A NEW MODEL FOR DISASTER PREPARATION AND RESPONSE FOR MICROFINANCE INSTITUTIONS

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The project was led by Stewart McCulloch; Global Insurance Director of VisionFund International (VFI) and Professor Jerry Skees of GlobalAgRisk. Dr. Jason Hartell, Daniel Bierenbaum and Dr. Benjamin Collier of Wharton were the lead writers for this report. In recent years, Dr. Collier has distinguished himself for his expertise in Microfinance and disasters. Contributions from Dr. Simon Young as a global leader in the development of parametric insurance schemes are gratefully acknowledged. In addition, numerous practitioners from World Vision, VisionFund and other MFI networks provided input into this process. Finally, the risk assessment work was made possible via a unique climate data set that was provided by Kinetic Analysis Corporation. As with any document of this nature, we anticipate that there will be omissions and errors. It is meant to be a confidential document provided to DFID and VFI senior management. Any reader must draw his or her own conclusions regarding the information provided within.
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1 Executive Summary

VisionFund is an international microfinance network serving over 1 million customers in 34 countries and is part of the World Vision partnership. This summary presents the VisionFund view of a new role for microfinance in disaster preparation and response based on our experience of making “recovery loans” to restore the livelihoods of the poor following Typhoon Haiyan in the Philippines. In addition, we draw on our work, supported by DFID and in partnership with GlobalAgRisk, which has been part of the development of Global Parametrics (GP), a new social venture that will be key to implementing our proposed model. GP will offer Financial Disaster Risk Management (FDRM) solutions that will support recovery-lending responses on a global basis.

1.1 Key points

• Immediately following a disaster, microfinance institutions (MFIs) can help their clients in a number of effective ways including: repayment holidays, loan forgiveness and access to compulsory savings. More broadly they can also help disburse cash aid from humanitarian programs if needed.

• MFIs have a potentially bigger role in the recovery and reconstruction phases after a disaster taking advantage of their local knowledge and resources. They can provide recovery loans to support individuals in rebuilding their livelihoods and possibly homes, which offers a cost-efficient way of supporting local economic recovery.

• Recovery loans can be positioned to be complementary to other tools in the disaster response toolbox. Getting a recovery loan should complement the recovery of certain beneficiaries receiving targeted humanitarian aid, livelihood support, etc. when appropriate to aid an earlier and fuller restoration of their livelihoods than might otherwise be possible.

• Recovery loans are not suitable for the highly indebted or those without viable cash generating livelihood options; but rather for the economically active poor, including (but not limited to) those not normally targeted for humanitarian aid. The support to this group should have a disproportionate effect on the community’s economic recovery.

• Bad debt provisions following disasters erode the capital base of MFIs and leaves them lacking solvency and liquidity, often making them unable to respond to post-disaster client needs. Under the proposed insurance backed funding model they would receive sufficient capital and liquidity injections to address this deficiency and play their proper and full part in recovery described above.

• A “before the event” funding model is proposed using insurance-like Financial Disaster Risk Management (FDRM) that offers a sustainable and affordable way to build the resilience against disasters of MFIs, and the clients and communities they serve.

• The ability to transfer risk should allow microfinance networks to expand their coverage in at-risk (particularly rural) areas, improving financial inclusion and stimulating growth.

1.2 Changing the role of microfinance in disasters

VisionFund’s experience is that micro-loans used in disaster recovery situations, alongside other humanitarian relief interventions, can help small businesses, smallholder farmers and their communities recover their livelihoods more rapidly. This market-led approach of a
‘hand up’ rather than a ‘hand out’ can reduce the amount of grant aid needed in helping communities recover economically while additionally attracting commercial funding to scale the process up even further. This is a potential game-changer to the way in which humanitarian aid has traditionally been used to restore livelihoods. It complements the core high impact, high volume relief programs with meaningful amounts of money targeted by local banks/MFIs towards opportunities brought forward by the poor to restart their businesses and livelihoods.

The nature of disasters means that banks and microfinance institutions (MFIs) that operate in impacted areas will suffer loan impairments and other losses which erode their capital (equity) base and hence ability to lend. Therefore the most common response in the local banking sector post disaster is actually to reduce lending at the very moment when there is a greater demand from the community for loans needed to rebuild. Without a flow of finance to help restart the local economy, any nascent recovery will be heavily constrained. To start making loans in disaster affected areas, the banks/MFIs need to rebuild their capital and have access to liquidity funding to support their clients via recovery loans. Further, most lending organisations operating in developing countries have no experience in lending into post disaster scenarios. This inexperience means that most lenders overestimate the risks of recovery lending. We have sought to address this challenge by bringing our real world experience from a number of disasters and the available academic literature together to demonstrate that post disaster loans are not high risk if managed effectively.

The funding issue is more challenging, as post disaster funding is not readily or quickly available for either the restoration of capital or liquidity to enable recovery lending. Further, more traditional sources of debt and equity for microfinance are equally slow in responding following a disaster. Whilst this may change over time, we believe that a more effective approach to funding may be provided by a disaster insurance scheme ‘backstopping’ our loan portfolios. In collaboration with GlobalAgRisk, we are actively exploring how capital and liquidity needs post disaster can be provided through an insurance-like FDRM solution, which Global Parametrics (GP) would be ideally placed to implement. The FDRM solution is designed to be financially self-sustaining (once initially funded) and may also be a scalable approach that could be used by other banking/MFI industry players in due course.

The FDRM solution also brings additional benefits because it enables banks/MFIs to better manage their exposure to climate hazards in each country they operate. Doing this enables them to increase their
lending to climate-exposed sectors such as agriculture, thus expanding financial access to more vulnerable rural communities. It may also enable banks/MFIs to increase their leverage (i.e. borrow more), creating the virtuous circle of increased sustainability, more funds to deploy and further increasing financial access to those who need it most. Growing agricultural lending is a fundamental part of VisionFund’s strategy; over 60% of our loan portfolio is to smallholder farmers or agricultural dependent businesses and we want to increase this further to help lift the rural poor out of poverty, but need a risk-transfer solution to do this.

1.3 Recovery Loans in Practice Post Haiyan
VisionFund’s MFI in the Philippines had 7000 clients that were severely affected by Typhoon Haiyan; one of the most severe windstorms ever to hit land. Soon after the disaster staff visited clients to understand what their individual circumstances were and how we could help them restore and/or rebuild their livelihoods. What we found was consistent with our experience of previous disasters elsewhere, including the drought in the Horn of Africa in 2009/10. In a survey of our affected clients in the Philippines 8 weeks after the disaster we discovered just how resilient the poor are:

- A small number (less than 5%) of clients believed that they would be unable to repay their loans, which would need to be forgiven – their livelihoods were destroyed and unable to be recovered. They would almost certainly need grant assistance to get back on their feet
- Nearly a third of clients were able to repay as normal – they could get back on their feet fast without additional assistance from us, relief efforts had helped enough for them to do this
- Another third were able to repay if they were given an extension of the loan, with an interest-free grace period of up to 3 months – they were able to rebuild their businesses quickly and restore their income with some limited help from us
- The final third said that if they had a new loan to replace lost assets, they would be able to start earning an income and repay both old and new loans. A good example was fishermen who had lost boats or fishing gear. By replacing these, they could start fishing again and start earning rapidly after getting the loan.

For some individuals loans are more appropriate and better value for money than grants. Because of our focus on poverty alleviation, we sought to support our clients and others in the community in restoring their livelihoods by making $1.2m of recovery loans to 4,000 small businesses. These loans were a drop in the ocean in the overall scale of the disaster relief that was available, but the loans were warmly welcomed by existing and new clients, they had a demonstrable impact on the recovery of their livelihoods, and to date they have a repayment rate of over 98%. Had more funds been available we could have lent two to three times more, and probably sooner after the event – for some clients, the loans could not come soon enough. We also saw significant demand for loans to rebuild houses, including cases where clients had been given building materials by NGOs but did not have the expertise or wherewithal to complete construction and earn a living. Given what we have learned and these larger objectives, there is considerable scope to extend the use of recovery loans in such situations.

To fund this response, we stretched our own global resources and had a small contribution of $400k that was made available from the $70m of disaster relief funds raised by World
Vision globally. In the process, it became clear that making recovery loans is not something that is included in most donor promises from disaster relief fund raising. Thus, unrestricted funds that could be used for this purpose were very limited. By demonstrating that recovery lending coupled with other donor responses to disasters can be an effective use of funds, we hope that donors will recognize that recovery lending complements other responses and merits more support.

Our experience would therefore suggest that, assuming capital and liquidity is available, recovery loans are a win-win, as through supporting clients with loan rescheduling and new loans, a bank/MFI actually reduces its credit losses while economically restoring clients and communities. That said, recovery loans are not a panacea, and do not replace the cash and goods that are needed in the immediate aftermath of the disaster. Not all clients can afford to take a loan; some will need cash transfers and other forms of aid. However, there is a spectrum from pure grants to loans that can be used to help rebuild livelihoods and replace assets, reducing the need for a purely grant driven approach.

### 1.4 Funding recovery lending with an insurance like scheme

The primary financial challenge of this approach is that the very banks/MFIs that could provide recovery lending in a disaster are themselves impacted by it. In many cases they are compelled to withdraw from the affected market, and risk ending up in a vicious circle of spiraling credit losses, reduced capital, and less liquidity as depositors remove their funds to cope with the emergency.

The FDRM solution incorporates insurance-backed disaster response funds alongside access to liquidity. The system pivots around a central Disaster Recovery Fund, which holds an initial ‘buffer’ of funds and acts as a conduit for flows of funding between MFIs and the sources of liquidity (credit) and capital for disaster response. A bespoke index-based risk transfer product (parametric insurance) will be designed by GP to provide coverage for extreme climate events. MFIs would pay an access fee to the scheme and in the event of a disaster the
structure affords the flexibility of offering a tailored mix of capital and liquidity, dependent on the scale of the event and needs of the MFI. Once in place it is envisioned that VisionFund will be able to leverage the structure to tap into additional external liquidity sources for post-disaster lending (i.e., donors, development financial institutions and even commercial lenders could be more willing to lend to financial institutions using these mechanisms to protect their balance sheets post-disaster).

Supported by DFID, VisionFund has been working with GlobalAgRisk to provide a real-world example of how such FDRM solutions would work, and how it might actually impact the poor in the field. The FDRM solution has been modelled for 70% of the VisionFund portfolio in 11 countries with weather data going back to 1980. The amount of cover needed depends on a number of factors. These include the level of reserves held by MFIs (these reserves would cover smaller scale disasters), the portfolio at risk, and the recovery lending plan in place. The modelling of VisionFund’s portfolio suggests that covering 15% of portfolio would be a realistic average amount, varying from 10% to 30% depending on the country. This level of protection would give rise to annual premiums of the order of 1-2% of total portfolio value.

In providing a qualitative assessment of alternative funding modalities, the FDRM solution ranks well. Given that payments are triggered based upon real-time scientific data, cash should flow quickly after the disaster. If implemented properly, this solution will reduce MFI losses post disaster and provide the protection needed to fund recovery lending at a reasonable cost. With the recovery fund and the risk transfer combined, the system should be reliable and financially sustainable over the long term.
1.5 Conclusion and Next Steps

We have demonstrated the benefits of recovery lending in a number of disasters culminating in our response to Typhoon Haiyan. We believe that although further evaluation is needed we have shown that recovery lending brings a new complementary modality to disaster response using locally based financial institutions.

As for next steps, we plan to continue our work with GlobalAgRisk to ground the work completed thus far into the reality of the needs of the poor and to progress our own strategy of expanding outreach to the most poor and vulnerable. We also recommend the following, most of which will require additional funding.

1) Communicate the analysis and findings of this paper to donors, NGOs and MFIs in order to promote an enhanced role for MFIs in disaster response.
2) Conduct an in-depth, independent study of the costs and benefits of the Haiyan recovery loans.
3) Pilot our enhanced understanding of recovery lending in a further disaster response in order to further evaluate its effectiveness in building back livelihoods and enhancing resiliency of local communities to natural disasters.
4) Conduct and advocate greater contingency planning between MFIs, relief organizations and government, and particularly among those MFIs affiliated with international NGOs where joint action is more easily coordinated.
5) To further refine the FDRM solution and build the capacity GP will need in its customers, further work is needed on global drought indexes; Risk assessment and disaster planning of individual MFIs to further refine their needs; Evaluation of specific tax and regulatory requirements for participation and the resultant product design/pricing.
6) Development of initial capacity building and implementation plans for VisionFund.

In summary, by working closely with GlobalAgRisk, we have modeled the unique offering that GP is building using a real world example. The result demonstrates how such a socially orientated insurance scheme could deliver real benefit to the poor by creating an ideal funding scenario for our recovery lending. This funding scenario brings further benefits to financial inclusion and resilience at an affordable level.

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2 Empowering Financial Services for Relief & Livelihood Restoration

Microfinance services for the working poor have long been viewed as an important vehicle for greater financial inclusion, poverty alleviation, and economic growth in lesser developed regions and countries (Armendáriz and Murdoch 2010). Having access to the full suite of formal financial services including savings, credit and insurance is not only a hallmark of economic maturity but is also considered a condition for sustained economic development.

Microfinance institutions (MFIs) are also increasingly being called upon to contribute products and services that help the poor prepare for, manage and recover from natural disasters and other risks, particularly severe covariate risks (Nagarajan 2006, Miamidian et al. 2005, Parker and Nagarajan 2000). One impetus for considering this additional role is because MFIs are principally focused on relationship and proximity-based lending for micro, small, and medium enterprises (MSMEs) that features frequent contact and intimate knowledge about the conditions experienced by their clients and other community members. In an emergency situation, detailed local knowledge of existing vulnerabilities and likely impact of a disaster event is highly valuable information for the organization and execution of relief and recovery efforts (consideration of how the poor are impacted by natural disaster and the role of banking services in recovery is reviewed in section 5.1).

A second reason is that many MFIs are closely associated, sometimes wholly owned, by international non-governmental organizations (NGOs) that convey not only a development orientation but also an articulation of social responsibility as a guiding principle. And in responding to a destructive natural disaster, these organizations look to all available resources to bring an immediate and effective response effort, including that of microfinance partners.

Many microfinance organizations do respond in numerous ways in the wake of a natural disaster. The view that MFIs can, and should, be involved in disaster relief and recovery is therefore not new, but is more recently focused on articulating an ex ante framework for how and to what extent they can respond. There is an inherent tension, however, in balancing a humanitarian role with their responsibility as a sustainable financial institution reliably providing financial services to the working poor (Parker and Nagarajan 2000).

2.1 MFI Disaster Response Modalities
The response that a particular MFI will be able to undertake will depend considerably on the financial resources on-hand or available through cooperative agreements and joint programming with government or non-governmental relief organizations. All the possible response efforts capitalize on the MFI’s in depth knowledge and close contact with local communities, and can be further categorized as support for relief efforts and support for livelihoods restoration with a view that rebuilding livelihoods post-disaster with household engagement can also build longer term resiliency for the households and the community.

2.1.1 Immediate disaster relief
Possible ex post actions available to MFI’s to help clients manage in the immediate aftermath of a disaster include:
o A temporary pause in loan repayment or full loan rescheduling to help ease the immediate financial stress of impacted clients;

o Allowing access to compulsory savings that are associated with credit activity and not normally available until the end of a lending cycle;

o Forgiving debt of the most highly impacted clients, although this practice is infrequently used out of concern for erosion of repayment discipline and because it is subject to high information asymmetry between the client and the MFI;

o Helping deliver basic emergency kits and other in-kind assistance to clients and community members in the MFI’s service area in coordination with relief organizations;

o Disbursing cash grants for immediate consumption needs using own resources or that provided by third parties, particularly NGOs;

o Providing small emergency loans for immediate consumption needs of established clients;

o Providing information to impacted clients and community members regarding where, when, and how to access emergency relief services as well as feeding information about the needs of impacted clients and communities back to responding organizations.

Often these activities are ad hoc, informal, and initiated after the disaster strikes without the benefit of advance contingency planning and coordination that would make the response more effective. More recent commentary on the role of MFI participation in disaster response calls for greater ex ante efforts to not only bolster the speed and efficiency of the above mentioned responses, but to actively assist clients and communities to increase their resiliency and disaster risk readiness (Goldberg and Varada 2008). Greater contingency planning is proposed between MFIs and relief organizations and government, and particularly among those MFIs affiliated with international NGOs where joint action is more easily coordinated. Income diversification through assisting in establishing multiple livelihood strategies as well as developing new contingency and emergency loan products are also some ways the MFI can contribute to disaster preparedness and household and community resiliency. Examples of where pre-disaster planning enabled highly effective MFI relief intervention are of the Grameen Bank, BRAC and others during prolonged countrywide flooding in Bangladesh (for a case study see Vatsa 2005).

2.1.2 Post disaster livelihoods restoration

A potentially greater contribution for MFIs, however, comes after the relief phase of an emergency response and takes advantage of their comparative advantage in the facilitation of financing for livelihoods restoration. Following a disaster, the working poor need support to replace lost inventory and other assets to restart their livelihoods, or they may need investment capital to enter a different livelihood strategy, possibly one more resilient to future disaster events.

The financing required for restocking and replacement of assets frequently exceeds the characteristic working capital lending that dominates most microfinance lending, and therefore requires a different term structure, particularly when there is a lag between the investment and its returns such as, for example, may be the case for some types of agriculture. These situations not only call for larger loans of longer maturity but also creativity in identifying viable income bridging opportunities and adequate monitoring to reduce the likelihood that loans meant for productive purposes are not diverted to other
household uses. Established MFIs have a unique advantage in providing this service, relative to newly established lenders or international humanitarian providers because they have to build from scratch the micro, small-scale relationships and local knowledge needed to sustainably provide resources for individual livelihoods recovery. It is natural that existing clients of an MFI, and potentially new clients, will turn first to their known local lending institution for this service where they already have a track record and where there is some assurance the lender will be there in the future.

Livelihoods restoration can also be supported through the use of conditional or unrestricted cash programming. These approaches have gained interest following on the successes of cash in lieu of in-kind traditional food aid. Similar to efforts to ensure nutritional completeness, the use of extensive cash programming for livelihoods recovery must be assessed in light of the disaster impact, the capacity of local financial institutions, potential indebtedness burdens, the ability to effectively target, and other market factors that can perverse incentives and harm local financial market performance (Bhatt, 2005).

Cash programming and MFI livelihoods restoration lending can function together in many circumstances in a complimentary fashion, particularly if coordinated, but the cash-based approach is necessarily temporary. The presence of functional MFIs is important for households that suffered less or no impact will need uninterrupted access to working capital financing. In some cases, support provided directly to MFIs can convey longer-term benefits that expand access to finance and increase the resiliency of the institution to successfully navigate risks in the future. These topics, central to the proposed disaster risk financing modality, are discussed in detail in Appendix A.

2.1.3 MFI institutional survival

MFIs, as well as other proximity-based lenders, are vulnerable to large-scale natural disasters (Miamidian et al. 2005, Goldberg and Varada 2008). Aside from the direct destruction of physical assets, MFIs can suffer from the temporary loss or reduction of revenue streams if clients are unable to maintain their repayment schedule, and can quickly experience catastrophic capital depletion when even moderate numbers of outstanding loans/portfolio becomes impaired. Liquidity problems then arise as the lender is less able to meet repayment obligations on funding debt and operational expenses. Liquidity problems are exacerbated if the MFI also provides savings products, which are likely to be rapidly withdrawn by clients to manage immediate emergency needs (impact of natural disasters on banks, and the unique lending environment of MFIs is documented in Section 5). These damages to the MFI’s ability to operate come at the precise moment that its clients are in greatest need of financial services (Mathison 2003).

