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Natural Disaster Risk Management in Microfinance

Ex-ante Evaluation of GlobalAgRisk's Risk Pooling Concept

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I Abstract

Low-income households suffer from a limited microfinancial access in times of natural disasters, because the providers of microfinancial services theirselves lack appropriate access to external financial resources. The existing risk transfer solutions the global financial market offers to microfinancial actors are too expensive. Microfinancial actors are distributed globally and natural disasters do not occur in every world region simultaneously. This coherence demonstrates the potential to transfer natural disaster related risks by pooling them among the microfinancial actors. The risen level of diversification lessens the funding needs for covering a certain extent of risks.

GlobalAgRisk intends to implement a natural disaster risks pooling concept among microfinancial actors in 2018. By the concept's objective to increase the microfinancial access in times of natural disasters, the natural disaster resiliency of low-and-middle-income households should be enhanced. The concept is targeted at ensuring a cost-efficient and reliable, i.e. fast and sufficient, access to external financial resources for microfinancial actors in times of natural disasters.

The thesis establishes and applies nine criteria to evaluate, whether GlobalAgRisk's concept is optimally designed in order to achieve its aims. The evaluation reaches the result that the concept most likely will fulfil partly what it is assigned to. A sole consideration of credit risks, potential profit extractions as a consequence from pooling the risks through a for-profit company and a limited ability to ensure financial access in times of the most severe disasters are a few of the identified shortcomings.

Drawing on these findings, the thesis portrays seven potential improvements to increase the concept's likelihood achieving its aims and depicts certain constraints for the potential improvement's implementation. To alleviate the mentioned shortcomings the thesis suggests the inclusion of insurance risks in the concept, establishing the global risk pool as a mutual or cooperative company and the elimination of certain payout restrictions.

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IV Abbreviations

ARC	African Risk Capacity
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CEO	Chief Executive Officer
CGAP	Consultative Group to Assist the Poor
DRF	Disaster Recovery Fund
eds.	editors
e.g.	for example (Latin: exempli gratia)
EM-DAT	Emergency Events Database
ESRB	European Systemic Risk Board
et al.	and others (Latin: et alii)
f.	and the following page
FDRM	Financial Disaster Risk Management
ff.	and the following pages
FSP	Financial Service Provider
ICMIF	International Cooperative and Mutual Insurance Federation
i.e.	that is (Latin: id est)
IFAD	International Fund for Agricultural Development
MFI	Microfinance Institution
p.	page
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
pp.	pages
U.S.	United States (of America)
USD	U.S. Dollar
VFI	Vision Fund International

1 Introduction

Motivation

More than 1 billion people escaped from poverty[1] during the past 15 years (World Bank, 2017, p. 3). Natural disasters jeopardise these achievements by pushing 26 million people into poverty annually (Hallegatte et al., 2017, p. 2). According to the database EM-DAT, between 1995 and 2015 more than 7,000 natural disasters occurred globally. 4.3 billion people were affected and the damage is estimated at USD 2.3 trillion. The most dangerous disasters were floods, storms, droughts and earthquakes (Hess & Hazell, 2016, p. 9). Rural people represent the majority of the global poor (World Bank, 2016, p. 35). Especially rural farmers are not able to cope with the risks evolving from natural disasters (Hess & Hazell, 2016, p. 7).

Despite the debate how beneficial microfinance to the poor is, through its evolution many previously unbanked people got access to financial markets (Rosenberg, 2009; Cull et al., 2009). This access is an important pillar of low-income households resiliency to natural disasters (Rockefeller Foundation & GlobalAgRisk, 2016, p. 7). However, rural farmers still suffer from a limited financial access. In particular, in times of natural disasters microfinance institutions (MFIs) cease to provide the urgently needed financial services to farmers (Skees & Barnett, 2006, p. 4 ff.).

