presented while drawing any overarching learning that cuts across the case studies. This focused on the minimum conditions that need to be present in the enabling environment for private investment to flow towards adaptation. This helped us understand and unpack mechanisms by which different case studies and financial instruments worked or failed to work, thereby providing an explanation of how it works. We also conducted a limited number of interviews with private investors and market players to identify contextual success and limiting factors.

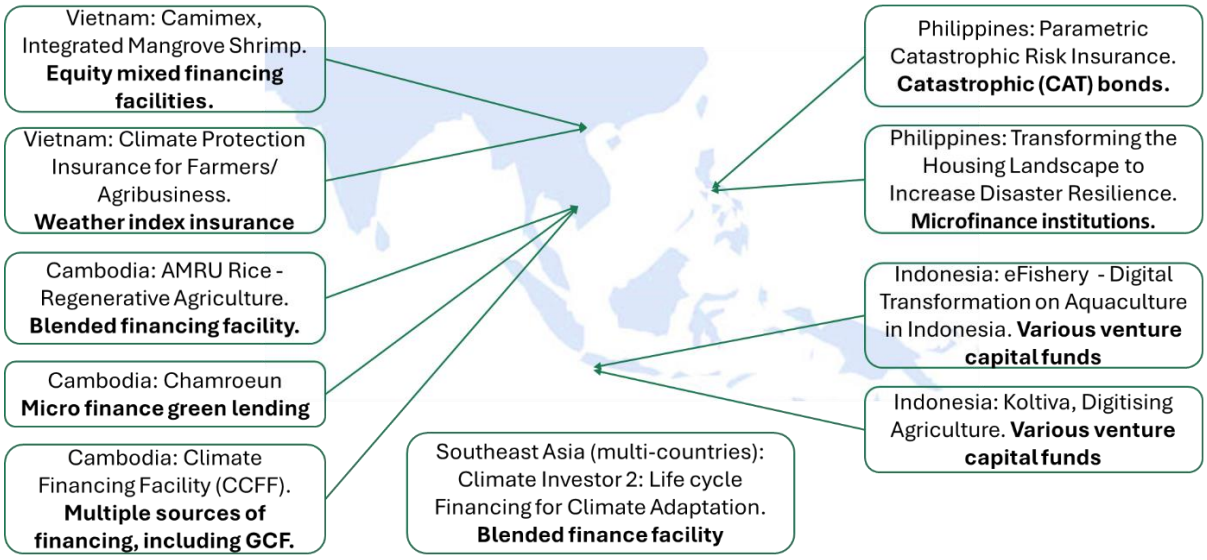
Step 3: Identifying other contexts with similar conditions for private sector investment in adaptation

The case study analysis informed identification of the policy, regulatory, and enabling environment factors that are important for replicating and scaling up private investment in adaptation, drawing on a combination of the success factors for the case studies and lessons learned from challenges. We then looked at opportunities in ASEAN countries and key sectors within those countries where conditions may exist to allow replication or scale up of private sector investment in adaptation.

Finally, we made recommendations on the enabling conditions and good practice to identify the key factors that will support scale up and replication of private investment in adaptation in Southeast Asia.

Chapter 2: Summary of case studies on private investment in adaptation

The prioritisation process selected ten case studies, three from Cambodia, two each from Vietnam, Philippines, and Indonesia and one multi-country covering several countries in South-East Asia. The table on the following page provides a summary of the ten case studies.



A one-page summary of each of the ten case studies follows. The full case studies can be found in Annex D.

Case Study Summary 1 - AMRU Rice: Regenerative Agriculture

Summary

Amru Rice (Amru) was incorporated in Feb 2011 and has grown into a vertically integrated agribusiness which is the largest exporter of Organic Rice in Cambodia. Amru works through Agriculture Cooperatives and smallholder farmers using a contract farming model, offering a fair incentive system creating a sustainable and inclusive supply chain. Amru projects that sustainable organic rice is the key product for its future business. Amru is exploring a climate smart farming model through Regenerative Agriculture (RA).

Location

Cambodia

Financial Structure

In Cambodia there is limited working capital and obstacles to access finance from local commercial banks which hinders commercial expansion in the agriculture sector. In 2020, IFC provided AMRU a USD 10 million loan and supported Amru in adopting Sustainable Rice Platform standards. In 2023, Emerging Markets Investment Advisers, further invested in Amru. Amru is now seeking a further round of capital to expand its RA operations.

Adaptation benefits

Climate change is projected to lower yields for rice, maize, and cassava, with particularly strong negative impacts for rainfed rice in Cambodia. Rice farmers in the sourcing regions Amru operate in, rely on rain-fed agriculture in a highly climate vulnerable region. Amru seeks to help farmers overcome the barriers by introducing RA, which builds resilience to climate risks and areas affected by climate hazards (droughts, flooding, and increase in temperature).

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Tax incentives and benefits for the rice industry provide a stronger business and investment case	Strong supply chain linkages with cooperatives and smallholder farmers	Global demand for organic rice; Cambodia's growing reputation in the global organic rice market

Replication and scale up in SE Asia

The RA model is most applicable in areas of rainfed rice.

Analysing conditions for rainfed rice, Thailand provides the most supportive environment to replicate organic/RA practices across Southeast Asia. This is primarily due to the large area of rainfed rice, good supply chain linkages to smallholder farmers and cooperatives, and the existing market access which Thailand enjoys.

Lao PDR also offers possibilities for replication, though it would require more engagement from processing companies.

Case Study Summary 2 - Philippines Catastrophe Risk Insurance

Summary

The Catastrophic Risk Insurance Programme was initiated to strengthen the country's disaster risk financing mechanism. 25 provinces within Philippines were selected for the programme based on an assessment of their exposure to risks using the catastrophe risk model. The programme showcased the effectiveness of parametric insurance in providing rapid liquidity to local government after climate shocks while increasing knowledge and capacity in disaster risk financing.

Location

Philippines

Financial structure

The Philippines utilised the international financial markets to transfer the risks associated with typhoons and earthquakes from the country to the international reinsurance market. A state-owned insurance company i.e., Government Service Insurance System (GSIS) was the primary insurer. The World Bank Treasury reinsured 100% risk from GSIS and retroceded 100% of risks through catastrophe swaps to a panel of international insurers. Reinsurers showed interest for several reasons including diversification benefits, predictable loss patterns based on predefined triggers and parameters, opportunity to access to new markets, and the use of innovative risk transfer solutions.

Adaptation benefits

Parametric insurance offered a flexible and efficient tool by providing rapid and predictable financial protection against climate induced disasters. It assesses losses based on exogenous variables such as typhoon wind speed or a measure of ground shaking in an earthquake while avoiding physical assessment of actual individual losses after an event. Insurance payments are made when an earthquake or tropical cyclone strength exceeds a predefined threshold.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Policies in place to encourage parametric risk insurance	Capacity of government on earthquake and typhoon risk assessment	Strong reinsurer interest in parametric catastrophe risk financing

Replication and scale up in SE Asia

The programme enabled the government to adopt a strategic approach to disaster risk management leading to the implementation of other instruments, such as catastrophe bonds. It also stimulated interest from the private sector through the establishment of the Philippines Catastrophe Risk Insurance Facility.

Based on the country comparison, Viet Nam provides the most supportive environment to replicate catastrophic risk insurance, while Thailand also offers opportunity for replication.

Case Study Summary 3 - Climate Investor 2: Life cycle financing for climate adaptation

Summary

The Dutch Fund for Climate and Development (DFCD) enables private sector investment into projects aimed at climate change adaptation in developing countries. The DFCD is managed by FMO (Dutch Entrepreneurial Development Bank), in partnership with Climate Fund Managers, Worldwide Fund-Netherlands, and SNV. The DFCD includes a novel financing facility called Climate Investor Two (CI2) managed by Climate Fund Managers. This is an example of a blended public and private finance vehicle which seeks to simplify and accelerate project financing for private sector climate adaptation investments.

Location

Multiple countries in SE Asia

Financial structure

CI2 is an example of a blended public and private finance vehicle which seeks to simplify and accelerate project financing for private sector climate adaptation projects. The different stages of finance include the development fund which seeks to generate a pipeline of bankable climate adaptation projects and mobilise commercial equity investors for the construction phase; the construction equity fund which avoids complex negotiations with multiple financiers by making available equity financing for a large part of the construction costs and; the refinancing fund which targets debt investors seeking long-term de-risked infrastructure assets, such as institutional investors.

Adaptation benefits

Climate Fund Managers undertook an assessment to determine Priority Investment Themes for climate change adaptation in the water sector. This includes bulk water supply, water treatment plants, desalinisation, and wastewater treatment which build resilience where there are scarce freshwater supplies. It also supports coastal and marine protection which provide natural defence against coastal flooding and storm surges. For example, in Thailand the fund is investing into the production of safe drinking water in an area faced with seasonal water scarcity through seawater desalination. Intra-Asia is investing in Spectainer, a growth stage green intermodal innovation company that has developed a next generation shipping container ecosystem.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Supportive regulations for investing in water infrastructure (e.g., higher water prices)	Overall investment climate and familiarity with project finance for infrastructure	Water security and climate risks; demand for freshwater

Replication and scale up in SE Asia

Based on our assessment (see Annex 3) of the critical success factors in other countries of Southeast Asia, Thailand, Vietnam, and Cambodia were highlighted as offering the best opportunities for replication in the immediate term. Regulations and setting of water tariffs remain a key issue.

Case Study Summary 4 - CAMIMEX: Integrated Mangrove Shrimp

Summary

Camimex seafood processing company has been a pioneer in organic, Integrated Mangrove-Shrimp production in Viet Nam. This began in 2004 with more than 800 households certified according to Naturland and Bio Suisse standards. In 2021, Camimex produced 5,200 tons of shrimp with 38% from ecological sources (i.e. integrated mangrove-shrimp). Camimex supplies some of the leading food chains in Europe with the European market accounting for 47.2% of their export volume. They seek to expand the number of smallholder farmers with organic certification standards and become a global leader on integrated mangrove-shrimp.

Location

Viet Nam

Financial structure

Camimex is in a strong financial position with a profitable track record over the prior three years. Primary customer markets are Europe, Korea, and Japan, where there is greater demand for high-value, healthy and ecological seafood products. In 2021 Camimex received investment of nearly USD 15 million from KB Securities, a leading investment bank in Korea. In 2024, FMO, under DFCD, agreed a € 12 million (over USD 13 million) loan with the company

Adaptation benefits

Integrated Mangrove Shrimp is a method of aquaculture farming in brackish water, and extensive farming system, where shrimp and other produce (crabs, snails, and timber) are farmed in co-existence and benefit from a high-level of mangrove cover. Sustainable integrated mangrove-shrimp practices increase resilience to heat stress, saline intrusion and reduced freshwater flows at a farm level. The mangroves help to regulate pond temperatures, act as wind breaks, and act as a partial barrier against storm surges. This builds climate resilience, as well as sequesters carbon though higher levels of mangroves.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Current policies requiring integrated mangrove shrimp in coastal regions	Strong supply chain linkages with SH farmers who can receive Payment for Forest Ecological Services	Growing global demand for organic shrimp, mangrove shrimp

Replication and scale up in SE Asia

It will be challenging to replicate this model in other countries, as they do not have the supporting regulation on integrated mangrove-shrimp in place. In Thailand, the situation is more conducive, and efforts could be explored there. Indonesia has by far the largest mangrove area, and there is recognition of the need for replanting on degraded shrimp farms, so it should also provide opportunities for replication.

Case Study Summary 5 - Climate Protection Insurance for Farmers and Agribusiness

Summary

The Coffee Climate Protection Insurance project mitigates climate risks through a co-contribution model for coffee weather-based index insurance. It specifically targeted smallholder robusta coffee farmers in Dak Lak and Lam Dong provinces offering them financial security against the adverse impacts of unpredictable weather conditions. The project showcased a promising response from coffee producers towards index insurance solutions, presenting a potential avenue for smallholder farmers to effectively handle the potential risks and financial implications of climate change.

Location

Viet Nam

Financial structure

The index-based insurance operates based on objective parameters, such as rainfall and temperature measurements, over agreed-upon time periods. This mechanism correlates to payouts to an index linked to agricultural production losses rather than actual physical loss or damage.

A study on willingness to participate for index insurance revealed that the farmers are willing to pay a premium on insurance products and the current ECOM's contribution to insurance premiums can be reduced by up to 90%, thereby indicating potential for sustainability and replication of the scheme.

Adaptation benefits

Climate has a substantial influence on coffee yields and bean quality, significantly impacting farmers' income. Evidence from Centre for Tropical Agriculture indicate that the areas suitable for Robusta coffee in Central Highlands would reduce by up to 36% under low climate impact scenario and 83% under the high impact scenario. This project is designed to build resilience to these climate risks through a co-contribution model for coffee index insurance.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Policy/ regulatory factors that promote sustainable coffee production	Farmer's awareness of the benefits of insurance schemes	Strong reinsurer interest and presence of local insurance provider

Replication and scale up in SE Asia

Given the large coffee sector dominated by smallholders who are highly vulnerable to climate change, Indonesia has the greatest need and provides the most likely environment for replication.

Case Study Summary 6 - Koltiva: Digitising Agriculture

`Summary

Koltiva is an agricultural technology company established in 2013 that provides technology solutions to develop traceable, inclusive, and climate smart agricultural supply chains. Products and services include integrated multi-crop platforms that enable seed-to-table tracking, supply chain deforestation assessments, and supply chain greenhouse gases assessments. Koltiva serves over one million producers and more than 6,500 agri-business, with about 49% of the farmers based in Indonesia. The company has recently expanded its operations to moderate-temperature countries including the US, UK, France, Switzerland, and Germany.

Location

Indonesia

Financial structure

Koltiva is a notable example within Indonesia's emerging startup ecosystem for agri-tech/digital solutions for agriculture. In 2023, Koltiva secured a seven-figure Series A financing led by Venture Capital firm 'AC Ventures' with participation from Silverstrand Capital, Planet Rise, Development Finance Asia, and Blue 7, with existing investor the Meloy Fund - a prominent impact investor in Southeast Asia. With this series of new funding, Koltiva is set to bring further products. There remains high interest and potential financing for digital solutions.

Adaptation benefits

Digital agriculture solutions help develop climate resilience as it helps to collect and track climate data, as well as monitoring crop and soil conditions. The analysis of these data sets can be used to improve the resilience of the crop through more accurate weather predictions, optimise the use of resources (e.g., fertilizer and water), identify drought-tolerant crops, determine optimum planting period, crop diversification planning, and many others.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Government policies are supportive of digital and technology solutions in the agri-sector.	Large corporations increasingly recognise the need for traceability and transparency in agri-supply chains	Indonesian agri-tech startups have been drawing investor interest as it's currently under-represented while viewed as having significant growth potentials

Replication and scale up in SE Asia

Viet Nam and Malaysia provide the most supportive environment to replicate the Koltiva model. Thailand also offers possibilities for replication, especially related with attracting more interest from investors in agriculture technology.

Case Study Summary 7 - eFishery – Digital Transformation on Aquaculture in Indonesia

Summary

eFishery started as a smart fish feeding company in 2013 and has since grown into the largest feed distributor for aquaculture farmers in Indonesia. It works with over 55,000 fish and shrimp farmers across Indonesia. The company launched an Internet of Things mobile-based solution to boost the efficiency and productivity of fish and shrimp farmers through data gathering and uses sensors to optimise feeding practices. It has been able to attract significant investment.

Location

Indonesia

Financial structure

eFishery received an early-stage investment from Aqua Spark in 2015. Since then, it has grown significantly. The company recently secured USD 200 million in Series D funding, increasing its market value to USD 1.4 billion. The funding was led by Abu Dhabi-based 42XFund and included participation from Kumpulan Wang Persaraan, Malaysia's largest public sector pension fund. Existing investors include NorthStar, Temasek and SoftBank.

Adaptation benefits

Climate hazards are projected to significantly reduce fish larvae, also affecting migration, spawning, dispersal, and growth of freshwater fishes[1]. Aquaculture is widely recognised as a critical adaptation measure in the face of growing climate risks[2]. It provides an alternative supply of fish to depleted wild fisheries and an alternative livelihood option in the face of salinity intrusion. eFishery technology helps improve fish health and water quality whilst reducing waste, which is one of the biggest challenges in aquaculture. eFishery has enhanced both the supply and resilience of the aquaculture supply chains.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Supporting policies/ regulatory factors for the aquaculture industry.	More integrated supply chains ease introduction of these technologies.	Investors interest in aquaculture related business opportunities and agri-tech.

Replication and scale up in SE Asia

Thailand provides the most supportive environment to replicate eFishery's case. Thailand fosters a regulatory environment favourable for private investment and possesses well integrated aquaculture supply chains. Viet Nam offers possibilities for replication, though the Venture Capital market remains at an early stage and the overall supply chains are less integrated across the groups involved.

[1] Climate change diminishes Indonesian aquaculture, diversifying its livelihood

[2] http://blog.worldfishcenter.org/2017/11/aquaculture-a-climate-smart-innovation-to-feed-the-world/

Case Study Summary 8 – Chamrouen Micro Finance Institute, Cambodia

Summary

French NGO, Entrepreneurs du Monde, along with the Phnom Penh Municipality and the Cambodian Ministry of Foreign Affairs established a social microfinance project named ‘’Chamroeun” (meaning “progress”) in 2005 to provide financial and non-financial services for poor families. It targets poor individuals, communities, and smallholder farmers, who are excluded from formal financial services in Cambodia. Chamroeun’s first branch opened in 2006, and in 2011 they obtained a full microfinance license. Chamrouen now operates in 15 provinces, with 21 branch offices.

Location

Cambodia

Financial structure

The main product offerings consist of financial services (microloan, social emergency, and capital build up). Chamroeun offers a wide range of loan products: an agriculture financing loan, aquaculture loan, agriculture cooperative loan, and contract farming loans. About 40% of its portfolio is delivered through group loans.

From 2018 to 2020, Chamrouen saw a 63% increase in clients and 105% increase in gross loan portfolio. In 2023, it had USD 44.98 million gross loan portfolio.

Adaptation benefits

Nearly the entire country faces high exposure to agricultural losses due to drought. Most farmers depend on rainfed cropping systems which are particularly vulnerable to more frequent and intense precipitation decreases or longer dry seasons. Managing climate risk at the farm level can be achieved through improved access to financial services, such as loan products provided by Chamroeun. These include smallholder loans to adopt conservation agriculture practices and loans for agricultural cooperatives in the organic rice value chain, as well as general agriculture loans.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Policy/ regulation that encourages microfinance in promoting businesses/ financial literacy	Microfinance Institutions (MFIs) landscape, with history of organisations providing finance to support farmers	Demand for loan (microloan, emergency loan, and capital build up)

Replication and scale up in SE Asia

Chamrouen has been successful in raising debt and expanding their customer base. They seek to expand further and offer additional financial products.

Financial inclusion and the use of MFIs is well developed in countries such as Philippines, Indonesia, and Thailand. These countries provide the most amenable places to replicate a similar model as Chamrouen. However, regulations to integrate climate risks into lending remain rudimentary across the region.

Case Study Summary 9 - Cambodian Climate Financing Facility (CCFF)

Summary

The CCFF[3] was established under Cambodia's state-owned Agricultural and Rural Development Bank with Mekong Strategic Capital as the delivery partner and independent investment advisors. It was established to address the existing market failure in providing financial support to catalyse the development of a green economy in the country. The Facility has cross-cutting goals, which include accelerating implementation of the country's Nationally Determined Contribution, scaling up climate finance, and lowering greenhouse gas emissions while boosting climate resilience. The Facility will also support capacity building of stakeholders to tackle non-financial barriers and convene stakeholders to coordinate policy dialogues.

Location

Cambodia

Financial structure

The CCFF was capitalised in Q1 2024 through concessional capital of USD 109 million from the GCF covering 50.4% and other lenders covering the rest. The Korea Development Bank is the GCF Accredited Entity to oversee the execution. With the establishment of the CCFF and successful investment into climate projects, the expectation is that it will attract further finance.

Adaptation benefits

CCFF has been developed to provide financing support for both climate change mitigation and adaptation. For adaptation, it covers four sectors: infrastructure, piped water, aquaculture, and irrigation technology. The programme also supports sectoral intersections with mitigation solutions through green buildings, water conservation, and behaviour change.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Strong regulation around climate finance and banking in the country	Collaboration with competent technical groups like Mekong Strategic Capital who guided the process	Support from the GCF to provide concessional financing which crowds in other financiers

Replication and scale up in SE Asia

The Facility is viewed as a breakthrough considering the absence of appropriate domestic funding sources for climate friendly businesses and projects that cover both climate mitigation and adaptation. The Facility provides an example of a bank financing scheme for climate adaptation which could be replicated in other countries. In Indonesia and Philippines, Environmental, Social, and Governance (ESG) requirements in banking offers growing opportunities while Thailand and Malaysia have the most developed banking systems in place to respond to ESG requirements (which includes climate change). These countries provide the most immediate opportunity to establish credits lines focused on investing in climate resilience.