MFI disaster management planning therefore must first focus on institutional survival that ensures continuity of financial services for existing clients through the preservation of liquidity and supporting capital (UN 2005). Second, it should plan for the possibility of extending enhanced lending products for livelihoods restoration. This logic is maintained in the financial disaster risk management framework provided in section 7. Contingent funding is contracted to counteract a MFIs expected financial stress from a disaster event, and then there is an opportunity to “top-up” coverage to provide capital needed to leverage additional funds for livelihood lending.

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1 See section 4 for further discussion of cash programming.
MFI efforts to recapitalize following a disaster are often ad hoc and costly in terms of business interruption and slow to reestablish financial services access to clients. Independent MFIs can make appeal to existing shareholders/founding members for additional equity capital to meet the portfolio impairment but this strategy suffers from considerable uncertainty of the ability of shareholders to respond in a timely manner and with sufficient resources. Some MFI managers recognize there is considerable risk that shareholders won’t be able to respond at all and that their willingness and/or ability to respond become less likely in the event there are back-to-back disaster events.

Depending on the formality of the financial sector, MFIs may have access to lines of credit from private or state-owned apex institutions or regional and commercial banks. However, the existing conditions for access may not be met when the credit-worthiness of the MFI is in decline due to natural disaster impairment and losses. Furthermore, in more formal regulatory settings, delay in resolving capital or liquidity performance measures may result in regulatory intervention, which usually features an immediate moratorium in any new loan issuance and other requirements until the impairment is settled.

Some international NGOs and development institutions have established funds that explicitly target MFI liquidity shortfall following a broad range of financial crises that cause unexpected and temporary impacts (Becchetti and Castriota 2011). Disbursements from these funds are usually in the form of a loan and available only to those lenders who have pre-qualified and who are assessed to be recoverable. An example is the Indonesia Liquidity Fund After Disasters (ILFAD) established by Mercy Corps. The fund is designed to ensure that microfinance lenders meet their obligations to savings account holders and to facilitate emergency lending and includes a technical assistance component for developing loan products for disaster coping and recovery. Any intervention that strengthens and incentivizes savings also fits for livelihood strategy enhancement and resiliency. Related mechanisms involve proposals for establishing stabilizations funds so that MFIs are able to respond to an increased credit demand following a disaster (Bhatt, 2005).

In some cases, funding for post-disaster livelihoods restoration lending is made directly available by ad hoc recapitalization by international NGOs or other donor organizations. The interventions are designed to ensure continuity of service and to enable additional lending for livelihoods (a review of formal evaluations of these interventions within a lending context is found in section 5.4.). Not unlike the constraints encountered in emergency relief funding, uncertainty in timing, amounts and conditionality of funds are often considered to be constraining to the potential magnitude of impact.

Pre-disaster planning and securing an ex ante solution to potential MFI capitalization and liquidity positions will bolster market confidence in the resiliency of the institution, and can help minimize additional disruptions. For example, a partially damaged MFI has to carefully manage expectations of its clients that it will survive the crises and continue services in the future. When confidence is eroded clients may feel compelled to remove all savings from the institution (exacerbating liquidity problems) and/or strategically default on existing loans regardless of their ability to repay (increasing capital impairment and probability of MFI failure).
A key aspect of enhancing financial services that can withstand the stress of a disaster is a fundamental issue of increasing access to both savings and credit among the working poor. To the extent that this is done with local knowledge of the members of the community there are certain synergies of information that will make many forms of post-disaster intervention both more effective and more efficient. Added to this is the hypothesis that empowering local decision makers to make their own decisions about alternative livelihood strategies will accelerate the adaptation and resiliency processes. The latter issue is paramount given that risks are increasing due to growing populations in vulnerable areas, increased assets at risk and climate change.

3 VisionFund Experience and New Directions

World Vision is “dedicated to working with children, families, and their communities worldwide to reach their full potential by tackling the causes of poverty and injustice.” One means of reaching this goal is via its expansive network of MFIs managed by VisionFund International (VFI) for the past 11 years, which provides the means to improve the livelihoods of poor households through microfinance services. In this way World Vision is demonstrating a long-term commitment to using funds to achieve long-term improvements in the livelihoods of the communities it serves.

VFI has explicitly recognized that to be sustainable and responsive to the needs of the poor, its MFIs must control costs, fraud and provide sound underwriting of loans with clear incentives for repayment. Significant progress has been made in improving the performance of the MFIs operating within the network. Still, opportunities for further improvement exist beyond current performance to begin to deal with the next level of long-term risks in the VFI business model. In particular, geographically concentrated, highly correlated disaster events (i.e., droughts, flooding, earthquakes, typhoons, etc.) regularly create both liquidity and capital problems among the network’s 36 MFIs.

Concerns over the risk of such disasters is curtailing lending to certain priority communities and reducing their access to effective financial services. In a survey of our branch managers perception of disaster risk was the most significant factor in preventing them including disaster prone communities in loan provision. In VisionFund our intent is to use resilience tools and this risk transfer scheme to overcome this and aid financial inclusion.

Further, when an event affects a region where VFI operates, the MFIs capital base may be eroded limiting its ability to lend to the community post disaster. Yet, immediately following a disaster is when the MFI is needed most to support the rebuilding of the community and its livelihoods. This fact was demonstrated recently after typhoon Haiyan in the Philippines where VFI found raising capital for recovery loans challenging, slow and insufficient to support huge demand (see sections 3.1-3.5 below). In reality, being unable to make productivity-enhancing loans post disaster misses significant opportunities for the MFI to improve livelihoods, promote recovery and to build greater resiliency in the community.

Under the current disaster risk management system, World Vision or other donors regularly replenish the capital base and provide much needed liquidity for MFIs within the VFI network post disaster. But relying on the parent entity, World Vision, for emergency capital needs results in slow response times due to the process for securing additional
unplanned funds. The slow response brings large, unknown opportunity costs that extend down to VFI clients and their families.

A cost-benefit analysis conducted of the African Risk Capacity’s early action for drought found that early intervention combined with preplanning and increased precision in targeting generated a marginal contribution of 1.28 to 1.9 per dollar of additional financing (Clarke and Hill 2013). In the case of the VFI Ethiopian MFI in 2011, the severe drought caused a great deal of hardship for clients who were reducing their food intake, selling important assets, taking children out of school but still paying their loans. World Vision contributed to a VFI response that had a positive impact on clients, but this response was well into the drought cycle and consequences had already begun to mount for clients. Following the drought, which affected both Ethiopia and Kenya, rural lending fell by over 30% in both countries. With a more efficiently designed FDRM system in place, VFI could have more confidence to increase lending to disaster prone regions and, in the event of a disaster, act quickly to recapitalize the affected MFI to ensure clients can rebuild and, importantly, that others can gain access to much needed support following a disaster.

VFI has three unique characteristics that drive both its need to innovate in this area and its suitability to progress this set of solutions for the industry. Firstly, VFI is predominately a rural organization with the strategic intent to further extend its rural footprint by providing greater financial inclusion for rural communities; it thereby has a significant and growing climate risk profile. Secondly, VFI owns and controls a global network and so can take a global view on the disaster risks inherent in its loan portfolio. Thirdly, VFI has been providing extensive customer input into the Global Parametrics (GP)2 initiative and sponsoring the development of relevant capacity building needs. VFI is therefore ideally placed to forward this initiative given its intimate awareness of the GP program, global reach and rural business model.

### 3.1 Recovery Lending Post-Haiyan: A VisionFund Learning Example

The meteorological record was set for the most powerful storm to make landfall when super typhoon Haiyan (named Yolanda locally) moved across the central Philippines on 7-8 November 2013. The storm brought sustained wind speeds of up to 235 km/h, torrential rains that caused widespread flooding and triggered landslides, and a wind-driven storm surge as high as 5 m on the leading edge of Leyte island (NASA 2013, NDRRMC, 2013). The humanitarian toll was also high, with an estimated 16 million individuals affected, 1.1 million homes damaged or destroyed displacing 4.1 million people. The storm killed 6,300 people, caused injury to another 28,000 and inflicted damages to infrastructure and agriculture of nearly US$ 800 million (USAID 2013, NDRRMC 2013). Three months following the disaster, the government of the Philippines and the international community began the transition from emergency response to recovery and reconstruction, an effort estimated to take four years to complete (OCHA 2014).

Community Economic Ventures Incorporated (CEVI) is a microfinance institution within the network operated by VFI and operates in some of the areas most severely affected by the typhoon. In response to the disaster impact on its clients, CEVI participated in early

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2 Global Parametrics is an initiative being led by GlobalAgRisk in collaboration with DFID to launch a social venture that will provide the type of risk transfer solutions explored within this project to investors in developing countries, such as VFI. See section 8.2 for more details on the synergies between VFI’s project and the GP initiative.
assistance efforts by providing limited direct aid (food, aid kits, and limited cash disbursements) provided by World Vision and its own resources. To help clients cope in the immediate aftermath, clients were also given special access to savings that are usually meant to partially collateralize lending. In addition, upon individual assessment, most of the affected clients were granted loan rescheduling, with a collection pause of 2 to 3 months.

CEVI and VFI also recognized that many affected people remain dependent on external aid and/or other temporary means. Many household livelihood activities of both clients and non-clients were wholly or partially damaged and that restarting previous or new businesses often require one off capital investments that exceed the usual lending limits of many microfinance providers. In response, CEVI designed a special financial intervention called “Bangon Kabuhayan”, a “livelihood restoration” loan product. For example, a fisherman who has lost his/her boat and gear has to replace them before they can go fishing again so there is no partial answer to the restoration of that livelihood. While in another example of a general store, partial restoration limits the amount of stock that can be purchased, substantially increasing the cost of transportation on a per unit basis, severely depressing profitability of the store.

The product offered a once-off opportunity for existing and new clients to obtain a new loan of larger size, up to US$ 910, with a term of 6 to 18 months. It also featured a 40% reduction in combined interest rates and service charges. For some current clients the new and their existing loans were rescheduled and rolled into one.

3.2 Rational and objectives
The intervention made by VisionFund was based on the hypothesis that immediate and ongoing access to capital to restore, innovate and diversify household livelihood activities and income sources will speed recovery and possibly even contribute to building the resilience of these households to future disasters. VisionFund (Internal assessment January 2014) undertook a baseline survey of 7000 clients in the affected communities and an assessment of livelihood support needs in which CEVI identified a range of livelihood and recovery related problems that could be addressed by the new loan product.

- **Lack of capital for start-up, revival and expansion of productive livelihood activities:** The baseline results (VFI survey in January 2014) showed that most households were engaged in self-managed and productive livelihood activities that included fishing, processing/trading fish, livestock production and petty trade among others. Despite this, results also showed a fairly high (18% overall) proportion of households who when prompted mentioned lack of access to capital as a problem in engaging in livelihood activities. 31% of the surveyed VFI client population indicated access to capital as a priority solution to their recovery. Furthermore, all households participating in the livelihoods needs assessment of affected households indicated a lack of capital for equipment and working capital as the major challenge following Haiyan.

- **Low willingness to make investment without assured access to credit:** Building resilience of households to disasters and risks associated with climate change is compromised by the lack of willingness of households to take investment risks. Low and limited incomes lead vulnerable households to prioritize consumption over productive investment. The baseline findings confirmed this trend with 5 of 8
top household expenses being social or consumption orientated (food, education, health care, transportation and water), followed by loan repayment and electricity. Assured access to lending thus gives the flexibility and confidence of households to engage in productive activities, to innovate and diversify their income base, to both raise income levels and provide a measure of resiliency.

The recovery loan product was thus designed around the idea that demand for additional lending for livelihood restoration exists but is constrained by sufficient supply as well as access, and that the lack of reliable access is a disincentive for households to attempt making livelihood recovery and resiliency increasing investments. Therefore, not only is there a need for a surge of resources post disaster that can be directed toward livelihood restoration credit, but it is also important for there to be assurances the financial institution itself is able to remain intact following a similar disaster in the future.

The new loan program was further anchored in operational and integrated programming with World Vision to achieve the following objectives:

- **Recover** – Asset recovery loans enable typhoon-affected clients to recover and restart businesses without becoming over indebted.
- **Adapt** – Affected families are aware of hazards and take preventative action.
- **Transform** – Recipient clients not only recover but bounce back better with improved child well-being outcomes.

### 3.3 Selection, targeting and implementation

Microfinance lending is a self-selecting and demand-driven intervention in contrast to many post disaster interventions, which are based on meeting greatest need. Prospective clients must request a loan and be determined to be able to afford the loan, such that they effectively design, deliver and finance their own recovery. The special recovery loan product was designed specifically to support the recovery of livelihood activities affected by typhoon Haiyan and for clients who have the capacity to the manage debt. That is, the loan was to be used for income generating assets or working capital, and the client must articulate a viable business opportunity to be funded by the loan. Each borrower was individually assessed in a one off exercise taking over a week in each branch with additional central support; travel difficulties, additional criteria, additional review and the one off nature of the exercise made this a more significant exercise than the usual loan assessment process by at least a factor of 50%. Some of the businesses started below capacity and will grow back over time. Others did not restart as they lost key inputs or equipment; but the individuals sought alternatives such as reconstruction whilst the economy recovered. There were also other activities that restarted without investment but had the capacity to grow if capitalized.

Loan availability and targeting, in addition to the livelihood recovery and affordability criteria, was confined to those populations considered “affected”, and within that segment the following categorizations apply:
CEVI was concerned that some clients expressed strong opinions on the need to prioritize assistance on shelter, which highlighted a risk of loan diversion. To help lower this risk, while at the same time acknowledging this fundamental need, the intervention targeted the municipalities and specific barangays\(^3\) where the World Vision shelter program has been implemented. In addition, the loan product was promoted to households targeted by other response interventions. It is worthy of note that clients seemed to cope well receiving mixtures of grant aid and loans from similar organisations.

To help fully capitalize on complementary programing, the loan product was promoted concurrently with the other World Vision livelihoods components, though using different tools. Households who expressed interest in the loan program were then channeled through CEVI’s loan procedures. Whilst World Vision’s relief efforts helped many thousands with immediate survival, health, water and other needs the CEVI program was amongst the most significant livelihood interventions in the affected communities and so was highly complementary to other initiatives.

### 3.4 CEVI portfolio stress and funding of the loan intervention

The first loan disbursements commenced in February 2014 and continued through March 2014. Nearly US$ 1.2 million were disbursed during this time to 1,800 clients, supporting approximately 7,200 household members. Of 9 branches that were directly affected, 5 were severely impacted and separated out from the core organization for 12 months to obtain a clear focus on the branch offices’ recovery and the recovery of their clients. 7,000 clients experienced financial distress and problems with loan repayments. Nearly 17% of the total CEVI countrywide loan portfolio was impacted. CEVI’s balance sheet before the typhoon was adequate for internal and external requirements but was not sufficient to fund the lending response without assistance from World Vision and VFI.

World Vision raised US$ 70 million for its relief efforts following Haiyan and used those funds to positively impact a million people. As a large international NGO these funds were directed by the relief team in accordance with their long experience of meeting the needs of communities in distress and in accordance with the UN coordinated response across the disaster areas; the approach taken was therefore not organized or prepared to support microfinance interventions. In these circumstances the demands on relief funding exceeded

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\(^3\) Barangays are the name for the smallest administration divisions in the Philippines

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Industries</th>
<th>Targeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly impacted livelihood –</td>
<td>Lost a business asset or significant inventory which is impacting ability to generate an income, but the underlying livelihood remains viable.</td>
<td>Most industries covered:</td>
<td>- Core target market for the Bagong Kabuhayan Recovery Loan product</td>
</tr>
<tr>
<td>opportunity to recover</td>
<td></td>
<td>- Fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Production</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Transportation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Trading &amp; Retail</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Some Agriculture</td>
<td></td>
</tr>
<tr>
<td>Highly impacted livelihood –</td>
<td>Livelihood is no longer viable, or is severely depressed</td>
<td>Varies by locale, includes (but not limited to):</td>
<td>- Access to Bagong loan if an alternative livelihood is established</td>
</tr>
<tr>
<td>challenges to recover</td>
<td></td>
<td>- Agriculture</td>
<td>- Ideal candidate for collaborative alternative livelihood program with WV (to be developed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Some Trading</td>
<td></td>
</tr>
<tr>
<td>Minimal</td>
<td>Some impact, but livelihood remains viable with no major impediments to generating income</td>
<td>Most industries covered</td>
<td>Potentially able to access Bagong Kabuhayan loan if able to demonstrate a viable business opportunity, but generally steered towards standard CEVI products.</td>
</tr>
</tbody>
</table>
the supply but just as importantly the use of much of the funding was restricted either by those raising the funds or the operating models of those using the funds. Unrestricted funds were therefore limited and in high demand to meet the greatest needs. Even where funds were raised and were to be spent over longer periods lending these to support microfinance activities until needed also proved to be challenging because of the restrictions applied by how they were raised. The impact on clients of this situation was a slower start to recovery lending than would have been desirable; a two month period where lending had to cease while further funds were found and significant well-qualified unmet demand.

The CEVI team worked closely with the relief team but the need for a long-term internal initiative was recognized. Collaboration between donors, fundraising teams, the senior relief managers and the VFI financial institutions are necessary to be able to access the needed relief funding sources.

While CEVI’s balance sheet was adequate before the disaster, the cost of the response, and provisions for possible default put the balance sheet under significant strain. Without VFI support CEVI would have been unable to raise the funds to respond to the disaster based on its own credit rating. VFI therefore redirected resources from other uses to lend to CEVI to then on lend to clients. CEVI’s calculations are that all of the funds will be repaid to VFI and the interest charged will largely compensate for the costs incurred in the response. Projections also suggest that the 5 branches most affected will grow due to the good will and new relationships formed by the response. Additional financing therefore will be needed in due course. It is important to note that in more heavily regulated countries more capital would have been needed alongside the liquidity in this response to maintain prudent capital adequacy levels.

To mitigate this situation in the future, VFI has recognized the need to be more proactive in setting up disaster financing in advance as discussed at length in this report.

3.5 Impact evaluation and assessment

VFI has commenced an initial assessment of the impact of this initiative after 12 months and will be performing further studies. The initial assessment is based on detailed interviews of 10 communities who received recovery loans. Having completed the first round of interviews the indications are positive and the key points are:

1. Clients had a great deal of focus on restoring their livelihoods as soon as practical. They valued relief efforts but saw these as temporary and so valued income restorations longer term impact highly.
2. Most clients started to restore what they could of their livelihoods immediately following the disaster and with a sense of urgency including looking for alternative sources of income.
3. The vast majority of clients receiving loans were able to restore their incomes to pre typhoon levels within 3 months of re-establishing their businesses.
4. Repayment rates on the recovery lending and amongst those supported were initially extremely high at 98% payment on time; before in due course falling back to a more normal level of 95%. We anticipate a residual loyalty effect from this support.
5. Other livelihood interventions from relief organizations in these communities were small and standardized at the individual/household level or directed at communities
and groups. Our initiative therefore appeared to be highly complementary to existing relief methods and the distinction appeared to be clear to the beneficiaries.

Further work is being done to continue to develop these assessments. However, VFI has drawn the following key hypotheses on which this report is based:

1. Even after a major disaster many households are resilient and can continue or rapidly restart or shift to new economic activity.
2. A combination of modest grace periods (8 weeks), loan restructuring and recovery lending can restore livelihoods to an extent that makes over indebtedness and defaults minimal and restores pre disaster income levels in many cases.
3. Recovery lending associated with livelihoods is likely to have a very good repayment record.
4. Interest on the new recovery loans is potentially sufficient to repay the additional costs of client assessments, grace periods and the recovery lending process.
5. Given the above the funding for a disaster is primarily a medium term liquidity issue with capital needs to maintain regulatory standards, loan covenants and cover initial losses and provisions.
4 Disaster Response and Funding Modalities

International non-governmental organizations are well known for their ability to rapidly assess and respond to humanitarian crises precipitated by severe natural disasters and other crises. The vast majority of front-line crisis relief is provided by these civil society organizations (Osman, 2013). To enhance their effectiveness across the full spectrum of disaster response modalities, international NGOs in collaboration with UN agencies, other donor organizations, and national governments have invested heavily in joint response protocols, specialized training, and decision-making tools to avoid costly duplication of effort and to enhance effectiveness through rapid deployment and better targeting. These protocols led by the UN give a uniformly high quality of response across multiple NGO’s improving both the management and “fairness” of the response in communities served by different agencies. This approach leads to effective needs based programs that help many thousands of people. Figure 4.1 below positions the proposed recovery-lending concept within the existing spectrum of disaster response modalities.

