Climate Resilience and Adaptation Finance and Technology Transfer Facility (CRAFT)

ANNEXES
August 2017

ANNEX 1: INVESTMENT CRITERIA

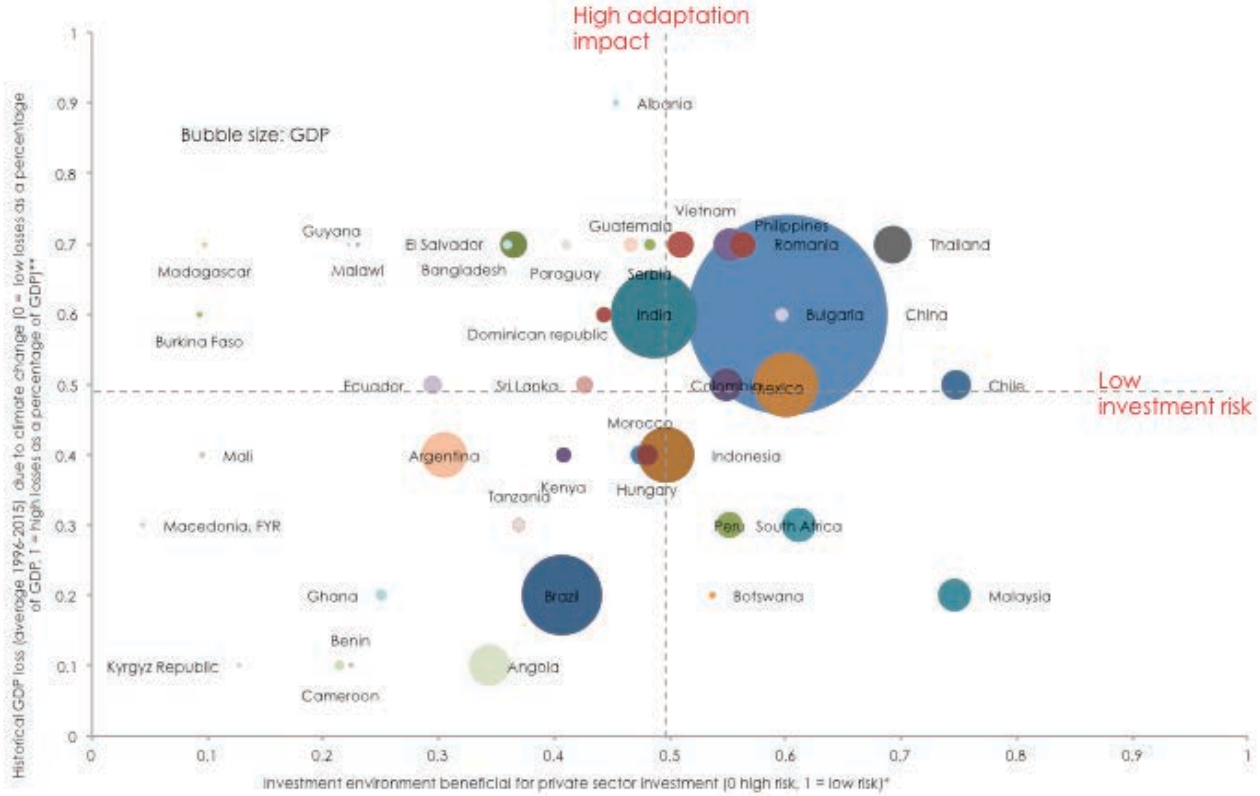
The CRAFT Fund will invest in companies meeting the following criteria:

- ***Climate Adaptation or Resilience Solution*** – The company offers a climate adaptation or resilience solution (whether intelligence, product, or service) that helps address a key climate vulnerability. A preliminary list of key climate vulnerabilities (based on those described in the IPCC 5th Assessment Report) includes, *inter alia*: water stress and scarcity affecting both urban and rural populations; declining agricultural productivity; physical damage to agriculture from storms, floods, and drought; food scarcity or insecurity including dependence on food imports (and resulting price insecurity); damage or disruption to electric grids; supply chain disruption; physical damage to buildings or infrastructure; human health impacts from the spread of disease vectors; increased financial markets volatility.
- ***Established Business, Ready to Scale*** – The company has reached a stage of development where additional capital, expertise, and other resources can further catalyze rapid growth. Specifically, the company has meaningful revenues, demonstrated customer adoption, is past technology risk, and has adequate distribution channels or other go-to-market capability to support accelerated revenue growth.
- ***Attractive Unit Economics or Margins*** – The Company has attractive current unit economics and/or gross margins (typically >30%).
- ***Leading Market Position*** – The Company has established a top market position within an emerging sub- sector or market segment. This will typically mean #1, 2, or 3 market share (either currently or expected post-investment).
- ***Persistent Advantage*** – The Company will be able to sustain its market position and profitability in the future through some durable differentiation or competitive advantage, whether from proprietary technology, an exclusive partnership, or other barrier to entry.
- ***Superior Management*** – The management team has substantial experience and a successful track record, with the capabilities and relationships needed to usher the company through the growth phase.
- ***Commitment to ESG/Resilience Metrics*** – The Company is committed to upholding environmental, social and governance standards goals and has the ability to track proposed climate resilience key performance indicators (KPIs).