[3] $100M Climate Fund Offers Long-Term Green Funding

Case Study Summary 10 - Build Change: Capitalising on the microfinance landscape for disaster risk reduction in Philippines

Summary

Build Change is strengthening the capacity of MFIs to enable their clients to upgrade their houses to better withstand climate related disasters by providing access to finance for housing retrofits. Build Change adopts innovative financing, infusing engineering and technology to create resilient buildings allowing low-income families to afford resilient houses. Building on the success from the Philippines, Build Change is working with the government and private entities in Columbia, Haiti, Indonesia, Nepal, and Philippines to fulfil low-income families' need for resilient housing.

Location

Philippines

Financial structure

MFIs emerged as a key conduit for Build Change to connect with homeowners to access finance to build resilience of their houses. Historically, MFIs had limited internal capacity for housing product development and limited funding sources. Build Change engaged MFIs to initiate house strengthening loan products and partnered with six MFIs. Build Change successfully applied the lending model in Philippines with repayments exceeding 99%

Adaptation benefits

It is estimated that there are 15.6 million vulnerable housing units in the Philippines inhabiting 69.9 million Filipinos who are mainly poor and have limited financing options for improving their households. Housing investments informed by climate and disaster risk information can help to reduce exposure and vulnerability, while reducing the impact of hazards and risk of disasters. Build Change partnered with local MFIs to develop a product that required no collateral and provided small sized loans to clients requiring small repairs, tailoring those loans as per clients' needs.

Critical success factors

Policy and regulatory	*Enabling environment*	*Market/ economic factors*
Supporting policies for the micro-finance, client trust, and support from the government	Evidence on vulnerable housing units affected due to environmental disasters	Growing demand for loans for resilient housing

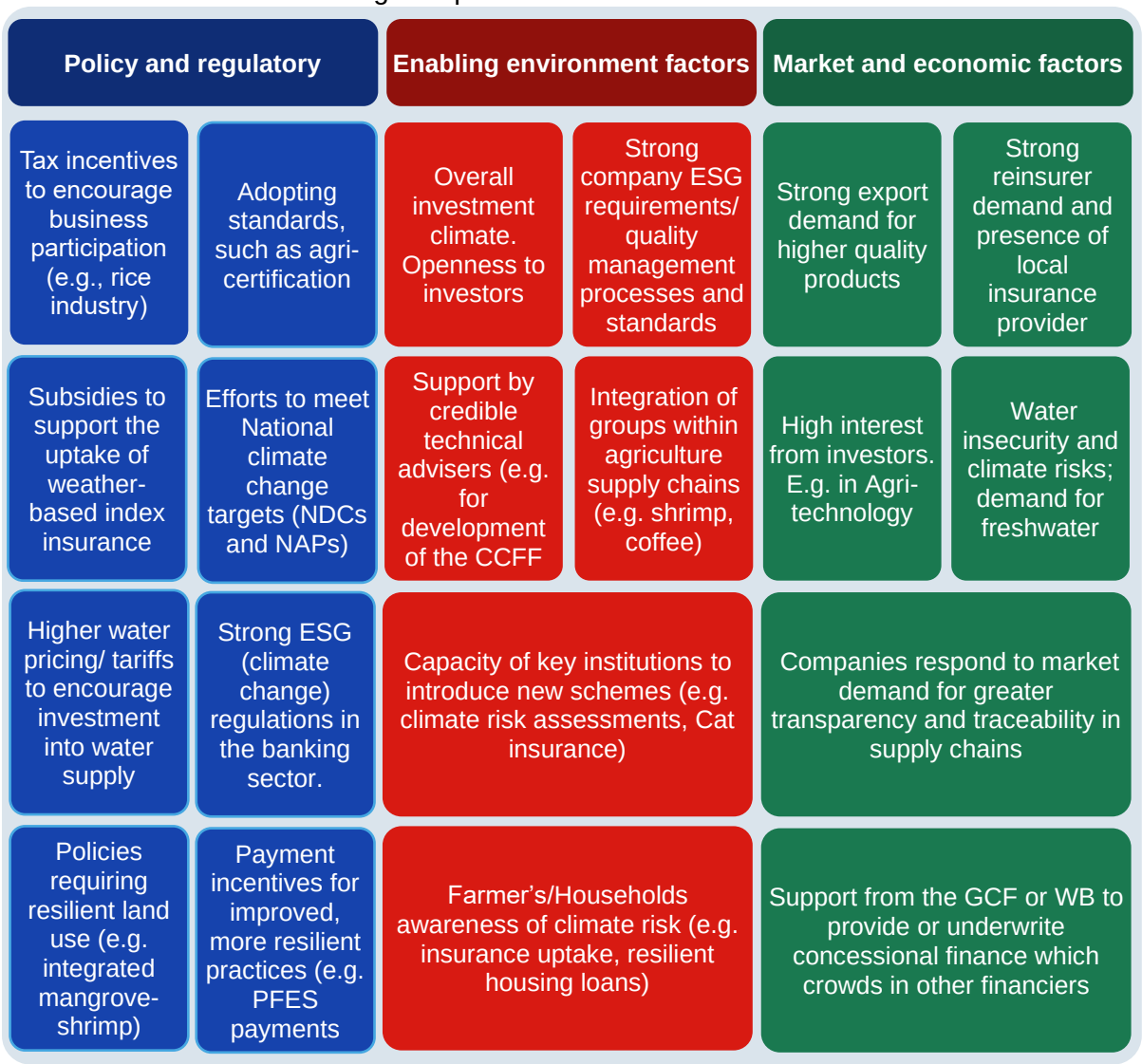
Replication and scale up

The product allowed MFIs to replicate the approach adopted by Build Change with additional clients. Based on the country comparison of the critical success factors, results show that both Indonesia and Cambodia provide the most suitable environment to replicate Build Change's case. In Cambodia, additional specific evidence on number of vulnerable housing units can be helpful for replication of Build Change's case.

Chapter 3: Key policy, regulatory, and enabling environment factors that will allow scale up of private investment in adaptation

3.1: Policy, regulatory and enabling environment, as well as market and economic factors identified from case studies

The chart below summarises the key policy, regulatory, and enabling environment factors, as well as market and economic factors identified as critical to the success of the case studies. Based on these findings we put forward a number of recommendations.



3.2: Recommendations

There is an urgent need to catalyse private sector expertise, innovation, and financing, to provide new technologies, goods, and financial products that stimulate investment into climate change adaptation. The case studies in this report highlight successful private sector engagement in providing goods and services for climate adaptation in countries across Southeast Asia. The case studies provide recommendations for scaling and replicating successes in other countries. It should be noted that the case studies also show that investing in climate adaption in developing countries comes with considerable risk, both in terms of the sectors, such as agriculture, water and Nature based Solutions, and country risk given limitations in some investment climates. In some cases, there remains the need for public involvement to mitigate investor risks.

Looking across the case studies, their enabling factors and our analysis of replication and scale up opportunities, we have summarised eight recommendations that would accelerate private investment in adaptation and resilience in South-East Asia.

Recommendation 1: Government, supported by donors where needed, should make available better data and information on physical climate risks to companies, households, and other stakeholders.

Companies, smallholder farmers, and other stakeholders cannot respond effectively to the impacts of climate change without the data and understanding of their exposure and vulnerability to climate risks. Generating and sharing information on these risks, enables stakeholders to factor climate information into their investment decision-making. Such data may be available from national meteorology centres or from open platforms, such as the World Bank Climate Change Knowledge portal. In the case of climate insurance for coffee farmers in Vietnam, when information on climate risks were shared, it influenced the decisions of farmers on their willingness to pay for insurance.

Recommendation 2: Countries should set out investment plans linked to National Adaptation Plans (NAP) and Nationally Determined Contributions (NDC) which identify priorities for private investment in climate adaptation.

From the case studies, it was clear that few countries have translated their national climate adaptation priorities into investment needs. Governments should translate their NDCs and NAPs into an investment strategy to prioritise options where private sector investment can be identified and send clear policy signals to investors. The case studies also clearly show how government policies can stimulate investment into climate adaptation. For example, in the case of Viet Nam, where specific policies were created to increase mangrove cover on shrimp ponds in highly vulnerable coastal areas, investment followed. There is the need for countries to set more coherent policies to incentivise private investment into climate adaptation for national adaptation priorities.

Recommendation 3: There remains a need to strengthen the investment climate, especially in Least Developed Countries (LDCs).

In LDCs, the local investment climate can be highly challenging. The risk-adjusted rate of return may be uncompetitive. Investors must contend with a lack of liquidity, currency volatility, poor regulatory and policy frameworks, and limited capital markets. As expected, we found more examples of private sector investment in countries with better developed institutional, legal, regulatory, and capital frameworks, such as Thailand and Indonesia. They are in a stronger position to attract investment, including for climate adaptation. Private commercial finance will not flow freely to countries where the local investment climate is challenging, and markets are not functioning well. In countries with weaker investment

climate, such as Lao PDR and Myanmar, basic investment climate reform is a prerequisite for attracting significant private investment into adaptation.

Recommendation 4: Provide support to pipeline development, especially in LDCs.

Countries have a variety of adaptation investment needs, and each investment will require different approaches, a variety of partners, and can be complex and costly to prepare and structure. This phase is often under resourced. For investing into a high-risk segment, such as climate adaptation, there is a need for early-stage support to build a pipeline of prospects to help bridge this gap between grants and later stage investment. Pipeline development can involve several stages — from upstream activities such as conceptualisation and identification through to downstream activities such as financial structuring and transaction support. Technical support facilities, incubators, and accelerators are particularly important for countries where the capacity and private sector is less developed. Venture capital, angel capital, and private equity funds can stimulate investment into new climate adaptation businesses.

Recommendation 5: Develop capacity on blended finance and continue to support risk mitigation facilities to attract private capital.

The study highlighted that more risk-tolerant financial instruments such as Climate Investor Two (CI2), that blend public and private finance, are needed to deal with the high-risk investments in climate vulnerable countries. This layering creates a revenue distribution waterfall whereby senior investors receive returns first before remaining gains “cascade” down to junior investors. Such financing models support riskier investments and should be replicated and scaled across the region. In the case of the Cambodia Climate Finance Facility (CCFF), it provided technical assistance and cheaper credit to entice potential businesses.

Recommendation 6: Work through National Development Banks and local commercial banks.

As shown by the CCFF, there is a critical role for the local banking sector to scale private sector finance. National Development Banks can provide longer-term, more affordable financing than what is available in the local domestic market from commercial banks. Combined with their detailed knowledge of local markets and relationships with local private and public sectors, they possess important comparative advantages over the international lenders. They may need targeted support from bilateral donors to strengthen their ESG systems increase their access to concessional capital and build their capacity to support the climate agenda.

Local commercial banks are very important for financing the range of projects that will be needed, especially at local level. Supporting improved understanding and ability to appraise climate resilience risks and technologies will help local commercial banks to make informed lending decisions. This is important to avoid risk-aversion from preventing financing for viable adaptation and resilience projects.

Recommendation 7: Take opportunities provided by technology.

Advancements in technology have an important role to play in stimulating private sector engagement. There are a growing number of early-stage companies, as highlighted in the case studies such as E-fishery and Koltiva, seeking to introduce new, more sustainable, or deforestation-free business models using technology such as smart apps, sensors, Internet of Things, blockchain and Artificial intelligence. This offers new business opportunities in the region which can be encouraged, through venture funds and early growth support.

Recommendation 8. **Taxonomies and standards can help to create/shape private sector markets in key sectors for adaptation and resilience.**

While there is growing interest from countries in Southeast Asia to deliver on their NDCs and NAPs, there remains uncertainty about what constitutes investment in adaptation. This represents a major knowledge gap. The development of taxonomies is important in that respect, to not only define what constitutes investment in climate adaptation but also to track flows. Taxonomies strengthen signals to investors on where they can invest into adaptation and helps reduce the risk of 'green washing'.

Annex A Long list of private investments in adaptation

This Annex provides a more detailed overview of the investment sub sectors, their importance for climate resilience, as well as potential/barriers to investment. In the final column we highlight examples of companies in Southeast Asia, and in most cases, sources of finance. The investment sub-themes have been selected to maximise impact and are based on an analysis of available evidence, particularly drawing from the Intergovernmental Panel on Climate Change (IPCC) (2018) Special Report on Global Warming of 1.5 ºC. They also draw on the team's knowledge of private sector interest, context-specific climate action, and needs in Southeast Asia.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
Agriculture, Forests, and Land Use			
Improved livestock systems	Improved breeding strategies, livestock management systems, and production adjustments to reduce vulnerability of livestock and pastoralists to climate shocks (heat stress; access to water and fodder).	- Changes often favour more intensive, sedentary livestock systems which require significant investment. - More viable for countries with high/growth demand for diary. - Can be combined with better manure management by using biogas digestors, and improved grazing practices.	*Kirisu* is one of the few domestic, high-tech, dairy farms in Cambodia. Financed by Emerging Markets Investment Advisers and Nexasia, a Japanese fund. *Freisland Campina* is expanding operations across Vietnam and Indonesia supporting higher tech, resilient livestock practices, and dairy supply chain. Balance sheet financing.
Sustainable aquaculture	A climate resilient livelihood option, particularly in deltas due to sea level rise and salinity intrusion. May offer a more diversified farm income and food source that increases resilience. The business case has been proven in many locations.	- High upfront costs. This can be partially overcome through support from an off taker or credit facility. - Potential negative environmental impacts (water use, deforestation, etc.). Meeting certification standards may mitigate these issues.	*Aqua-Spark* is a global community of investors supporting the growth of a new sustainable, commercial aquaculture industry. Companies include: *eFishery* (Indonesia), *Tepbac* (Vietnam), *Energaia* (Thailand), etc. *DELOS* is an aqua-tech company seeking to disrupt the fragmented aquaculture industry in Indonesia, funded by VC Indos Pacific Impact Fund. Local bank debt financing for large players such as *CP* and *Minh Phu*. Groups such as *Viet Uc*

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
			moving into recirculating aquaculture systems technology.
Climate resilient seeds	Improved varieties can be more heat tolerant, pest resistant, and salinity or water tolerant in response to climate changes.	- Need for upfront investment in research and development. This may require partnership with research and extension organisations. - Requires well-functioning seed systems. - Investment needed along the value chain, often in combination with the provision of key services, such as credit.	*Loc Troi,* Vietnam; integrated rice/ climate resilient rice varieties, various investors including Mekong Capital. International Finance Corporation (IFC), and Financial Management Office (FMO). *Golden Rice*: A loan from Proparco for more sustainable and resilient rice production. *East-West Seeds* have various investments in more resilient rice seeds across Asia.
Irrigation efficiency and expansion	Reduced vulnerability to water scarcity. Improved soil quality and fertility.	- Reasonable return on investment, especially if water is priced correctly. - Relatively high capital investments may lead to slow uptake. - For small-scale irrigation schemes there is a continued need to demonstrate benefits to local users. -Low awareness and perceived need. -Policy or price incentives would change this.	Multiple suppliers of agriculture equipment, including small-scale irrigation. But there remains a major market opportunity to be stimulated. *MimosaTEK* (Vietnam) is supplying precision agriculture to smallholder farmers. It applies smart irrigation system that allows farmers to use smartphones to monitor weather conditions and adjust irrigation of crops while optimizing water use.
Conservation/ organic/ Regenerative agriculture	Reduced water use in water-scarce environments. Enhanced soil productivity. Increased soil organic carbon storage.	- Investment case viable in water constrained places. Growing market demand - Upfront costs are barrier to smallholder farmers switching practices. - Support needed for access to inputs/ training. - Company off take agreement (and provision of credit) can support shift. - Carbon revenues can be key to business case.	*AMRU rice is seeking to switch to 100% o*rganic/ regenerative rice production. Early support from Singapore-based private equity fund manager, Emerging Markets Investment Advisers, through its ASEAN Frontier Markets. Fund. Seeking further finance for scaling regenerative practices. Umatt organic rice in Northern Thailand. Also seeking to use rice husk to products. Hivos-Triodos fonds provides trade finance loans.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
Shifting to more climate resilient crops	For the coastal provinces subject to increased salinisation, there is the need to transition to alternative crops. Some more salt tolerant crops include coconut, fresh-brackish agriculture, salt tolerant fruit, vegetables, and rice-shrimp systems.	- Farmers often reluctant to change crops even when climate risks are high. Off take agreements can help. -Companies may be unwilling to invest into new crops. - Government incentives may be needed to attract investors to vulnerable places.	*FLC FAM* seeks to improve the climate resilience of farmland in the Mekong Delta, by converting from rice farming which is not resilient to saltwater intrusion. *Betrimex* undertaking coconut products expansion in high salinity areas.
Services – cold chain	Over 30 percent of all produced human food is wasted or lost which undermines the adaptive capacities of vulnerable populations through decreased food availability and reduced incomes. Improved storage and cold chains can significantly reduce food loss.	- High upfront costs of equipment. Agreement on usage can reduce risks. - Good potential for returns from investment if demand is there. Mobile units can help. - Opportunities for SMEs to enter the international supply chains for temperature sensitive products. - Barriers tend to be policy (in distribution services industries) and the logistical difficulties and delays.	*Khmer Cold Chain Company.* Secured USD 19 million funding from Infraco Asia. *Fresh Factory*, an Indonesian startup in the field of integrated cold chain systems raised USD 4.15 million in Pre-Series A fundraising led by SBI Venture Capital. *Coldspace* is an integrated Venture Capital supported cold chain company
Agro forestry	Soil fertility improvements. Enhanced adaptive capacity of farmers through reduced financial and market risks relating to climate related shocks from monoculture production systems.	- Low adoption rates due to the initial capital outlay and the delayed return on investment. - Intercropped trees can have good market potential (e.g., fruit trees). -Could be triggered by policy requirements or off take requirements.	*Camimex,* Vietnam, USD 20 million investment from FMO integrated mangrove-shrimp, currently under Due Diligence. *Louis Dreyfus* coffee plantations, Indonesia. Corporate sustainability bond. *Kennemer Foods,* Cocoa, Philippines and FMO, entered a Philippine peso loan to the equivalent of USD 2 million.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
Inclusive Forestry Plantations	It has been estimated that about 500 million ha could be available for the re-establishment of forests on lands previously deforested. This is often degraded and sloping areas. Replanting helps to build resilience of large, degraded areas.	- Adequate returns in those regions appropriate for timber production (fast growing tropics with larger land areas). -Need for emphasis on technological and silvi-cultural improvements and a rigorous approach to environmental and social values. - Stricter requirements from consumer countries on the legality and sustainability of timber (certified)	*Burapha* (Lao PDR). Investment from Proparco, FMO, Temasek. Currently in the process of sale. *Mekong timber*, (Lao PDR) various investors including New Forests and FMO. Inclusive plantation model. New Forests made equity investment into this company. In Malaysia *New Forests* made an equity investment into Malaysia's Acacia Forest Industries which owns a Eucalyptus plantation in Sabah.
Deforestation free production	Forest loss exposes the soil and makes it more vulnerable to climate hazards. There is a need to ensure production that does not cause further forest degradation and loss.	-National or international regulation will spur the market for deforestation free production (e.g., EUDR). - Commitment of companies for deforestation free production. -National regulation and enforcement capacity will be the key.	*IBIS Rice (Cambodia*). Investment from Phnom Penh Commercial Bank. Significant public funds prior to debt financing. Invested USD 12 million as an 8-year loan facility in *PT Hilton Duta Lestari* to create an inclusive palm oil supply base in West Kalimantan, Indonesia that ensures No Deforestation, No Peat, and No Exploitation.
Peatland restoration	Improved hydrology and soil enhancement. Improved livelihoods and enhanced adaptive capacity of local communities.	-Growth in forest carbon asset class due to Net Zero commitments and Nature Based Solutions movement. -Regulatory environment in Indonesia and Malaysia (where most peatland is) will be the key. Both are developing carbon markets.	*Forest Carbon* (Indonesia), Investment from AXA Alts (USD 5-10 million). Looking to scale to other areas.
Novel technologies	Technological and associated management improvements can help to enhance the food system and reduce pressure on ecosystems. Provides climate resilient livelihood options.	-May require research and development to test and trial new technologies. - High risk for investors but has potential to provide significant returns if the technology is adopted and scaled - Growth of venture funds for companies working on plant-based foods/ ingredients,	*Orlar* vertical farming – Seed investment from Invest International *Shiok (Singapore)* produces crustacean products from stem cells. *Gaia foods (Singapore),* alternative meat products.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
		food technology, and alternative proteins provides investors options.	
Productive energy services	Provides opportunities to reduce GHG through reduced use of fossil fuels and biomass. Access to clean energy for different companies improves their ability to respond to weather related shocks. Support energy access more broadly by providing electrification to underserved communities making them more resilient.	-High upfront and investment costs. -Regulation on RE making this more commercially viable. -Potentially misunderstood or mistrusted novel technologies. -Lack of standards and quality assurance track record of suppliers. -Non-existent or outmoded financing availability for new technologies.	*Husk Ventures,* rice waste to energy, Cambodia. Under DD from Mekong Capital. Large forestry and agri-business in Indonesia and Malaysia have expanded into the use of POME for energy. For example, *PT Dharma Satya Nusantara*. These companies are large enough to mobilise bank financing.
Water and coastal			
Water treatment	Industry and municipal drinking water storage and treatment. Specifically, treatment technologies (chemicals, filters, ultraviolet, etc.) to improve microbiological and chemical quality of water. Builds resilience where scarce freshwater supplies.	- Opportunities for small-scale decentralized alternatives where municipal water systems are unavailable or unreliable. - Scaling opportunity for improved low-cost technologies. - Can be undertaken with renewable energy sources (e.g., solar based water treatment).	*Wasol* is one of the leading full package contractors in Vietnam for industrial and municipal water treatment technology solutions. *Watermech* is one of the leading suppliers for water and wastewater treatment equipment and chemicals in Cambodia. *Aquamasters* in Philippines.
Water supply and distribution	Investment in municipal water use operational efficiency, particularly the reduction in non-revenue water (especially leakage), can significantly reduce the pressure on available water resources and contribute to adaptation to climate change.	-Requires significant investment into infrastructure and high costs. -Revenue streams are dependent on fees for water. -Companies may need to enter public private partnership or some form of public support. -Potential environmental impacts of construction.	In Cambodia, the private investor is granted a Private Water Operator License. Infraco Asia is investing into *Khmer Water Supply Holding*. USD 3.6 million and looking to replicate this model with other Private Water Operators. Infraco Asia also invested USD 15.4 million *Darco Ba Lai Company Limited* to provide clean drinking water.
Desalinisation	Investment in desalination facilities contributes to building resilience to	-Requires high level of investment into de-salinisation technologies.	*Patong desalinisation* (Thailand) produces safe drinking water in an area faced with seasonal