**Figure 4.1 Spectrum of disaster response modalities**

The international community has learned that following a disaster, an early effort to dynamically jump-start livelihoods and to create employment opportunities for the most impacted households shortens both the amount of time that relief services are needed, addresses concerns of aid dependency, and ultimately hastens recovery (ALNAP 2002). With the correct programming, recovery not only implies replacing lost income streams and assets, but building in greater productivity and resiliency through new design in shelter and other basic life services, replacement of outdated technology, and through disaster risk awareness, pre-planning and risk reduction. That said these relief efforts, because of their size and scale, tend to be relatively standardized to hit the largest number of people with the greatest need as effectively as possible. In contrast Microfinance is demand led and that demand comes from local people’s desire to restore their livelihoods to a more long-term sustainable activity in many different ways based on their own individual circumstances and their intimate knowledge of local markets. The loans empower those people to make choices and the local knowledge of the MFI helps them make those choices. In the typhoon Haiyan response there were some examples where the relief provided part of the answer to restoring a livelihood and the loan
completed the answer; for instance providing the money to turn materials provided by NGO’s into productive assets.

A market-based approach, via preservation of MFI services with an ability to offer enhanced livelihood and business recovery lending, is an important, and largely neglected until now, part of the recovery modality menu (Table 4.1). Its particular strength, as mentioned before, lies in the institution’s deep local market knowledge and ability to meaningfully interact with its clients. **Considering MFI recovery lending against a selection of other emerging policy options in disaster response, it is not able to provide standalone protection or a complete solution to livelihoods restoration – it should be considered alongside other interventions, particularly shelter initiatives, direct cash programming of various types, and larger livelihood programs. These other activities have potential for great complementarity**, but also can create destabilizing effects if poorly implemented. This increases the importance of further research and practical experience to inform how to structure disaster response so that it can enhance local financial services and other markets rather than replace them.

Table 4.1 Disaster response modalities

<table>
<thead>
<tr>
<th>Modality</th>
<th>Description</th>
<th>Targeted Outcomes</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donor in-kind aid</td>
<td>Donated food and other key supplies to meet basic human needs. Standard rationed supplies to restore livelihoods and shelter</td>
<td>Save lives, Restore shelter, Restart livelihoods</td>
<td>Can distort markets and undercut local suppliers Rationed and standardized</td>
</tr>
<tr>
<td>Cash-based programming</td>
<td>Provide cash grants to allow impacted communities to meet basic needs and restart productive activities</td>
<td>Save lives; Rebuild livelihoods; high value for money</td>
<td>Conditionality, mis-targeting, disruption of local food or credit markets.</td>
</tr>
<tr>
<td>Recovery lending</td>
<td>Empower impacted households with credit to reinvest in their businesses and homes</td>
<td>Rebuild livelihoods; Increase resilience</td>
<td>Potential for over indebtedness, does not target the poorest of the poor (but may reach them)</td>
</tr>
<tr>
<td>Long-term Livelihood programs</td>
<td>Programs designed to assist beneficiaries improve their livelihoods and resilience</td>
<td>Rebuild livelihoods; Increase resilience</td>
<td>Large-scale development programs post disaster</td>
</tr>
</tbody>
</table>

4.1 **Constraints in disaster response and livelihood funding**

Disaster response and livelihood recovery financing both face characteristic constraints that can hinder mounting an effective and sustained campaign. These constraints include:

- **Timeliness** – funds are available when they are needed.
- **Conditionality** – funds are not restricted in their use
- **Predictability** – funds are assured to arrive when needed
• Proportionality – funds are commensurate with the need

In the current system, private and government funds are mobilized through appeals following a major natural disaster event, or sometimes upon advance warning. However, even when a known humanitarian crisis is unfolding, funds of significant quantity may not materialize until crisis images are released to international audiences. At this stage many lives have already been lost, livelihoods destroyed and hard-won development gains undermined (Venton et al. 2012). Some disaster events, though locally severe, fail to ever gain enough public attention to motivate sufficient giving. In response to these financing gaps, donors and NGOs have made efforts to develop specialized funds that are able to be mobilized quickly and for less visible disaster events, such as, for instance, DFID’s Rapid Response Facility, World Vision’s HEA fund and the START Network fund.

While media coverage is frequently thought to be important in prompting individual humanitarian giving, government and donor funding is strongly influenced by political and security interests (Drury, Olson, and Van Belle 2005; Macdonald and Valenza 2012). The politicization of humanitarian aid may in part explain the relatively low levels of humanitarian aid flowing to some regions. The presence of strong NGOs and other humanitarian stakeholders operating in the political sphere may countervail the former factors, as well as impartial automatically triggered funding such as can be provided by risk transfer mechanisms solutions (Olsen, Carstensen, and Høyen 2003, Goes and Skees 2003).

Disaster response managers must take a strategic view in overseeing their organization’s multiple funding streams to best meet the demands of relief and recovery activities. The source, type and timing of the flow of funds can dramatically impact how an NGO is able to respond to the needs of affected populations. Funding constraints, primarily conditionality, can also hinder an organization’s ability to adhere to the principles of humanitarian action of humanity, impartiality, independence and neutrality (Macdonald and Valenza 2012). Government and donor funds can be conditional, tied to a specific project, beneficiary or materials supplier, and fail to reflect the on-the-ground needs following a disaster. Often grant funding from donors is matched with unrestricted funds making those funds larger but again restricted. Restrictions may also be placed on the use of funds for replenish a NGOs own limited reserves frequently exhausted during the immediate response effort. In-kind material contributions may similarly not reflect the needs of relief or recovery operations, or present expensive logistical and transport barriers (Telford 2007).

A complementary disaster response from MFIs must also overcome constraints faced by the institution at the time of a disaster including liquidity, solvency, and related regulatory and/or loan covenant performance ratios that may limit its ability to respond. Often the primary challenge to the institution will be liquidity and financing to support an expanding loan portfolio. The event may also put pressure on the ratios enforced by local regulators and/or lenders further exacerbating liquidity or capital problems, perhaps even pushing an MFI into insolvency. While a relatively small injection of donated funds could offset these challenges to the institution, the conditionality of most donated funds limits MFI access to these resources.

Either for immediate response or livelihoods recovery, NGOs prefer unconditional liquid funds that they can used quickly and flexibly following a disaster, giving them the freedom to allocate resources to where it and responding partners determines is the most pressing
need (Van Wassenhove, Tomasini, and Stapleton 2008). But such funds invariably represent only a modest part of the funding that is in high demand. Central to this way of thinking are new recommendations and reforms for the deployment of agile and flexible funding (Save the Children UK and Oxfam 2012, Nyirenda and Goodman 2013, Levine, Crosskey and Abdinoor 2011).

4.2 Response modalities

4.2.1 Donor in-kind aid
This report is primarily looking to compare microfinance with other cash based modalities. That said, where in-kind aid is given for productive purposes rather than consumption there are overlaps and issues. The key is coordination between the provision of in-kind aid and financial resources that both provide for the acute relief and recovery needs of households while also supporting the recovery and development of the local economy, including financial services (BWTP 2006). Where aid in the form of materials or productive assets (e.g., livestock, boats, etc.) does occur at the household and community level we argue that this can be done very positively but may have drawbacks in disturbing or delaying recovery of local markets. Microfinance used in combination with this type of aid can be useful. For instance, donation of materials to allow boat building aligned with a loan to help create the final asset by using local boat builders is one way to positively leverage the impact of in-kind aid on local markets.

4.2.2 Cash-based programming
The use of cash in livelihoods recovery likely has its genesis in the transition in emergency relief from purely in-kind food aid to cash disbursements for household food purchases. This shift has come amid mounting evidence and concern that food aid delivery is typically slow arrive, may not be culturally appropriate, and can have depressing consequences on local and regional food markets and value chains, including local production of foodstuffs after the disaster event has subsided (Lentz, Passarelli, and Barrett 2013; Osman 2011). Cash for food, when there are functional local markets, enables the poor to purchase food directly in the market, helping to stimulate the local economy and preserving an aspect of dignity among recipients. Some studies of cash for food programs have found that a mix of the two is often desirable to achieve minimum nutritional goals, and find that potential diversion of cash to non-food purposes to be minimal (Kardan, MacAuslan and Marimo 2010; Harvey 2007).

Cash programming has also been implemented for livelihoods recovery as a conditional cash grant to community individuals. Targeting is on the basis of community survey often with input from community leaders. These disbursements are larger and meant for restarting previous or newly identified businesses according to a pre-agreed business plan with the recipient. To prevent diversion, projects make periodic disbursements with frequent monitoring. Those found non-compliant are not eligible for subsequent disbursements until corrective measures have been achieved.

Microfinance and conditional cash grants have the commonality of focusing on restoration of productive assets and livelihoods involving typically larger sums than other relief modalities. Microfinance has the distinct advantage of having in place a proven and inherent monitoring system whereas cash programming requires this be built locally for the duration of the project. Cash programming is complementary to microfinance in that targeting criteria can access those who are unbanked or potentially represent a credit risk the MFI is unwilling to
accept. However, the cash based approach is a one-off mechanism, whereas the additional recovery lending administered through the MFI results in a permanent increase of local lending capacity through the recirculation of funds injected via the this disaster response mechanism. This feature alone will ultimately expand access to financial services for the working poor.

4.2.3 NGO livelihood programs post disaster

NGO livelihood programs are designed to support economic recovery of households and communities. Targeted to the most vulnerable households, the program may typically attempt to first restore some level of income through a cash-for-work program or similar intervention that attempts to support restoration of necessary community infrastructure while also providing immediate income to meet basic needs of selected households. As the recovery progresses the activities will shift to more sustainable or household directed activities such as small livestock raising, community gardens, general stores, and similar standard activities of a community. An NGO will also often provide training programs in more sustainable livelihoods, particularly where a primary source of regular income has been damaged or destroyed and households must shift to new activities.

These programs are designed to reach many thousands of people and are consequently standardized to a “menu” of several options offered in each community. Supply inputs typically must be procured outside of the local markets to be able to meet the extreme demand, bypassing the local value chain and often distorting the local market place for the necessary inputs and resulting outputs. Furthermore, with such a standardized approach, the particular challenges of individual households may not always be met.

But when paired to a recovery lending program those issues can be addressed through the adaptability offered in cash-based lending. The lending in this case giving often greater levels of immediate assistance complementing the situation of the household and any relief with sufficient resources to restore livelihoods to pre-disaster levels of income more rapidly. Further when applied to a community this effect can multiply up as the value chains and networks of economic actives are restored.

4.3 Disaster funding modalities

Disaster modalities provided by NGO’s are provided from two principle sources: Relief appeals and Grants from donors. Theoretically, relief money can be spent flexibly whereas grants are for specific purposes. In the first few weeks of a disaster response NGO’s often spend their own money then seek to recover it as the appeal and grant money arrives. As grants are raised they are often “matched” with appeal money to create programs to aid the poor. These programs are coordinated across the various NGO’s by the UN creating a highly standard and effective response. In these circumstances donors have not historically funded microfinance, relief leaders have rarely used microfinance in the responses they have managed and the UN is not typically looking for a microfinance component to NGO responses. Further, unrestricted funds that might be able to be used to fund microfinance are in high demand and are most likely to be directed elsewhere. In the response to typhoon Haiyan, World Vision raised some US$ 70 million to assist 1 million people however for the reasons outlined above only US$ 400,000 was found to fund microfinance and that arrived over one year after the Typhoon.
Governments and donors have created schemes in very large responses to finance MFI lending. In typhoon Haiyan such a scheme was put in place. However, such schemes have typically required strong balance sheet and lending conditions that are too onerous for MFI's weakened following a disaster, which can limit access to and take-up of such schemes. Further, MFI's have not typically developed the understanding of recovery lending needed to want to put more money at risk after a disaster. The proposals in this report seek to use “insurance” tools to restore the balance sheet of the MFI and recovery lending techniques to supply sensible post disaster lending methods. These two elements may improve the take up of schemes to finance MFI's or in their absence the use of more open market sources of funds to fuel the post disaster lending.

In conclusion, microfinance can be highly complementary to current disaster preparation and response modalities. However, the financing of a microfinance response is not currently dealt with effectively by typical disaster financing methods. We will argue therefore that an insurance backed approach to ex ante financing is probably the most effective way of ensuring an adequate response and may have the added benefit of fostering greater financial inclusion and resilience.
5 Review of the Economics of Natural Disasters on Poverty, Banking and Underdeveloped Markets

5.1 Natural Disaster Impact on Economies and the Poor
Vulnerability and poverty are economic concepts where the relationship between development and the degree of distributional inequality are important determinants of the observed impact of natural disasters. Poverty and inequality dynamically affect economic choices, such as the level of disaster risk mitigation effort both individually and collectively. For example, while poorer countries are unable or unwilling to spend scarce resources on mitigation investments, and may be subject to a variety of other institutional and market limitations, high inequality at any level of average development also correlates with less resources being devoted to mitigation (Cavallo and Noy 2010).

Stylized observations emerging from the empirical literature include that smaller and poorer states are more vulnerable to natural disaster impacts (Clay and Benson 2005; Kellenberg and Mobarak 2011; Cavallo and Noy 2010; Loayza et al. 2012), that they experience more disaster related deaths (Toya and Skidmore 2007), that larger disaster events have a proportionally greater impact on poor countries than wealthy countries (Noy 2009), including larger losses relative to their GDP (Wenzel and Wolf 2013). Furthermore, the poor are not homogenous, with gender an obvious but often underappreciated distinction. While women and girls are frequently more vulnerable and hence experience greater negative impact from natural disasters, women also have important, but unexploited, contributions to make to disaster risk mitigation (UNISDR, 2009). These and other studies have included socioeconomic characteristics and indicators of development as part of their investigations, but more is needed for a fuller understanding of the channels and magnitudes through which natural disasters influence income distribution, poverty and recovery (Noy 2009).

Disaster resiliency and prospects for disaster recovery at both the micro and macro levels are dependent on the availability of emergency and reconstruction funding, where capacity further depends on the functioning and penetration of credit and insurance markets (Kellenberg and Mobarak 2011; Loayza et al. 2012). Not only are formal financial markets critical for ongoing development and poverty alleviation, they serve an important risk management and recovery function (Becchetti and Castriota 2011; Khandker 2007; Skoufias 2003). In particular, financial markets provide a means through which to efficiently allocate risk and help minimize economic losses through the timely finance of recovery and reconstruction efforts (Garmaise and Moskowitz 2009; Loayza et al. 2012; Yaron 1997). When these markets exist the human toll and economic effects of natural disaster are less pronounced.

The poor are generally more vulnerable when financial access and formal risk management are limited (Loayza et al. 2012). Self-insurance strategies of the poor are costly in terms of current income and opportunity cost. In addition, localized informal group risk sharing and consumption smoothing strategies employed by the working poor are designed for idiosyncratic risks that are overwhelmed by highly correlated natural disaster events where group income moves strongly together (Anderson 1976; Becchetti and Castriota 2011; Skoufias 2003). Losses in the immediate aftermath of disaster are compounded by the temporary failure of local markets and employment opportunities, which further
exacerbates livelihood disruptions. When consumption-smoothing efforts force the sale of productive assets, poor households face a real threat of persistent poverty, trapped in a state of low productivity that inhibits future growth (Barnett, Barrett and Skees 2008; Carter et al. 2007; Dercon 2005; Wenzel and Wolf 2013). Poverty can be further transmitted into the future via curtailed childhood education and poor nutritional status when there are few sources of financing for disaster coping and recovery (Becchetti and Castriota 2011).

Improving access to financial services to help moderate the effect of natural disaster, improve resiliency and speed post event recovery is more pressing with the recognition that the return period for some catastrophic natural events appear to be shortening, and as populations of the poor and vulnerable increasingly concentrate in disaster prone areas.

5.2 Perspective on How Lending Works in Under-Developed Markets

The focus here is on the banking sector, and of microfinance in particular, and its role of credit provision to the real economy, and for the working poor in particular. While formal banking services can help improve the risk management capacities and disaster resiliency of the working poor, correlated natural disaster risks also pose special problems for the availability and performance of these services. That is, disaster risk exposure of a lending institution’s borrowers can greatly constrain financial market development and overall access to finance (Collier and Skees 2012; Garmaise and Moskowitz 2009; Skees and Barnet 1999; Skees, Varangis, et al. 2004). Here, we describe the underlying economic dynamics of MFI lending and show how lenders react when many of their clients are exposed and/or impacted by a natural disaster event.

5.2.1 Lending and the Information Problem

Banking research sees the fundamental challenge of lending as an information problem – if the bank lends to this potential borrower, will she repay (Diamond 1984; Stein 2002; Stiglitz and Weiss 1981)? Banks need some method for selecting good investments and holding these borrowers accountable. Collateral is one form of accountability. Developed country credit markets have expanded in recent decades with commercial banks lending to small firms due to new forms of collateral (e.g., accounts receivable, inventory, etc., Berger and Udell 2006.) Information technologies such as credit bureaus have also contributed to this expansion by increasing both information about borrowers and their accountability through linking repayment to future credit access (De Young et al. 2004; Peterson and Rajan 2002).

These information problems are perhaps greatest in markets serving the poor (Armendáriz and Morduch 2010; Behr et al. 2011), small and medium enterprises (SMEs, Agarwal and Hauswald 2010; Beck et al. 2008; De Young et al. 2000; Peterson and Rajan 2002) and agricultural producers (Binswanger and Rozensweig 1986; Boucher et al. 2008; Hoff and Stiglitz 1990). For these borrowers, production risks are high; little formal financial records are available; collateralizable assets are few; and in some cases, potential borrowers are remote. Consequently, these are some of the least developed credit markets. For example, about 50% of SMEs in developing countries cite access to financial services as an operational constraint, and 40% report not having any access at a formal financial institution (Stein et al. 2013). Stein et al. (2013) estimate that this developing country credit market gap is over US$ 2 trillion. Formal SMEs account for approximately 30% of total economic output in these countries (Ayyagari et al. 2007). Given the important role of SMEs in developing
country economies, the benefit from approaches that reduce these credit constraints could be substantial.

To reach the poor, MFIs have developed alternative approaches to overcome information problems (e.g., see Armendáriz and Morduch 2010). For example, these lenders offer improving loan terms over time so borrowers repay based on the potential of larger loans or lower interest rates. Also, group lending relies on the group to select its members, taking advantage of their private information, and holds all members accountable for repayment.

In both developed and developing countries, the community bank model is perhaps the most pervasive lending approach to overcoming information problems in MSME and agricultural credit markets. With this strategy, lenders imbed themselves in a community. They select borrowers based on their expertise in the local economy and the reputation of community members, and they monitor these borrowers through frequent interaction (Agarwal and Hauswald 2010, Behr et al. 2011, Uchida et al. 2012). For example, agricultural lenders often hire agronomists and maintain small rural offices near their borrowers (Wenner et al. 2007).