ANNEX 2: METHODOLOGY FOR TARGET COUNTRY SELECTION

The chart below compares general investment environment with recent economic losses from climate change, with the size of each data point corresponding to the country's Gross Domestic Product (GDP).

Targeting Countries with High Climate Vulnerability and Low Investment Risk[1]



[1] * Indicator based on sub-indicators VC/PE Attractiveness Score (IESE, 2016), Domestic credit to private sector average (WBG, 2010-2015), net FDI as a % of GDP (WBG, 2015), lending interest rate (WBG, 2010-2015), political risk scores (OECD, 2015), Ease of Doing Business Index (WBG, 2015), Currency Volatility (Oanda, 2010-2015). Data normalized on a range from 0 to 1. Indicators weighted based on completeness of data by indicator.
** Indicator based on economic losses from climate change as a percentage of GDP (average 1996-2015)(Germanwatch, 2017) and the range of percentage losses is reflected by percentiles due to account for outliers distorting the range.

The table below highlights the adaptation sector priorities of countries submitting NDCs, and shows that CRAFT target countries have highest priority in Agriculture, Water, and Health.

Demand for adaptation solutions by sector and country

Inclusion in Nationally Determined Contribution (NDC)	Adaptation Sector					
	Agriculture	Water	Health	Disaster Risk Mgmt	Coastal Zones	Energy
Sector included in NDC (#)	109	100	76	79	62	53
Sector included in NDC (% NDCs)	50%	46%	35%	36%	29%	24%
Sector included in NDC of CRAFT target countries(#)*	12	11	10	8	8	5
Sector included in NDC of CRAFT target countries(%)*	86%	79%	71%	57%	57%	36%

* Bangladesh, Chile, China, Colombia, Dominican Republic, India, Indonesia, Kenya, Mexico, Morocco, Mozambique, Philippines, Thailand, Vietnam

ANNEX 3: WATERFALLS OF EXISTING BLENDED FUNDS

To inform the financial modeling scenarios for CRAFT, the Lab looked at several existing blended finance vehicles to understand current practices. The following table describes the Lab's understanding of the GEEREF and Danish Climate Investment Fund investor waterfalls.

Step	GEEREF Waterfall[2]	Danish Climate Investment Fund Waterfall[3]
1	Repay commercial investors	Repay all investors
2	Preferred return 4% to commercial investors	Disproportionate amount of preferred return of 6% to commercial investors
3	Repay concessional investors	Disproportionate amount of next 6% to concessional investors
4	Preferred return 6% to commercial investors	Distribute other returns 80/20 (commercial & concessional investors/fund manager)
5	Distribute other returns 80/20 (commercial & concessional investors/fund manager)	

[2] Source: slide 15 of http://www.iccgov.org/wp-content/uploads/2014/05/2014-05-09_Canu.pdf
[3] Source: p. 10 of http://www.sida.se/globalassets/global/partners/naringsliv/presentationer-fran-22-okt-2014/final-report-from-meeting_mobilising-institutional-investment-in-africa.pdf

ANNEX 4: CASH FLOW ANALYSIS

1. Assumptions

Our modelling exercise for the CRAFT Fund relies on two linked financial models, a model generating cash flows from individual investments in the portfolio and a fund model simulating the distribution of fund proceeds to investors.

Fund – We consider a $500 million fund. The commercial capital in the Fund receives a 4% preferred return, with an 80-20 split between commercial Limited Partners and General Partners thereafter. Management fees are 2.5% on committed capital for the first five years and 2.5% on net invested capital for the remaining years of the fund. We assume (1) a 10 year fund life with a 2-year extension period, (2) investment period of 5 years, mostly invested in the first 4 years of the fund life, and (3) an average investment holding period of 3 to 4 years before exit.