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
	droughts through the augmentation of water supplies. Their application in water scarce areas make them highly relevant to contribute to adaptation to climate change.	-Significant environmental impact and energy use. The need for clean energy sources.	water scarcity. Investor is private equity firm Climate Fund Managers. USD 28.3 million estimated construction finance.
Coastal protection and sustainable use	Ecosystem based solutions utilise the natural capacity of wetlands, tidal marshes, mangroves, dunes, and coral reefs. They provide natural defence against coastal flooding and storm surges by wave energy dissipation and erosion reduction, helping to stabilise shore sediments.	- Long lead in time before returns generated. Likely requires blended finance solutions covering early-stage costs. - High costs of project development and need for patient capital. - Lack of clear revenue streams. Need to tap into different revenues streams, for examples through carbon payments.	The *livelihoods fund* is supporting a mangrove project to restore more than 5,000 ha of degraded mangrove in Northern Sumatra. It is receiving investment through various companies: Crédit Agricole, Danone, Firmenich, Hermès, Michelin, SAP, Schneider Electric & Voyageurs du Monde. There is also an agriculture fund which receive carbon and agri-payments.
Disaster risk management			
Climate proofed infrastructure	Drainage, public buildings, and other infrastructure are increasingly vulnerable to climate impacts, such as flooding, and it is necessary to invest into infrastructure which builds resilience to climate risks.	- The investment case is often dependent on supporting standards (e.g., building standards) and regulations. - In many cases private-public partnerships will be needed. - Guarantees and underwriting of possible risks may be required to encourage private sector entrance and investment.	The *ASEAN Catalytic Green Finance Facility* is an infrastructure fund supporting governments in Southeast Asia to prepare and finance infrastructure projects that contribute to climate change goals. The Facility, managed by ADB, provides access to USD 1.9 billion in financing from nine financing partners. The Asian Infrastructure Investment Bank priced its first Climate Adaptation Bond. The 5-year bond raised USD 333 million, with proceeds partly used for adaptation projects.
Climate resilient energy infrastructure	Energy infrastructure is increasingly vulnerable to climate change impacts--particularly infrastructure in areas prone to severe weather and water shortages. Climate changes are projected to affect infrastructure throughout the energy supply chain.	-High costs and risks of infrastructure. -The need for government support and potential private-public partnership. -Feed in tariff will impact revenue generation.	IFC and Energy Development Corporation Philippines supported issuance of Philippines' first green bond for adaptation and resilience-related measures at EDC Philippines' plant. It had a value of about USD 90 million with a 15-year maturity.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
Climate resilient transport technologies	Sea level rise due to climate change is increasing coastal flooding, leading to damage at ports, roads, railways, and coastal airports – and causing disruptions of operations and shipping. Tropical storms also lead to widespread disruption to traffic and unsafe travel conditions.	- Need clearer understanding on what resilience look like for the transportation sector (e.g., adoption of global standards - Less prioritisation for investments due to the relatively higher costs. - Regulatory hurdles, political instability, and lack of transparency in the investment process.	- The ADB is mainstreaming climate adaptation into its transport operations and loan products. - The World Bank is supporting the road sector in Cambodia with the implementation of performance-based contracts to increase private sector participation and improve the efficiency and sustainability of investments
Climate early warning systems	Early warning systems (EWS) include detection, analysis, prediction, and then warning dissemination followed by response decision-making and implementation. EWS aims to avoid or reduce the damages caused from hazards.	- Lack of willingness of consumers to pay with the expectation that public authorities should provide this service. - Private sector investment has therefore remained limited, and financing has relied significantly on the public sector.	*Alibaba* uses cloud innovation and AI to assist in disaster prevention and reduction, with a focus on Asia – for instance to support the recall of fishing vessels in typhoon weather, cleaning up rivers in flood season. *Google, Amazon, Microsoft, and Meta* also have efforts to enable access to climate information. However, this remains supported by the companies.
Climate information services	Involves the production, translation, transfer, and use of climate knowledge and information in climate informed decision-making which helps groups to better anticipate and manage adverse climatic conditions.	- Business engagement has met challenges with maintaining systems beyond pilot project stage, due to technical, institutional, design, financial and capacity barriers. - Requires a supporting environment, in the capacity of national meteorological and extension services.	*Karsa* (Indonesia), provides farmers real-time data on their crops, aggregating information such as weather requirements, weather forecasts, farm inputs, prices of produce. Supported by VC Funds. *Ricult* is an agri-fintech in Thailand providing weather information and tech solutions to farmers. Currently seeking Series B funding.
Access to Clean Energy	Improved access to clean energy can be associated with reducing sensitivity and exposure and increasing adaptive capacity during adverse effects of shocks and stresses.	- High upfront costs and long payback periods compared to other investments. - Potentially misunderstood or mistrusted novel technologies. - Lack of standards and quality assurance. - Non-existent or outmoded financing availability.	*Capas* (Philippines), Solar PV. *Ecotech* wind project in Vietnam. *Shire Oak* in Vietnam and Indonesia. These companies are receiving investment under Climate Fund Managers Climate Investor One. *Agros,* Cambodia is serving smallholder farmers in Asia, a one-stop-shop which combines technology (including Agrosolar and Agrosoil), inputs, advisory and financing. Early investor Silverstrand.

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
Financial Products and Services			
Access to credit	With access to credit farmers can invest into various goods and services which make their operations more productive and resilient to climate risks.	- The poorest and most vulnerable have the least collateral to secure credit. - Supporting regulations, policies, and program may be needed in-country to enable access to credit for the poor (banking reforms, collateral requirements. - Provide more flexible condition for the poorest (e.g., collateral requirements.	*Chamroeun* is a social enterprise that assists very poor individuals (and communities), in urban and sub-urban areas, who are excluded from formal financial services in Cambodia. Its client portfolio is predominately rural (60%) with half this group directly working in agriculture. Chamrouen already raises debt from clients such as *Credit Agricole, Oikocredit, Triplejump.*
Climate lending products	Loan products tend to be insufficiently adapted to climate adaptation. Some financial products need scope to adjust of grace periods and loan terms. MDBs could support local FI thorough a guaranteed mechanism that will take first losses.	-Lack of awareness and understanding of climate risks from borrowers (and lenders). -Loan terms tend to not be attractive for long term horizons. -Regulations on collateral requirements tend to be a barrier for many SMEs.	Mekong Strategic Capital established the *Cambodia Climate Finance Facility* (CCFF), a USD 100 million facility which will offer concessional funding to qualified banks to on-lend to green projects. Sectors include forestry and agriculture and other nature-based solutions.
Insurance products for low-income, vulnerable households	Formal, market-based (re)insurance spreads risk and provides a financial buffer against the impacts of climate change. It helps vulnerable households and firms gain resources to recover from disasters such as flooding.	- Low demand for commercial market insurance for low-income populations. -General lack of awareness and recognition of benefits has hampered demand. -Payment terms may need to be tailored to the cashflow of households and local context.	*Triple P Sea Financial Inclusion Fund LP* is a Southeast Asian fund dedicated to the insurance and non-banking financial services sectors. This investment offers individual insurance products or life insurance products to lower-middle-income populations. Supported by Proparco, with HQ in Singapore.
Climate insurance	Climate insurance shares and spreads the financial consequences of physical climate risks. It compensates for a specified loss or damage in return for payment of a premium. Types of insurance include index (parametric) insurance where insurers pay out benefits against predetermined	- Low demand has prevented the growth of commercial markets for weather index insurance, suggesting that insurance is unlikely to reach a market-priced solution. - Schemes may require public subsidy and/or regulation.	*Igloo,* an insurtech company in Southeast Asia, receives finance from Fund manager BlueOrchard. This is supported under the InsuResilience Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions. *The Southeast Asia Disaster Risk Insurance Facility Insurance Company* is fully owned by member countries and provides the first regional

Investment sub sectors	Climate resilience	Potential/barriers to investment	Companies and financers
	variation of a given measure (e.g., days without rain) against an index.	- Success and private sector entry when scale can be reached. For example, linking to existing government subsidy programs.	catastrophe risk insurance in Asia. It is providing cover against flood risks in Lao PDR.
Cat Bonds/ Resilience Bonds	C*atastrophe (or "cat") bonds* cover losses from disasters beyond capacity of insurers or governments by transferring risk to the capital market (often based on a parametric trigger). Resilience bonds are a type of cat bond, allowing governments to raise debt for projects that fund climate change adaptation.	-Currently there is an insufficient supply of issuances. - There is insufficient demand from mainstream investors; also lack of engagement of rating agencies. - Regulation hinders growth and there is a need for regulation that promotes growth of this asset class.	The Philippines placed on the international financial markets a portfolio of catastrophe risk that transferred typhoon and earthquake risk from the Philippines through the World Bank to the international reinsurance market in local currency. In 2018, the GOP purchased a second insurance policy, doubling the amount of coverage. The program finished in 2019.
Debt for nature/climate (DFC) swaps.	DFCs are a type of debt swap in which the debtor nation, instead of continuing to make external debt payments in a foreign currency, makes payments in a local currency to finance climate projects based on an agreement with the creditors.	- Current debt levels in LDCs creates a need and opportunity for debt swaps. -Dependent on the creditors. China is a key lender and may not be amenable to such schemes. -They can be complex to negotiate and structure, though there are many examples. -So far not been a high willingness from countries in Southeast Asia.	*BIofin* is currently exploring debt for nature swaps with several countries in Southeast Asia. However, there are none which are far advanced. An example outside Southeast Asia is the *Seychelles Conservation and Climate Adaptation Trust* which was established to raise grant and loan capital for debt conversion, and, in exchange, the Seychelles government committed to increase investment in marine conservation and adaptation.

Annex B Detailed Case Studies

Case Study 1. AMRU Rice: Regenerative Agriculture

Background on the company/project

Amru Rice (Amru) was incorporated in Feb 2011 as a rice trading company. Over 12 years, Amru has become a vertically integrated agribusiness and is now one of the major rice exporters in Cambodia. Amru works through Agriculture Cooperatives and over 18,000 local farmers using a contract farming model, offering a fair incentive system and capacity development programs, to create a sustainable and inclusive supply chain. Amru currently has three production facilities located in Phnom Penh, Kampong Thom and Battambang which process and packages export quality rice, for both bulk as well as consumer packages. At present, 50% of sales (by revenue) are from organic rice with the rest conventional rice. Amru is planning to expand its production of organic rice and rice applying regenerative agriculture (RA) practices. Its organic products are certified with its main markets the EU and USA.

Adaptation benefits

Climate change is projected to lower yields for rice, maize, and cassava, with particularly strong negative impacts for rainfed rice[4]. The World Bank Country Climate and Development Report highlighted the urgent need to support farmers in adopting climate-smart agricultural practices with improved financial instruments and insurance products.

Rice farmers in AMRU's sourcing regions, rely on rain-fed agriculture in highly climate vulnerable regions. Amru supports farmers to introduce RA practices, which builds resilience to climate risks RA practices will ultimately provide economic benefits to farmers in the longer term as it improves yields. Such practices will also ensure Amru can access more organic paddy to process and export. Other benefits highlighted by AMRU associated with RA include brand/corporate perception, ability to attract climate finance/concessional finance, as well as potentially growing demand from EU corporate buyers driven by initiatives such as the Green Deal.

Amru's business model is to work with 30,000 farmers converting at least 100,000 hectares of agricultural land to RA farming by 2028. The expansion is likely to be carried out in Amru's three main supply regions, namely: Praeh Vear (North central Cambodia), Battambong (West Cambodia), and Mondulkiri (East Cambodia). AMRU also plans to access carbon markets to augment revenues from RA practices.

Financing and financial structure

In Cambodia there is limited working capital and obstacles to access finance from local commercial banks hinders commercial expansion, resulting in missed opportunities to move up the value chain. Amru's efforts in working with farmers and shifting to organic rice has attracted interest from outside investors, in particular Multi Development Banks and Impact Investment Funds.

[4] Modelling for the Cambodia Country Climate and Development Report showed that rainfed rice could experience yield losses of 21–30 percent on average between 2030 to 2060 under different climate scenarios.

Since 2020, one of Amru's creditors has been the IFC, through a blended finance facility under the Global Agriculture and Food Security Programme. An IFC loan of USD10 million supported Amru in adopting Sustainable Rice Platform standards and enabled the company and its contracted farmers to meet international buyers' requirements. The company was able to meet IFC Performance Standards in relation to Environmental, Health and Safety matters. This positioned AMRU to attract further investment. In 2023, Singapore-based private equity fund manager, Emerging Markets Investment Advisers, invested in Amru Rice, through its ASEAN Frontier Markets Fund. The fund is backed by international organisations, including the IFC, DEG, FMO, Norfund, and Swedfund. Amru is seeking a further round of capital to expand its RA operations.

Key success factors

Policy and regulatory factors:

- AMRU has internationally recognised quality control systems in place such as ISO 22000, which has helped build trust with customers and investors.
- AMRU enjoy tax incentives and benefits from being in the rice industry, as Cambodian's economic policy creates a favourable business environment for companies in this industry.

Key enabling environment factors include:

- Secured and expanded rice supply chain through collaborating with key stakeholders such as Agriculture Cooperatives, government bodies, and Cambodia Rice Federation. This has helped the build strong linkages across their supply chain.
- Embracing environmentally friendly practices enhanced the company's reputation, meeting the growing demand for eco-friendly products, and addressing concerns related to social responsibility.
- Having milling operations located near paddy source and well-established logistics and distribution networks in place.

Key Market and economic factors include:

- Growing global demand for environmentally friendly and ethically sourced rice products like Amru is providing. Promising retail markets in Europe, USA, China, Hong Kong, Australia, NZ.
- Wide geographical outreach, covering buyers in over 40 countries).
- Expansion into higher margin products (speciality rice and small packaging). Having high value products for niche markets such as organic rice, fair trade, and Sustainable Rice Platform standards.
- Demand for carbon credits is expected to increase. Integration of carbon credit programs with agricultural supply chains allows companies to trace the carbon footprint of their products.

Scope to scale

Amru, along with other leading companies, have put Cambodian rice, and particularly high-quality organic rice, on the global map. This has facilitated more private investment into the organic rice sector in Cambodia, which can be expected to scale further. Amru continues to pioneer high impact models of rice production by supporting RA practices. Amru is seeking further expansion through RA to cover 100,000 ha. Since this business model remains unproven and will rely on the capture of carbon revenues, it is unlikely that private finance,

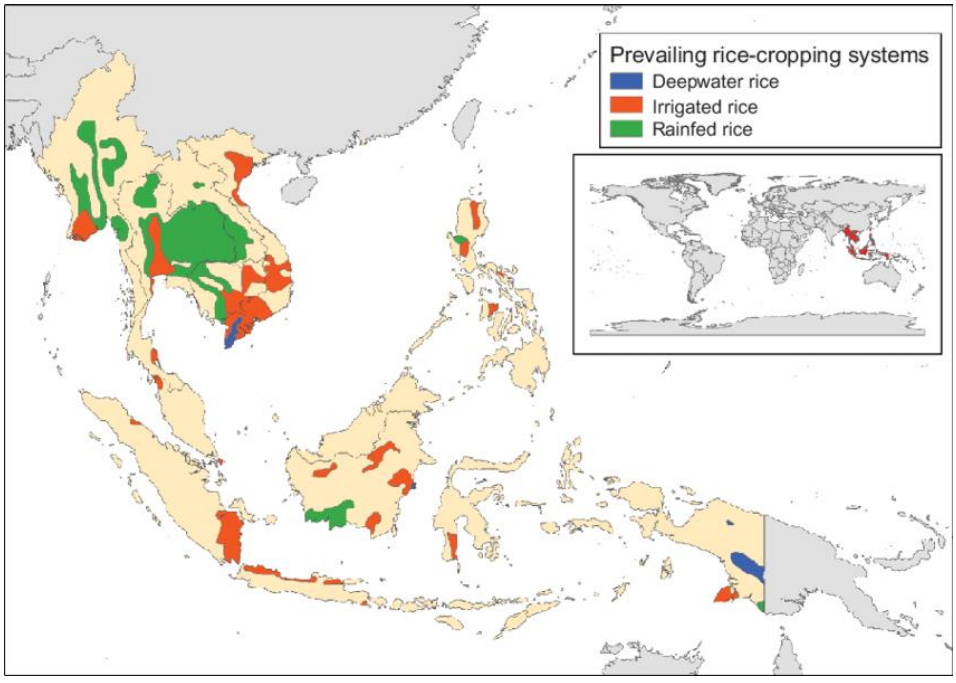
from either banks or other commercial financiers, will currently be willing to invest alone. Amru faced challenges in accessing finance from local commercial banks in Cambodia which hindered its ability to move into high value products, such as organic rice. It was able to overcome this barrier through accessing international capital. Its business model of working with farmers and cooperatives in more climate resilient, organic rice, attracted support and finance from Multilateral Development Banks and Impact Investment Funds, such as IFC and the ASEAN Frontiers Market Fund.

Opportunities for replication in Southeast Asia

We identified the following success factors as critical for replicating Regenerative Agriculture practices in the Southeast Asia region.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
Tax incentives and benefits that Amru enjoys from being in the rice industry	Strong supply chain linkages with cooperatives and smallholder farmers.	Growing global demand for environmentally friendly rice products. Cambodia's reputation in the organic rice market.

To identify countries in Southeast Asia where the case could be replicated requires an understanding of the rice sector in each of the countries and the importance of rainfed rice, which could potentially be converted into regenerative agriculture. Map 1[5] below highlights those countries with larger areas of rainfed rice.



Based on the map key countries are Thailand, Lao PDR, and Myanmar. We examine the critical enabling factors for each of these countries. In the case of Myanmar, given the

[5] Kuenzer, Claudia & Knauer, Kim. (2013). Remote Sensing of Rice Crop Areas – A Review. International Journal of Remote Sensing. 34. 2101-2139. 10.1080/01431161.2012.738946.

current political situation we have removed from the analysis. These are set out in the table below.

Key locations	*Thailand*	*Lao PDR*
Scoring		
Tax incentives/supporting policies for rice	The government of Thailand has implemented various policies and incentives to support rice farmers and promote rice production.	Lao PDR) also has incentives to grow rice, given its importance as a staple food crop and a significant contributor to the country's economy.
Strong supply chain linkages/fragmentation of rice value chains	Supply chains have improved linkages. Good example of companies working with smallholder farmers and cooperatives.	Supply chains are quite fragmented, with a lack of large processing companies with clear linkages to smallholder farmers.
Demand for organic rice/lack of intensification	Thailand is a global leader on certain types of organic rice/ possibility for regenerative agriculture.	Lao PDR is currently not viewed as a leader on organic rice, though could potentially build its strength in this market.