This approach has expanded credit to households and firms that would have otherwise been excluded from formal markets, but it has two important consequences for managing disaster risks. First, it motivates geographic specialization (BCBS 2010, DeYoung et al. 2004), constraining the ability of these lenders to diversify portfolio concentrations of disaster risk. Second, it increases lender autonomy (Houston et al. 1997, Stein 2002). Lending to informationally opaque borrowers creates opaque lenders. In contrast to commercial banks that can provide lending rules based on credit scores and collateral quality, the lending rules for these MFIs rely on judgment and qualitative information. Consequently, MFIs often find attracting new equity investors difficult (Portes and Rey 2005). Moreover, the challenge of communicating this information from a subsidiary to a parent company decreases the likelihood that lenders using the community bank model, or who are part of a bank holding company, will be provided additional support in periods of crisis (Stein 2002).

5.2.2 Lender financial structure and its implications

While banks perform a variety of functions and often have numerous investments and sources of revenue, consider a stylized situation where the sole business activity is retail lending to the working poor for business investment, working capital, and consumption smoothing, which is supported by retail and wholesale funding. This stylized model closely aligns with the functions of many MFIs. The bank earns revenue from the interest rate spread between its source of funds and the loans it makes to businesses and individuals.

Figure 5.1: Stylized Balance Sheet
Figure 5.1 represents the balance sheet of this lender. The left hand side describes the assets held by the bank (the use of funds); the right hand side describes who owns those assets (the source of funds). These two columns must always be equal in size.

5.2.2.1 Lender assets
Lender assets comprise cash and loans. Cash holdings are used for lending, address financial obligations, and manage liquidity risks, as discussed below. Loans are the main assets of the bank. A loan’s value is a function of its current and expected performance. Credit risk refers to the losses a bank incurs when its borrowers fail to repay their loans in part or in full on schedule. When a lender recognizes there is some likelihood of a loan not being fully repaid, it is considered impaired and the lender adjusts the value of the asset on its balance sheet (Krueger 2002).

Lender judgment also influences the adjusted value of an impaired loan. While standards differ across countries, frequently, they emphasize proactive management of credit risks and so loan quality depends on both the actual payments made by the borrower and the lender’s assessment of the borrower’s ongoing ability to repay (BIS 1999, van Gruening and Bratanovic 2009). For example, impairment standards for regulated financial institutions in Peru state that a loan is “deficient” and its book value should be written down by 25% if it is in arrears for 60 to 120 days or if the borrower is in a weak financial situation and cash flow projections do not suggest improvements soon (SBS 2008). Additionally, standards provide lenders additional flexibility in that they typically allow poorly performing loans to be valued at higher levels if they are restructured (e.g., increasing loan maturity and reducing monthly payments, SBS 2008; van Gruening and Bratanovic 2009). Because lenders have an incentive to signal that their assets are of good quality, the discretion available to them challenges the external assessment of potential investors.

5.2.2.2 Lender liabilities and equity
Financial intermediation can be accomplished through several channels. One is through consolidation and transformation of many small deposits of short-term maturity into larger loans with a longer maturity (retail funding). Alternatively, institutional investors (second-tier banks or even donor organizations) provide funds for on-lending (wholesale funding). The
claims of retail and wholesale funders are fixed with retail having the primary claim. Deposits can reduce funding costs as retail customers typically accept lower interest rates than institutional investors, but deposit-taking institutions are more closely regulated to protect consumers. Moreover, deposits increase a lender’s liquidity risk as these investors can often withdraw their funds on demand. Thus, while banks use a combination of wholesale and retail funding, many MFIs do not accept deposits and so rely solely on wholesale funding.

Equity (e.g., the claims of common stockholders) functions differently. Equity holders are most subordinate, but own the residual of assets and liabilities. In contrast to liability funding, which lenders can typically adjust as needed, equity is a more permanent resource on which a lender builds its operations and so is called the lender’s “capital.”

Fixed claims (retail and wholesale funding) tend to be easier for banks to access than equity because the value of equity is determined by the value of its asset holdings, which is difficult to assess externally. With some exceptions discussed below, wholesale funding is primarily based on demonstrated cash flow — whether a lender’s cash flow is likely to be consistent enough service the fixed claim. Banks rely more heavily on liabilities than firms in other sectors (van Greuning and Bratanovic 2009). These forces increase the financial risks of banks. Banks need consistent returns to meet these liabilities. But also, large liabilities increase the risk of insolvency.

Diversification is the linchpin that allows this business model to work. On the assets side, lending to many borrowers reduces the consequences of nonrepayment from a single borrower. On the liabilities side, holding deposits from many savers reduces the consequences of funding withdrawal from a single depositor.

Concentrations of risk in the loan portfolio may remain after the lender has exhausted its ability to diversify. The bank’s capacity to bear losses is based on its capital ratio, its level of equity relative to its risky investments (loans in this case). Thus, a lender with a capital ratio of 10% could lose 10% of its loans before becoming insolvent. All lenders must manage their capital ratio due to insolvency risk. Funding costs and equity share prices are also influenced by the capital ratio, motivating lenders to adhere to market norms. Almost universally, regulated lenders must comply with minimum capital requirements (e.g., that the capital ratio must remain above 8%). Thus, whether regulated or unregulated, lenders tend to operate with an internal target capital ratio that provides some capacity to manage losses.

In underdeveloped markets where the need for credit is great, lenders typically are constrained not by profitable lending opportunities but by their capital. Equity determines the size of the loan portfolio. As an example, consider a bank that has US$1 million in equity and targets a capital ratio of 10%. This target capital ratio fixes a target value of outstanding loans at US$10 million (US$1 million/0.1). Without additional external capital, lenders grow through reinvesting profits.

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4 International banking standards such as the Basel Accords identify several forms of capital with equity being the strongest. Other forms such as certain types of long-term, subordinate wholesale funding (e.g., bank bonds) have similar characteristics to equity, relatively permanent and subordinate to other liabilities, and fall into a second tier of capital. MFIs and the other lenders of interest in this paper rely almost exclusively on equity. We use capital and equity synonymously hereafter, but the narrative also applies generally to non-equity capital.
5.2.3 Summary
Lenders face an information problem in identifying to whom they should lend. Agriculture and MSME lending experience perhaps have the greatest informational constraints. Lenders serving these markets frequently specialize geographically, overcoming the information problem through developing local expertise and monitoring borrowers. Lending based on the judgment of loan officers creates a credit portfolio of assets that are difficult to evaluate externally and so limits access to additional equity funding. Instead, lenders rely on retail and wholesale funds that are structured as fixed claims. This model works as long as lenders can reduce risk concentrations via diversification.

5.3 Banks and Natural Disasters
Lenders specializing geographically cannot fully diversify against local shocks such as natural disasters. In the developing world, disasters are first and foremost a credit risk. Loan losses reduce the returns and assets of the bank.

Disasters can also create two financing challenges. First, disasters create a need for liquidity. Second, disasters create a need for capital. Both challenges are a consequence of the information problem, which is exacerbated by disasters as the extent of lender losses will be externally unclear. If inadequately addressed, can have lasting implications for the lender including insolvency (Berg 2010, Collier and Skees 2012).

5.3.1 Disasters and liquidity
Disasters increase demand for cash in the local economy to meet emergency consumption needs, offset business disruption losses for firms, and finance recovery and reconstruction. Frequently, depositors withdraw their funds as a result (Hoque 2008). Moreover, poor loan performance concurrently decreases lender revenues.

A liquidity crisis emerges if the lender cannot access enough cash to meet its current obligations (e.g., deposit withdrawals, debt servicing, operational expenses). At the extreme, cash shortages can motivate lenders to sell assets. Especially in developing countries, markets for unsecured loans are very thin and so can lead lenders to liquidate assets at fire-sale rates, taking substantial losses. Any investment (equity or liability) in the bank will tend to enter as cash and so can address liquidity shortages; however, short-term liabilities are typically well suited to address emergency liquidity needs as these events can be acute but short-lived.
Lenders that cannot access funding face a collective confidence problem. For lenders approaching insolvency, the challenge of evaluating its assets quickly becomes the purview of depositors and wholesalers. Wholesale markets typically allow banks to supplement retail funding, but concern about the ability of affected banks to repay may limit access to wholesale funds after a shock. Concerns among depositors can lead to a bank run.

Liquidity risk is typically managed through an appropriate mix of funding sources to ensure stability and by maintaining a buffer of liquid assets. First, lenders hold cash reserves. These cash holdings are costly as they are funded through liabilities so lenders must balance this cost with the risk management benefits of these reserves. Second, some lenders have access to emergency liquidity funds through their governments or a private source. These emergency facilities are intended to provide a rapid injection of funds into otherwise healthy banks facing an unusual stress event. They can be quite valuable for the lender and in turn the market is serves; however, whether to lend to a bank in crisis often remains at the discretion of the liquidity provider so these facilities are not a guaranteed solution to liquidity risk.

5.3.2 Disasters and capital
Bank capital is quite sensitive to loan losses. For a lender with a 10% capital ratio, losing 5% of its loans to a disaster translates into losing 50% of its equity. Without access to external capital, lenders may choose to deleverage, reduce investments in risky assets. This process effectively reduces the size of the lender to bring it in line with its smaller capital base. Secondary markets are thin in most developing countries for small business investment, working capital and consumption loans so the primary avenue to deleverage is through a reduction or temporary suspension of new loan origination (Collier, Miranda, and Skees 2013; Collier and Skees 2012; Khandker 2007).

Using data from over 500 MFIs in 58 developing and emerging economies that report to MIX Market (2014), Collier (2015) finds that disasters reduce lending following the event. Median annual loan growth for these MFIs is 24%. On average disasters reduced loan growth by 11 percentage points in the current year and another 8 percentage points the following year. These effects are largely explained by capital constraints. Lenders with low capital ratios before a disaster lent substantially less afterward, but those with high capital ratios lent at the same rate following the event.

Unfortunately, deleveraging by distressed lenders comes at the precise moment when the affected community most needs robust or even expanding financial services to assist victims. Financial services have been shown to reduce the economic consequences of natural disasters (Zander 2009). These missed opportunities represent delayed recovery and more suffering for affected communities.

Lenders manage capital risks by operating with large capital reserves and rationing credit. Those lenders who have limited ability to diversify their portfolio or avoid areas at higher risk to correlated disaster events are forced to maintain higher precautionary capital buffers, holding capital well above regulatory minimums or market norms. For example, while

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5 A lack of confidence may motivate depositors to withdraw their funds if 1) they worry about lender solvency, or 2) worry about its ability to access cash. Even in markets with deposit insurance, the latter can motivate a bank run if depositors worry about their assets being tied up in the deposit insurance claims process.
regulated minimum capital requirements are typically 8-10%, the average capital ratio of lenders reporting to MIX Market (2014) is 38%.

The implications of this strategy are huge for communities with underdeveloped credit markets since higher capital buffers implies less lending for each dollar of equity to cushion against an infrequent but severe shock. Returning to the example of a lender with US$1 million in equity, a 10% target capital ratio as might be seen at a commercial bank would lead it to hold a portfolio of US$10 million. However, a capital ratio of 38% results in total loan allocations of only US$2.6 million.

Van den Heuvel (2006) goes further to show that lenders will reduce loan origination following a shock to its capital base even when bank capital erosion does not fall below regulated minimums, and that this effect can be persistent. Given the substantial operational challenge and cost of these undiversifiable shocks, it is perhaps unsurprising that lenders avoid vulnerable populations and communities despite the presence of profitable lending opportunities during non-disaster conditions (e.g., Boucher et al. 2008; Hoff and Stiglitz 1990).

5.3.3 Disaster and credit rationing
Natural disasters damage lenders and induce price and non-price rationing to preserve survival and profitability. Rationing behavior is not only a consequence of efforts to cope and deleverage following a disaster event that erodes the lender’s capital, but also as a means to protect the institution from future events.

In isolated credit markets, the combination of effects are internalized and force up interest rates (Ray 1998) or can be expressed as an increase in the minimum loan size in order to lower per unit administrative costs (Jonston and Morduch 2008). In some situations of slow onset disaster or where there are reliable indicators of an impending natural disaster, lenders may simply curtail additional lending until the crisis has passed to avoid predictable default problems. This reaction was found among some agricultural lenders in areas of Northern Peru at risk to El Niño induced rainfall and catastrophic flooding (Collier and Skees 2012; Skees, Hartell, and Murphy 2007).

Rationing can also be expressed through preferential lending in ways that minimize the information problem and default risk. For example, Berg and Schrader (2011) shows that relationship lending is an important rationing device when credit demand exceeds bank capacity following volcanic disasters in Ecuador. While overall lending declines, clients with known histories of good repayment are just as likely to be approved for a loan before and after the disaster disruption. Unknown clients are less likely to be approved for a loan after the disruption. In related work, Berg and Schrader (2010) also find that the same known clients were offered preferential interest rates following the disaster while new clients were charged higher rates. While the higher rates also resulted in higher default among new clients, the preferential treatment of known clients help maintain a monopolistic lending dynamic that would allow the lender to recover lower returns in the future.

Similar bank lending channel impacts are documented by Mian and Khwaja (2006). They show that developing market lenders that face liquidity shocks frequently transfer these instabilities to their client when there are credit market imperfections affecting both lenders and clients. The effect of lender damage is a rationing of the amount of credit offered, with
both new and existing clients having a lower probability of obtaining a loan even if the client’s creditworthiness is unchanged. They show that larger firms, which are better known to other lenders, typically found alternative sources of funding, but smaller firms did not. Firms that could not find alternative funding in essence absorbed the liquidity shocks of their lenders and were significantly less profitable in the following periods. Even in well developed capital markets, the impact of natural disasters can result in a decline in lender capacity and transmit rationing effects even to firms unaffected by the disaster event (Hosono et al. 2012).

Managing disaster risk as a bank holding company: A contrasting case

Bank holding companies (groups of banks that are typically organized with parent and subsidiary banks) also lend in areas experiencing disasters. These lenders operate “internal capital markets” by which they can reallocate capital and liquidity toward the greatest needs in the group. Hard information (credit scores, borrower financial records, collateral, etc.) greatly improves the functioning of internal capital markets. Soft information (lending that relies on lender judgment) can put the parent office in a difficult decision of differentiating between bad luck – losses due to a disaster that could not be avoided – and bad management – imprudent lending practices by the local office (Stein 2002).

Large banks have been shown to use internal capital market inter-regionally (Campello 2002, Houston et al. 1997) and internationally (De Lis and Harrero 2010). Lenders with access to these internal markets behave differently. Independent banks target higher capital ratios and exercise additional caution after a shock to manage their scarce capital; however, bank subsidiaries with international parents hold small capital reserves and lend more after a shock based on their access to additional capital if needed (De Haas and Van Lelyveld 2010).

5.4 Empirical Evidence of MFI Lending and Recovery Outcomes

The existing empirical literature examining MFI lending as a recovery mechanism for households and businesses is fairly limited. What does exist however provides a number of important insights and design considerations that broadly support the proposed recovery lending intervention as well as the funding modality using contingent FDRM solutions rather than ad hoc financing.

A number of early studies have examined the use of various coping mechanisms, including various credit mechanisms, employed by the poor and vulnerable during the 1998 catastrophic flood event in Bangladesh that affected approximately 68% of the country.

Khandker (2007), using household-level panel data, found that robust and well capitalized microcredit facilitated borrowing as a key coping strategy of poor and vulnerable households following severe flooding in Bangladesh. Access to credit, such as through microfinance organizations, enabled households to maintain both consumption and asset holding. Shoji
(2008) employed a micro panel dataset to examine coping strategies of agricultural-based households during covariate shocks when mutuality fails. Under moderately severe conditions, the poor use interest-free credit from friends and relatives and increase hours devoted to fishing to smooth consumption.

Under the most severe conditions both of those coping strategies are replaced with borrowing from moneylenders at high interest rates, suggesting that access to formal credit markets would be helpful for household coping and recovery. Zaman (1999) and Hoque (2008) focus on the role of household participation in the Bangladesh Rural Advancement Committee (BRAC), a large microfinance provider, in coping and recovery from economic crises, including natural disaster. Hoque’s work showed that BRAC participants borrowed more, used more of their own savings, and sold fewer assets compared to non-BRAC households, but nearly half of the households of both groups only coping activity was to increase time spent at work. Zaman describes the multiple efforts BRAC took to help their clients during the flood, including the ability to borrow an additional 50% of their current loan amount with repayment extended by six months. The loans were intended for both immediate consumption needs as well as for livelihood recovery. He found that the credit program was used in conjunction with other coping mechanisms, including reduction in food consumption, personal savings, and borrowing from both relatives and moneylenders. None of the studies, however, attempted to formally measure the contribution of credit access or use to the pace or extent of livelihood recovery following the flood event.

Save the Children commissioned a study of microfinance lending on long-term indicators of child welfare after the 2004 tsunami that struck Aceh, Indonesia (Stark et al. 2011). The evaluation was undertaken four years after the loan intervention and focused on the “Group-Guarantee Lending and Savings” (GGLS) program that specifically targeted women, where the rationale was that the extra income earned by women would be used for the family unit. The study intended to move beyond traditional financial indicators of microfinance lending performance and focus on client outcomes, which included lending effects on health, childcare, diet and education.

While the evaluation found that there were no significant differences between welfare indicators for women who received loans compared to those who did not, it did find that the average loan amount predicted whether clients were still engaged in their business. The authors’ interpretation is that higher loan amounts may make businesses more sustainable over time. Average loan size was around 42 US$ but the variation in loan size across the sample was not reported. The study suffers from a number of biases but does raise the important points that outcome indicators for recovery programs should look beyond MFI loan performance only, should carefully consider the anticipated time path of intervention outcomes, and that loan size may importantly determine the degree to which lending is capable to aiding successful recovery.

In a study of an intervention similar to that of CEVI, Becchetti and Castriota (2011) made use of a quasi-natural experiment to investigate the role of MFI recapitalization and additional lending as an effective recovery tool after natural disaster. They conceptualize that non-price credit rationing could be avoided using bank recapitalization and can serves as a recovery tool to correlated disaster events, possibly at lower cost than other donor supported modalities. Credit, rather than cash, has the benefit of not affecting income in only that short term and, if the loan is repaid, perpetuates financial flows. MFI
recapitalization, in their view “acts as a sort of expansionary monetary policy for the poor”. The context is that of a Sri Lankan MFI (Agro Micro Finance) whose capital base was depleted following portfolio losses of ~24% in the aftermath of the 2004 Indian Ocean tsunami. Real income was reduced for both those clients directly impacted by the tsunami as well as for clients experiencing indirect market disruptions, though the reduction was less for the latter. Recapitalization enabled the MFI to avoid default and continue lending.

Welfare indicators examined were the percent change in income and worked hours after financing, which was available to both directly and indirectly impacted clients. Lending was represented as a loan-to-income ratio measured as the size of issued loans scaled by the clients’ post-tsunami, pre-financing monthly income. Loan size, on average, was found to be equivalent to nearly nine months of income, but with some important differences related to relationship lending practices and social objectives. For example, clients suffering the most damage, having lower income, and with longer seniority received loans first and larger loans relative to their income.

Evaluation results found that the poorest were the most impacted by the event and also demonstrated the most significant recovery over time. The loan significantly affected worked hours and real income for directly impacted clients but only income for those indirectly impacted. After three years, directly impacted clients had not yet fully recovered to their pre-disaster purchasing level while those indirectly affected showed significant improvement. Nevertheless, the effect of lending was found to significantly affect clients’ recovery and relatively more so for directly affected clients, contributing to convergence between those most and least impacted by the event. The study, however, did not compare these outcomes with other types of recovery interventions.

In the same Sri Lanka and tsunami disaster setting, Becchetti, Castriota and Conzo (2012) study MFI lending and client default using a panel data set spanning the period 1995 to 2011, composed of bank records and interview data of 200 individuals and 767 loans. As preliminary to the analysis, they note that MFI following an 18% default rate, lending peaked after the tsunami due to recapitalization that enabled it to respond to an increase in credit demand. About half of post-tsunami lending was issued to those directly impacted. An interesting condition emerged around average interest rates that prior to the tsunami fluctuated in response to market conditions, in particular the inflation rate. Donor recapitalization, however, was conditional on the offer of favorable interest rates to those who were directly impacted. While the overall average interest rate fell after recapitalization, interest charges to those who were not or only indirectly impacted rose by an average of 8% in order to cross subsidize the reductions of the former. This has important implications later for strategic default among clients.