The fund is split into two sleeves of $250 million each, one holding investments focused on developing countries, with a higher risk profile, and a second sleeve holding investments focused on developed countries, with a lower risk profile.

Revenues derive from the sales of shares in participating companies, at an exit multiplier, which is subject to uncertainty.

Uncertainty – To represent the different risk profiles, we assign probabilities to multipliers relating to individual investments in each of the two sleeves of the fund, using assumptions provided by the proponent for "high risk" and "low risk" sleeves, as other data sets on the performance of these investments in developed versus developing countries is not publicly retrievable.[4] Assumptions are broadly in line with figures observed globally for the clean tech sector, where observed gross deal level returns between 2000 and 2014 range between the 21% seen on average for the advanced material sector and the +29% for smart grid (Cambridge Associates, 2016a). However, appear developing countries are only slightly more volatile based on assumptoin data

Proponent's assumptions on expected returns are summarized in Table 1 below:

Table 1 – Proponent's assumptions

	IRR % (probability)			Holding period
	Successful case	Middle Case	Low Case	
High risk (developing country) sleeve	57% (33%)	0% (40%)	-29% (27%)	4 years
Low risk (developed country) sleeve	44% (40%)	8% (40%)	-9% (20%)	3 years

We perform Monte Carlo simulations to reflect the combined effect of these uncertainties, and discuss as outcomes: (a) averages and (b) ranges based on 75% of confidence intervals. We also perform sensitivities to represent the impact of risk and risk mitigants to expected returns.

[4] Publicly available data from Cambridge Associates (2016b, 2016c, 2016d, 2016e) provides IRR figures from private equity, growth, and venture capital investments in emerging and developed economies. However, such sources do not refer to clean tech, and IRR values included are net of fund management fees and effect of waterfall structure, they can then be used more as a benchmark than as an input. Another study from Cambridge Associates (2016a) includes gross IRR figures for clean tech, but does not distinguish between investment in developed and developing countries.

2. Results: Returns without public capital

Based on the planned management fee structure outlined above, $430 million of the overall $500 million CRAFT Fund will be devoted to new investments, with an expected net return to commercial limited partners of 18.2% and 15.7% for the developing country and developed country sleeves respectively (average expected net return to commercial limited partners of 17.1% IRR). These represent higher than average upper quartiles observed for private equity and venture capital investment in the years 2010-2015.[5]

Although actual figures are subject to uncertainty, modeled returns for limited partners from the developed country sleeve range from 7% to 27%, with volatility rising for the developing country sleeve, which ranges between 10 and 31%.

3. Results: Role of public capital

The main role envisaged for the public sector is to address the uncertainty of returns by providing concessional capital with a lower level of "seniority" on payments. In this way, public capital could attract additional private investment by helping de-risk the higher-risk, developing country sleeve. For the developing country sleeve we therefore assume $100 million concessional public capital is invested, with the remaining $150 million invested by commercial Limited Partners ($147.5 million) and General Partners ($2.5 million). Two types of concessionality are modelled:

Concessionality Scenario 1

In a first hypothesis, public equity is highly concessional, **making additional capital available for investment with no return expectations other than capital reimbursement**. Returns generated by public investment beyond capital repayment are thus delivered to commercial investors and the General Partner.

The model indicates that offering concessional capital under these conditions significantly increases average expected return for commercial investors in the high-risk sleeve from 18.2% to 26.8%, as a result of the decrease in the average expected returns for concessional investors from 18.2% to -0.6%. By supporting higher returns for commercial investors, concessional investment lowers the risk for commercial investors by reducing the probability that commercial investors do not reach minimum return expectations by 35-50% on average, depending on the minimum return expectations and assuming a public-sector investment of $100 million.

Figures 1 and 2 below map net IRRs and probabilities of failing to reach different minimum return expectations under different levels of public participation. The results indicate higher levels of public participation (especially >$150 million) positively impact returns for private Limited Partners in particular while returns for the Sponsor tend to improve, but show greater volatility.

Figure 1 – Level of Public Participation and Net IRRs

[5] Average upper quartiles for the years 2010-2015: 15.99% for emerging markets private equity & venture capital, 16.86% for US private equity, 13.08% for other developed markets private equity & venture capital, 16.31% for US buyout & growth equity.