Summary

Based on the country comparison of the critical success factors, results show that Thailand provides the most supportive environment to replicate organic/regenerative agriculture practices across Southeast Asia. This is primarily due to the large area of rainfed rice, better supply chain linkages to smallholder farmers and cooperatives and the market access which Thailand already enjoys. Lao PDR also offers possibilities for replication, though it would require strengthening supply chains, working through processing companies.

Case Study 2. Philippines Catastrophe Risk Insurance

Background on the company/programme

The Catastrophic Risk Insurance Programme was initiated in 2017 in response to the Philippines' vulnerability to natural disasters. 25 provinces were selected based on an assessment of their exposure to risks using the Philippines catastrophe risk model. The two-year pilot successfully doubled coverage through a second policy, fostering transformative approaches in disaster risk financing and insurance[6].

Adaptation benefits

Philippines is highly vulnerable to the impacts of climate change, including rising sea level, increased frequency of extreme weather events, rising temperatures, and extreme rainfall[7]. The World Risk Index 2023 ranked Philippines as the country with the highest disaster risk[8]. Estimates suggest that economic damages from climate change could reach up to 13.6% of the country's GDP[9]. The country is exposed to fiscal risks in the absence of a financial system for resilient recovery from the climate change impacts. Considering this, the World Bank, in partnership with Global Facility for Disaster Reduction and Recovery (GFDRR) is supporting the Government of Philippines' (GoP) to increase its financial resilience.

Following the World Bank and GFDRR initiative, the Philippines Catastrophe Riks Insurance Programme[10] showcased the effectiveness of parametric insurance in providing rapid liquidity after climate shocks, successfully placing the policy in the market, and streamlining payout processes. This type of insurance assesses losses after climate shocks based on exogenous variables such as typhoon wind speed or a measure of ground shaking in an earthquake while avoiding physical assessment of actual individual losses after an event. Insurance payouts are made when an earthquake or tropical cyclone strength exceeds a predefined threshold.

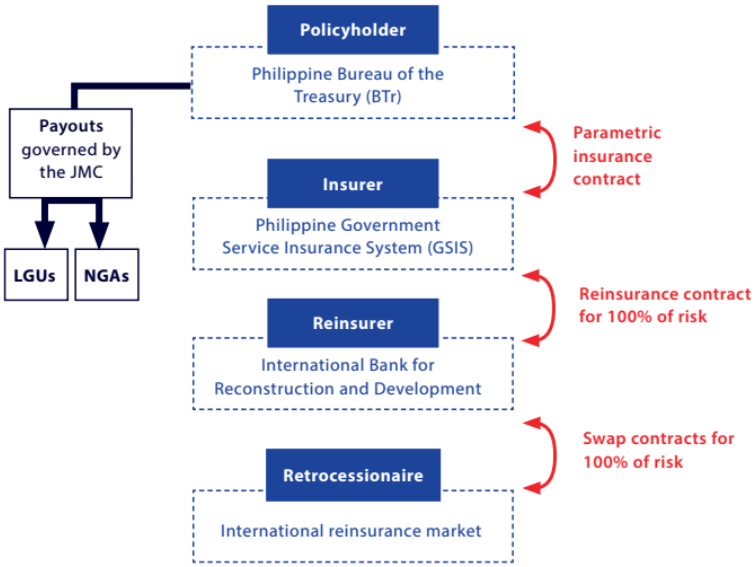
The initiative significantly advanced the government's knowledge of disaster risk financing and insurance, overcoming initial institutional gaps. The programme prompted the government to strategically manage disaster risk while strengthening country's financial protection from natural disasters by providing governments with rapid liquidity following disasters.

Financing and financial structure

The programme was structured with the Philippine Bureau of Treasury as the policyholder and the Government Service Insurance System (GSIS) as the primary insurer. The World Bank Treasury, on behalf of the International Bank for Reconstruction and Development (IBRD), reinsured the entire risk from GSIS and retroceded it through catastrophe swaps to international reinsurers[11].

[6] The World Bank (2021) Lessons Learned: The Philippines Parametric Catastrophe Risk Insurance Program Pilot
[7] Climatelinks Philippines At a Glance
[8] World Risk Report 2023
[9] USAID Philippines Climate Change Country Profile
[10] This programme was supported by financial assistance from DFID and the EU, through the GFDRR
[11] International reinsurers interested includes Nephila Capital, Swiss Re, Munich Re, Axa, Hannover Re, Hiscox Re, Allianz, SCOR, and Swedish state pension fund AP3.

The payout structure included predefined partial and full payouts based on specified probabilities. The fixed budget for the premium payment determined the total coverage, with allocations made under the National Disaster Risk Reduction and Management Fund.



Philippine Insurers and Reinsurers Association, the National Reinsurance Corporation, and the Insurance Commission also signed a memorandum of understanding to establish the Philippines Catastrophe Risk Insurance Facility for creating a risk insurance pool for households and small businesses aiming to sustain and reduce dependency on international reinsurers.

Key success factors

Key policy and regulatory factors include:

- Key policies include the 2010 enactment of the Disaster Risk Reduction and Management Act, the 2011 approval of the first World Bank contingent credit line, and the 2014 release of the national Disaster Risk Finance and Insurance strategy.
- A joint memorandum circular (JMC) drafted in 2017 between Department of Finance and Department of Budget and Management facilitated the remittance of funds for premium payment, with input from a technical working group of government agencies and the World Bank.

Key enabling environment factors include:

- Unlike traditional indemnity-based insurance, this type of parametric insurance relies on pre-defined triggers, expediting claims processing within two to four weeks of the triggering event.
- This approach prioritises immediate liquidity post-disaster, facilitating swift response and recovery.
- The capacity building on earthquake and typhoon risk assessment of officials from line ministries and local level played an important role for the success of the programme.

Key Market and economic factors include:

- The World Bank facilitated the programme's placement in the insurance market, attracting global reinsurers and achieving a competitive price.
- Strong reinsurer interest in parametric catastrophe risk financing. Catastrophe risk modelling, transparent product design, and regular interaction with reinsurers led to significant interest from financial markets.

Lessons learned

- Parametric insurance can be a useful tool in providing governments with rapid liquidity post-disaster, but it needs to be evaluated in the full context of the government's public financial management of disasters.
- To enhance effectiveness of budget execution, specifying the intended beneficiaries within the insurance contract is important.
- Strong political and technical buy-in within government is essential for success of the programme.
- The successful preparation and execution of a new programme demands extensive technical assistance and advisory support over an extended period, typically facilitated by donor funds.

The programme's potential effectiveness for beneficiaries should be evaluated by considering the actual contingent liabilities they face in the event of disaster. Conducting further analytical work to understand contingent liabilities for different local government units and clarifying government regulations on post-disaster expenditure sharing would enhance the design of future financial protection programs, ensuring maximum benefit for local governments.

Scope to scale up

The private sector showed interest in parametric insurance. In Philippines, reinsurers viewed the programme to diversify their own risk portfolios, resulting in a doubling of counterparties in the second year. The World Bank also had interest from pension funds. This indicates that such innovative programmes could help the World Bank expand the private insurance capital available to vulnerable countries.

The programme prompted the Government to adopt a more strategic approach to disaster risk management, leading to the implementation of other instruments tailored to its needs, such as catastrophe bonds[12] using a similar risk model. Furthermore, initiatives such as the Philippines Catastrophe Risks Insurance will be the first private sector focused disaster risk financing initiative allowing insurers to pool their disaster risks rather than seeking international reinsurance[13].

[12] The World Bank (IBRD) issued two tranches of catastrophe linked bonds (CAT bonds) to provide GoP with financial protection up to USD 75 million for losses from earthquakes and USD 150 million against losses from tropical cyclone risk. The catastrophe bond provided the GoP USD 52.5 million recovery payout, but eventually matured without investors facing any further loss. According to ARTEMIS, GoP is now focusing on shifting back towards indemnity insurance.

[13] Philippines Catastrophe Insurance Facility (PCIF) means less risk ceded to reinsurers

Opportunities for replication in Southeast Asia

To identify countries in Southeast Asia where the Philippines Catastrophe Risks Insurance case could be replicated, the primarily requirement is countries which are highly vulnerable to climate change. According to the Global Climate Risk Index 2020[14], Myanmar, Vietnam, and Thailand are among the top ten most affected countries by climate induced disasters over a twenty-year period (1999 – 2018). We identified the success factors below as critical for replicating catastrophe risk insurance in Southeast Asia. We examined these success factors for each of these countries.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
Legislation and detailed high-level policies established to support parametric risk insurance.	Capacity built at all levels of government on earthquake and typhoon risk assessment	Strong reinsurer interest in parametric catastrophe risk financing

Key locations	*Viet Nam*	*Thailand*
Scoring		
Policies in place to set up parametric risk insurance	Viet Nam's law on Natural Disaster Prevention and Control acknowledges insurance as a tool for disaster preparedness. There is a room to develop regulatory framework for parametric insurance and define its role in disaster risk financing[15].	Comprehensive disaster risk financing approach is seen as less of priority and the Government's focus appears on ex-ante financing. There is limited mainstreaming of proactive risk financing approaches[16].
Capacity of the Government on climate change related risk assessment	Viet Nam has developed its capacity to assess climate change risks including mapping of disasters and highly vulnerable communities. It has an online platform which collates updated climate and hazard risk information, community-based disaster and climate change risk assessment, and early warning systems for hazard forecasting and monitoring[17].	There exists risk information databases and hazard maps at all levels of government, however, data available are fragmented and difficult to access[18].

[14] Global Climate Risk Index 2020
[15] Inclusive insurance and risk financing in Viet Nam – Snapshot and way forward 2023
[16] Inclusive insurance and risk financing in Thailand – Snapshot and way forward 2023
[17] Inclusive insurance and risk financing in Viet Nam – Snapshot and way forward 2023
[18] Disaster Risk Reduction in Thailand – Status Report 2020

Strong reinsurer interest in parametric catastrophe risk financing	There is a strong reinsurer interest. 75 insurance companies are operating in Viet Nam including 2 reinsurers[19].	There is a strong reinsurer interest. 55 insurance companies operating in Thailand including one reinsurer[20].

Summary

Based on the country comparison, results show that Viet Nam provides the most supportive environment to replicate catastrophic risk insurance. Even though there is no regulatory framework for parametric risk insurance, there is an opportunity to develop legislation for this given that the Natural Disaster Prevention and Control law has already acknowledged insurance as a useful tool for disaster preparedness. In addition, Viet Nam has comparatively good capacity for risk assessments and offers a good market for insurance and reinsurance companies. Thailand also offers possibilities for replication, though it would require strengthening legal frameworks and capacities of government and strengthening and consolidating data on disasters and losses.

[19] Insurance and Reinsurance in Viet Nam
[20] Insurance and Reinsurance in Thailand: Overview

Case Study 3. Climate Investor 2: Life cycle financing for climate adaptation

Background on the company/programme

The Dutch Fund for Climate and Development (DFCD) enables private sector investment into projects aimed at climate change adaptation in developing countries. The DFCD is managed by FMO, in partnership with Climate Fund Managers, WWF-Netherlands, and SNV. The fund deploys public and private capital in pursuit of impactful climate adaptation investments. It is designed to link prospects with potential investors at the earliest stage and provides life-cycle financing, starting from grants for identification and support to structuring the prospect, through to investment and re-financing. The DFCD includes a novel financing facility, Climate Investor Two (CI2), managed by Climate Fund Managers, which seeks to mobilise private investment into climate adaptation solutions.

Climate adaptation benefits

DFCD undertook an assessment to determine Priority Investment Themes for climate change adaptation. This analysis drew upon the high impact adaptation options, identified by the IPCC (2018) Special Report on Global Warming of 1.5 ºC. The DCFD focuses on a set of high impact investment themes: water, agriculture, forestry, and environmental protection. All of which are critical to tackling climate change and achieving the Sustainable Development Goals. The chosen focus areas are where there is the most pressing need for investing in climate-resilient projects in vulnerable countries.

In assessing stand-alone prospects all DFCD cases must clearly demonstrate they meet Rio Marker 2 for climate change adaptation. This follows a three-step approach, as recommended by the OECD DAC Rio Markers for Climate Handbook[21]. All DFCD cases must also clearly demonstrate that they improve the lives of the most vulnerable groups.

Financing and financial structure

The (CI2) [22], established by Climate Fund Managers under DFCD, is an example of a blended public and private finance vehicle which seeks to simplify and accelerate project financing for private sector climate adaptation projects. The different stages of finance are shown in Figure 1 and include:

- *The Development Fund*. CI2 provides technical assistance and project development funding through its Development Fund (funded by Donors). The Development Fund ultimately seeks to generate a pipeline of bankable climate adaptation projects and mobilize commercial equity investors for the construction phase. The reimbursable loans are repaid along with a premium once construction financing is secured.
- *The Construction Equity Fund*. The structure avoids complex negotiations with multiple financiers by making equity financing available for a large part of the construction costs through CI2 Construction Equity Fund (funded by Donors, development finance institutions, pension funds, family offices, and institutional/commercial investors). The

[21] Revised climate marker handbook_FINAL.pdf (oecd.org)
[22] Climate Investor 2 is the predecessor to Climate Investor 1 which focused on Renewable Energy projects in Developing countries.

fund utilises blended finance at two levels, first at the overall facility level, where the concessional Development Fund aims to mobilise private capital into the other two funds targeting later project stages, and then within the 3-tier structure of the Construction Equity Fund itself, each offering a unique risk-return profile to appeal to different investor types. The Construction Equity Fund contains a first-loss tranche (Tier 1) capitalised by donor contributions. There are two further tranches: one is a subordinate or mezzanine tranche with medium risk to investors, and the other is a senior, fixed-rate tranche with the lowest risk to investors. This layering creates a revenue distribution waterfall whereby senior investors receive returns first before remaining gains "cascade" down to junior investors. Donors serve as partial-risk takers during the construction phase by being subordinate to Tier 2 and Tier 3 investors.

- *Refinancing Fund.* The Construction Equity Fund recycles its capital via refinancing and exit (equity sale). Soon after the project is operational, CI2 allows project debt to be raised for the first time, at a lower expected cost, through CI2 Refinancing Fund. This is attractive to commercial banks and institutional investors. This facility will target debt investors seeking long-term de-risked infrastructure assets, such as institutional investors. This phase is typically where risk is lower and less expensive debt, including from private investors, is typically available.
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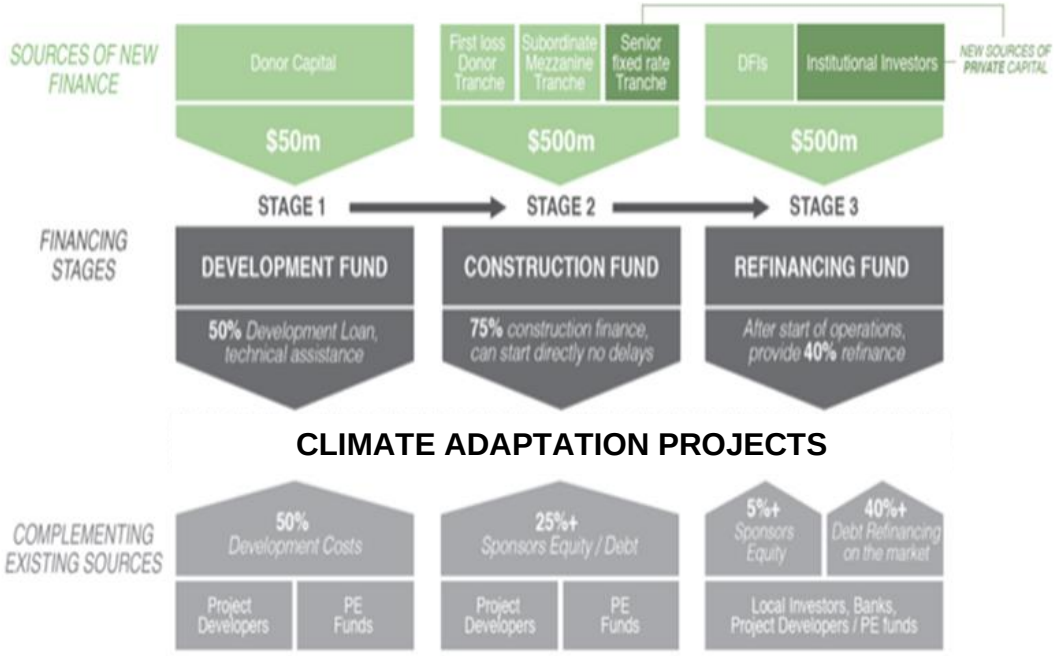


The whole-of-life financing method should enable CI2 to maximize the number of projects it supports. It has supported projects across the world, including in Southeast Asia. For example, in Thailand the fund is investing into the production of safe drinking water in an area faced with seasonal water scarcity through seawater desalination. In Asia, it is investing into 'Spectainer', a growth stage green intermodal innovation company that has developed a next generation shipping container ecosystem through its collapsible shipping containers and Internet of Things security and location devices.

Key success factors

Several success factors were highlighted as part of a mid-term evaluation of climate investor one[23]. These include:

- CI2's bundled concept is a success, making good progress in contracting and supporting project developers and it has demonstrated both financial and non-financial additionality. One of the most consistently cited value-adds of CI2's support across projects is that it is bundled to provide a significant share of development and construction finance. This feature is still uncommon.
- The design Innovations have been able to overcome some of the barriers to scaling finance and avoiding protracted development and construction phases due to a lack of appropriate financing. The fund has also helped lower cost of capital by avoiding high perceived market risk and problems with exit or refinancing for private investors.
- CI2's governance structure is functioning as intended, though there are tensions due in part to different priorities, such as between financial returns and development impacts, and ways of working for public and private investors that require ongoing proactive management from all involved.
- The more requirements and restrictions investors placed on a fund manager like Climate Fund Managers, the more challenges they will have to find suitable projects, which slows progress. Lengthy approval processes due to public investor requirements also reduce CI2's attractiveness to developers relative to other options.
- The current monitoring framework is suboptimal for reporting against its Theory of Change, but Climate Fund Managers is addressing this. As a new organisation, Climate Fund Managers needs to expand internal capacities and operational systems, including finding ways to streamline the experience for project developers.
- Climate Fund Managers is seeking to better reflect CIO activities and results to public investors, such as by exploring ways to incorporate ESG in asset valuation and calculate impact per dollar spent.

The evaluators have three suggestions for other public investors as they consider supporting blended finance mechanisms: 1) Seek to fully understand the core parameters, how the strategy may evolve and how the fee structure will manifest over the life of the fund; 2) Maximise flexibility for the fund by limiting restrictions attached to contributions and clarifying expectations as the context evolves; and 3) Standardise reporting requirements and timetables across public investors as feasible.

Scope to scale up

This blended financing structure was first introduced under Climate Investor One which focused on Renewable Energy projects. The initial success of this blended structure led to the development of CI2 with a focus on climate adaptation and water. With an initial capitalisation of Eur75, the fund reached its third close on November 2023 with USD 875

[23] J. Larkin, A. Gardiner & M. Gulati.2023. Mid-Term Evaluation of Climate Investor One Final Report, Sustainable Quality Consult.

million in commitments and is targeting a final close of USD 1 billion by March 2024. For each standalone investment, further refinancing attractive to commercial sources is expected. The target is to mobilise an additional USD 1 billion. For many investors, CIO represented the first exposure to a blended structure, creating many opportunities for learning at different levels of risk.

Opportunities for replication

While it is too early to judge the success of the investments, the financing vehicle has proven able to mobilise significant volumes of public concessional and private finance for water adaptation projects. Such financing vehicles can be replicated elsewhere to boost private investment into water adaptation projects across Southeast Asia. Below we examine critical success factors and assess potential to replicate across Southeast Asia:

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market factors*
Supporting regulatory environment for investment into water infrastructure. More specifically water pricing.	Overall investment climate and familiarity with project finance in infrastructure.	Overall water security in the country and need for climate resilient investment.

To assess these factors across the countries of Southeast Asis we applied various indices and reports.

- *The scoring for the investment climate* is based on the Milken Institute Global Opportunity Index (GOI). The index is based on 100 indicators classified into five categories: Business Perception, Economic Fundamentals, Financial Services, Institutional Framework, and International Standards and Policy.

- *The Asian Water Development Outlook* (AWDO) report describes the water security status in Asia and the Pacific. It includes availability of adequate water to ensure safe and affordable water supply, inclusive sanitation for all, improved livelihoods, and healthy ecosystems, with reduced water-related risks toward supporting sustainable and resilient rural–urban economies. At Stage 1, the water situation is nascent and there is a large gap between the current state and the acceptable level of water security. Stage 2 where most rural and urban households have access to basic water supply but less to sanitation. Environmental governance is moderate, with severe pressures on aquatic ecosystems. Progress in achieving disaster risk security is low. Stage 3 is capable, access to safe drinking water and sanitation facilities is improving and there are some institutional commitments to reduce disaster risk. At NWSI Stage 5, the country offers a model for its management of water services and resources, and as water secure as possible under current circumstances.