Of loan size determinants, the authors found that those impacted by the tsunami received larger loans relative to those not impacted, and that loans were provided post-tsunami even if outstanding loans had not been fully repaid, consistent with the view that without further financial support recovery may not have been possible, including repayment of previous loans. The authors also found a positive relationship of social relationships with both financial access and loan size.

Determinants of loan default probability showed no relationship between impact status nor an index of intensity of damages—default rates between impacted and non-impacted clients
were similar—an unexpected result since one would anticipate less default among those clients without tsunami damage. Interest rates were negatively associated with default as were larger loans. However, credit history in terms of repayment or default is not associated with higher default post-tsunami. This is an important observation for MFIs as it shows that support following a disaster-induced default does not imply anything about future repayment performance. While the MFI showed a preference for existing business expansion and recovery over new business start-up in terms of loan size, there was no difference in their probability of default.

The authors note that the interaction of the interest rate differential combined with group lending liability may have contributed to the higher than expected default rate among non-impacted clients. They suggest that group contagion (domino affect of group members having to support default group-mates) or strategic default (rational response to the additional cost imposed to support the tsunami impacted clients) could be at play, although they are unable to distinguish the two with their data set. Note that donor interest-rate conditionality for recapitalization may be partially responsible for the interest rate differential, although Berg and Schrader (2010) document preferential interest rate setting that occurs independently of donor conditionality in a study of relationship lending practices during crises events. Zander (2009) also documents similar opportunistic behavior of non-impacted MFI clients following the 2006 Yogyakarta earthquake in Indonesia. Becchetti, Castriota and Conzo point to contingent repayment systems currently adopted in Bangladesh (Dowla and Barua 2006) as being able to mitigate strategic default, but that credit access may still be impaired for non-impacted or new clients. Their recommendation is to adopt individual compulsory disaster insurance as a way to avoid uncertainty in timing, amounts, and conditionality of donor funds for recapitalization following future disasters.
6 The Use of Risk Transfer Mechanisms in Response to Climate Volatility and Disasters

A well-developed market for disaster risk transfer is a core component of economic development that increases investment, strengthens the risk-taking capacity of the private sector as it also provides long-term investments for economic growth. Insured businesses need to hold less capital when risks are transferred and better managed, which frees up savings for increased investment and consumption. Such financial disaster risk management (FDRM) offerings also enable businesses to engage in higher-risk, higher-return activities that contribute to their growth. As FDRM markets deepen, institutional investments by investors increase in sectors critical to economic development, including infrastructure, social sector funds, and government securities. Lloyd’s research suggests that a one percentage point increase in insurance is tied to a two percentage point increase in the stock of domestic investment held by insurers. Figure 6.1 provides a perspective of gross domestic product (GDP) growth with and without risk transfer for natural disasters in developing economies. FDRM and its innovations serving high income countries prove their demand by private-sector companies, which clearly implies an opportunity for low and middle-income countries.

![GDP Growth Rates without and with Risk Transfer for Natural Disasters](image)


In contrast to the limited means for natural disaster risk transfer in developing countries, in high-income countries, financial innovations in response to significant natural disasters have increased availability and lowered the cost of FDRM for catastrophic events. One important development is the emergence of insurance-linked securities (ILS), a unique class of financial instruments that facilitate the transfer of specific risks (related often to natural catastrophes) from the sponsors to investors. Catastrophe bonds (CAT bonds), a form of ILS tailored to catastrophic risks, represent an important growth sector within this market. Since their emergence in the early 90s, their total supply, as of 2013, has grown to approximately US$ 17.5 billion, according to Aon Benfield.

![Cumulative Impact on GDP Without Risk Transfer](image)

The vast majority of the catastrophe risk is being addressed only in developed economies. As competition forces players to try to squeeze out more deal flow from markets in high income countries, reinsurers and others are looking to low and middle-income countries to generate new business. Yet, the scale of individual deals, the underdeveloped legal and
regulatory environments, the limited data, and a lack of familiarity with these new markets have posed major barriers to entry. Finding a way to unlock the massive potential avenues for new catastrophic risk origination in developing economies represents a major opportunity within the global reinsurance and ILS markets and for economic development, poverty reduction, and mitigation of conflict in these countries.

Partially driven by the growing interest in securitizing and investing in catastrophic risk, the capacities for understanding these risks have improved significantly. However, these innovations have benefited high-income countries in a highly disproportionate fashion. Advancements in remote sensing technologies for weather and other key indicators allow for improved data at lower costs. In addition, the expertise in predicting and measuring extreme climate events has advanced to new levels partly driven by global (re)insurance and ILS markets serving mostly high income countries. The same is true for measuring seismic events. As markets for risk transfer develop in developing economies, advances in understanding, measuring, and predicting natural disasters will expand significantly. The synergy between these two markets is inseparable — a positive outcome for building disaster resiliency in developing economies is the enhancement of existing and future global markets.

### 6.1 Parametric FDRM

Historically, indemnity insurance has been the standard model for risk transfer offerings to businesses for property losses, damage to agricultural assets, and business interruption. Indemnity insurance products base payments on a direct assessment of the estimated losses of those insured. While such a process has clear logic for addressing claims that result from losses, it often requires extensive work by an assessor to determine payments, which can be costly and time consuming. In addition, indemnity products are more prone to information asymmetries, which create problems of moral hazard and adverse selection. Indemnity products require more data, strong legal and regulatory systems, and stronger institutional arrangements. Parametric FDRM, on the other hand, are able to mitigate many of these constraints. Table 6.1 summarizes the benefits of parametric structures over traditional indemnity products.
Table 6.1 Benefits of Parametric FDRM over Traditional Indemnity Insurance

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quicker Payments</strong></td>
<td>More timely payments have the potential to add significant value to policyholders who are provided with those funds during difficult conditions. Parametric products provide payment based on a predetermined measure of the disaster event and so can be paid more quickly than indemnity insurance, which requires a loss assessment sometime after the event. Parametric FDRM products using forecasts even have the potential to pay before an event, giving policyholders the opportunity to prepare for an event and reduce losses, as does the aforementioned El Niño insurance designed by GlobalAgRisk.</td>
</tr>
<tr>
<td><strong>Broader Scope</strong></td>
<td>Different entities are affected by the same event and there is potential for any vulnerable party to use the same parametric product structure. Indemnity insurance such as agricultural insurance only serves a specific set of those who are vulnerable. For example, agricultural insurance markets protect producers from yield losses but do not tend to be available for agricultural processors or wholesalers whose revenues are also adversely affected by low yields.</td>
</tr>
<tr>
<td><strong>Greater Flexibility</strong></td>
<td>Disasters create a variety of adverse consequences for those affected such as revenue losses, increased expenses, and asset losses. With parametric products, the level of coverage is chosen by the policyholder, and the payout can be used for any purpose the policyholder chooses. Indemnity insurance such as property insurance traditionally will only protect against asset losses.</td>
</tr>
<tr>
<td><strong>Lower Transaction Costs</strong></td>
<td>By using a transparent third-party metric to trigger payments, parametric products avoid the costs of verifying actual losses and are much less prone to problems of moral hazard and adverse selection that can dramatically increase the cost of indemnity insurance for agriculture or business interruption.</td>
</tr>
<tr>
<td><strong>Better Form of Risk Protection for Business Interruption</strong></td>
<td>Firms can purchase FDRM products to protect against business interruption and extra costs that may be tied to an extreme catastrophe events. Traditional business interruption insurance is prone to legal disputes and prolonged court cases to resolve different assessments in evaluating loss. No disputes should emerge from FDRM. The event occurs and the conditions of the contract specify the payment based on a third party metric.</td>
</tr>
</tbody>
</table>

Parametric FDRM is often best used as one component of a more comprehensive risk management strategy. Such a strategy includes investments in risk mitigation and diversification as well as a blend of financial mechanisms — reserves, credit, and risk transfer (Figure 6.2).
6.2 Logic and Value of Risk Pooling with CCRIF and ARC, FDRM for Sovereigns

This section considers risk pooling structures as one form of FDRM that is being utilized at the sovereign level in developing countries.

The human consequences of natural catastrophes have long been endured, and considerable progress had been achieved in the last decades of the 20th Century in reducing the humanitarian impact of extreme weather events (mainly hurricanes and droughts) through a combination of ex ante disaster preparedness and more effective ex post disaster response, even in the face of the rapid growth of at-risk populations. However, the economic and financial consequences of disasters were more slowly recognised and addressed, a factor which has become more critical as developing world nations and their populations become more reliant on economic growth.

At individual, community and sovereign levels, the immediate to long-term economic consequences of weather disasters are a significant drain on resources otherwise focused on economic development. Thus the sustainability of development is itself undermined, leading to the identification of financial disaster risk management as a critical component of the development toolkit for the many countries faced with weather risk.

Weather risk management strategies at the sovereign level are driven by particular aspects of the risks. A key factor is the covariant nature of the risk; weather disasters hit multiple individuals simultaneously, making traditional informal (and most formal) risk sharing mechanisms inadequate. For small island states (e.g. those in the Caribbean and South Pacific), this means that the entire national economy and population can be impacted by a single event simultaneously, however well diversified the economy. For most sub-Saharan African states, drought can have a similar impact, affecting multiple areas simultaneously and often leading to food insecurity at the national level.
In such cases, there is considerable value in forming a risk pool at the sovereign level, which mimics informal risk sharing within, say, a village. When one villager gets impacted then the other villagers help out, on the basis that it might be their turn to be impacted next time. In a formalised insurance pool such as CCRIF or ARC, each sovereign member pays the same (on a per-risk basis, so relative to the total amount they are likely to get back over a long period) and each gets a payout when the fixed pre-conditions regarding the degree of impact of a weather disaster are met. Using sophisticated weather risk and financial analysis models, the fairness of the pool can be demonstrated and the efficiencies of pooling captured. In addition to simple efficiencies of scale, sovereign pools allow capital to be held on a mutual basis such that much less capital is required to fund the same set of disasters over a period of time than would be the case if each country held capital to cover its own disasters alone. This geographical diversification of covariant risk is the core principal underpinning the financial efficiency of a risk pool.

Additional benefits have accured from engagement of developing-world sovereigns in the risk assessment and management space. Sovereign government officials can become comfortable with the concept of a risk profile and the value in quantification of risk, critical tools in better identifying the potential economic impact of big weather disasters on the sovereign balance sheet and better managing direct contingency liabilities.

At present, multi-national pools such as CCRIF and ARC are used in a relatively limited way by Sovereigns to provide liquidity quickly after a natural catastrophe. They provide only a modest amount of funding, constrained by the amount of money available each year for premium, and respond for events which are of a severity sufficient to impact on national-level budgetary response mechanisms such as contingency funds and budgetary reallocations. The parametric nature of the products offered means that they are most suitable to cover risk in the tail of the distribution, which is also the area of the risk profile in which risk pooling provides highest relative benefit.

It is notable, however, that financial efficiency is not the sole driver of decision-making around risk transfer; maintaining budgetary contingencies, including 'rainy day' funds, is challenging in many environments, and the certainty of annual premium payments and contracted terms for payouts may have benefits far beyond pure financial efficiency. Frequency of payouts, rather than the scale of a payout in the worst disasters, is also a driver for risk transfer parameter selection in the Sovereign environment.

In addition to substantial direct contingent liability, Sovereigns also have lots of secondary liability; the political expediency of helping voters get back on their feet is high, so protecting the Sovereign economy means also protecting individual livelihoods. As a result, sovereign support for development of meso- and micro-level FDRM has begun to take root. CCRIF already supports non-Sovereign parametric products at both meso- and micro-level in the Caribbean, and ARC is exploring ways in which it can assist its Member States in the development of FDRM instruments at the sub-Sovereign level.

6.3 Funding Modalities and Design: Lessons from Fonkoze
FDRM has been significantly enhanced in recent years by a number of semi-independent developments. The improvement in risk modeling technology has enabled quantification of weather risk in a more accurate way across a broader range of impacts at higher resolution and for the whole world. The maturing of parametric risk transfer products has provided
the opportunity for transfer of weather risk in a variety of forms making the basic financial tool much more accessible. And most recently, the commoditisation of weather risk has extended from niche developed-world weather risk markets to a broader range of actors across the entire capital market space, bringing a pricing environment making products cheaper than ever before.

These factors have opened opportunities for risk transfer product development in even the most challenging environments. An example of this is the creation of the Microinsurance Catastrophe Risk Organisation (MiCRO) and particularly its product-development work with Fonkoze in testing a micro-level product, Kore W in Haiti.

Haiti has extremely high exposure to weather hazards and is also inherently vulnerable due to environmental degradation and widespread poverty. Fonkoze, the largest MFI in Haiti, supports female micro-entrepreneurs through provision of small loans to support a broad range of business activities that form the backbone to the Haitian economy. Fonkoze's network covers the entire country, so within Haiti their portfolio is geographically diverse, and Fonkoze operates a “Grameen” model of group lending.

Kore W was developed by Fonkoze to offer insurance-like protection to all of its borrowing clients. Coverage was mandatory and subsidised such that each client paid an additional 2% or so in repayments each six months. The product was essentially a fixed-benefit indemnity coverage, with peer-level adjustment of claims overseen by Fonkoze staff. Should a claim be accepted, benefits comprised writing off of the outstanding balance on the loan, a fixed cash benefit, and access to credit on the same terms as before. The portfolio of indemnity risk was insured by MiCRO, with both event and annual retentions by Fonkoze, and MiCRO was reinsured on a parametric basis by the global reinsurance markets (the only such Haitian risk to be accepted into the global markets after the 2010 earthquake).

Major challenges with the program included multiple national-level events which highlighted the limit to diversification within Haiti, limited capacity for Fonkoze to retain risk, high hazard and risk levels (making any management of risk very expensive), and high uncertainty in the quantification of the indemnity risk, especially around claims adjustment and including mis-alignment of interests.

Facing the unsustainability of the Kore W product, Fonkoze reverted instead to a portfolio coverage, supporting the needs of their clients through better internal FDRM allowing appropriate response to disaster events impacting clients in a sustainable way. The main lesson from the Kore W pilot is the difficulty in delivering weather risk products to individual low-income borrowers; instead, portfolio level coverage, especially if it can be diversified through pooling, appears to be a more efficient way to achieve robust FDRM for MFIs, which in turn enhances client services in times of disaster.
Household-level index based risk transfer

Risk transfer such as insurance and insurance-like mechanisms can play an important role in financing disaster recovery and reducing the negative consequences on economic growth and poverty. For instance, Peter, Dahlen, and Saxena (2012) find the negative effect of a disaster event is propelled by the magnitude of the uninsured part of disaster losses. However, Niehous (2012) finds that even where markets and institutional frameworks exist to support risk sharing, a large portion of correlated risk remains retained (self insured or uninsured) by individuals and businesses.

Given these and similar observations, the past decade has seen considerable innovation and development directed towards household level microinsurance products against natural disaster risk, predominantly weather risk for agriculture in developing countries (Greatrex et al. 2015). Distinct from microinsurance products for health, credit life, funeral expenses, etc, these are index-based approaches designed specifically for overcoming difficulty in insuring against correlated risks. The risk transfer is meant to assist in ex post disaster coping and to influence behavior towards investment in profitable but potentially more vulnerable production activities.

Despite the seemingly great potential of index insurance for household risk management and generally positive impact results from pilot efforts studied, the approach has generally not met expectations of scalability, has suffered from low insurance take up despite almost universal price subsidization, low levels of the sum insured, and high development costs (Binswanger 2012). Central to the discussion of take up and scale is the problem of basis risk, the potential for payments not being made when the insured experiences losses. In addition, infrequency of payments combined with low insurance education and distrust continues to suppress widespread adoption of these products (Carter et al. 2014). It is unlikely that household level risk transfer will be a major contributor to mitigating the impact of a serious natural disaster in the near future.

6.4 Credit Market Dynamics Following Disasters

Figure 6.3 provides an illustration of what is likely to occur in local credit markets following a disaster. The supporting equations and calibration for this figure are provided in Appendix C. The solid blue line represents demand for credit from local households and firms. The line is sloped downward as more individuals would borrow if interest rates were lower. The solid green line represents credit supply. Supply is increasing throughout, but becomes steeper due to capital constraints. When the lender’s capital ratio is low, the interest rate must increase substantially to motivate it to lend. Equilibrium occurs at Point 1, where supply meets demand.
The dashed lines represent market conditions following a disaster. Disasters increase demand for credit. Moreover, the disaster destroys lender capital, reducing the amount of credit it is willing to supply. These conditions have the effect of reducing the quantity of credit and increasing interest rates and so lead to a new equilibrium at Point 2.

**6.4.1 FDRM and Credit Market Dynamics**

Figure 6.4 builds on Figure 6.3 showing the emerging equilibrium following a disaster (Point 2). FDRM reduces the consequences of undiversifiable concentrations of disaster risk. The cost of risk transfer increases the lower bound of the supply curve; its benefit comes through reducing the uncertainty in lending, allowing the lender to lend more and at a lower interest rate, shown in Point 3.

**Figure 6.4 Credit market dynamics with FDRM**
When a disaster occurs, the FDRM mechanism offsets the lender’s capital losses, maintaining the curve designated “Supply FDRM.” Market forces push interest rates higher, leading to a post-disaster equilibrium at Point 4. Compared to Point 2, Point 4 represents a much larger quantity of credit provided at lower interest rates. Lenders intent on assisting communities following disasters might also select a level of FDRM coverage that exceeds their exposure. The payout would expand supply during disasters beyond the “Supply FDRM” curve in anticipation of increased demand, further increasing quantity and lowering interest rates in affected communities.

6.5 Implications of Bank Independence and Transparency for Strengthening Local Credit Markets.

The specific FDRM mechanisms needed to strengthen local credit markets depend on the characteristics of the bank. Independent banks (ones that are not part of a bank holding company) operating in communities vulnerable to disasters would likely require a contract that transfers its risk directly to an external counterparty (e.g., a reinsurer).

Collier, Miranda, and Skees (2013) show transferring disaster risk can be expected to reduce local credit contraction following a disaster. They also show that it expands lending in non-disaster conditions as bank that can transfer their disaster risks target lower capital ratios.

For banks lending on hard information (i.e. quantitative data), these FDRM mechanisms might be loss based, providing payments triggered by portfolio losses, and would look quite similar to securitization in developed country credit markets. The banks of interest in this paper almost always rely on soft information (i.e. qualitative information), and for them, the same information problems that constrain access to external capital also tend to preclude loss-based FDRM. Instead, an event-based approach is more feasible. An event-based mechanism relies on observable, parametric indicators of a disaster such a contract based on the magnitude of an earthquake or centimeters of rainfall.
Bank holding companies could structure internal FDRM markets that would take advantage of the greater capacity of the parent company to diversify than the subsidiary. A loss-based FDRM approach is effectively an internal capital market. Bank holding companies with opaque subsidiaries might also consider an event-based approach in which they contract with their subsidiaries based on an observable measure of the disaster. Whatever the approach, profit maximization requires that subsidiaries pay an internal price for this FDRM mechanism and that this transfer price be the expected cost of the contract to the parent. Without the internal price, over time the FDRM mechanism could create a cross subsidization in which less vulnerable communities would pay for the losses of more vulnerable communities. To the extent that these internal FDRM markets challenge the capacity of a bank holding company, it may benefit from transferring these liabilities to an external counterparty.
7 The FDRM Scheme: Blending Recovery Lending, Liquidity Reserves and Risk Transfer

7.1 Concept Overview
Global AgRisk and VFI have together developed a prototype design blending risk transfer structures with dedicated liquidity reserves for a comprehensive FDRM system to support recovery lending in the face of natural disaster risks within the VFI network (See Appendix A for a more detailed discussion). Early evidence from a number of disasters, but most recently from the work done following typhoon Haiyan, suggests that this new approach will significantly aid recovery in impacted communities and defines a new and positive role for MFIs in disaster relief. With the capital and climate information garnered from the proposed FDRM system, this type of response could be deployed more proactively and rapidly thereby both reducing the medium term impact on livelihoods and restoring those livelihoods more quickly.