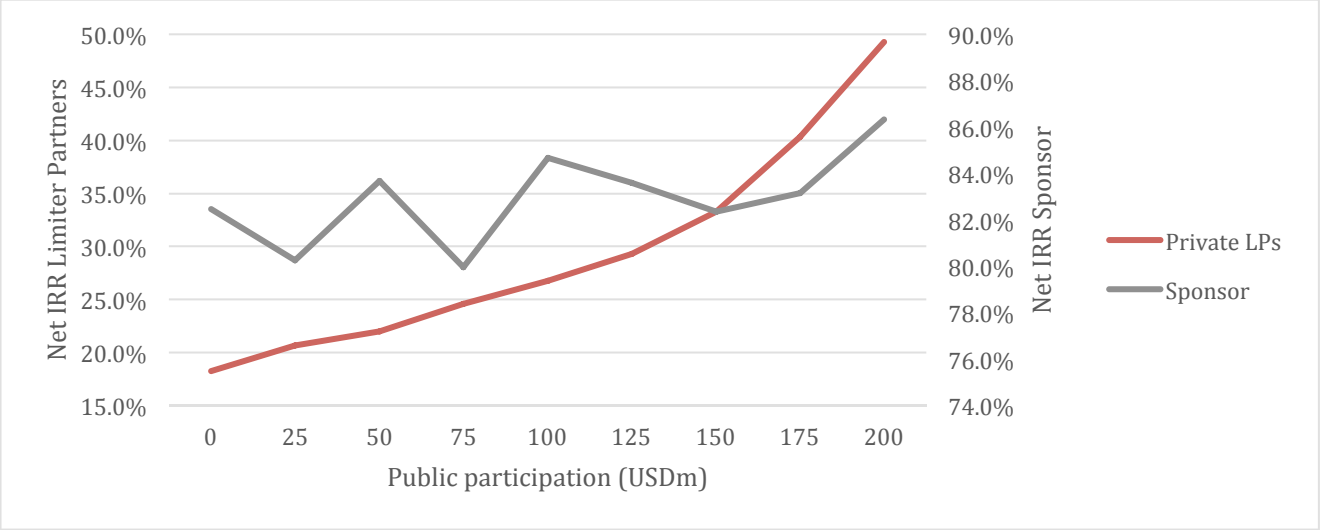
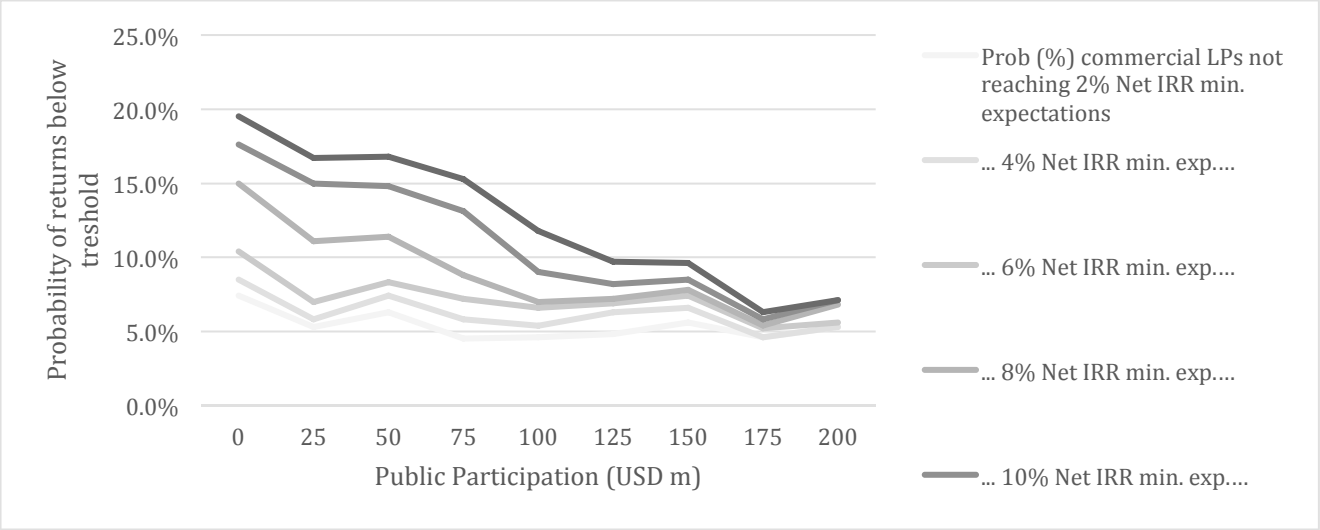


Figure 2 – Level of Public Participation and Probability of Below-threshold Returns



Concessionality Scenario 2

In a second hypothesis, public finance targets exclusively the reduction of uncertainty by **providing subordinate equity capital with a lower level of "seniority" – on payments up to the defined threshold based on the preferred return rate**.