- *Water charges.* This information is a ranking of average tariff per cubic metre of water across all the countries. The higher price receives a lower score and indicates a better opportunity for investment.

	MY	VN	Laos	Camb	Indo	Phili	Thai	Timor Leste
Overall investment climate (Milken Index)	**27**	**65**	**100+**	**93**	**55**	**91**	**37**	**100+**
Overall water security in the country and need for climate resilient investment (rank according to stage)	3	**2**	**2**	**2**	**3**	**3**	**2**	**2**
Water tariff (higher price – lower score and better opportunity for investment	7	**6**		**4**	**8**	**3**	**5**	**-**

Based on our assessment (see Annex 3) of the critical success factors in other countries of Southeast Asia, Thailand, Vietnam, and Cambodia were highlighted as offering the best opportunities for replication in the immediate term. Regulations and setting of water tariffs remain a key issue.

Summary

There is an urgent and growing need for water infrastructure in Southeast Asia. This is only set to heighten with growing climate risks. Currently there is little private sector investment into water supply and sanitation in Southeast Asia. The sector remains heavily influenced by the public sector and water prices are highly subsidised. Examples from countries such as Cambodia[24] have highlighted how water can be use more effectively with the right water pricing. Based on the above scoring the best opportunities in the more immediate term will be Thailand, Vietnam, and Cambodia. As CI2 provides life cycle financing over long periods it can develop water infrastructure investment under riskier circumstances.

[24] How Phnom Penh Improved Water Services through Pricing Reforms | Development Asia

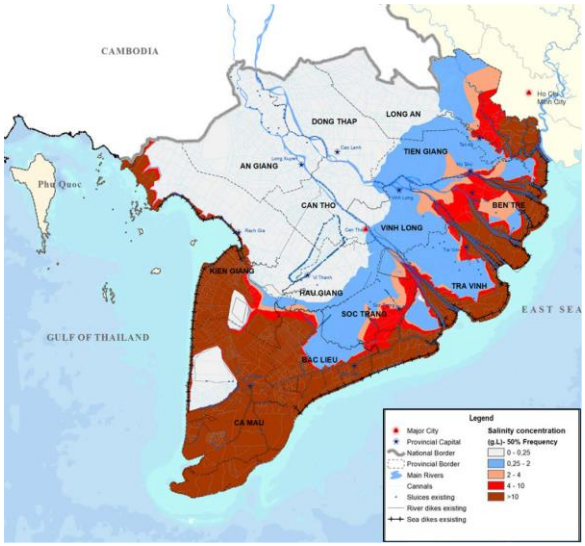
Case Study 4. CAMIMEX: Integrated Mangrove Shrimp

Background on the company/project

Camimex Group was the first seafood processing enterprise in Ca Mau province. In 2011, the company become 100% privately owned. Camimex has been a pioneer in organic integrated mangrove-shrimp production in Viet Nam. In 2004, more than 800 households became certified according to Naturland and Bio Suisse standards. In 2021, Camimex produced 5,200 tons of shrimp with 38% from ecological sources (i.e. integrated mangrove shrimp farming). Camimex supplies some of the leading food chains in Europe with the European market accounting for 47.2% of their export volume. Camimex seeks to expand the number of small holder farmers with organic certification standards.

Climate adaptation benefits

The Mekong Delta faces significant risks from climate change[25]. Sea level rise, reduced water flows and storm surges means that saltwater intrusion is a growing risk to agricultural production, hastened by freshwater extraction, upstream damming, and mangrove decline. Unplanned and unregulated shrimp farming, driven by growing international demand, has had devastating effects on the mangrove forests in the Delta. Mangrove forests are mainly distributed along the coastal saline swamps and estuaries in Ca Mau Peninsular (shown by the brown area in the map), which also has the highest shrimp production of any province in the country. The large-scale clearance of mangroves has exposed the coast to accelerated erosion, making it increasingly vulnerable to the impacts of climate change. The shrimp industry offers one of the few employment opportunities. At a farm level there are widespread underperforming, or even abandoned farms, with farmers struggling to make a living with pond management systems that are inappropriate to the local ecological context. Farmers are unable to make sufficient investments in the face of growing risks from disease, price fluctuations and climate change.



[25] World Bank.2022. Vietnam Country Climate and Development Report. World Bank. Washington

Integrated Mangrove Shrimp is a method of aquaculture farming in brackish water where shrimp and other produce (crabs, snails, and timber) are farmed in co-existence with, and benefit from, a high-level of mangrove cover. It provides a biodiversity-friendly and resilient farming practice while meeting organic certification standards. The increased planting of mangrove cover helps support long-term preservation of the mangrove ecosystem and habitats in the region. The adoption of certified integrated mangrove-shrimp is not widespread in Vietnam, given existing barriers, which includes norms and perceptions, upfront costs, fragmented value chains, and a lack of access to technical knowledge and high-quality inputs.

Financing and financial structure

With around 38% of its products are from integrated mangrove-shrimp, it is the largest producer of organic integrated mangrove-shrimp in Vietnam. Camimex seeks to expand its integrated mangrove-shrimp offering to 16,500 hectares of wetlands. This requires working with small holder farmers on their land, although their current production is primarily from land managed by Camimex. FMO is providing a Euro12M loan, for the enhancement of their hatchery, upgrading processing facilities and strengthening backward linkages with smallholder farmers. For FMO the company meets the basic financial requirements although the significant expansion and the relatively high environmental risks make it challenging. At the same time, they recognise the investment would allow for an impactful intervention where production is combined with restoration/preservation of critical and climate vulnerable areas in Vietnam.

Key Success factors

Policy and regulatory factors include.

- Regulations exist which require shrimp farming in Forest Management Boards to maintain 50% of the area in mangroves. However, this target is often not attained in practice.
- At a trade policy level, the EVFTA (EU Vietnam Free Trade Agreement) took effect from 1 August 2020, under which the EU will eliminate taxes on 99% of all goods imported to the EU and into Vietnam. The free trade agreement has already increased the demand for Vietnamese seafood exported into the EU.
- Support for moving towards organically certified integrated mangrove-shrimp is recognised in local government policies (provincial regulation 111/PPC).
- Vietnam's NDC states that only 30% of the required adaptation measures can be covered by the domestic budget. The NDC therefore calls for stronger private sector investments in adaptation and scaling of sustainable agriculture and aquaculture.

Enabling environment factors include:

- Camimex has been able to secure supply though outreach and close collaboration with local farmers working through Forest Management Boards, as well as working through the Vietnam Sustainable Shrimp Alliance.
- In meeting certification requirements, farmers receive organic certification premiums, and those who meet the minimum threshold of mangrove cover can sell timber from their mangroves. In addition, the protection of mangrove forests entitles farmers to receive Payments for Forest Ecological Services, as mandated by Decree 156.

- Quality management processes (GMP, SSOP, HACCP, ISO, BRC) have been implemented and continuously improved. The company also meets high food standards and ecological certification such as BAP, IFS, Bio Suisse, Naturland.

Market and economic factors include:

- According to the Vietnam Association of Seafood Exporters and Producers, in April 2023, Vietnam's shrimp exports reduced by 35% compared to previous year. Ecological shrimp markets have been more robust. Camimex continue to set high growth targets and remains bullish given the outlook.
- Camimex seeks to focus on mid- and high-end customer segments and to drive sustainability across the sector. These customers have demand for high-value, healthy and community-oriented products.
- Diversity of products. Besides the organic black tiger shrimp, Camimex also supplies other types of shrimp allowing them to access multiple markets. They also offer a diversity of shrimp products, from fresh frozen shrimp to processed shrimp.

Scope to scale up

Camimex is in a strong financial position with a profitable track record over the prior three years (>USD 3 million in net profit each year). Primary customer markets are Europe, Korean, and Japanese, where there is greater demand for high-value, healthy and ecological seafood products. In 2021 Camimex received investment of nearly USD 15 million from KB Securities, a leading investment bank in Korea. In 2024, FMO, under DFCD, agreed a Eur12m loan with the company.

Key lessons learned

Regulations which require mangrove cover in shrimp ponds in Protected Forests provides the legal basis to move towards organic integrated mangrove-shrimp certification standards. The scheme could be scaled to all the other Forest Management Boards in Ca Mau, increasing mangrove cover, and building resilience to climate change. Companies of sufficient size and collateral can access bank/investment finance, whether they are pursuing certified or non-certified business models.

While Camimex has proven the viability of certification, they have focused on certification on their own lands and have not yet worked extensively with smallholders who farm their own land. In Ca Mau, public structures, and extension for service delivery (such as training, access to inputs and financing) to farmers to meet organic, certified integrated mangrove-shrimp, do not exist, with local extension services focused on intensive aquaculture practices. While companies are willing to share the costs, it is challenging for them to meet all the certification costs. The initial investments for setting up the service delivery infrastructure are considerable. For this reason, upfront investments in service delivery infrastructure may continue to need part subsidies. The hope is that over time part of the service delivery model can become self-reliant and therefore financed commercially by driving scale, adoption, and loyalty.

The business model of working with farmers in vulnerable coastal areas and moving towards more climate resilient, organic integrated mangrove-shrimp remains attractive to development finance institutes. Given the high climate impacts of this business model, both in terms of mitigation and adaptation, as well as high social impacts (smallholder engagement) means it should be able to access international (concessional) finance.

However, without extension support a financing gap may remain which may hinder expansion, funded through private finance.

Opportunities for replication in Southeast Asia

We identified the following success factors as critical for replicating Integrated Mangrove Shrimp practices in the Southeast Asia region.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
The current policy supports integrated mangrove shrimp in coastal region of Vietnam	Strong supply chain linkages with smallholder farmers who can receive payments for meeting higher standard.	Growing global demand for organic shrimp, mangrove/shrimp.

To identify countries in Southeast Asia where the case could be replicated requires an understanding of the shrimp sector in each of the countries, most specifically integrated mangrove-shrimp. The major producers of shrimp in Southeast Asia are Indonesia, Viet Nam, and Thailand. While there are lower levels of production in Malaysia, Myanmar, and Philippines. Also, the countries have significant areas of mangrove cover, though Indonesia and Malaysia and Myanmar are significantly higher. We therefore focus our replicability assessment on Indonesia, Malaysia, and Thailand.

Key locations	*Thailand*	*Malaysia*	*Indonesia*
Scoring			
The current policy supports integrated mangrove shrimp in the coastal region of	There are no equivalent policies in Thailand	There are no equivalent policies in Malaysia	There are no equivalent policies in Indonesia.
Strong supply chain linkages with smallholder farmers who can receive payments for meeting higher standard.	There are some good examples of companies working with their suppliers for shrimp production.	Not well developed across the country.	Not well developed across the country.
Growing global demand for organic shrimp, mangrove/shrimp	The organic market for shrimp-mangrove is not well developed	The organic market for shrimp-mangrove is not developed	The organic market for shrimp-mangrove is not developed

Summary

From our assessment, it will be challenging to replicate this model in other countries, as they do not have the supporting regulation in place and the organic market is not well developed across the countries. In Thailand, the situation is more conducive, and efforts could be explored here. Indonesia has by far the largest mangrove area, and there is recognition of the need for replanting on degraded shrimp farms, so it also could provide opportunities in particular provinces or districts with a more progressive outlook.

Case Study 5. Climate Protection Insurance for Farmers and Agribusiness

Background on the company/project

The DeRISK Southeast Asia project designed and piloted two weather index insurance products specifically aimed at addressing extreme rainfall and drought. The pilot for these index insurance products was led by ECOM Sustainable Management Services along with other organisations including a local insurance company (Bao Minh Insurance Corporation)[26]. One hundred farmers who have a coffee sustainable farming programme with ECOM were selected to participate in the project, with 100% premium costs initially contributed by the company.

This project is designed to mitigate risks through a co-contribution model for coffee index insurance premium namely Coffee Climate Protection Insurance (CCPI). It specifically targeted smallholder Robusta coffee farmers in Dak Lak and Lam Dong provinces offering them financial security against the adverse impacts of unpredictable weather conditions.

Adaptation benefits

Coffee production in Vietnam contributed to about 21% of the total gross domestic product (GDP) for agriculture in 2019 while involving more than 1.4 million smallholder farmers[27]. Central Highlands area including Dak Lak and Lam Dong provinces contributes to about 95% of coffee production in Vietnam[28]. Climate has a substantial influence on coffee yield and bean quality, significantly impacting farmers' income. Evidence suggest that climate change could reduce the global production of Robusta coffee by 23.5%[29]. The areas suitable for Robusta coffee in Central Highlands would reduce by up to 36% under low climate impact scenario and 83% under high impact scenario[30].

Recurrent droughts have caused substantial agricultural and economic losses, with evidence indicating production reductions of up to 25% during droughts. In addition, excessive rainfall and elevated mean minimum temperatures during the harvest season significantly increase the probability of defects in coffee beans, including insect damage, mouldy beans, and variations in bean sizes. The severe climate impact in 2015-2016 left provinces like Dak Lak and Lam Dong grappling with drought-related challenges, resulting in substantial loss of 152,000 hectares of agricultural land and direct economic losses of approximately USD 269 million. Smallholder farmers with limited coping mechanisms felt the greatest impact.

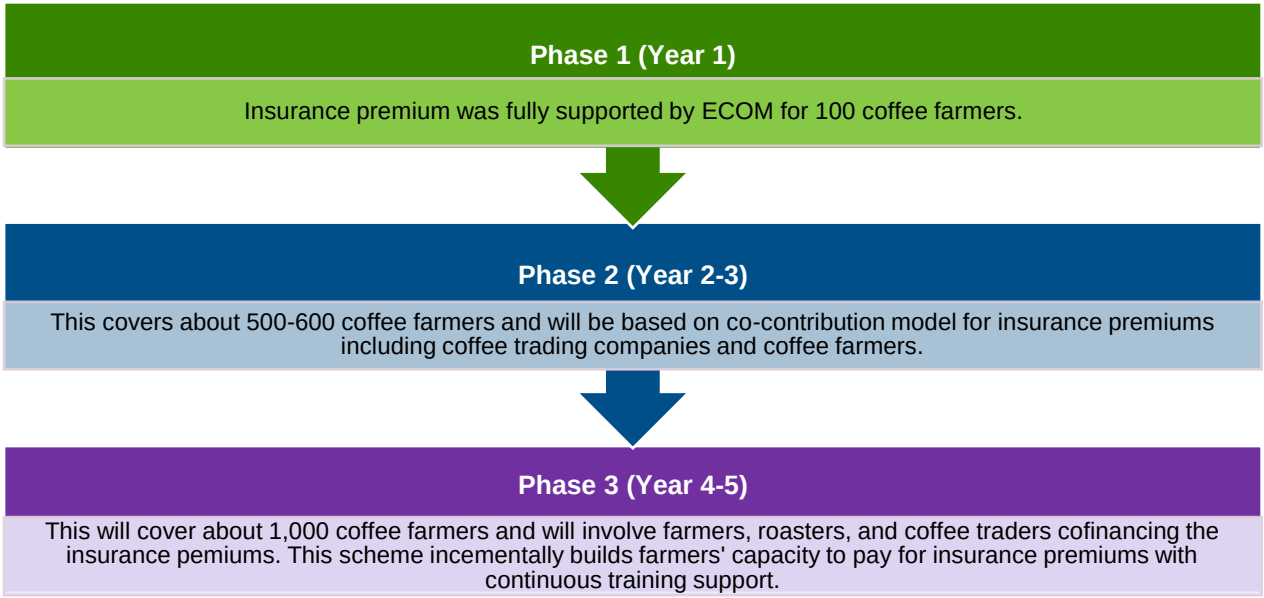
Financing and financial structure

The DeRISK Southeast Asia project implemented a risk management measure by shifting climate risks from farmers to insurance markets. Through close collaboration with smallholder coffee farmers, the project assessed climate risks and their implications on coffee production. Guided by the analysis of the most impactful risks, the project co-developed and road-tested index insurance products.

[26] Other organisations involved in the project include Willis Towers Watson, Alliance of Biodiversity International and International Centre for Tropical Agriculture, World Meteorological Organisation, and University of Southern Queensland
[27] General Statistics Office: Vietnam
[28] Country Coffee Profile: Vietnam
[29] A global assessment of transboundary climate risks in agricultural commodity flows
[30] Climate Change impacts on Robust coffee production over Vietnam

The index-based insurance operates based on objective parameters, such as rainfall and temperature measurements, at defined locations or weather stations over agreed time periods. This mechanism correlates to payouts to an index linked to past agricultural production losses rather than actual physical loss or damage.

The CCPI scheme is being tested in three phases starting in 2021 and will run till 2025. The project successfully completed Phase 1 with potential for scale up as evidenced by findings of a survey conducted with the beneficiaries[31].



Two products were developed: a low cumulative rainfall index (drought) and high cumulative rainfall index.

Rainfall in mm	**Insurance claim for farmers**
Low Cumulative Rainfall	
180 mm	No payout
110 mm	USD 222 [formula:(147 mm – 110 mm)*USD 6]
75 mm or less	Receives maximum payout possible i.e., USD 432 [formula: (147 mm – 75 mm)*USD 6]
High Cumulative Rainfall	
480 mm	No payout
600 mm	USD 630 [formula: (600 mm–495 mm)*USD 6]
695 mm or more	Receives maximum payout possible i.e., USD 1,200 [formula: (695 mm – 495 mm)*USD 6]

Key Success factors

Policy and regulatory factors include:

[31] Are Vietnamese coffee farmers willing to pau for weather index insurance?

- This project collaborated directly with the coffee industry and research institutions, aligning policies to enhance the adoption of index insurance.
- Evidence-based policy development. The index insurance policy was developed based on the ERA5 dataset.

Enabling environment factors include:

- Fostering participatory approach by involving farmers in the design of insurance products. Farmers' understanding of insurance and their awareness of climate change's impact on coffee production positively influences their decision to participate in insurance schemes.
- Experienced project team was able to secure interest of a reinsurance provider.

Market and economic factors include:

- Farmers expressed preference for ECOM and/or government agencies as their preferred choices for distributing insurance products. Presence of respected technical partners (Willis Towers Watson and USQ) helped to secure interest from global reinsurer and local insurance providers to participate in the pilot scheme.

Scope to scale up

The project showcased a promising response from coffee producers towards index insurance solutions, presenting a potential avenue for smallholder farmers to effectively handle the financial implications of climate change, Evidence gathered through household surveys and workshops, suggests that both the coffee supply industry and smallholder farmers recognise the value of insurance solutions and were keen to participate in CCPI. This creates an opportunity to attract increased private investment and explore avenues for scaling up such initiative.

A study on willingness to participate for index insurance revealed that the farmers are willing to pay a premium on insurance products and the current ECOM's contribution to insurance premiums can be reduced by up to 90%. However, factors influencing farmers' decision such as education, farm size, climate change perception and experiences and insurance knowledge should be considered[32].

Key lessons learned

- Importance of innovative insurance options with user adoption of risk management techniques, such as seasonal forecasting, to attract insurers.
- User centred and industry led piloting of insurance initiatives proves effective in scaling up solutions.
- Insurance literacy workshops and surveys significantly increased awareness and interest in insurance.
- Substantial efforts are required for creating awareness and capacity building at various levels, ranging from national government agencies to smallholder farmers as well as national farmers' unions.