The envisioned FDRM system incorporates disaster response reserve funds owned and managed by VFI alongside parametric-based risk transfer mechanisms benchmarked to relevant natural disaster risks. Figure 7.1 below provides a basic schematic for how this system would work. While this figure highlights the activity at the global level, a key value of this effort is represented by how this can facilitate recovery within each country by financing the rebuilding of livelihoods of members of the community affected by the disaster.

Speed and certainty of response to disaster likely provide the greatest value of such a scheme. What the recent experience in the Philippines and other disasters has clearly shown is that the empowering actions VFI has taken to restore livelihoods through recovery lending are highly valued by clients and have a positive effect on community recovery. Yet, funds for these investments in community recovery from VFI have often been limited and challenging/slow to raise, leaving significant demand and needs unmet. The proposed FDRM system would begin to build a certain, proactive and rapid disaster response from VFI that will lead the way for its peer organizations.

Discussions with a small number of peer MFI’s at a high level have shown some interest in this concept and an appetite to explore it in greater detail. A number of MFI’s had established contingency funds but did not have insurance backing or a scientific way of determining the adequacy of the funds. A number of relief organizations were spoken to through the START network again they expressed interest both in the use of similar tools in disaster funding and a broader role for MFI’s in disaster response. More work on this area of engagement is needed following the publication of this report.

Further, as a result of this comprehensive approach, VFI expects to be able to increase financial inclusion by extending agricultural lending in the VFI portfolio to 60% of its portfolio (over a US$ 150m increase in Agricultural lending, taking it to US$ 300m) over the first three years of the scheme into geographies traditionally considered higher risk.
Figure 7.1 Rapid Disaster Recovery Fund backed by FDRM Products

FDRM SCHEME

Payouts based on disaster triggers in each MFI country under a global master contract

Premium paid for insurance-like product

INTERNAL DISASTER RECOVERY FUND

EXTERNAL LIQUIDITY SOURCES

GLOBAL

LOCAL

Infusion of loans and/or capital as needed

~2% fee (say) for access to scheme

VISIONFUND MFIs

VISIONFUND

7.2 Key Design Principles and Operating Model of an FDRM Funding Scheme for Recovery Lending

GlobalAgRisk and VFI have together developed a prototype for a comprehensive FDRM system to support recovery lending in the face of natural disaster risks within the VFI network. This prototype FDRM system is based on an economic loss model for climate risks and simulation of the VFI portfolio as it stands today and how it is projected to grow. The model incorporates historic weather data for the largest 11 countries (representing approximately 70% of the portfolio), the current VFI portfolio projections and an understanding of the level of payouts required to respond effectively.

The FDRM system follows the design set out in Figure 7.1 above, such that a Rapid Disaster Recovery Fund (RDRF) is utilized in tandem with a parametric risk transfer mechanism, or FDRM product, tailored to the specific climate risks of each country. The Fund and the FDRM products are layered to optimize flexibility and capital efficiency. As the first line of defense against natural disaster events within VFI’s portfolio, the RDRF is designed to provide stand-alone coverage for VFI’s losses and funding needs for events between 1 in 5 years and 1 in 7 years such that the maximum RDRF payment is based on 1 in 7 years event. For more extreme events of 1 in 7 years and worse, the RDRF is designed to provide its maximum payment level (i.e. based on a 1 in 7 years event) and the FDRM product is would cover any additional losses and funding needs up to the full amount of the sum insured selected by VFI. Under this structure any events that fall in the range of 1 in 5 years or less would generally be managed by the MFIs using local reserves.
Note that VFI selected identified the 1 in 7 years trigger for the FDRM product as the preferred level for this analysis but this may change as more work is done. For this project, a range of options for the trigger were considered to show the impact on the FDRM system (See Appendix A). With a more infrequent trigger for the FDRM product (i.e. 1 in 10 years), the cost of the insurance is reduced but the minimum size of the RDRF is greater as VFI would have to cover more of the risk internally. Similarly, with a more frequent trigger for the FDRM product (i.e. 1 in 5 years), the cost of the insurance increases and the minimum size of the RDRF is reduced. Based on this initial analysis, VFI determined that a 1 in 7 years trigger for the FDRM product would likely offer the optimal balance of risk transfer (via the FDRM product) and self-insurance (via the RDRF).

For the FDRM system, the sum insured is currently divided among the 11 target countries based on the perceived relative disaster risk exposure along with the percent of VFI’s portfolio within each country. This means that if the sum-insured were US$50 million and Cambodia’s accounted 10% of the weighted exposures then the maximum payment for events in Cambodia in a given year would be 10% of the sum-insured or US$5 million. Depending on VFI’s view of the relative risk exposures in each target country, this allocation of the sum insured will likely be modified in the future.

To understand the interdependence of the RDRF and the FDRM product consider a 1 in 6 year drought in one of VFI’s target countries. VFI would receive early notice of the nature and geographic footprint of such a drought from the underlying weather data modeling incorporated into the FDRM product. No FDRM payment would be triggered but based on the severity of the event and VFI’s established internal protocols, VFI would determine how much (if any) needed to be drawn down from the RDRF for the effected country. On the other hand, if a 1 in 50-year wind storm hit one of VFI’s target countries, then an FDRM payment would be triggered. This payment would be disbursed directly to the RDRF. Based on the weather data provided along with established internal protocols, VFI would then have the discretion to determine how much to draw down from the RDRF to support the impacted MFI.

The blending of dedicated reserves with an FDRM product affords VFI complete flexibility regarding what type and amount of funding would be provided following a local disaster within a specific country. If the disaster is extreme, VFI management may want to top up the capital for the MFI as a means to sure up the capital base and inject funds for recovery lending. If the disaster is moderate, providing liquidity in the form of debt may be the only financing need.

The risk transfer mechanism that backs the RDRF is designed as a parametric event-based protection. For each of the 11 MFIs prototype country-level products have been designed that pay when an extreme event occurs as measured by the relevant parameter by geography and time period of vulnerability for the lending portfolio. Potential disaster exposures for these products include drought, excess rain, extreme wind speed and extreme temperature. Based on weightings by country and risk type, these individual products are aggregated into a single global index representing the master FDRM product for VFI’s portfolio.

Based on the selected parameters for the underlying FDRM product, VFI would pay the insurer (e.g. Global Parametrics – GP) an annual rate-on-line set as a percent of the sum-
By aggregating climate risks across VFI’s 11 target countries into a single FDRM product, GP would be able to pass the diversification benefits onto VFI through reduced pricing.

For this initiative to be sustainable VFI must have a means of funding both the RDRF and the annual FDRM fee. Under VFI’s preferred structure, the target RDRF size is approximately US$6 million (See Appendix A for detailed calculations). The RDRF is sized to be largely resilient to scenarios in which multiple bad years occur in close succession so as not to need additional donor funding in the early years. It is envisioned that the once established the RDRF could be largely self-sustaining as capital will be replenished when loans to MFIs are repaid and when FDRM payments are made for more extreme events. VFI has earmarked a possible US$ 2 to 3 million from the disposal of its Eastern European subsidiaries to form the core capital base of the RDRF and it envisioned that the remainder would be funded through a mix of credit line(s) and donor grants. In addition, regular fees on the order 1-2% of the loan portfolio (depending on the parameters of the FDRM system selected by VFI) will be sought from the 11 MFI’s in the VFI network to cover the costs of the FDRM product as well as maintain the RDRF at an adequate level. The fee structure would be designed such that the system is fully self-sustaining. In order to grow the capital base in the RDRF as VFI’s portfolio grows and operations mature, VFI could gradually increase the annual fees paid by its MFIs. Under most scenarios these fees would still not need to exceed 2%.

### 7.3 VisionFund FDRM System Implementation Strategy

#### 7.3.1 Financial disaster risk management framework

Critical to being proactive in disaster response is to have the organization, products and funding in place to both protect the organization and its clients with the FDRM framework.

1. **Financial resilience building**: The first and most important part of the framework is to engage in building the financial resilience of clients through understanding their livelihoods and designing products to help them save, borrow and protect (Life & health) in ways that enhance resilience. VFI’s work with World Vision on market led livelihood development and on agricultural advice is important here.
2. **Risk knowledge management**: VFI systems strategy has been developed to learn more about the agricultural activities of its clients. In the meantime surveys provide information on the current state of the portfolio. Greater knowledge should be added over time from geographical information systems, weather data and agricultural expertise to have an increasingly valuable view of agricultural and rural activities and the associated risks.
3. **FDRM modeling**: As part of this report, a preliminary agricultural and climate risk model was built. To be a learning organization VFI needs to start somewhere and this model is a great start to form the basis of FDRM design. A second evolution will be needed within 12 months to support FDRM implementation and a third version 12 months after that to support the evaluation of the implementation. Risk models always evolve and it would be crucial that this is reviewed as part of the annual planning cycle.
4. **FDRM scheme and team**: This report proposes a FDRM scheme consisting of a charging mechanism, risk model, FDRM product, liquidity fund and a disaster response program. The team required to operate this would consist of:

   a. Global Insurance/FDRM Director
   b. FDRM Scheme Manager and Geographical and climate information manager based in the global center structure (ideally grant funded initially)
   c. FDRM/Insurance managers for Asia, Africa & LatAm based in those regions

5. **FDRM Partner**: Innovation requires forming partnerships that endure through the challenges, ups and downs of the innovation process. Partners with all of the skills to develop and innovate around the challenges of a topic and to learn the new capabilities together. VFI has partnered with GlobalAgRisk and intend to use this partnership to motivate the launch of “Global Parametrics” the venture being built with DFID and others. As GP is still in development, should it not proceed VFI would continue its partnership with GlobalAgRisk but regrettably be forced to seek alternative providers for the “insurance” component in the scheme.

6. **Evaluation and evolution**: A great deal of work is going into the design of the FDRM solution but even more work will be needed to perfect this design for each region and each country. Once the scheme is in place VFI will have a team that continues its development and should do this based on post implementation evaluations and following each disaster response.

7. **Industry advocacy**: VFI is just large enough to be at the start of the innovation in FDRM for MFI’s, but to create the capacity to sustain such an innovation and the scale to make it affordable, industry advocacy will be an essential ingredient to ensure these ideas develop fully. While this advocacy effort is still in its infancy, VFI has already introduced these ideas to the 8 MFI’s in the Global industry-working group representing over 40 million clients and the START network representing the major relief organizations.

7.3.2  **Costs and revenues for this FDRM solution**

VFI has a clear strategy to grow and to extend further its rural and agricultural footprint. As part of this effort they are engaging further in work with World Vision on rural livelihoods, extension of savings offerings and technology to reduce cost of lending to these communities. These changes will increase client resilience and understanding of relevant risks.

Separately, VFI is proposing funding an FDRM scheme. The business case for this needs further refinement but preliminary results indicate an average annual funding need of approximately 1-2% of the targeted loan portfolio.

There are a number of methodologies one might put forward to pay for this additional cost including price increases to clients, reductions to certain costs and subsidies. In looking at price increase as the most feasible of these options, VFI must first look at the improved offering to clients:

1. Greater access to agricultural lending
2. Greater access to risk and resilience assessments and advice
3. Rapid assessment of need following a major disaster
4. Grace periods following a disaster
5. Assessment for livelihood restoration lending following a disaster
6. Immediate cash and aid packs after the assessment
7. Recovery lending

The benefits of this package will primarily accrue to those borrowing for agricultural and agricultural dependent activities and will be greater for those taking greater risk. Additionally, once the FDRM system is in place, VFI may be able to access cheaper wholesale lending and these benefits would then be passed onto the MFIs accordingly.

Looking at the scale of price rise that might be acceptable; there are instances of crop insurance reaching scale charging 5% for benefits not far short of this offering (Kilimo Salama crop input insurance in Kenya). There are other examples of our MFI’s buying guarantees at 2% and passing on the costs. Given these benchmarks, a rise of 2 to 5% may be feasible if targeted at those who benefit most clearly. VFI is also developing potential plans to introduce risk based pricing to pay for these protections and services such that the fees would vary based on the degree and types of natural disaster risks faced. As detailed earlier, for the FDRM system to be fully self-sustaining (without additional subsidies), it would require annual fees from its MFIs of approximately 1-2% of the portfolio. VFI’s initial assessments suggest that such a fee structure would be manageable for its MFIs, although more in-depth research is needed.

As systems improve and more local knowledge is combined with the global data being provided, it may be possible to differentiate the risk for different clients and charge more or less interest based on risk. For example, if the global cost of the FDRM solution is 2% and the majority of the climate risk in a country is in the 60% of the portfolio that is agriculture then it could be argued that this cost should be recovered primarily from these Agri-clients. By contrast, in a Typhoon prone country it can be argued that the extreme event risk impacts the entire portfolio and all clients should be expected to pay some share of the FDRM solution.

To further highlight how surcharging agricultural loans may work in a scenario where VFI desire to recover the 2% cost of the FDRM solution from 60% of the portfolio, there is a need to pass on roughly 3.5% per year to this segment. If the current charges to agriculture were an annual interest rate of 33%, the new charges would increase to 36.5% or by about 10%. In this case the local MFI would enter into a contract with VFI for access to the RDRF and disaster support and pay VFI the surcharge for this access. There will be a need to consider how to structure such a contract and to consider withholding tax issues on a country by country basis.

Further, work is being done in the Philippines and Tanzania to test the feasibility of this type FDRM solution based on interactions with customers to gauge their reaction. It is likely that each country’s participation in the scheme and charging mechanism would need to be separately negotiated and agreed by their regulated board based on the scale of risk in their portfolio. However, VFI has developed the data and detail in this report and the related projects to begin those discussions. Therefore a process will be required to finalize and implement the FDRM solution tailoring it to each country whilst ensuring the economics are
sound overall. For simplicity this may require starting the scheme in one region (likely Asia) then globalizing it as a second stage. In this case the process would be:

1. Completion of detailed design and modeling for the region
2. Market testing the scheme in each country with the clients and MFI
3. Obtaining board approval in each country
4. Raising the initial liquidity fund for the region
5. Procuring the FDRM cover for the region
6. Implementing the operating and charging models in each country
7. Review and evaluation of the country implementations
8  Conclusions and Future Directions

This report weaves together academic literature and practitioner experience to build a theory of change for how a strong local financial sector can both help households recover their livelihoods faster and help the community build back better post disaster. We argue that, among other institutions, microfinance adds a complementary dimension to more programmed relief efforts following disasters by utilizing the deep local knowledge of MFI’s and empowering borrowers to take advantage of local conditions to restore their livelihoods. It is postulated that this dynamic will create more resiliency than other interventions and, if used properly, will lead to less cost for the global community in the longer run. A number of researchable questions emerge from our query:

1. How effective will recovery loans be in building back more livelihoods and enhancing resiliency of local communities to natural disasters? (Priority)
2. How does the ability of local decision makers using new risk management solutions, and risk information that comes with these solutions, improve decisions about investments for more disaster resiliency?
3. As the ability to manage and transfer risk out of local communities increases, will this increase supply of credit and other financial services as well as lower cost?

Relief funding modalities have historically taken little account of local financial markets which can be dominated by microfinance as a relief mechanism. Even where in larger disasters there have been credit funding schemes these have often been too restrictive to be utilized by any but the strongest institutions with the often more fragile MFI’s being unable to take advantage of the funding made available. Policy makers, donors and MFI funding institutions such as DFID and VFI should carefully consider options to strengthen MFI balance sheets following a disaster, taking account of the positive social impact that lending can have on livelihood recovery of the poor while being very cautious not to create moral hazards. To this end, the proposed financial disaster risk management solution in this report pays on events that are outside the control of the local community (parametric triggers from estimates of local climate anomalies). Given the potential of the FDRM solution presented here, there remain researchable questions:

1. Given past behavior of lenders being very conservative in making post-disaster recovery loans, to what extent will this risk transfer and added information result in more proactive lending post disaster?
2. If lenders such as VFI use the type of FDRM solution presented here to both protect their balance sheets and borrowers, will this reduce reliance on donors and lenders to restore their balance sheets post disaster?

8.1  GP and DFID: Thoughts on implications, issues and opportunities

This project aligns well with the larger effort that is underway inside DFID to support the launch of GP. As a vehicle designed catalyze more FDRM offering in LMICs, GP will have the capacity to assess disaster risks, design risk transfer mechanisms, originate corresponding products and hold the risk that it originates. GP is currently under the final stages of internal review within DFID with approval targeted before the end of Q2 2015. This would position GP to begin offering products in Q4 2016. As the sponsor of GP, the personnel of GlobalAgRisk would be in a position to further refine the outputs of the VFI project once
GP is launched. Ultimately, GP would then be well positioned to offer the resulting FDRM contract to VFI. There are other players in the market that could potentially offer such a product to VFI however, the innovative structure underlying its current design may not be familiar to them. As a result, the project partners believe it would take significantly more time and energy to convince an alternative player to GP to offer a product in this manner at this price point. By offering a clear demonstration of the GP value proposition to the microfinance sector, VFI’s collaboration with GlobalAgRisk and ultimately with GP will help to attract other potential clients of GP with similar needs and risk exposures to VFI and thus help grow the market. Extensive market scoping, which DFID funded as part of its due diligence of GP, enhanced the view that significant demand exists within the microfinance sector for FDRM services, making it a key potential market for this venture. For the past year VFI has been providing extensive customer input into the conceptualization of GP and sponsoring the capacity building needs of the initiative. VFI is therefore ideally placed to forward this initiative given its intimate awareness of the GP value proposition with comprehensive financial disaster risk management. Additionally, this project demonstrates that for an effort of this scale and potential value, support for technical assistance to work with socially oriented institutions like VFI is needed. Next steps from VFI in using the information and knowledge acquired through these efforts will provide a deeper view about the value for money in the supply of such technical assistance. These developments will therefore complement GP’s efforts to incorporate a Technical Assistance Facility into its structure to support precisely the type of work completed for VFI here.

8.2 Wider industry: options and opportunities for cooperation and scale

Looking ahead, once the proposed FDRM system can be demonstrated in the market, it is envisioned that other Microfinance Investment Vehicles (MIVs) and similar players would follow VFI’s lead. High interest in such offerings has already been demonstrated by MIVs to GlobalAgRisk through its work developing GP. This shared interest in such services offers potential to reduce costs and improve efficiencies. Initial assessments suggest the following key opportunities exist:

**Mutual RDRF:** With prudent policy guidelines in place, multiple MIVs might choose to pool their capital into a single RDRF. By further diversifying the risk exposures, the total funding need would be less than the sum of the individual MIVs’ needs. In addition, the greater scale could also facilitate more streamlined management of the single Fund. Together, these outcomes could reduce the costs of operating the RDRF and increase the capital efficiency.

**Improved FDRM products:** As many MIVs tend to overlap in the markets where they invest, redundancies in product needs would emerge. The greater demand for a given product would offer the means for a provider, such as GP, to further refine and improve those products. In addition, as many products will have high upfront R&D costs but relatively lower maintenance and renewal costs, the price to the end users would likely come down over time for products in high demand. As a result, clients could potentially get a better product at a lower cost.

**Increased supply:** Overall, increased demand for the innovative FDRM systems proposed in this project will motivate greater supply in the market as well. In the case of GP, this would offer more business opportunities and a clearer path to sustainability for the venture. More broadly, many (re)insurers are eager to find ways to access new markets in developing
countries. Over time these players would become comfortable with GP’s model and begin to bring the risk capital into the market alongside GP. As more capital enters the market, such competition would likely bring down the cost of products to end-users.