The model indicates that offering priority payments to the commercial investors up to a 4% preferred return rate increases their average expected returns in the high risk sleeve from 18.2% to 20.8%, while resulting in an associated decrease in the average expected returns for concessional investors from 18.2% to 17.9%. In addition, the risk that returns to commercial investors do not meet their expectations diminishes significantly.

Figures 3 and 4 below map net IRRs and probabilities of failing to reach different minimum return expectations under different preferred return rate scenarios with commercial investor seniority. The results indicate that priority payments to commercial investors up to a 4% preferred return reduces their risk of failing to meet minimum net IRR expectations by an average of 5-35%, strongly depending on variations in minimum return expectations (e.g. share decreases when minimum return expectations increases).[6]

[6] This confirms the assumption that to be effective hurtle rates and preferred returns must be aligned with the minimum expectations of investors. The higher their expectations are, the higher the hurtle rate for priority payments should be set to be effective. Vice-versa, if expectations are lower setting a high hurtle rate will not significantly improve their expectations.

In addition, the results indicate potential to strengthen the financial model by increasing the preferred return from 4% to 8%. In particular, such an increase could reduce the risk that the high-risk sleeve fails to deliver commercial investors their minimum return requirements by an average 25-45% without additional cost to public investors.[7] As such, an 8% hurdle rate would be suggested under the risk environment indicated by the current set of assumptions, provided that this threshold is in line with minimum net IRR expectations for commercial limited partners, and that it is compatible with expectations of the General Partner, whose revenues would slightly diminish.

Figure 3 – Hurdle rate scenarios and Net IRR with preferential returns

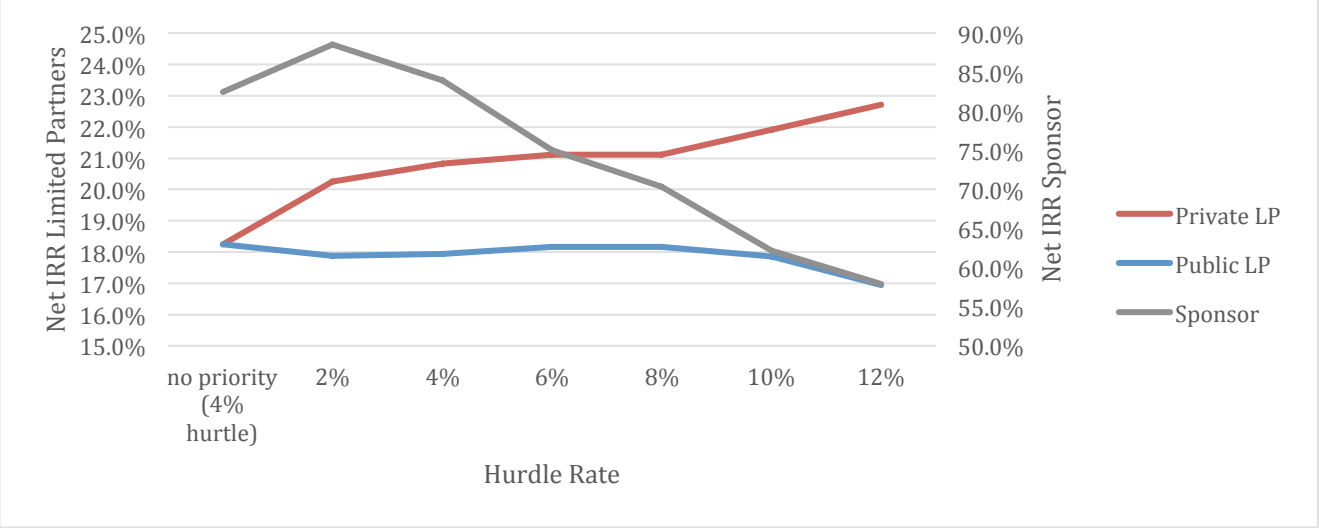
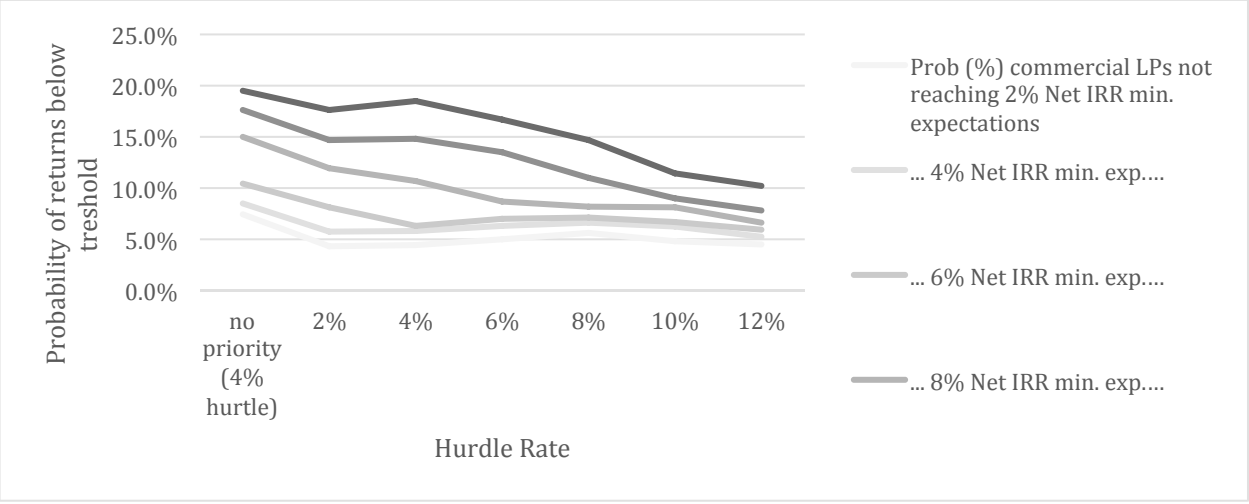