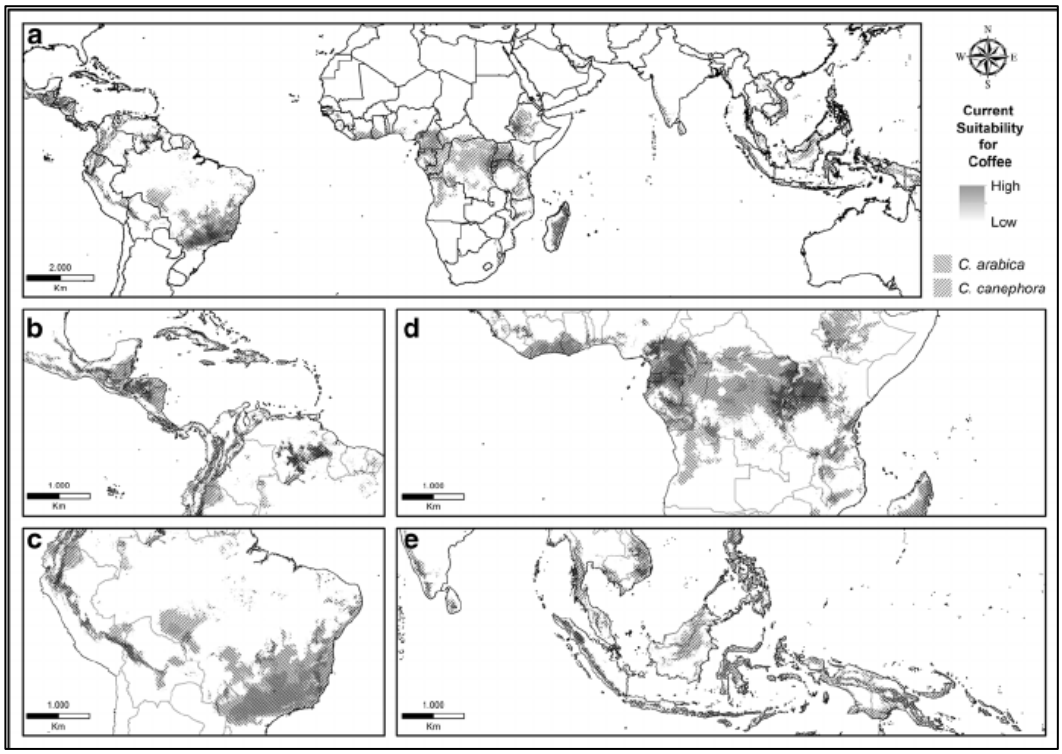
[32] Are Vietnamese coffee farmers willing to pau for weather index insurance?

Opportunities for replication to other countries in Southeast Asia

Based on the case study we identified the following success factors as critical for scaling to other countries in Southeast Asia.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
Policy/regulatory factors that promotes coffee production	Farmer's awareness of the benefits of insurance schemes	Strong reinsurer interest and presence of local insurance provider

To understand which countries this scheme could be replicated we identified which countries coffee production significantly contributes to country's GDP. According to suitability for coffee production in Southeast Asia[33], key countries for replication are Indonesia, Philippines, Cambodia, and Lao PDR.



We examine the critical success factors for each of these countries.

[33] A bitter cup: climate change profile of global production in Arabica and Robusta coffee

Key locations	*Indonesia*	*Philippines*	*Cambodia*	*Lao PDR*
Scoring				
Policy/ regulatory factors that promote coffee production	Government has prioritised coffee production and has implemented policies to increase coffee production along the value chain[34].	Philippine Coffee Industry Roadmap 2021-2025 aims to promote coffee production. Declining land area planted for coffee, poor quality of coffee beans due to poor farm practices, and low productivity of coffee farmers have led to decline in coffee production[35].	No policy at national level mentioned coffee production[36].	Lao Coffee Sector Development Strategy aims to promote coffee production. However, there are gaps regarding specific mandate policy and coordination between national and subnational level[37].
Farmer's willingness to participate in insurance schemes	A willingness to pay study showed that majority of smallholder farmers were willing to join the insurance for agricultural production[38].	Agricultural insurance is underdeveloped in the Philippines particularly to smallholder farmers in comparison to large-scale agri-businesses[39]. ADB suggests that there is a huge market for crop insurance in the Philippines[40].	A willingness to pay study showed that less than half of respondents were willing to purchase weather index crop insurance[41]. Most smallholder farmers had limited awareness of insurance schemes, had little insurance experience, and lack confidence in the insurance products/insurance providers [42].	Government needs to significantly focus on increasing awareness among smallholder farmers regarding insurance and its benefits[43] [44].
Strong reinsurer interest	Strong reinsurer interest and	Strong presence and interest of reinsurer/insurance	Comparatively smaller presence and interest - Only	Limited presence of insurance companies and

[34] Ministry of Agriculture implemented programmes on Good Agricultural Practices, quality seeds provision, adequate fertilizers and pesticides, and rejuvenation of coffee plantations, and community-based agroforestry system.
[35] What are the challenges and opportunities that stand-alone coffee shops in the Philippines face?
[36] A 2030 Roadmap for Climate Adaptation in the Coffee Bean Belt of Southeast Asia
[37] Building coffee climate resilient pathways in Lao PDR
[38] Small holder Farmers' Willingness to Pay for Agricultural Production Cost Insurance in Rural West Java, Indonesia: A Contingent Valuation Method (CVM) Approach
[39] The potential for agricultural insurance in the Philippines
[40] Testing Public–Private Partnership in Crop Insurance to Boost Filipino Farmers' Resilience
[41] Farmers' Willingness to Purchase Weather Index Crop Insurance: Evidence from Battambang, Cambodia
[42] Willingness to Pay for Weather-Indexed Insurance: Evidence from Cambodian Rice Farmers
[43] Willingness to Pay of Rice Farmers in Lao PDR on Agriculture Insurance
[44] A Study on the Farmers' Participation in Local Farmer's Organization: The Case of the Banana Farmer's Production Groups in Savannakhet Province, Lao PDR

and presence of local insurance provider	presence of insurance companies. There are eight reinsurance companies and 78 general insurance companies[45].	companies. There are 18 reinsurance and 89 insurance companies[46].	one reinsurance company and only 16 general insurers[47].	little interest from global reinsurers.

Summary

Given the large coffee sector dominated by smallholders who are highly vulnerability to climate change, Indonesia has the greatest need and provides the most supportive environment for replication. Philippines also offers possibilities for replication, though it would require strengthening policy and regulatory factors that promotes sustainable coffee production and agricultural insurance for smallholder farmers.

[45] Number of reinsurance companies in Indonesia
[46] Number of reinsurance Philippines
[47] Insurance and reinsurance in Cambodia: overview

Case Study 6. Koltiva: Digitising Agriculture

Background on the company/project

Koltiva is an agricultural technology (agri-tech) company established in 2013 that provides human-centred technology and solutions to develop traceable, inclusive and climate smart agricultural supply chains through digitization of agri-businesses. This includes comprehensive web and mobile apps that empowers supply chain actors to manage their farming activities; integrated multi-crop platform that enables seed-to-table tracking, supply chain deforestation assessment, and supply chain greenhouse gases assessment. They also provide free access to educational materials to train and coach agricultural experts.

The company is headquartered in Indonesia and has a global footprint. Koltiva serves over 1 million producers and more than 6,500 agri-business across 52 countries, with about 49% of the farmers based in Indonesia. The remaining are scattered globally in South America, Africa, and Asia. Koltiva also operates offices in Vietnam, Mexico, and the Ivory Coast, and has recently expanded its operations to moderate-temperature countries including the US, UK, France, Switzerland, and Germany.

Adaptation benefits

Climate change has brought significant challenges for agriculture in Indonesia. The adverse impacts are increasingly evident, including rising temperatures, unpredictable rainfall patterns, and more frequent extreme weather events and these are disrupting traditional farming practices and threatening the food security of the country. Digital agriculture solutions can help develop climate resilience as it helps to collect and track climate data, as well as monitoring crop and soil conditions. The analysis of these data can be used to improve the resilience of the crop through more accurate weather predictions, optimize the use of resources (e.g. fertilizer and water), identify drought-tolerant crops, determine optimum planting period, crop diversification planning, and many others.

Koltiva is seen as a notable example within Indonesia's emerging startup ecosystem for agri-tech or digital solutions for agriculture. Koltiva is committed to practicing climate-smart agriculture through its traceability platform and some extension services for sustainable agriculture. On the supply side, Koltiva offers farmers with crop profiling and plot mapping, seed-to-table traceability, as well as training and coaching. On the climate front, Koltiva helps with greenhouse gas assessments and offers farmers climate-smart farm support, land use mapping, and climate risk alerts. In addition to ensuring the transparency of the supply chain and to enable the customers to trace the origin of their food supply, Koltiva helps farmers to improve their on-farm resilience through the analysis of these data and capacity building support.

Financing and financial structure

In 2023, Koltiva secured a seven-figure series A financing led by venture capital firm AC Ventures with participation from Silverstrand Capital, Planet Rise, Development Finance Asia, and Blue 7, with existing investor The Meloy Fund, a prominent impact investor in Southeast Asia. Leveraging the funding round, Koltiva is set to bring two innovative technology modules:

- The first module, KoltiPay, is a fintech platform that extends beyond facilitating cashless transactions for small-scale farmers, but also offers other services such as crop insurance and loans and aims to uplift the financial resilience of farmers. Through KoltiPay, Koltiva is promoting financial inclusion of small holder farmers and all supply chain actors.

- The second module, KoltiTrade, empowers farmers by facilitating the purchase of affordable agricultural inputs and providing them with direct entry into premium markets for their crops to increase the farmers' incomes.

Key success factors

Policy and regulatory factors that contribute to success of the model

- The demand for Koltiva's services has increased in the recent years due to stringent ESG-oriented regulatory requirements for companies especially in European, American, and other Western companies.
- Furthermore, Koltiva's platform is important for multinational and local companies aiming to comply with the European 'no-deforestation' regulation. Thus, to meet these compliance requirements, Koltiva is providing essential services to supply chains including cocoa, coffee, rubber, and palm oil.
- The Indonesian government has been consistent in its efforts to push investment, including in agriculture sectors. The Ministry of Agriculture has improved the regulations and bureaucracy by adjusting 241 regulations and revoking 50 regulations permits that hamper the investment process.
- In March 2023, FAO and the Indonesian Ministry of Agriculture launched the "e-Agriculture National Strategy" to harness the data and information resources in agriculture to the benefit of smallholders.

Enabling environment factors:

- Globally, the importance of traceability and transparency in agriculture supply chains has been recognized with large corporations such as Unilever, Coca Cola and Nestle prioritizing sustainability in their supply chains. Koltiva, realizing the opportunity available in Agri-tech and Fin-tech space early on, has received a competitive edge.
- From the customer side, there is a growing demand to have sustainable products as well as to track food as it moves through the supply chain to ensure it's safe to eat. Producers are investing significantly to make this process more transparent.
- With the challenges being faced in meeting global food requirements and to make supply chains resilient, the digitization of agri-data across the entire supply chain and its swift availability is essential.

Key market and economic factors:

- The global traceability market is anticipated to increase considerably. Despite that the driver for this traceability is health and safety concerns, the tracking system will yield various agriculture data that can be used to improve the resilience of agriculture produces and farmers.
- Indonesian agri-tech startups have been drawing significant investor interest as they carve out their expansion plans to address inefficiencies in the agricultural supply chain. The agriculture sector is underpenetrated and has low valuations, and this might be the reason for investors to be attracted as it's estimated to have strong scope to grow.

Scope to scale up

- As global companies increasingly prioritize sustainability, Koltiva can play a significant role in establishing clear and more resilient supply chains through its efforts in supporting smallholder farmers in developing countries in improving their farm management.
- In addition, agriculture is one of the least digitalized sectors in Indonesia. This presents a large untapped opportunity for both startups and investors to build agri-tech and to

devise digitalized platforms for agricultural players. Realizing its business case, Koltiva has tapped into this opportunity which provides an example to other startups to tap into this market as well.

Key lessons learned

Koltiva brings an innovative approach through its triple technology element: Leading agri-tech start-up enabling inclusive, climate-smart, and traceable global supply chains. This end-to-end ecosystem drives the environmental preservation, climate-smart agriculture, ethical sourcing, and empowers rural communities.

In developing economies and in areas where financial and digital literacy is low, combination of on-ground services with the web services can greatly increase likelihood of success. This is because the presence of on-ground technical staff can both provide trainings and address concerns of agri-workers on using digital platforms and to adopt good agricultural practices.

Despite the large investment of Koltiva, there is no evidence of alignment between Koltiva's work with the Indonesian Ministry of Agriculture. This can be a potential collaboration for the private sector to contribute to improving the digitalization of agriculture sector in Indonesia, and for the Government of Indonesia to create an effective enabling environment for agri-tech companies to flourish.

In this global transformation towards sustainability, investors need to reassess their strategies to invest in food and agri-tech as this sector is growing in Southeast Asia. Globally, investors can play a crucial role in sustainable transformation wave and achieve profitable returns by investing in climate and sustainability funds.

Opportunities for replication in Southeast Asia

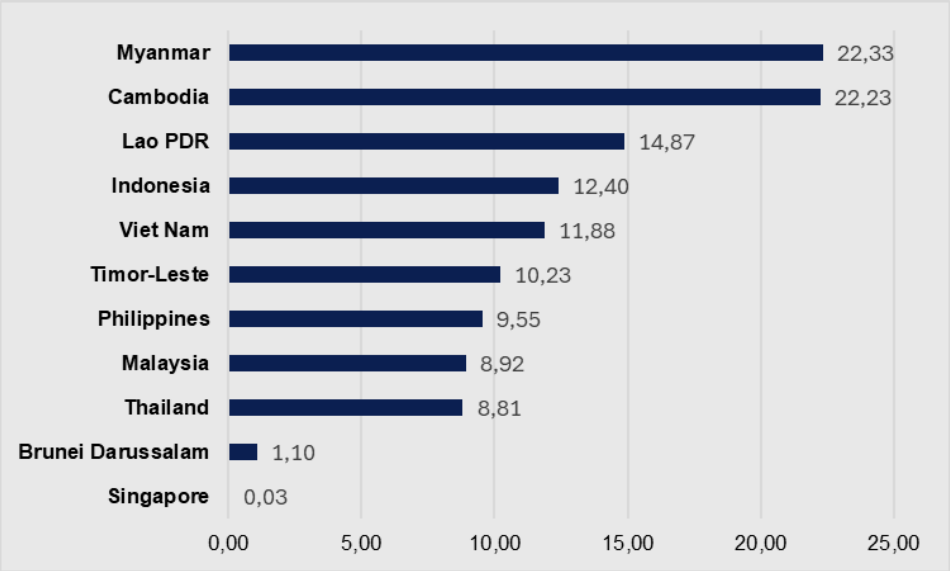
Based on the case study, we identified the following success factors for replication in Southeast Asia. The replicability analysis for Koltiva is assessed based on the replicability to develop agri-technology business in Southeast Asian countries. The growth of agri-technology business has increasingly incorporated cutting-edge technologies into agriculture and thus it is essential in solving climate issues as it will increase resource efficiency, decrease environmental impact, and increase crop resilience due to the precision farming, Internet of Things elements, AI-driven analytics, smart irrigation systems, and many others. Strong sustainable agriculture regulations that are aligned with the country's climate adaptation plan will help agri-technology business to incorporate elements to improve climate resilience within their business.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
• Government policies are supportive of digital and technology solutions in the agriculture sector. • Demand side: ESG-oriented for agriculture products and no-deforestation regulations	The importance of traceability and transparency as part of sustainable agriculture supply chains has been recognized by both large corporations and customers.	Indonesian agri-tech startups have been drawing investor interest as it's currently underpenetrated while having significant growth potentials.

for companies especially in European, American, and other Western companies.		

A key next step is to identify which countries in Southeast Asia can replicate the digitalization of agriculture that helps to enhance the resilience of the agriculture practices. Generally, agriculture sector is vital to Southeast Asian countries, especially due to its expansive rural populations and primary source of livelihoods in these nations[48]. Meanwhile, from its economic significance, these countries share similar percentage of GDP from the agriculture sector ranging from 8.81% to 22.33%, except for Brunei Darussalam and Singapore as can be seen in the table below. In this regard, the replicability will be assessed in all countries except the two and Indonesia as it's already Koltiva's main business area. Timor Leste was removed as it is not a focus of this study.

Table 1 Share of GDP from agriculture, forestry, and fishing in 2022 (%)



Source: World Bank Data

Table: Assessment based on critical factors

Key locations	***Cambodia***	***Lao PDR***	***Viet Nam***	***Philippines***	***Malaysia***	***Thailand***
Scoring						
Demand side: ESG-oriented for agriculture products and no-deforestation regulations from buyers	Accounting for 0.1% of the EU's total trade.	Accounting for 0.1% of the EU's total trade.	Among the top 15 import countries for agri-food to EU; More than 1% share of	Accounting for 0.4% of the EU's total trade.	Among the top 15 import countries for agri-food to EU; More than 1% share	More than 1% share of export to EU

[48] EU-ASEAN Business Council, 2023. *Towards Achieving UN SDGs in ASEAN.*

Key locations	*Cambodia*	*Lao PDR*	*Viet Nam*	*Philippines*	*Malaysia*	*Thailand*
especially EU[49,50]			export to EU		of export to EU	
Supply side: Improvement of regulations to support sustainable agriculture and/or climate adaptation plan. .	Strong climate adaptation strategy and regulations, no specific regulation on sustainable agriculture or digitalisation.	Existing policy framework for Green and Sustainable Agriculture[51].	Showing various international commitment regarding sustainable agriculture and food systems[52].	Existing National Climate Change Action Plan and Philippine Development Plan (PDP), but no specific regulation on sustainable agriculture or digitalisation.	Various policies or programme to improve agriculture practices, such as Malaysia Good Agriculture Practices (MyGAP), Malaysian Sustainable Palm Oil (MSPO), etc[53].	Various policies on to improve farming techniques and promote sustainable agriculture, including development of digital agriculture development strategy[54].
Interest of investors in agriculture sectors[55] 5th rank of Agri Food Tech Investment (USD 10 million)	7th rank of Agri Food Tech Investment (USD 1.6 million)	No information	4th rank of Agri Food Tech Investment (USD 28.5 million)	8th rank of Agri Food Tech Investment (USD 900k)	3rd rank of Agri Food Tech Investment (USD 36.5 million)	6th rank of Agri Food Tech Investment (USD 3.6 million)

Summary

- The '*importance of traceability and transparency as part of sustainable agriculture supply chains has been recognized by both large corporations and customers*' factor are not included in the ranking table above as this a globally driven factors that are increasingly called on to help halt and reverse forest loss that often associated with commodity supply chains[56].
- Based on the country comparison of the critical enabling factors, results show that Viet Nam and Malaysia provides the most supportive environment to replicate the Koltiva model. Thailand also offers possibilities for replication, especially related with attracting more interest from investors in agriculture sectors. Further development of similar business like Koltiva can be made more specific for agriculture commodities.

[49] MONITORING EU AGRI-FOOD TRADE
[50] OEC Overview
[51] A new and sustainable path for agriculture in Lao PDR
[52] VIET NAM'S STEPS TOWARD SUSTAINABLE AGRICULTURE AND FOOD SYSTEMS AT COP28
[53] Malaysian Sustainable Palm Oil (MSPO)
[54] https://ap.fftc.org.tw/article/3247
[55] All data are taken from *ASEAN 2020 AgriFoodTech Investment Report*. The top two highest investment secured for agrifoodtech in 2020 are: Singapore (USD 177 million) and Indonesia (USD 165 million).

[56] WRI, 2023. Traceability and transparency in supply chains for agricultural and forest commodities

Case Study 7. eFishery – Digital Transformation on Aquaculture in Indonesia

Background on the company/project

eFishery started as a smart fish feeding company in 2013 and has since grown into the largest feed distributor for aquaculture farmers in Indonesia. It works with over 55,000 fish and shrimp farmers across Indonesia. The company launched an Internet of Things mobile-based solution to boost the efficiency and productivity of fish and shrimp farmers through data gathering and using sensors to optimise feeding practices.

Adaptation benefits

The fisheries sector in Indonesia contributes to about 2.6% of country's GDP, 50% of the country's protein, and over 7 million jobs[57]. Thus, impacts from climate change have important implication for food security, and economic growth of the country. Evidence-based projection suggests that there will be warming from 0.2°c to 0.3°c per decade, and annual precipitation is projected to decline by up to 15% in Indonesia. In addition, global sea-level is currently rising at about 2 mm per year and is projected to increase at a rate about 5 mm per year over the next century. Such events can significantly reduce fish larvae, also affecting migration, spawning, dispersal, and growth of freshwater fishes[58]. Aquaculture is recognised as a critical climate smart response which is more resilient to climate change.

eFishery provides a success story of how technology can transform aquaculture. The use of an automatic feeder has helped improve fish health and water quality whilst reducing waste which is one of the biggest challenges in aquaculture[59]. eFishery has enhanced resilience of the aquaculture supply chain. In addition, it has helped to improve the farming operations of smallholder fish and shrimp farmers by improving access to local and global feed markets for better pricing; providing visibility for farm inputs and outputs; and access to financing. All these have contributed to improvement of practices, production volumes, profitability, and livelihoods of farmers.