References


Nagarajan, G. (May 2006). “Brief I: Microfinance Institutions and Disaster Relief”. Banking with the Poor Network.


http://reliefweb.int/sites/reliefweb.int/files/resources/Early%20Recovery%20and%20Livelihood%20Plan%20FINAL_0.pdf


http://core.ac.uk/download/pdf/6310221.pdf


Appendix A: VFI FDRM system details

A.1 VFI Portfolio Overview
Following from VFI’s interest in targeting the poor, their portfolio is heavily weighted towards rural lending with approximately 60% currently going to rural communities. As agriculture is the primary driver of rural economies, these communities have high exposures to natural disasters such as drought, flood and cyclones. Going forward, VFI intends to increase its lending in rural areas further, meaning that exposures to these natural disasters will increase as well. Given the existing and future natural disaster risk the VFI faces, formalizing a system to assess and manage the financial exposures from these events is essential.

As a first step to analyzing the VFI’s disaster risk exposures, an in-depth survey was conducted across VFI’s branches in the 11 target countries. This survey showed that approximately 63% of the 11 countries’ portfolios is dedicated direct agricultural lending or agricultural dependent lending. Figure A.1 below shows a breakdown by country of the agricultural lending as a percent of the total country portfolio. The most significant exposures to agriculture are in Uganda, Cambodia, Sri Lanka, Philippines, Ecuador and Malawi, which all have greater the 50% of their portfolio.

Figure A.1 Agricultural lending by country

Looking closer at the agricultural activity by country, clients are engaging in a range of activities. Figure A.2 summarizes the key primary agricultural activities across the 11 countries.

Figure A.2 Breakdown of agricultural activities across VFI’s 11 countries
It is important to note that crops have different disaster risk exposures than animals, and even among crops the planting seasons and water requirements may differ, leading to certain considerations for disaster risk assessment. For drought risk in particular the flowering period is a critical time for a crop’s success or failure. Based on the key crops in each country, the critical seasons for planting and harvest were identified and summarized in Table A.1.

**Table A.1 Breakdown of primary crops and critical planting months**

<table>
<thead>
<tr>
<th>Country</th>
<th>Primary Crop</th>
<th>Critical Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>Rice</td>
<td>July-Dec</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Pigs and hogs</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Philippines</td>
<td>Pigs and hogs</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>Poultry</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Pigs and hogs</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Malawi</td>
<td>Vegetables</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Corn/maize</td>
<td>Oct-May</td>
</tr>
<tr>
<td>Uganda</td>
<td>Poultry</td>
<td>non-seasonal</td>
</tr>
<tr>
<td>Zambia</td>
<td>Vegetables</td>
<td>Mar-Oct</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Teff and Enset</td>
<td>May-Oct</td>
</tr>
<tr>
<td>Honduras</td>
<td>Coffee</td>
<td>May-Apr</td>
</tr>
</tbody>
</table>

To complement the separate climate data analysis, branch managers were asked which natural disaster risks concern them most for their loan portfolios. Consistently, excess rain, drought, and extreme wind were the events that drew the most concern. Except for the Philippines the surveys indicated that rain related events (excess or drought) pose a greater risk than extreme wind.

The high dependence of these countries’ economies on agriculture makes them also prone to swings in food prices, which should be taken into account for this assessment. Table A.2 below summarizes the results by country of branch managers’ views on whether a spike in food prices would impact a borrower’s capacity to repay their loan. Except in Cambodia,
the majority of responses indicated food price fluctuations can impact loan repayment for all types of borrowers including non-agricultural business.

Table A.2 Does a spike in food prices impact loan repayment?

<table>
<thead>
<tr>
<th>Country</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sri Lanka</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malawi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myanmar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honduras</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Ethiopia not included due to inconsistencies in data

A.2 Climate Data

A.2.1 KAC Model Overview
Climate data utilized for this project was generated with models developed by Kinetic Analysis Corporation (KAC). KAC has a global model that uses a standardized methodology to derive daily climate data from 1960 to the present. To develop climate data outputs, KAC relies on advanced, multi-source weather data assimilation techniques to define initial conditions across the area of interest for any day within a historical record. The modeling incorporates interactions between weather components and the landscape, informed and bounded by the input conditions and observations (such as weather station and satellite data). Spatial resolution can be achieved at 16km or finer for all climate variables of interest. Figure A.3 below presents a general overview of the process used by KAC.
Figure A.3 KAC Climate Model Overview

An important characteristic of KAC’s approach is that it is consistent across time and geographic regions. This means that the methodology for assessing rainfall in Ecuador, for example, is the same that used for rainfall in Cambodia. Such consistency makes the model a powerful and transparent tool for global climate analyses.

A.2.2 VFI project data

For this project, KAC generated weather data from 1980-2014 for the 11 target countries within VFI’s portfolio. The key weather variables reported were daily rainfall (24-hr accumulation), maximum daily wind speed, and high and low temperatures for the day. Each VFI branch was matched to a unique ‘grid identification’ or GID. Weather data was then generated for each GID according to its longitude and latitude coordinates, such that the results include at least one daily output for each weather variable of interest for each VFI branch. Climate data was provided for a total of 707 unique GID locations across the 11 countries. For each weather variable, KAC estimated a result specific to the coordinates of each GID as well as regional averages and maxima within a 33 km radius of the GID.

Separate from the GID based analysis, KAC overlaid the weather outcomes on population and land use to provide estimates of the number of people or amount land impacted by a given day’s weather. This analysis is performed across each country’s administrative units (i.e. county, province, or state) and tabulated based on the total population or total land impacted according to specified category levels. In addition, land use impacts were broken down across five subsets: forest, grass, agriculture, urban, and barren. Table A.3 below summarizes the category levels used.

<table>
<thead>
<tr>
<th>Category</th>
<th>Wind</th>
<th>Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt; 18 m/s</td>
<td>5cm</td>
</tr>
<tr>
<td>2</td>
<td>&gt; 30 m/s</td>
<td>10cm</td>
</tr>
</tbody>
</table>
A.3 FDRM Scheme Details

A.3.1. Initial climate risk and loss assessment
An initial climate risk assessment was performed to determine the key risks of interest for each for 11 countries. The VFI survey data was used along with daily climate data from 1980 to 2014 and annual disaster impacts reported by the International Disaster Database EMDAT. While high and low temperature events were among the risks considered, it was determined that none of the 11 countries were exposed to notable extreme temperature risks so these events were excluded for this project. Table A.4 summarizes that climate risks with notable exposures by country.

Table A.4 Climate risks incorporated into FDRM Scheme

<table>
<thead>
<tr>
<th>Country</th>
<th>Excess Rain</th>
<th>Excess Wind</th>
<th>Drought</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecuador</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honduras</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cambodia</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Myanmar</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Malawi</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tanzania</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In order to benchmark the level of coverage needed, VFI looked to historical disasters to assess the potential capital and liquidity needs under an extreme event. The general findings are as follows:

Capital erosion
The total amount of capital erosion from an extreme event is estimated to be up to 10% of the portfolio for most countries, but reaching up to 20% for higher risk countries such as the Philippines and other countries exposed to typhoons. The main components of the capital erosion include:
1. Loan defaults and write downs: estimated at 5%
2. Lost earnings due to grace periods of 8 weeks or more on interest payments: estimated at 4% (Note that this amount reached 10% in the case of Haiyan in the Philippines)
3. Uninsured losses to the MFI and other extra disaster related costs: estimated at 1%

Extra liquidity
The total extra liquidity needed from VFI’s internal resources is estimated to be approximately 10% of the loan portfolio. Based on VFI’s experience in the Philippines after Haiyan, they estimate a temporary need for up to 50% of loan portfolio in liquidity for recovery lending. VFI envisions needing to provide 20% of this new credit from internal sources.
sources and the remaining 80% could be sourced from external lenders. Therefore, the liquidity component of the FDRM system could be targeted to cover the internal funding need of approximately 10% of the loan portfolio.

A.3.2 FDRM system structure

Following the layout of the FDRM structure in Figure 7.1 above, the system pairs a Rapid Disaster Response Fund (RDRF) with an FDRM portfolio product to incorporate mechanisms for providing both liquidity and capital to VFI’s network in the case of a natural disaster. While all funds will pass to MFIs from the RDRF, some may originate from the existing liquidity reserves maintained in the Fund and others may simply pass through the RDRF as payouts from the FDRM product. Figure A.4 below outlines the envisioned function of the components of the structure.

Figure A.4 Risk layering within FDRM system

For the less severe and more frequent events, the MFIs will be expected to use their internal capital reserves to cover any impacts. As the severity increases and frequency drops to around 1 in 5 years, the centralized VFI liquidity reserves in the RDRF will be expected to cover natural disaster events. For the most extreme and least frequent events of 1 in 10 years and beyond, the FDRM product would be designed to provide any additional liquidity or capital needs up to the amount of the sum insured elected by VFI. Inclusive in the system is real time climate data for the relevant disaster types of interest to give VFI early information on the severity of any events that might merit a payout from the RDRF and/or the FDRM product.

For this analysis the FDRM payouts are structured as a step function (rather than linear), and are weighted more heavily towards more catastrophic events. Figure A.5 below provides an example structure for step function payout on a hypothetical extreme contract.
Figure A.5 Payout rate for hypothetical extreme wind contract

The FDRM product mechanics include individual triggers and payout mechanisms for each country and risk of interest that are aggregated together into the single offering. As it is envisioned that this system could be implemented in 2016 the projected loan portfolio for that year totaling US$ 311 million is used. The amount of sum insured that VFI elects for its portfolio is allocated across the 11 target countries according to the size of the portfolio in each country and the perceived relative disaster exposure. VFI’s internal estimates of capital erosion and liquidity needs for extreme events laid out in Section A.3.1 above suggested that a need for between 10-20% of the loan portfolio to be insured. As a starting point this analysis assumes 15% of the total loan portfolio projected for 2016 or US$ 47 million. Within each country, the country level sum insured is allocated across the covered disasters according to the size of the country’s portfolio and the relative risk exposure. Table A.5 below summarizes the allocations of sum insured made across the 11 countries by risk type for this analysis.

<table>
<thead>
<tr>
<th>Country</th>
<th>Drought</th>
<th>Excess Rain</th>
<th>Excess Wind</th>
<th>Total Sum Insured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>6,550</td>
<td>6,550</td>
<td>-</td>
<td>13,100</td>
</tr>
<tr>
<td>Philippines</td>
<td>900</td>
<td>900</td>
<td>900</td>
<td>2,700</td>
</tr>
<tr>
<td>Myanmar</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1,700</td>
<td>1,700</td>
<td>1,700</td>
<td>5,100</td>
</tr>
<tr>
<td>Honduras</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Ecuador</td>
<td>3,000</td>
<td>3,000</td>
<td>-</td>
<td>6,000</td>
</tr>
<tr>
<td>Tanzania</td>
<td>900</td>
<td>900</td>
<td>-</td>
<td>1,800</td>
</tr>
<tr>
<td>Zambia</td>
<td>525</td>
<td>525</td>
<td>-</td>
<td>1,050</td>
</tr>
<tr>
<td>Malawi</td>
<td>225</td>
<td>225</td>
<td>-</td>
<td>450</td>
</tr>
<tr>
<td>Uganda</td>
<td>750</td>
<td>750</td>
<td>-</td>
<td>1,500</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1,650</td>
<td>1,650</td>
<td>-</td>
<td>3,300</td>
</tr>
</tbody>
</table>
The FDRM product has a term of 12 months over which period a maximum of 100% of the sum-insured allocated to a single risk in a single country can be paid. This means that if Philippines, for example, were to have two major cyclone events that each individually registered a payment of 75% of the sum insured, VFI would not receive a payment of 75% + 75% = 150% of the sum insured. Instead the payout would be capped at 100% such that the first event would generate 75% and the second only 25%.

The sections that follow will layout the specific processes used to quantify the risk exposures covered by the FDRM product and RDRF.

A.4 FDRM product and RDRF analysis

The FDRM product and RDRF analysis begin at the branch level for each country. As outlined above, each branch location is associated with a GID from KAC’s dataset based on unique latitude and longitude coordinates. To assess the risks for drought, excess rain, and excess wind indices are developed based on daily 24 hour rain and daily max wind speed measured both at the specific GID location and averaged over a 33km radius extending from the location.

For excess rain and excess wind the index values are simply the cumulative 24 hour rainfall and daily max wind speed, which are provided by KAC. For drought, a standard methodology is used to determine the daily Effective Drought Index (EDI). The EDI is based on a calculation of the Effective Precipitation (EP), which is the summed value of daily precipitation with a time-dependent reduction function. EP is calculated using the formula below in which \( P_m \) is the daily rain \( m \) days prior and \( i \) represents the duration of the summation, which is assumed to be 365 days.

\[
EP_i = \sum_{n=1}^{i} \left[ \left( \sum_{m=1}^{n} P_m \right) / n \right]
\]

To convert the EP to an EDI value, first the mean EP (MEP) is calculated across all EP’s and the deviation of EP (DEP) is simply \( DEP = EP - MEP \). Then DEP is standardized to get the EDI with \( EDI = DEP / \text{standard deviation (DEP)} \).

Once the daily index values are determined, the general steps to assessing the risk exposure for a given country are as follows:

1. Determine the triggers for damage payments for each risk at each branch location. Three different triggers are set as follows:
   - \( T1 = 1 \) in 5 years event, which is the minimum threshold for an event that would require external funding from the DRF
   - \( T2 = 1 \) in 7 years event, which is the minimum threshold for when the FDRM product will begin to make payments to VFI. Similarly this level is assumed to be the maximum severity event that would rely solely on the DRF for external funding support to an impacted MFI.
• T3 = 1 in 100 years event, which is the upper threshold for the FDRM product meaning that a maximum payment of 100% of the sum insured occurs.

Using statistical methods, values for triggers (i.e. 10 cm of rain or 40 m/s of wind) are determined for each risk at each location based on the daily index values for over the 35 years of data.

2. Using the triggers determined in Step 1, daily linear payment rates are calculated based on the index value for each day. If \( x \) represents the daily index value for the risk of interest, then payment rates are as follows:

<table>
<thead>
<tr>
<th>Condition</th>
<th>RDRF Payment Rate</th>
<th>Linear FDRM Payment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>If ( x &lt; T_1 )</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>If ( T_1 &lt; x &lt; T_2 )</td>
<td>( \frac{x - T_1}{T_3 - T_1} \cdot M )</td>
<td>0%</td>
</tr>
<tr>
<td>If ( T_2 &lt; x &lt; T_3 )</td>
<td>( \frac{T_2 - T_1}{T_3 - T_1} \cdot M )</td>
<td>( \frac{x - T_2}{T_3 - T_2} )</td>
</tr>
<tr>
<td>If ( x &gt; T_3 )</td>
<td>( \frac{T_2 - T_1}{T_3 - T_1} \cdot M )</td>
<td>100%</td>
</tr>
</tbody>
</table>

Where M is a multiplier that normalizes the RDRF payment calculations to use a consistent sum insured amount for both FDRM and RDRF payment estimations. M is defined as:

\[
M = \frac{1}{1 - \frac{T_2 - T_1}{T_3 - T_1}}
\]

3. The daily linear payment rates are then converted to step function payment rates in the following manner:

<table>
<thead>
<tr>
<th>Linear FDRM Payment Rate</th>
<th>Corresponding Step Function FDRM Payment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>&lt;10%</td>
<td>0%</td>
</tr>
<tr>
<td>&gt;10% &amp; &lt;30%</td>
<td>20%</td>
</tr>
<tr>
<td>&gt;30% &amp; &lt;50%</td>
<td>40%</td>
</tr>
<tr>
<td>&gt;50%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note that no FDRM payment is actually made until the linear payment rate reaches 10%. This can be thought of as the ‘deductible’ for the coverage and helps to reduce the overall cost of the risk transfer.

4. Branches are assigned weights based on the relative size of their loan portfolio. The RDRF and step function FDRM payment rates are aggregated across all branches using these weights to determine daily country level payment rates for each risk of interest.

5. Daily payment rates for each risk are summed over each of the 35 years to determine annual RDRF and FDRM payment rates. A condition is applied such that
the maximum country level FDRM payment rate in a given year for a specific risk is 100%.

6. Using the sum insured allocation assumptions from Table A.5 above, the payment rates for each risk by country are weighted accordingly. These results are compiled into a comprehensive table showing annual historical payment rates for each of the 11 countries by disaster risk, which is then brought into the portfolio model discussed in the following section.

A.5 Portfolio Model

The portfolio model brings together all the country level annual results to determine aggregated outcomes across the 11 countries. Beginning with the historical results yielded from Step 5, a stochastic catalog representing 1000 random draws of events for each risk by country is created. This methodology relies on a random number generator to create 1000 hypothetical years of payment rate outcomes for each risk by country. The stochastic catalog is adjusted to account for extreme events like El Niño characterized by correlated natural disaster conditions around the globe. This adjustment is modeled from correlations deduced from the historical data and applied to the most extreme events in a given draw in the catalog (i.e. the tail of the distribution) to increase correlation across countries. The portfolio analysis described in the steps that follow utilizes the adjusted stochastic catalog:

1. For each risk by country an average payment and maximum payment across the 1000 draws is determined for the RDRF and FDRM layers. In insurance language, the average payment is equivalent to the ‘expected loss’ and the maximum payment is the ‘probable maximum loss’ or PML.

2. The expected losses and PMLs are summed across the risks for each country to determine a single expected loss and PML for each country for the RDRF and FDRM layers.

3. The country level expected losses and PMLs are then aggregated to determine a portfolio values for all 11 countries. These outcomes are then utilized for reporting summary metrics for the RDRF and FDRM layers.

FDRM Layer. For this layer the goal is to determine a rate online representing the cost of offering the product to VFI. The rate on line is calculated using the following equation:

\[
rate\ on\ line = PR + C \times \left( \frac{PML}{Sum\ Insured} - PR \right)
\]

Where C is the risk-weighted return on capital for the insurer which incorporates the cost of developing and maintaining the risk transfer product along with the cost of holding the risk; PR represents the pure risk or expected loss divided by sum insured. C is assumed to be 15%.

RDRF Layer. For this layer, the goal is to estimate the target size for the DRF and the average annual payout from the RDRF’s liquidity reserves to VFI’s network. To determine the target
size of the RDRF, the PML of the RDRF layer is used plus an additional 33% cushion to ensure that resources remain in the fund after a year of extreme losses. The average annual payment from the RDRF's liquidity reserves is simply the expected loss for the RDRF layer.
A.6 FDRM System Funding and Costs

Note that the results presented in this section should be viewed as preliminary only. Further refinements of the climate data and FDRM structures remain ongoing.

FDRM Layer. Estimating the FDRM layer costs over the portfolio follows in a straightforward manner from the rate on line calculation described above. Assuming a sum insured of 15% of the total portfolio, the FDRM product rate on line in this analysis is determined to be 9.9% of the total sum insured, US$ 47 million. This cost is distributed across the portfolio of the 11 countries to find the rate as a percent of the portfolio of approximately 1.5%.

RDRF Layer. Based on the PML and expected loss of the RDRF layer, the target RDRF size is estimated to be US$ 6.0 million and the average annual payout is calculated to be US$ 1.8 million.