Figure 4 – Preferred return rate scenarios and Probability of returns below threshold



Based on the results of two scenarios, the first model should be prioritized if the primary aim is to achieve maximum return for private investors in the high-risk sleeve, while the second model should be prioritized if the primary aim is to reduce risk, without forgoing potential returns. Table 2 below summarizes key features under the two scenarios.

Table 2 – Key features of concessionality scenarios 1 and 2

Scenario 1	Scenario 2

[7] In terms of missed returns. Above the 8% hurtle rate threshold Net IRR decreases for the public Limited Partners

$100 million concessional equity capital with no payment distribution beyond capital repayment	$100 million subordinate equity capital, with a lower level of “seniority” up to a 4% (or 8%) predefined threshold
Increasing returns: 18.2% to 26.8%	Increasing returns: 18.2% to 20.8% (18.2% to 21.1%)
Reduced risk: 35-50% on average	Reduced risk: 5-35% on average (or 25-45% with 8% hurdle rate)
Cost for public sector: capital does not generate any return with an average net IRR = -0.6% (vs 18.2% commercial baseline)	Cost for public sector: capital generates return, subordinated to performance for private investors with an average Net IRR = 17.9% (vs 18.2% commercial baseline)

Cash Flow Analysis Sources

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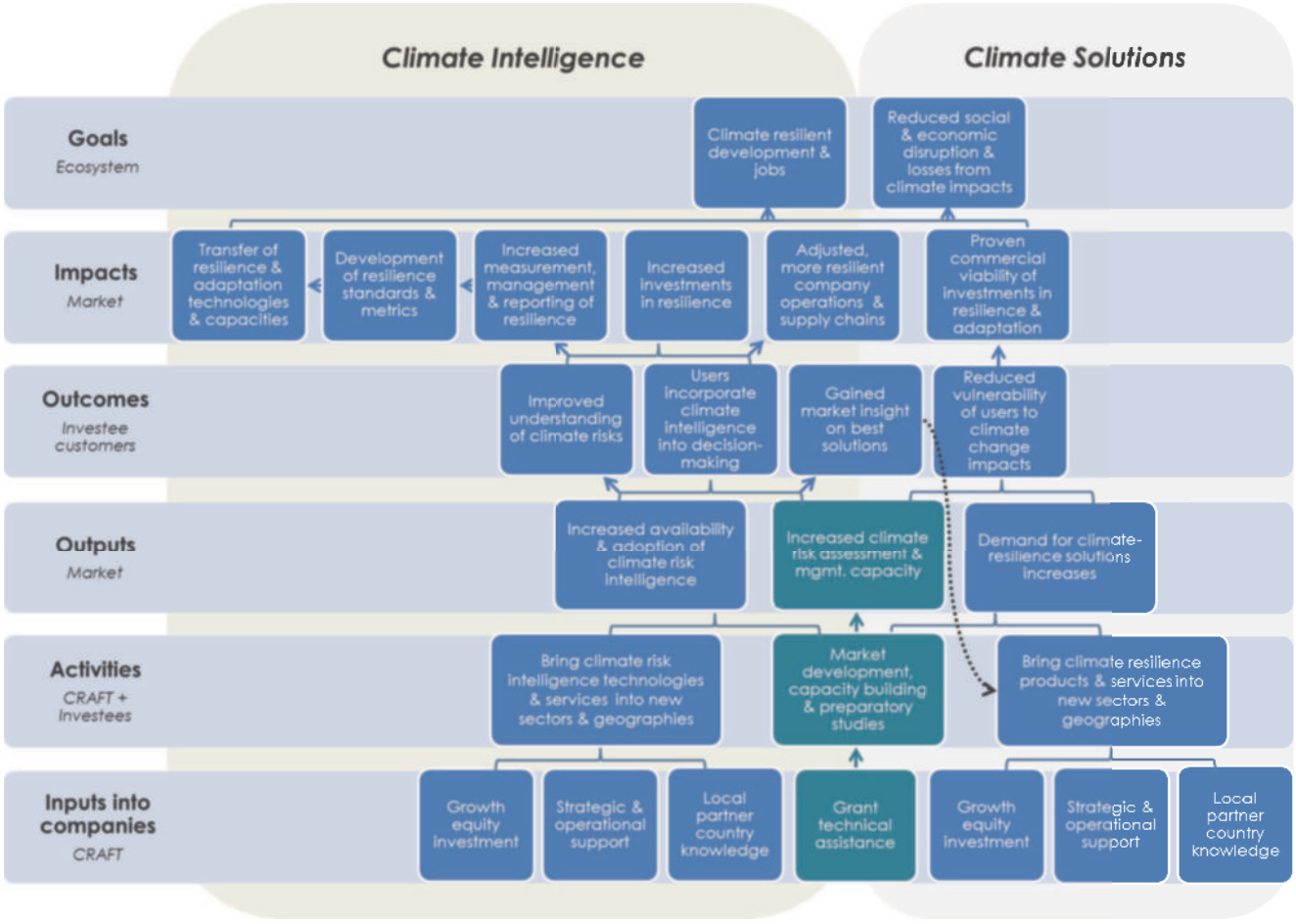
ANNEX 5: THEORY OF CHANGE

CRAFT's theory of change is to directly affect the climate resilience of individuals and businesses, as well as to catalyze a larger market through a demonstration effect. By expanding the availability and application of climate intelligence to new sectors and markets, including through the provision of technical assistance, CRAFT's investments will improve understanding of, and action on, climate risks. That is, as users begin to understand and integrate climate risk into decision-making through the use of climate intelligence, they will gain visibility