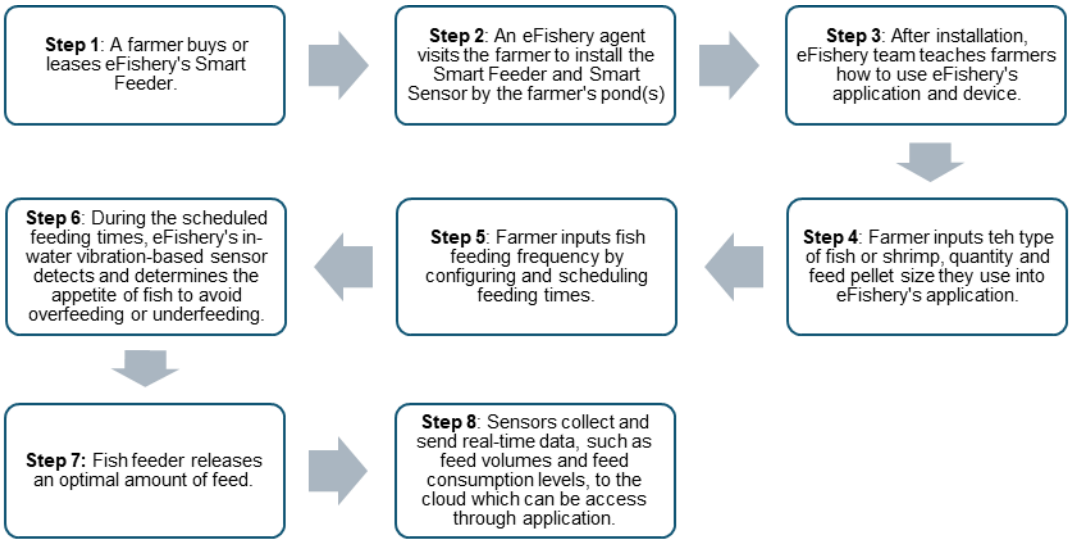
Financing and financial structure

eFishery received a significant investment[60] (undisclosed) from Aquaspark for engaging distributors, finding local partners, expanding its market share in Indonesia, and implementing a rental model in which smallholder farmers can rent the technology and pay monthly or pay after harvesting time. eFishery launched a digital cooperative application for business processes and relationships between fish farmers and related sectors. This application can be bought and used for free without additional costs (except for the purchase of feed). The application can easily be installed from the Play Store.

It has several features including 1) financial and capital facilities – a capital programme for farmers where all transactions can be done online; 2) eFishery Feed Partner – provides a purchase service where feed can be bought online; 3) Aquaculture Information and Recommendations – helps fish farmers sell and distribute crops.

[57] Hot Water Rising: The Impact of Climate Change on Indonesia's Fisheries and Coastal Communities
[58] Climate change diminishes Indonesian aquaculture, diversifying its livelihood
[59] Feed makes up to 70 percent of carbon emissions.
[60] Indonesian IOT startup eFishery gets pre-series A funding

Below is the diagram of how the service works[61]:



eFishery collaborated with Indonesia's largest mobile operator (Telkomsel) to develop Narrowband Internet of Things devices for the aquaculture sector which were rolled out from September 2018. Each service owner (Smart Feeder) needs to have a SIM card and internet access to fully access its functions. Feeders connect to the internet with minimal data costs, making it more affordable.

Key success factors

Key Policy and regulatory factors include:

- eFishery signed a Memorandum of Understanding (MoU) with the National Research and Innovation Agency. This enables eFishery to conduct more research to promote innovation in the aquaculture sector.

Key enabling environment factor include:

- Aqua Spark's investment in eFishery has been said to be the influenced by a combination of current market dynamics and, to some extent, by investors beginning to wake up to the aquaculture opportunity but lacking familiarity with the industry.
- Integrating overall supply chain within one application. eFishery provided integrated solutions to cover the entire fish and shrimp farming ecosystem, from access to feed to funding, and markets, for more than 200,000 farmers[62].

Key Market and economic factors include:

- By providing an inclusive digital economy platform, eFishery has contributed to increase in fish and shrimp feed sales with a record transaction worth USD 254 million and increase in business income in the aquaculture sector for farmers. According to the latest research from the University of Indonesia, eFishery's integrated ecosystem contributed to 1.55% of Indonesia's GDP (USD 2.242 billion) in the aquaculture sector by increasing accountability, efficiency, and convenience of fish farming.[8]

[61] The leasing model allows farmers to pay a fixed monthly fee. eFishery can also help farmers to acquire and use smartphones.
[62] eFishery ties up with BRIN

Scope to scale up

eFishery has become one of the largest digital cooperatives in the world. To date, thousands of eFishery's smart feeder applications have been used by more than 40,000 farmers from 24 provinces in Indonesia. During the pandemic, the company grew exponentially with their customer base multiplied by 10x. eFishery became the largest feed distributor in Indonesia within months, and they successfully expanded their network to selling farmers' fish and shrimp harvests directly to end buyers. Thus, revolutionising the aquaculture industry by integrating smaller Indonesian fish farmers into its value chain.

eFishery received an early-stage investment from Aqua Spark in 2015 when the company had less than 100 units in the field. Since then, eFishery has grown to more than 250,000 field units, and has developed a full-service solution for farmers in addition to automation of feed – It creates credit ratings for farmers and offers fair loans to farmers. Its goal is to reach one million aquaculture ponds in Indonesia by 2025.

The company recently secured USD 200 million in Series D funding, increasing its market value to USD 1.4 billion. This made eFishery the first startup in the global aquaculture industry to attain this status. The funding was led by Abu Dhabi-based 42XFund and included participation from Kumpulan Wang Persaraan (Diperbadankan), Malaysia's largest public sector pension fund and Swiss asset manager. Existing investors Northstar, Temasek and SoftBank, with Goldman Sachs acting as an exclusive financial advisor to eFishery. TechCrunch last covered the startup when it announced its USD 90 million Series C in January 2022[63]. eFishery now has successfully completed its first commercial pilot in India and aims to expand across Asia and Latin America[64].

Innovation and key lessons learned

- The application projected the amount of feed required effectively while enabling farmers to pre-order from feed manufacturers, leading to 24% feed savings and 5% lower cost in feed purchasing.
- Leveraging data on fish, feed, and water quality collected, strategically moving into feed supply, disease prevention and financing, created a marketplace to help farmers find end buyers for their products[65].

Opportunities for replication in Southeast Asia

Based on the case study we identified the following success factors as critical.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
- Private sector friendly policies/regulatory factors. - Partnering with National Research and Innovation Agency that enables to promote innovation/research in the aquaculture sector	Integrating overall supply chain (from access to feed to funding and market) within one application – helping farmers to find end buyers for their products	Investors interest in aquaculture related business opportunity

[63] Indonesian aquaculture startup eFishery nets USD 200M at unicorn valuation
[64] Indonesian aquaculture "unicorn' eFishery expands into India
[65] eFishery: Revolutionizing Fish Farming with an Aquaculture Super App

To identify in which countries in Southeast Asia the eFishery case could be replicated we examined recent statistics on fishery production in Southeast Asian countries. According to Southeast Asian Fisheries Development Center 2024, Indonesia (47.6%) reported the highest fishery production in terms of volume, followed by Viet Nam (18.4%), Myanmar (13.3%), Philippines (9.2%), and Thailand (5.3%)[66].

Based on the above the key countries with the greatest potential for scale up are Viet Nam, Myanmar, Philippines, and Thailand. Each of these contributes to more than 5% of fishery production within Southeast Asia. We examine the critical enabling factors for each of these countries.

Key locations	*Viet Nam*	*Philippines*	*Thailand*
Scoring			
Private sector friendly policies/regulatory factors. Partnering with National Research and Innovation Agency that enables to promote innovation/research in the aquaculture sector	Friendly policies for private sectors/foreign direct investment (FDI) particularly for enterprises engaged in export-oriented manufacturing[67,68]. There is an opportunity to partner with Viet Nam National Innovation Centre (under Ministry of Planning and Investment)[69].	Business environment for private sectors/FDI has been better with recent amendments to the Public Services Act. However, regulatory inconsistencies limit private sector investments and inhibits timely and fair resolution of commercial disputes[70].	Thai Government encourages private sector investments and has been a major destination for FDI. There is an opportunity to partner with National Research Council of Thailand which promotes private sector research.
Investors interest in aquaculture related business opportunity	Domestic and foreign investors have been significantly interested in aquaculture industry. Viet Nam's Venture Capital (VC) saw a sharp decline in 2022, however, investors continued to express interest in Vietnamese startups and the VC is gradually getting better.	There is a growing interest among investors in aquaculture industry in Philippines. VC market is seeing an increase in funding for tech startups, growing interest from local and international investors[71].	There is a growing interest among domestic and foreign investors (including aqua spark) to invest in aquaculture industry in Thailand. Thailand's VC market is experiencing a rapid surge specifically in tech startups due to country's growing innovation ecosystem[72].
Integrating overall supply chain (from	Supply chain is continuing to develop	There is a need to improve	Factors such as government support

[66] Fishery Statistical Bulletin of Southeast Asia 2021
[67] Viet Nam – Country Commercial Guide
[68] Investing in Aquaculture in Viet Nam
[69] This Government unit supports and develops the innovation ecosystem (based on technology and science)
[70] 2023 Investment Climate Statements: Philippines
[71] The Philippines' ecosystem for technology startups
[72] Thailand's tech startups developing rapidly

access to feed to funding and market) within one application – helping farmers to find end buyers for their products	in Viet Nam. Active participation between businesses and producers fosters conditions for product manufacture and consumption[73].	sustainable supply chain, including knowledge about sustainability of fisheries supplying domestic markets and conditions for local fishery[74].	in aquaculture promotion, infrastructure development, export facilitation, and support to small and medium-sized enterprises has boosted the industry[75]. There is an opportunity to integrate the overall supply chain.

Summary

Based on the country comparison, results show that Thailand provides the most supportive environment to replicate eFishery's case. Thailand fosters a regulatory environment favourable for private investment and possesses well-established aquaculture markets with significant support from the government to promote the aquaculture industry. Viet Nam offers possibilities for replication, though VC market and overall supply chain is less developed.

[73] Viet Nam focus on the development of consumption chain in the aquaculture industry
[74] Sustainable fishery management trends in Philippine fisheries
[75] Thailand Fish Market (2024-2030)

Full Case Study 8. Chamrouen Micro Finance Institute, Cambodia

Background on the company/project

Chamroeun started in 2005 by a French NGO, Entrepreneurs du Monde, with the Phnom Penh Municipality and the Cambodian Ministry of Foreign Affairs to establish a social microfinance project named ‘’Chamroeun" (meaning “progress” in English) to provide financial and non-financial services for poor families. It targets poor individuals, communities, and smallholder farmers, who are excluded from formal financial services in Cambodia. Chamroeun’s first branch opened in 2006, and in 2011 obtained a full microfinance licence. Its client portfolio is predominately rural with half this group directly working in agriculture and the rest indirectly impacted by agriculture, due to the dependence of rural communities on agriculture. The main product offerings consist of financial services (microloan, social emergency and capital build up). Chamrouen operates in 15 provinces, with 21 branch offices. 82% of its clients are women. Chamroeun’s non-financial services focus on increasing the revenue of clients and improving the professional skills by providing business support to small scale entrepreneurial ventures.

Adaptation benefits

Cambodia’s population relies heavily on agriculture and fisheries, providing 25% of GDP and employing 49% of the country’s labour force. Nearly the entire country faces high exposure to agricultural losses due to drought. Because only 20% of Cambodia’s rice fields feature irrigation, poorer farmers depending on rainfed cropping systems are particularly vulnerable to more frequent and intense precipitation decreases or longer dry seasons[76].

Poor people are disproportionately affected by climate hazards - not only because they tend to be more exposed to climate-related shocks, but also because they have fewer resources and receive less support from family, community, the financial system, and social safety nets to prevent, cope, and adapt. Climate change will worsen the shocks and stresses poor people face, thereby making it even harder to eradicate poverty. Climate change adds to the existing risks and uncertainties which farmers face. Managing risk and uncertainty at the farm level is essential to creating an environment for farmers to make the shift to improved, more resilient, practices. This can be achieved through improved access to financial services, such as insurance, savings, and credit. Savings help the poor in times of unexpected setbacks or facilitate investments in climate-resilient technology and access to credit can help farmers invest into these technologies that will increase yields and improve productivity. Key for adaptation is to increase financial inclusion and participation in banking to reduce the vulnerability of poor households’ assets. Providing access to finance must clearly meet high standards of integrity, or it could have the reverse affect.

Financing and financial structures

Chamroeun offers a wide range of loan products. The Chamroeun Loan is designed for the poorest groups who need small amounts of capital to start up and/or expand their businesses (trading, production, service, and handicraft). They also offer an agriculture financing loan, aquaculture loan, agriculture cooperative loan and contract farming loans. About 40% of its portfolio is delivered through group loans. While the provision of finance, in

[76] USAID (2019). Climate Risk Profile: Cambodia. URL: https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_ Cambodia%20CRP.pdf

a responsible way, helps reduce vulnerability to climate change Chamroeun also recognises the need for loan products directly responding to climate change risks. These include:

- End-user financing of solar and other 'green' products (i.e. water filters, bio-digestors, etc.).
- Financing of smallholder farmers to adopt conservation agriculture practices.
- Financing for SMEs involved in the renewable energy sectors.
- Financing of agricultural cooperatives in the organic rice value chain.

Key success factors

Key Policy and regulatory factors include:

- The National Strategy for Microfinance, promulgated by the Prime Minister in 2007, endorsed the role of microfinance in promoting businesses, increasing agricultural productivity, and improving the living standards of rural households and reducing poverty.
- The Royal Government of Cambodia has mandated the Code of Bank in Cambodia to regulate the banking and financial sector in a more sustainable manner.
- The Cambodia Sustainable Finance Initiative has been launched to further develop principles that guide financial initiatives in Cambodia.
- Climate policies, including NDCs targets are putting a greater emphasis on climate lending.

Key enabling environment factors include:

- Cambodia's openness to trade and financial flows fuelled one of the fastest credit growth episodes in Asia, although Cambodia remains a predominantly cash-based economy.
- Cambodia has more of a history of local organisations providing finance compared to its neighbouring countries.

Key market and economic factors include:

- Capital account openness and dollarization led to rapid growth in foreign currency deposits.
- Growing demand for climate related products.

Scope to scale up

From 2018 to 2020 Chamrouen saw a 63% increase in clients and 105% increase in gross loan portfolio. It currently has 41,608 active partners. In 2023, it had USD 44.98 million gross loan portfolio. In 2020 net profits stood at USD 0.96 million. Chamroeun does not take deposits from clients, and its loan portfolio is fully financed by loans from international investors. Chamrouen has been successful in raising debt to lend to their clients from international lenders, including Grameen Credit Agricole, Oikocredit, Triplejump, and others. The company was acquired in late 2018 by Regen, who has taken full ownership of the institution. While Chamrouen is not currently looking for new shareholders, their finance remains from international debt financing, and they are interested to seek new partnerships from organisations interested to develop their capacity on climate change.

Key lessons learned

While Chamrouen have been successful in mobilising finance, they have not sufficiently included climate-related covenants in the investment (debt) and /or the climate skills and

knowledge that other groups could bring. There are several lessons regarding the integration of climate related investments, many of which are applicable to MFIs across Cambodia.

- Generally, while climate change was considered important it is not a 'strategic' consideration. There was a lack of a clear corporate strategy on how the company aims to respond to climate change risks. More critically, despite having its portfolios dominated by climate-risk sectors (e.g. rainfed agriculture) or in highly climate vulnerable regions of the country, there was a lack of any assessment of the current climate risk to their lending portfolio. This represents a serious physical risk to their lending portfolio and overall business. They do not have the systems and strategies in place to adequately deal with climate risks.
- They are providing credit products, mostly short term, typical 'microcredit' products. They are willing to offer products specifically for, or related to, climate-smart or adaptation. However, they have no clear financial product. There are motivated to provide finance for climate change, but on the condition of support to establish low interest credit lines and/or technical assistance grants for various awareness raising and training programs. Insurance was identified as a financial product that they also wanted to consider in response to growing climate risks.
- Chamrouen noted the need for partnerships to aggregate clients, and train them, and support the creation of demand for climate-related technologies. In many instances they noted that climate smart products must be driven by demand to adopt improved production practices, something that was often lacking without partnerships with NGOs, or the government. There is the need for them to provide non-financial services, typically including training and capacity development for their clients (often through the group model also) supported through grants.
- ESG regulations are immature so there is little pressure to better integrate climate change across their operations. However, this will change as risks increase and regulations becomes stricter. There is a growing recognition of the need to integrate metrics on climate change. These are lacking for most FIIs, though some have developed them based on the requirements of investors. Regulations will be key to spur demand and supply of climate related financial products.

Opportunities for replication in Southeast Asia

Based on the case study we identified the following success factors as critical.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
Policy/regulation that encourage microfinance in promoting businesses/financial literacy/Country's openness to trade	MFIs landscape, trust, and reach with history of organisations providing finance to support farmers	Demand for loan (microloan, emergency loan, and capital build up)

The next step is to identify in which countries in Southeast Asia the Chamrouen's case can most easily be replicated. This primarily requires countries in Southeast Asia where there is good access to finance and where the microfinance market/sector is well developed.

Financial inclusion is comparatively high in Malaysia, Thailand, Indonesia, and Philippines[77]. Similarly, Microfinance has developed well in those countries, whereas it is still developing in Viet Nam, Lao PDR, and Myanmar[78]. Based on this preliminary assessment we focused countries for potential replication: Malaysia, Thailand, Indonesia, and the Philippines. We examine the critical success factors for each of these countries.

Key locations	*Thailand*	*Malaysia*	*Philippines*	*Indonesia*
Scoring				
Policy/regulation that encourage microfinance in promoting businesses/financial literacy, and country's openness to trade	Coefficients of trade openness shows positive result[79]. 12th National Economic and Social Development Plan mentions strategies to develop MFIs[80]. National strategy for financial education is under development.	There is a national strategy for financial inclusion to encourage MFIs in promoting businesses[81]. However, OECD survey suggests that financial knowledge is lower compared to other countries.	Regulatory inconsistencies limit private sector/foreign investment. National strategy for financial education is under development.	Friendly policies that promote trade, productivity, and business. Indonesia is implementing national strategies for financial education resulting in higher financial knowledge.
MFIs landscape, trust, and reach with history of organisations providing finance to support farmers	Well-developed microfinance sector with diverse institutions in both rural and urban areas [4] – over 15 million clients. Includes a mix of financial institutions, NGOs, cooperatives, and government supported programmes.	Made significant strides in recent years[82] - serving about 90,000 clients. Comparatively less institutional diversity/loan portfolio.	Vibrant microfinance sector with institutional diversity including government programmes, NGOs, cooperatives, and private sector initiatives.	Significant growth in recent years with diverse landscape including institutions, rural banks, and fintech companies. MFI industry is developed and is predominantly formal, savings-based MFIs (with high degree of

[77] OECD: Financial Inclusion and Consumer Empowerment in Southeast Asia
[78] Performance of microfinance institutions and their accessibility in South and East Asia
[79] Thailand: Trade openness
[80] Microfinance participation in Thailand: The village fund (VF) is the largest government microfinance programme (with a reach of 77,000 villages and urban communities) which plays an important role to finance farmers.
[81] National financial inclusion strategies and measurement framework
[82] The Malaysian microfinance system and a comparison with the Grameen Bank (Bangladesh) and Bank Perkreditan Rakyat (BRR-Indonesia)

				financial self-sufficiency.
Demand for loan (microloan, emergency loan, and capital build up)	Growing demand for micro loans considering climate change vulnerability, financial constraints faced by smallholder farmers, and for improving market opportunities.	Decreased social quality and climate change has severely impacted food supply. Smallholder farmers have a demand for microloans to support their agricultural production.	High demand for loan mainly among poor smallholder farmers.	Low productivity due to climate change have severely impacted independent smallholder farmers. There is a growing demand for green finance/loan in Indonesia.[83]

Summary

Based on the country comparison of the success factors, results show that Indonesia provides the most supportive environment to replicate Chamrouen's case. Philippines and Thailand also both offer potential opportunities.

[83] Financing Indonesia's Independent Smallholders

Case Study 9. Cambodian Climate Financing Facility

Background on the company/project

The CCFF[84] is established under Cambodia's state-owned Agricultural and Rural Development Bank, with Mekong Strategic Capital as the delivery partner and independent investment advisors. It was established to address the existing market failures in providing financial supports to catalyse the development of a green economy in the country. The Facility has cross-cutting goals, which include accelerating implementation of the country's Nationally Determined Contribution (NDC), scaling up climate finance, and lowering greenhouse gas emissions while boosting climate resilience. The Facility will also support capacity building of stakeholders to tackle non-financial barriers and convene stakeholders to coordinate policy dialogues for development of policy framework. The facility is seen as a breakthrough considering the absence of domestic appropriate funding sources that are available to support and enable climate friendly businesses and projects, that cover for both climate mitigation and adaptation. This is the first bank lending platform which specifically targets climate resilience, as well as climate mitigation in Cambodia, and one of the first in Southeast Asia.