To fund the FDRM system, VFI can charge its network an access fee. The fee could vary based on the position of the RDRF each year and the cost of the annual FDRM product. To account for the dynamic nature of the RDRF over time a number of assumptions must be made to understand its behavior. Key assumptions include:

- All funding supplied to VFI’s network from the RDRF reserves are provided as credit
- All funding provided to VFI’s network from FDRM payments is injected as equity
- Credit to VFI’s network from the FDRM system earns 5% interest net of withholding and other taxes and has an average term of 12 months
- 15% of credit extended to the network is assumed to have a term of greater than 12 months and therefore does not get repaid into the fund until over a year later
- Some erosion of the RDRF reserves occur each year due credit converting to equity, delinquency in loan repayments and other issues, estimated at 20% of the annual credit extended to the network
- The reserves in the RDRF not being lent out to the VFI network earn 1% annual interest
- Annual administrative and general operating costs of the RDRF are assumed to be US$300,000
- The FDRM premium payment is made from the RDRF
- The VFI access fee to its network is designed to replenish the RDRF to its target balance

To see the potential interplay of these assumptions table A.6 below uses the actual climate data from 2010-2014 to estimate the annual funding need from the FDRM system.
Table A.6. Simulation of FDRM system from 2010-2014 (PRELIMINARY RESULTS)

<table>
<thead>
<tr>
<th>Year</th>
<th>RDRF beginning balance</th>
<th>RDRF payment to VFI network (credit)</th>
<th>FDRM payment to VFI network (equity)</th>
<th>Interest on credit</th>
<th>Interest on treasury mgmt</th>
<th>&gt;12 mth term credit in year</th>
<th>RDRF reserves erosion</th>
<th>RDRF operating costs</th>
<th>FDRM premium payment</th>
<th>RDRF ending balance</th>
<th>Access fee from VFI network as % of portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>6,000</td>
<td>1,804</td>
<td>5,165</td>
<td>90</td>
<td>42</td>
<td>271</td>
<td>361</td>
<td>300</td>
<td>5,336</td>
<td>4,647</td>
<td>1.71%</td>
</tr>
<tr>
<td>2009</td>
<td>6,000</td>
<td>1,639</td>
<td>2,050</td>
<td>82</td>
<td>44</td>
<td>246</td>
<td>328</td>
<td>300</td>
<td>5,523</td>
<td>4,647</td>
<td>1.65%</td>
</tr>
<tr>
<td>2010</td>
<td>6,000</td>
<td>3,587</td>
<td>2,730</td>
<td>179</td>
<td>24</td>
<td>538</td>
<td>717</td>
<td>300</td>
<td>4,894</td>
<td>4,647</td>
<td>1.85%</td>
</tr>
<tr>
<td>2011</td>
<td>6,000</td>
<td>1,336</td>
<td>490</td>
<td>67</td>
<td>47</td>
<td>200</td>
<td>267</td>
<td>300</td>
<td>5,884</td>
<td>4,647</td>
<td>1.53%</td>
</tr>
<tr>
<td>2012</td>
<td>6,000</td>
<td>1,158</td>
<td>860</td>
<td>58</td>
<td>48</td>
<td>174</td>
<td>232</td>
<td>300</td>
<td>5,601</td>
<td>4,647</td>
<td>1.62%</td>
</tr>
<tr>
<td>2013</td>
<td>6,000</td>
<td>1,803</td>
<td>3,665</td>
<td>90</td>
<td>42</td>
<td>270</td>
<td>361</td>
<td>300</td>
<td>5,375</td>
<td>4,647</td>
<td>1.70%</td>
</tr>
<tr>
<td>2014</td>
<td>6,000</td>
<td>1,262</td>
<td>1,262</td>
<td>63</td>
<td>47</td>
<td>189</td>
<td>252</td>
<td>300</td>
<td>5,639</td>
<td>4,647</td>
<td>1.61%</td>
</tr>
</tbody>
</table>

Using statistical methods to create 1000 outcomes based on the actual climate data, the above structure was used to estimate the annual funding need VisionFund will need to meet in order to fund the entire FDRM system. This analysis yielded an average amount of 1.65% of the total portfolio. Over the 1000 hypothetical years of data the maximum and minimum funding needs in any single year were calculated to be 1.93% and 1.43% respectively. These figures represent the all in costs of maintaining this system to VisionFund once it has been established.

Many of the parameters used to generate these results can be modified based on VisionFund’s cost and risk coverage preferences. Two key parameters to consider is the amount of sum insured that VisionFund requires for its FDRM system and the disaster return periods that each layer is designed to cover. To provide a sense for how modifying these items impacts the results, Table A.7 outlines key outcomes when assuming 10%, 15% and 20% sum insured of the loan portfolio. Scenario A uses the return periods assumed for the above analysis (T1=5 years, T2=7 years, T3=10 years) and Scenario B considers the outcomes when changing T2 to 10 years. Under scenario B the RDRF layer is therefore used to cover a greater proportion of the risk compared to Scenario A.

Table A.7 FDRM system varying sum insured (PRELIMINARY RESULTS)

<table>
<thead>
<tr>
<th></th>
<th>Scenario A (T2=7)</th>
<th>Scenario B (T2=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of portfolio insured</td>
<td>10% 15% 20%</td>
<td>10% 15% 20%</td>
</tr>
<tr>
<td>Sum insured (US$ '000)</td>
<td>31,000 47,000 62,000</td>
<td>31,000 47,000 62,000</td>
</tr>
<tr>
<td>FDRM rate on line (% of portfolio)</td>
<td>1.00% 1.50% 2.05%</td>
<td>0.85% 1.35% 1.80%</td>
</tr>
<tr>
<td>Target RDRF size (US$ '000)</td>
<td>4,000 6,000 8,000</td>
<td>7,000 10,000 13,000</td>
</tr>
<tr>
<td>Avg annual funding need (% of portfolio)</td>
<td>1.15% 1.65% 2.25%</td>
<td>1.05% 1.55% 2.05%</td>
</tr>
</tbody>
</table>
A.7 Future directions and considerations

While not incorporated into this project, a couple potential modifications to the FDRM structure will be considered going forward.

Population and land use FDRM triggers

As a modification of the FDRM trigger structure outlined in section 3.3 above, the triggers could also explore utilizing the population and land use impacts data provided by KAC. This data is organized according to administrative units within the selected country (rather than GID) so would require the VFI branch portfolios to be allocated across the relevant administrative areas. An example methodology for creating excess wind and rain FDRM contracts only according to the population effect by an event is laid out below:

1. For each day from 1980 to 2014 of historical wind and rain data, convert the population affected by category of impact to percent of population affected (PPE).
   Three PPEs will be determined for each 24 hour rain and max wind speed as outlined in Table A.8.

<table>
<thead>
<tr>
<th>Table A.8: PPEs for 24 hr Rain and Max Wind by Admin Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>PPE 1</td>
</tr>
<tr>
<td>PPE 2</td>
</tr>
<tr>
<td>PPE 3</td>
</tr>
</tbody>
</table>

2. Set T1 as 1 in 7 year and T2 as 1 in 100 years and the payment rate for an event for either wind or rain in the first category (PPE1) would be calculated as:

   \[
   \text{if } PPE1 > T1 \text{ then Payment rate } PPE1 = \frac{\min(PPE1,T2)-T1}{T2-T1}
   \]

   \[
   \text{if } PPE1 < T1 \text{ Payment rate } = 0
   \]

3. Set a sum insured for the entire country to hedge VFI portfolio against specific events (extreme rain or wind in this case)

4. Allocate the sum insured to each administrative unit based on a combination of population and VFI loan portfolio in the administrative unit.

   \[
   \text{Share} = \frac{\text{Population within the administrative unit}}{\text{Total Population of the country}}
   \]

5. Calculate the payment for each PPE for each administrative unit. For example, PPE1 for Wind would be calculated as:

   \[
   \text{Payment for Admin Unit } = \text{Payment Rate } PPE1 \times \text{Sum Insured (country)} \times \text{Share}
   \]

6. All PPEs are summed for the year and the condition that the total for the year cannot exceed 1 is imposed.

7. Provide severity weights (w1, w2, w3) to the different PPEs, such as

<table>
<thead>
<tr>
<th>Table A.9: Weights imposed on PPEs for Rain and Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>PPE1</td>
</tr>
<tr>
<td>PPE2</td>
</tr>
<tr>
<td>PPE3</td>
</tr>
</tbody>
</table>

\[
\text{Payment for Admin Unit } = w1 \times \text{Payment } PPE1 + w2 \times \text{Payment } PPE2 + w3 \times \text{Payment } PPE3
\]
8. Sum all payments for the year over all administrative units. Check the condition that the payments cannot exceed the country sum insured.

9. Tabulate the final payments by year and create a 34 year series of loss cost

\[ \text{loss cost} = \frac{\text{Final Payment}}{\text{Sum Insured}} \]

10. Calculate the expected loss for the country portfolio as the simple average of the 34 year series of loss cost

Incorporating population and/or land use impacted by an event could potentially offer more refinement in assessing the damages to VFI’s portfolio. More work will be required to assess this alternative trigger structure with the existing one used for this project.
Appendix B: Peer Organizations

B.1 Microfinance Organizations
VisionFund is a member of the Microfinance CEO Working Group (MCWG), which is a collaborative effort by a number of leading international organizations that promote microfinance around the world. MCWG consists of the leaders of ten international microfinance organizations:

ACCION: Michael Schlein, President and CEO, Accion
Brac: Shameran Abed, Director Microfinance
CARE: Lauren Hendricks, Executive Director Access Africa
FINCA: Rupert Scofield, President and CEO, FINCA
Freedom_from_Hunger: Steve Hollingworth, President, Freedom from Hunger
Grameen_Foundation: Alex Counts, President and CEO, Grameen Foundation
Opportunity International: David Simms, Global Chief Development Officer & President
Pro_Mujer: Rosario Pérez, President and CEO, Pro Mujer
VisionFund: Scott Brown, President and CEO, VisionFund
Women’s World Banking: Mary Ellen Iskenderian, President and CEO
Working Group Founding Co-Chair

In early 2011, an informal group of industry leaders began to meet to discuss the state of the microfinance sector as it matures and encounters new challenges. Participants quickly discovered a shared perspective on the future of the microfinance industry – one rooted in high standards, client orientation, and collective action.

The Working Group seeks to support the positive development of its member organizations and the microfinance industry at large. Its members advocate in favor of responsible microfinance practices and commit to upholding their organizations to the highest standards. The Center for Financial Inclusion in Washington, D.C. currently serves as the Secretariat of the Microfinance CEO Working Group. The members of the Microfinance CEO Working Group are:

The Microfinance CEO Working Group believes that a responsible microfinance institution is one that:

- is client-focused;
- does all in its power to protect clients from harm;
- is transparent about its fees and interest rates; and
- measures its effectiveness in achieving desired client-level outcomes.

The Working Group has focused its efforts around support for three industry initiatives that are playing a major role in advancing commitment and capacity to responsible microfinance:

- The Smart Campaign: A global campaign committed to embedding client protection practices into the institutional fabric of the microfinance industry, the Smart Campaign has been endorsed by over 4,300 institutions and individuals since its launch in 2009.
• **MFTransparency**: MicroFinance Transparency serves as a public forum for microfinance institutions to demonstrate their commitment to pricing transparency and integrity.

• **The Social Performance Task Force**: The SPTF is an ambitious effort by more than 1,000 stakeholders to develop common tools for measuring and managing social performance. It has developed “Universal Standards for Social Performance Management” that will guide organizations as they work to translate their missions into reality.

Together these organizations serve over 40 Million clients around the world. Scott Brown the VisionFund CEO has written to the working group seeking their views on current best practice and where this has been received it is included in this report. VFI believes that the proposals in this report represent an innovative approach to disaster preparation and response. Upon completion of the report, VFI intends to share the results with the group to raise awareness and seek further input.

### B.2 Relief Organizations

World Vision is a member of “The Start Network” a consortium of 19 leading NGOs working together to strengthen the humanitarian aid system. The consortium works in three areas: Start Fund (financing for emergency response); Start Build (strengthening civil society capacity); and Start Beta (creating platforms for partnerships and learning). Other members include: Save the Children, Oxfam, Care, and all of the leading players with significant UK based operations. The network extends to nearly 7,000 partner agencies, comprised of over a million staff working in 200 countries and territories. Start’s objectives aim to help civil society innovate, adapt and respond to the growing demands of the future.

In order to meet the needs of crisis-affected people in a future of great uncertainty and complexity, Start believe that the humanitarian sector must change. The Start Network members collaborate because the change that is demanded cannot be achieved by any single organisation acting alone. Start promote a way of working that enables international and local humanitarian actors to coexist. The vision is of a self-organising system where the agencies best placed to respond to a crisis are empowered to do so. To realize this vision, we are working to catalyse a humanitarian sector that is more diverse, decentralised and collaborative.

World Vision has had significant discussions with the Start team and have started to reach out to a small number of relevant member organisations. It must be said that FDRM based thinking is fairly novel to this community as is the use of microfinance in relief efforts but the team intends to continue this line of advocacy once this report is available.
Appendix C: Equations and Calibration Supporting Credit Market Equilibrium Figures

The models used to develop the figures in section 6.3 are stylized illustrations. Their calibration values are found in Table C.1. We chose values to demonstrate the principles discussed in the report with a preference for simplicity and without modeling a specific case. The key messages are robust to a variety of alternative calibrations. Demand is explained by a downward sloping function of the form

\[ r = \alpha_0 - \alpha_1 l + \alpha_2 D \quad (1) \]

where \( r \) is the interest rate and \( l \) is the level of outstanding loans in the market. \( D \) is a measure of a disaster. In the calibration, we use a binary indicator, \( D \in \{0,1\} \). The parameters \( \alpha \) change the intercept, slope, and effect of the disaster on demand, respectively.

Lenders provide credit while managing their stock of equity capital \( k \). Let \( \xi \) be a random variable describing the proportion of loan non-repayment, which is a function of the disaster state. Lenders consider potential consequences of lending on their capital ratio. Let their capital ratio be

\[ \frac{K}{L} = \frac{k - \xi l}{l - \xi l} \]

That is, the capital ratio is assessed given the performance of its portfolio. The lender incurs a penalty if the capital ratio is below a target level \( \kappa \), which could be an internal target or one set by regulation or the market. This penalty \( g \) takes the form

\[ g = \max \left( 0, \kappa - \frac{K}{L} \right)^2 L^2. \]

When the lender’s capital ratio is above the target, it incurs no penalty. Below the target, the penalty increases as the capital ratio falls. These penalties are more severe for larger lenders.

The lender attempts to maximize expected profit given its desire to stay above its minimum capital target.

\[ \max_{\xi \geq 0} E[\pi] = \left( r - r_f - E[\xi] \right) l - \beta_1 l^2 - \beta_2 g \]

where \( \pi \) is profit, \( r_f \) is the lender’s financing costs, and \( \beta_1 l^2 \) describes the cost of monitoring and selecting borrowers and is convex in loans and \( \beta_2 \) describes the severity of the penalty.

The lender supplies credit such that its expected marginal revenue equals its expected marginal cost, leading to the equation

\[ r = r_f + E[\xi] + 2\beta_1 l + \beta_2 E \left[ \frac{\partial g}{\partial l} \right] \quad (2) \]
where $\partial g / \partial l$ indicates the partial derivative of the penalty function with respect to outstanding loans. Market equilibrium leads to a level of outstanding loans and interest rate at the point where Equations 1 and 2 intersect.

We add insurance to this model assuming the case of a lender that is a member of an international network of lenders in which capital can be reallocated. The parent can provide FDRM at its cost to a local lender. The cost of risk transfer will be higher for autonomous lenders buying FDRM from an external counterpart and will tend to motivate partially insuring this risk and so retaining a portion of the exposure. The capital ratio can then be written as

$$\frac{K}{L} = \frac{k - \xi l + qi}{l - \xi l}$$

where $q$ is the sum insured and $i$ is the payout function. Here we use a binary payout function to match the indicator, $i \in \{0,1\}$. In the case of the integrated holding company, the optimal amount to insure is the disaster exposure. The new supply function is

$$r = r_f + E[\xi] + 2\beta_1 l + \beta_2 E\left[\frac{\partial g}{\partial l}\right] + pq$$

where $p$ is the premium rate.

<table>
<thead>
<tr>
<th>Table C.1 Model calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values</td>
</tr>
<tr>
<td>Disaster probability</td>
</tr>
<tr>
<td>Demand</td>
</tr>
<tr>
<td>$\alpha_0$</td>
</tr>
<tr>
<td>$\alpha_1$</td>
</tr>
<tr>
<td>$\alpha_2$</td>
</tr>
<tr>
<td>Supply</td>
</tr>
<tr>
<td>$K$</td>
</tr>
<tr>
<td>$\beta_1$</td>
</tr>
<tr>
<td>$\beta_2$</td>
</tr>
<tr>
<td>$r_f$</td>
</tr>
<tr>
<td>$\xi$</td>
</tr>
<tr>
<td>$\kappa$</td>
</tr>
<tr>
<td>Insurance</td>
</tr>
<tr>
<td>$i$</td>
</tr>
<tr>
<td>$p$</td>
</tr>
<tr>
<td>$q$</td>
</tr>
</tbody>
</table>
Appendix D: VFI Country Summary

This report is based on 11 of the 34 countries in the VFI global network representing some 70% of the loan portfolio. Eastern European subsidiaries were excluded as these are in the process of disposal to fund expansion in southern hemisphere countries as represented by this group. The table below gives a top down estimate of the indicative scale of these MFI’s over the next three years.

<table>
<thead>
<tr>
<th>Country</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>104</td>
<td>131</td>
<td>163</td>
</tr>
<tr>
<td>Philippines</td>
<td>6</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Myanmar</td>
<td>15</td>
<td>30</td>
<td>56</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>12</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Ecuador</td>
<td>51</td>
<td>60</td>
<td>71</td>
</tr>
<tr>
<td>Honduras</td>
<td>8</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Uganda</td>
<td>7</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Malawi</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>18</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>Tanzania</td>
<td>9</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Zambia</td>
<td>5</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total USD 000’s</strong></td>
<td><strong>237</strong></td>
<td><strong>311</strong></td>
<td><strong>408</strong></td>
</tr>
</tbody>
</table>

% of total continuing portfolio

As of today, VFI supports 3 million children through its work and seeks to treble this to 9 million over the next five years whilst maintaining and enhancing focus on the most vulnerable in the rural contexts we mainly operate in. VFI’s work in targeting vulnerable children is likely also to extend into urban contexts and fragile states in due course.

To achieve this, VFI is introducing new technologies to increase the sustainability of its rural lending and increase its ability to manage the risk of that rural portfolio with a deeper understanding of agricultural clients. New, more tailored products are being developed to further enhance loan offerings to agricultural clients and a great deal of effort is being put into savings and insurance products to enhance financial resilience. These platforms are being primarily developed in Tanzania and Cambodia.

Agricultural lending in this group is 54% of this portfolio but this is skewed by the significance of Cambodia and shows wide variation around this figure. Activities are also diverse with only 30% of lending in maize and rice. This all points to a good spread of risk with only a few point concentrations that need separate attention. Over time VFI will increase agricultural lending in most countries outside of Cambodia requiring better management of the risk concentrations as this happens.
Given the size of Cambodian operation, the growth potential of Myanmar operation and the level of disaster risk in South East Asia more generally this area has represented a more critical focus in this initiative to develop an FDRM approach. Further, ADB has funded an initiative in the Philippines to assist in developing how VFI’s community resilience, disaster relief and FDRM might work together. In Cambodia VFI have significant exposures to agriculture and are piloting a new model of operation; deepening understanding in this country is critical to this initiative and broader strategy.

VFI has also focused on East and Central Africa and the specific concerns of smallholder farmers around drought and to some extent intense rainfall and the associated flooding that may follow. VFI has a project in Tanzania looking at the resilience and livelihoods of farmers and how an FDRM approach to drought may help them when such events occur given the shortening drought cycle in the region.

Finally, in South America VFI has a large MFI in Ecuador that is leading edge in looking at social impact and a number of MFI’s exposed to risks of similar magnitude to South East Asia.

Overall these 11 countries are representative of the core of VFI’s business and hold a good range of diversity allowing for internal risk diversification. The richness of the countries also bolds well for replication of the ideas presented within.