on opportunities to reduce their climate vulnerability through the adoption of resilience products and services. The demonstration effect begins by highlighting what climate resilience solutions look like and showing that there are a range of existing companies and solutions in many sectors that can help assess and manage climate risks and impacts.



ANNEX 6: IMPACT CASE STUDIES

Case Study 1 – Cold Chain Logistics in South Africa

Sector: Transport

Climate vulnerability addressed: Food security, Health

Increasing water stress and rising temperatures caused by climate change will reduce food security, increasing dependence on food imports and driving up food prices. Africa is particularly vulnerable to droughts and struggles with declining agricultural production and food security (UN FAO, 2017b).

Reducing food waste can help strengthen resilience to agricultural shocks. Globally, 1/3 of food is lost or wasted due to inadequate food management, with the food waste rate as high as 80% in developing countries (UN FAO, 2017a). If current rates of food spoilage and population growth are maintained, we will have to increase food production by 70% by 2050 (Winkworth-Smith et al., 2015) which will in-turn intensify land-use emissions and water scarcity.

Adaptation Strategy: Cold Chain Logistics

CRAFT is considering investing in a cold chain Logistics Company in South Africa that provides fully integrated cold chain services, and plans to expand across Southern Africa. A cold chain is a temperature-controlled supply chain, providing refrigerated services from production and storage through distribution and customer sale.

Improving the cold chain can significantly reduce food waste. A Carrier-funded pilot study in India found that cold chains can reduce food loss by 75% and reduce C02e emissions by 16% (Carrier, 2016). There is also an additional health benefit to providing cold chains to developing countries as they ensure food safety and enable the cooling of prescription drugs and vaccinations.