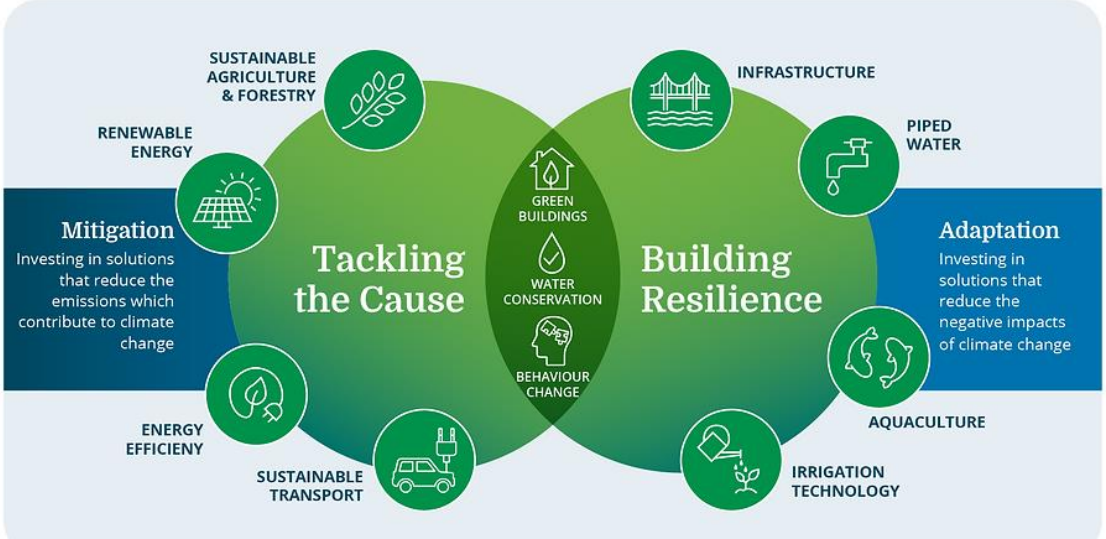
Adaptation benefits

The Global Climate Risk Index and World Risk Index placed Cambodia as the 19th and 17th country[85] with high risk and most vulnerable to climate impacts, based on the extent the country has been affected by weather related losses. The character of the country's vulnerability is evidenced by irregular rainfall and frequent flooding, agrarian based economy, restricted human and financial resources, inadequate infrastructure, and limited access to technologies. These adverse climate change impacts are projected to have negative effects on sectors key to human development such as health, infrastructure, and agriculture. Considering the size of these challenges, both public and private investment are required to address these threats and to minimise climate change impacts on the economy, business environment, and the welfare of the population.

CCFF is developed to provide financing support for both climate change mitigation and adaptation solutions as presented in the Figure below, with a focus on resource constrained NDC priority sectors. For adaptation, the programme will invest in solutions to build resilience in reducing the negative impacts of climate change which cover four sectors including infrastructure, piped water, aquaculture, and irrigation technology. The programme also supports sectoral intersections with mitigation solutions through green buildings, water conservation, and behaviour change.

Figure: Climate Change Mitigation and Adaptation Solutions Targeted for Financing

[84] USD 100 million Climate Fund Offers Long-Term Green Funding
[85] based on 1998–2017 data for Global Climate Risk Index, and based on 2019 data for World Risk Index



Source: Mekong Strategic Capital website

Financing and financial structures

The CCFF will be capitalised with funding from GCF (50.4%), and co-financing by the Ministry of Economy and Finance and other financiers[86]. The Korea Development Bank will act as the GCF accredited entity for the CCFF to oversee the execution.

The facility adopts a dual approach in serving as a model for climate financing: [87] (1) long-term direct lending to private sector climate ventures; and (2) partners with local financial institutions and provide them with affordable funding to support businesses that yield positive climate outcomes. This innovative dual approach intends to leverage domestic private capital, aiming for a wider systemic change towards more climate-focused lending practices in Cambodia. Mobilising and de-risking domestic capital for climate action through the local banks is critical and non-negotiable part of the Facility's design, as it will permit the programme to scale up and achieve a much larger systemic impact.

For operationalisation, the Agricultural and Rural Development Bank will establish a dedicated CCFF Working Group, responsible for deal sourcing, credit assessment, and loan issuance and administration as per CCFF Operational Guidelines. The Facility is also expected to mobilise more capital upon the concessional funding provided by GCF.

Key success factors

Policy and regulatory factors include:

- Cambodia has prioritized environment sustainability and readiness for climate change in their 2018 Fourth Phase of the Rectangular Strategy, particularly for the Rectangle 4 on inclusive and sustainable development.
- The Cambodian government has also made significant progress for climate finance in accordance with cross-sectoral policies including Green Growth Strategic Plan, Cambodia National Environment Strategy and Action Plan 2018-2023, Cambodia Climate Change Strategic Plan 2014-2023, and the National Policy on Green Development and the National Strategic Plan on Green Development 2013-2030. These documents were analysed and developed to seek alignment with GCF result

[86] GCF Greenlights CCFF to Propel Cambodia's Eco-friendly Economic Growth
[87] Green Climate Fund Endorses Cambodian Initiative with $100 Million to Promote Green Economy

areas for mitigation (LUCF, Agriculture, Energy, Industry, and Transport) and adaptation (Agriculture, Forestry, Coastal zone, Human health, and Infrastructure).
- The CCFF fills the market gap as a green lending institution and it progresses by providing complementarity from the earlier CSFI initiative in improving environmental and social risk management standards, as well as improving the green lending appetite from the banking sectors.

Enabling environment factors include:

- In 2016, Mekong Strategic Partners (MSP), with funding support from USAID, designed and launched an initiative to support the Association of Banks Cambodia (ABC) to establish the Cambodian Sustainable Finance Initiative (CSFI) and produced the CSFI sustainable finance principles. This initiative has triggered Cambodian banks to improve their environmental and social risk management lending standards and safeguards capacity across their industry.

Market and economic factors include:

- There is growing demand from businesses to borrow for climate resilient activities in Cambodia, which requires concessional financing. There is a growing interest and pipeline from companies particularly for the agriculture and water sectors based on some information circulated around by other climate impact funds such as DFCD (Dutch Fund for Climate and Development).
- The GCF concessional finding is the key element to crowd in more private capital and blended financing from domestic sources, international donors, and climate focused lenders to support the shift to a greener private sector and a greener finance sector in Cambodia.

Scope to scale up

While the fund has only recently been accepted by the GCF Board, the financing facility, backed by the Ministry of Environment and the Association of Banks provides a funding modality which could be significantly scaled. Many countries in the region will be watching the development of this fund and its ability to invest into pipeline. If it is successful, the expectation is that other similar finance facilities will be established in other countries in Southeast Asia.

Key lessons learned

This initiative marks Cambodia as the first country in Southeast Asia to launch a national climate financing mechanism. Some key lessons which contributed to the success are:

- The Facility was successful due to the robust support and commitment from multiple key stakeholders, especially international organisations. The design was developed by Mekong Strategic Capital, who provided multiple trainings and awareness raising with local banks and supported the GCF proposal, in collaboration with the Korean Development Bank. The company also managed to establish strong cooperation with the key government stakeholders such as the Ministry of Environment, Ministry of Economy and Finance, National Bank of Cambodia, Agricultural and Rural Development Bank, and other development partners such as USAID, Agence Française de Développement, and International Finance Corporation.
- There continues to be a need for concessional capital to capitalise such facilities. This requires a mix of technical assistance support and credit enhancement to support climate resilient businesses. There is a key role for the GCF in this regard

given its more generous terms of financing. However, it took nearly four years to receive funding from GCF which hampers replication.

Opportunities for replication in Southeast Asia

Based on the case study we identified the following success factors as critical.

Critical Success factors		
Policy and regulatory	*Enabling environment*	*Market and economic factors*
The Cambodian government has made significant progress for climate finance in accordance with cross-sectoral policies	Launched an initiative to support the Association of Banks Cambodia to establish the Cambodian Sustainable Finance Initiative and produce sustainable finance principles	There is growing demand from businesses to borrow for climate resilient activities in Cambodia, which requires concessional financing.

To identify in which other countries in Southeast Asia a Climate Financing Facility could be replicated through local banks we examine how far advanced ESG policies are across the other countries. We use an assessment undertaken by WWF Singapore[88]. Where they are more advanced polices this provides greater opportunity to establish similar climate financing facilities with local banks.

Key locations	***Indonesia***	***Lao PDR***	***Viet Nam***	***Philippines***	***Malaysia***	***Thailand***
Scoring						
Stakeholder engagement in sustainable finance initiatives						
Statements on specific ESG issues						
Assessing E&S risks in client & transaction approvals						
Staff E&S training and performance evaluation						
E&S integration in products and services						

Summary

There are generally three different groupings in terms of how advanced ESG banking regulations are in country. It remains at a rudimentary level in Lao PDR and Vietnam, although Vietnam has recently indicated greater commitment towards ESG. In Indonesia and Philippines, it is more advanced and offers opportunities. While Thailand and Malaysia have the most developed banking systems in place to respond ESG requirements. This provides the opportunity to establish credits lines focused on investing in climate resilience.

[88] See WWF Singapore SUSBA | Home for data.

Full Case Study 10. Build Change: Capitalising on the microfinance landscape for disaster risk reduction in Philippines

Background of the company/project

Build Change (non-profit social innovator) provides the public and private sectors with technical assistance to successfully invest in disaster resilient housing, creating long-term housing and economic resilience with financial, social, and environmental benefits. Build Change is building the capacity of Microfinance Institutions (MFIs) to enable their clients to upgrade their houses to better withstand disasters by providing access to finance housing retrofits. Build Change adopts innovative financing, infusing engineering and technology to create resilient buildings. This created a significant market appetite for retrofitting loans, allowing low-income families to afford resilient houses. Building on success from the Philippines, Build Change is working with government and private entities in Columbia, Haiti, Indonesia, Nepal, and Philippines to fulfil low-income families' need for resilient housing.

Adaptation benefits

The Philippines is one of the world's most disaster-prone countries with recent increase in extreme events including heavy rainfall and tropical cyclone activity[89]. Since 1990, the country faced 565 disasters, killing 70,000 and damaging infrastructure worth USD 23 billion[90]. It is estimated that there are 15.6 million vulnerable housing units in the Philippines inhabiting 69.9 million Filipinos who are mainly poor and have limited financing options for improving their households. By helping to construct resilient housing in Philippines together with MFIs, Build Change proved that house improvement programmes could be executed successfully by combining a resilient construction with appropriate financial services[91].

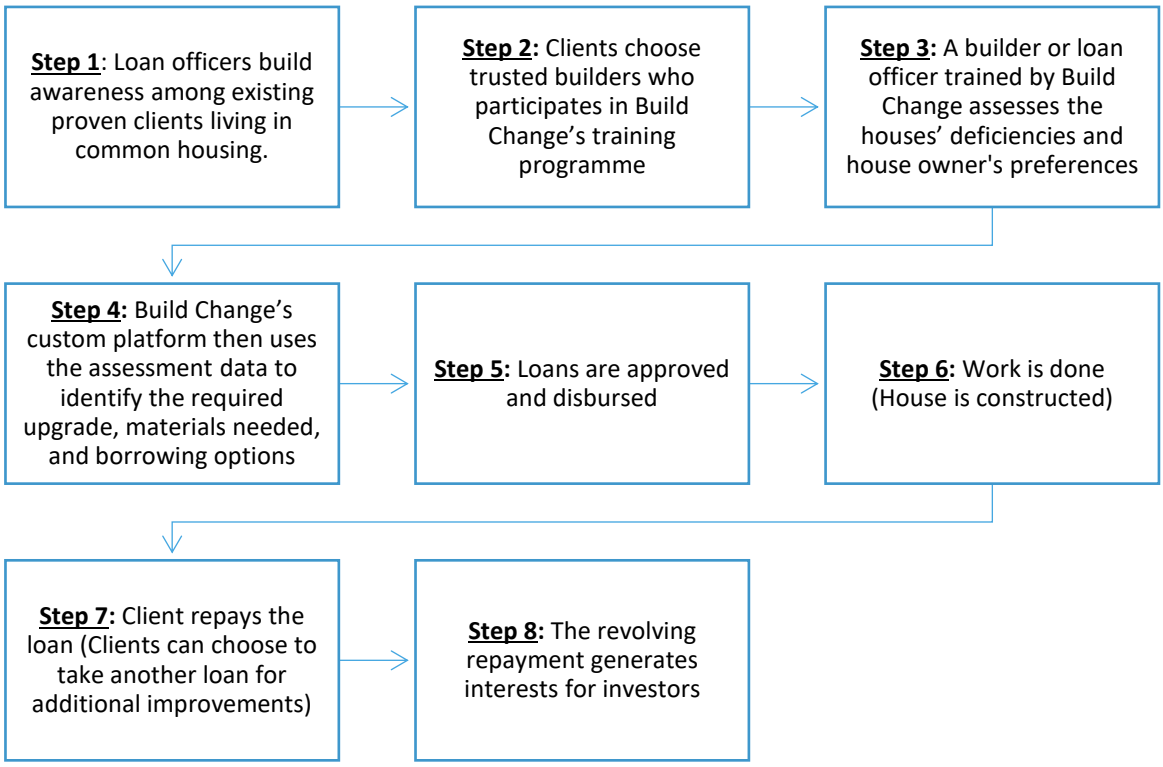
Financing and financial structure

MFIs in Philippines have a reach of 11 million clients and are a trusted community financier[92]. MFIs emerged as a key opportunity for Build Change to connect with houseowners to financing mechanisms that would foster resilience. Historically, MFIs had limited capacity for housing product development and limited funds. Build Change advocated MFIs to initiate house strengthening loan products and partnered with six MFIs to develop a product that required no collateral and could provide small loans to clients for small repairs.

Build Change incorporated responsive solutions from building awareness to providing simple tools for MFIs and houseowners to select the loan for each house. Build Change helped MFIs to develop resilient housing loans which can be acquired by low-income families, creating more stable lending conditions for deploying capital in disaster prone areas.

[89] Climate Risk Country Profile: Philippines
[90] Climate Change Knowledge Portal
[91] Building Resilience of the urban poor: Incorporating climate and disaster risk information into pro-poor housing investments
[92] Low-income families are not catered by most commercial banks and lending institutions and most of such clients access funds through MFIs or informal lending.

How does it work?



Key success factors

Policy and regulatory factors:

- Philippine Disaster Risk Reduction and Management Act, provides a comprehensive, all hazard, multi sectoral, inter agency and community-based approach to disaster risk through the formulation of the National Disaster Risk Management Framework and Plan.

Enabling environment factors:

- Build Change developed an investment strategy for improving existing housing in consideration of the applicable hazards.
- Build Change extensively engaged in building awareness in the community about typhoons and earthquakes and its impact while providing streamlined, simple, and clear tools for MFIs and houseowners to select the right loan for each house.
- Build Change together with its partners enhanced MFIs' technical ability to strengthen their housing loan resources and mitigate lending risks.
- Local Government Units are well-positioned to aid the low-income households for retrofitting houses. Initiatives on disaster resilient houses can be integrated into Local Government disaster risk management framework and local development plans.

Market and economic factors:

- Research on the market for residential retrofit financing conducted by Build Change suggested that the market for housing retrofitting is approximately 15.6 million units. Out of 15.6 million vulnerable housing units, a study conducted by Build Change estimated that MFIs can cater to about 8.6 million units[93].

[93] Building Resilience of the urban poor: Incorporating climate and disaster risk information into pro-poor housing investments

- Build Change engaged other financially capable lenders with a higher risk tolerance to stimulate the financial market, attracting more resources into the hands of the MFIs.
- Financing type depends on market segment. Different market segments have differing preferences and capacities to repay debt. Build Change featured multiple loans, making house improvements more economically manageable.

Scope to scale up

There is a high market appetite for retrofitting loans among low-income households in the Philippines and mobilising MFIs or other trusted financially capable lenders can be an effective way of connecting with houseowners to financing mechanisms.

Build Change successfully applied the lending model in Philippines with repayments exceeding 99%. The product allowed MFIs to replicate the approach adopted by Build Change with additional clients[94]. This initiative increased the willingness among private financial institutions to introduce resilient housing loan products[95]. For instance, Holcim Philippines (building solutions provider), Build Change, and Alalay sa Kaunlaran Foundation (an MFI) are partnering to help strengthen 28 houses in Aurora against extreme weather, creating 100 jobs and training 1,500 people on climate resilient building. These organisations launched a programme to access house strengthening loans from the Alalay sa Kaunlaran Foundation using Holcim's low carbon products and engineering design of Build Change which drew interest from over 750 Aurora residents and local government leaders[96]. In addition, other four MFIs were offering house strengthening loans for clients to increase the resilience of their houses against disasters in Philippines.

Build Change is at a stage of unlocking its capital while replicating the model in other vulnerable countries. In Nepal, Build Change partnered with the government to open technical resource centres and is working with 7,000 houseowners enrolled in the Government led houseowner driven reconstruction process[97].

Key lessons learned

Build Change suggests that making existing housing resilient is untapped billion-dollar market. It is estimated that 50% of Filipinos need housing improvements[98] and there is possibility of replicating such initiatives at a large scale in other disaster-prone countries including Indonesia and Nepal.

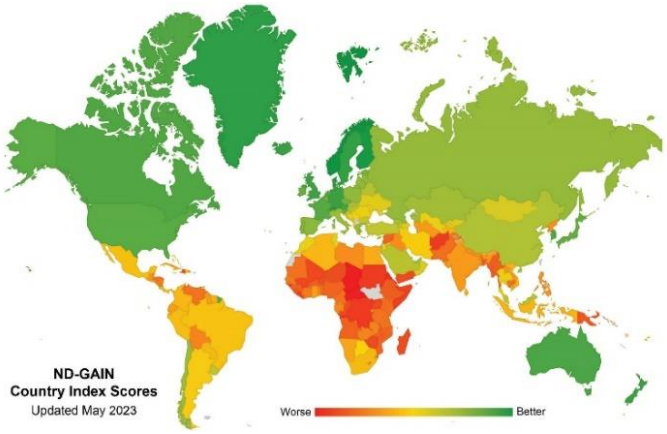
Potential for replication across Southeast Asia

Based on the case study we identified the following success factors as critical.

Critical Success factors		
Policy and regulatory	***Enabling environment***	***Market & economic factors***
Supporting policies for the microfinance – its reach, clients' trust, and support from the government.	Evidence on vulnerable housing units affected due to environmental disasters.	Demand for loans for resilient housing.

[94] Financial pathways to climate resilient housing
[95] The Power of a Housing Investment
[96] Holcim, partners inaugurate pioneering program for climate-resilient housing
[97] Build Change Nepal
[98] Disaster Resiliency in Housing in the Philippines

A next step is to identify in which countries in Southeast Asia the Build Change's case could be replicated in terms of capitalising on the microfinance landscape for providing access to finance housing retrofits. This primarily requires countries which are highly vulnerable to climate change in Southeast Asia (in terms of country's vulnerability of housing/ living conditions). We used ND-GAIN Index vulnerability (human habitat) score. ND-GAIN Index vulnerability (human habitat) score captures the latest evidence on a country's vulnerability of housing/living conditions based on indicators such as projected change of flood hazard



Indonesia, and Cambodia were listed as the most highly vulnerable countries (with score above 100) in ND-GAIN Index human habitat score. We examine the critical enabling factors for both countries.

Key locations	*Indonesia*	*Cambodia*
Supporting policies for microfinance reach, client trust, and support from the government.	MFIs landscape is well developed with high financial self-sufficiency.	Good MFI ecosystem (Chamrouen operates in 15 provinces with 21 branch offices)[99]. Cambodia has a national strategy for microfinance[100].
Evidence on vulnerable housing units affected due to environmental disasters.	As of 2022, Government estimated that 12.71 million housing units needs improvement[101].	Almost 40% of Cambodia's urban population lives in slums and requires resilient housing[102]. There is need to gather further specific evidence on number vulnerable housing units.
Demand for loans for resilient housing	High demand for loans for resilient housing. The cost of retrofitting buildings is high and there is limited availability of public funding[103]. Habitat for Humanity collaborated with MFI (KOMIDA) to develop housing loan product, serving more than 10,000 low-income families.	High demand for loan for resilient housing. Approximately 16.7% of the total population lives below poverty line[104] and over 10 million need decent housing.

[99] FMO: Chamroeun Microfinance PLC
[100] World Bank Group: Microfinance and Household Welfare
[101] Habitat for Humanity in Indonesia
[102] Habitat for Humanity: Country profile Cambodia
[103] Improving existing vulnerable housing stock in Indonesia
[104] Housing Poverty in Cambodia

Summary

Based on the country comparison of the key enabling factors, results show that both Indonesia and Cambodia provide a supportive environment to replicate Build Change's case. In Cambodia, this could be strengthened by the government gathering further evidence on the number of vulnerable housing units.