Impact potential: By investing in a Cold Chain Logistics company, CRAFT can allow the company to offer cold storage in Sub-Saharan African regions that have only low or no ability to store perishables and protect them from heat. Cold transport and cold storage will allow safe food transportation and storage despite increasing temperatures from climate change in the region. This will increase the climate resilience of the region through:

- **Increased food availability:** In South Africa, 31.4% of locally produced food is wasted, and the majority of the loss happens in transport and storage (Oelofse, 2013). Cold storage increases the storage potential for fresh green vegetables from 2 days to 30 days (Winkworth-Smith et al., 2015). This is a shelf-life improvement of 1500%. Reducing food loss would decrease the number of undernourished in Sub-Saharan Africa by 10.6 million (Winkworth-Smith et al, 2015).
- **GDP loss avoided**: In 2012, total cost of food waste in South Africa was approximately $4.69bn which is equal to 2.1% of the country's GDP. $3.24bn (70%) of these losses come from post-harvest handling and storage, processing and packaging, and distribution, which are most directly linked to lacking cold chains (Oelofse, 2013 and Winkworth-Smith et al., 2015).
- **Water saved**: In South Africa, water loss from food waste is equivalent to 22% of total water used for crop production.
- **Additional mitigation benefits:** Globally, food waste accounts for 4.4 GtCO2e (8%) of total emissions every year. This is bigger than India's and Japan's combined emissions (FAO, 2015). The carbon footprint of a ton of food in an individual country depends on the energy mix, food logistics and processing levels of food.

Case Study 2 – Climate Intelligence

Sector: Supply Chains, Transport, SMEs

Climate vulnerability addressed: Food Security, Price Stability

Climate change, through increased frequency and severity of extreme weather events and increased weather volatility is a major threat to global supply chains. The frequency of climate change-related events has increased from 195 a year from 1987-1998 to 365 a year from 2000-2006 (CRED, 2007).

These events impact global supply chains. Vulnerability of a supply chain specifically depends on the degree of vulnerability of a product or service to climate change as well as whether suppliers are concentrated by geography. Agricultural supply chains are particularly vulnerable to climate change; given strong geographical concentrations of growing regions. For example South and South East Asia that provides 28% of global rice exports which makes the availability and price of rise highly vulnerable to extreme weather in the region (Gledhild et al., 2013).

Adaptation strategy: Supply Chain Analytics

CRAFT is considering investing in a supply chain analytics company to allow it to incorporate climate risk in its analytics services and enable the company to expand from the USA to Asia, Africa, and Latin America.

Supply chain analytics software can make supply chain management of operations more resilient to climate change by incorporating the risk of disruptive weather events and enabling planning and design of more resilient supply chain and logistics systems. Supply chain analytics software enables SMEs and communities to assess, engage and manage supply chains in a more climate aware and resilient way by identifying vulnerabilities, incorporating planning for recovery and flexibility, and building in real-time alert capability. This can improve the livelihoods of factory workers and employees by dramatically improving companies' avoidance and ability to respond to and recover from interruptions caused by extreme weather events, heat waves, floods, freezes, etc.

Impact potential: If CRAFT invests in this US-based Supply Chain Analytics company, the company will be able to expand their services to Asia, Africa, and Latin America and will incorporate predictive climate risk assessment and resilience into their software offerings. If the company offers these services to agribusinesses and food companies in developing countries it will enable those businesses to avoid food losses due to extreme weather caused by climate change. If the company offers this service to electronics or manufacturing companies in developing countries, these suppliers can reduce impacts from severe weather which will enable them to build financially more sustainable and resilient businesses. Overall, improved long-term supply chain security and resilience will:

- **Avoid revenue and job losses:** In 2014 the economic impact of two Typhoons in SE Asia caused revenue losses of more than $11bn and the combined recovery period was 79 weeks (Snell, 2015). This amounts to 1.5 years of income loss for the manufacturers and might impact the long-term ability of the manufacturers to assure customers that they will be able to secure supply. Workers in developing countries are more vulnerable the negative impacts of job losses as household savings are not as high and social security are not as developed as in developed countries.
- **Increase food security:** A 2010 heat wave in Russia caused restrictions on wheat exports, leading to a global spike in wheat prices (Gledhild et al., 2013). Consumers in developing countries spend a larger percentage of their income on food and are highly vulnerable to price increases in rice or wheat.

Case Study Literature

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