Research Question

This paper aims at contributing to solving this problem. It deals with the question, how the access to microfinancial services in times of natural disasters can be enhanced. The debate about the advantages and disadvantages of microfinance is beyond the scope of this study. To answer the research question its scope will be further clarified at first. In the past, microfinancial services were mainly seen as the provision of microcredit to low-income households. However, the aim of microfinance besides financing income-producing activities and supporting the building of assets is also to stabilise consumption and to protect against risks (CGAP, 2017). Consequently, microcredit, microsavings, micropayments and microinsurance are seen as subcategories of microfinance. This paper focuses on microcredit and microinsurance, because mainly the provision of these financial services makes the suppliers vulnerable to natural dis-

1 The World Bank uses the USD 1.90 poverty line (World Bank, 2015).

asters by acquiring natural disaster related credit and insurance risks (Rockefeller Foundation & GlobalAgRisk, 2016; Hess & Hazell, 2016).

Out of the two subcategories MFIs primarily provide credit to its clients. Additionally they sometimes provide insurance themselves and sometimes they act as an intermediary between clients and microinsurers who concentrate on providing insurance (Luckja, 2017; Representative 1 of the Microfinance Sector, 2017; Ling, 2017; Representative of a Financial Consultancy, 2017; Representative of a Finance Think Tank, 2017; Kuhn, 2017). Financial services to low-income households are sometimes provided by banks or insurers that serve higher-income households, either (Representative 2 of the Microfinance Sector, 2017; UAP, 2017). Hence, these financial institutions are considered as well when MFIs and microinsurers are mentioned.

Typical customers of MFIs are the rural poor, because normally they are not seen as an attractive consumer type by commercial banks due to their socio-economic characteristics (Tripathi, 2014, p. 1135). Because of their special exposure to natural disasters, rural farmers are assumed to be the main beneficiaries of the desired increasing microfinancial access in times of natural disasters (Rockefeller Foundation & GlobalAgRisk, 2016, p. 28; Hess & Hazell, 2016). Nevertheless, the impact of natural disasters is not limited to rural farmers. For example through price fluctuations the impacts spread to various regions and economic sectors (Hess & Hazell, 2016, p. 7; Representative 1 of the Microfinance Sector, 2017). Therefore, the focus of the paper is not limited to rural farmers just as microfinance incorporates the financial services to low-income households among all economic sectors in rural and urban areas (CGAP, 2017).

The natural disaster criteria from the EM-DAT database are adopted for this paper. An event is classified as a natural disaster, if at least: i) 10 or more people died; ii) 100 or more people are affected/injured/homeless or; iii) a state declares emergency or appeals for international assistance (Hess & Hazell, 2016, p. 9).

Research Design

This paper provides an applied research. Hence, it does not contain a classical theoretical chapter. The main analysis will be conducted in chapter four. The risk pooling concept that GlobalAgRisk[2] intends to implement in 2018 will be evaluated here.

Previously, in chapter two and three the context will be illustrated that the concept should be placed into. Chapter two outlines how microfinancial access can ensure the natural disaster resiliency of low-income households and why microfinancial actors need access to external financial resources to provide these services.

Chapter three introduces index-based natural disaster risk pooling among microfinancial actors as an approach to enhance their access to financial resources in times of natural disasters and hence, to support the provision of the required microfinancial services to low-income households.

Chapter four starts illustrating the goal, objective and targets of the index-based natural disaster risk pooling concept among microfinancial actors that GlobalAgRisk intends to implement. Hereafter, certain ex-ante evaluation criteria will be established that the concept needs to fulfil in order to achieve the desired aims. Afterwards, the concept's design will be displayed, followed by an application of the formulated criteria reaching the result that the concept is suited to achieve the desired aims with reservations.

Chapter five portrays which potential improvements are required to increase the concept's likelihood to achieve its aims and what circumstances the implementation of these potential improvements constrain.

Finally, chapter six concludes the thesis.

2 GlobalAgRisk describes itself as “a U.S.-based research and development Company with linkages to the University of Kentucky. The firm focuses on innovations in financial disaster risk management solutions for lower income countries. The research of GlobalAgRisk is solely supported via public funds from charitable foundations and donor development banks. A major motivation for its work is to improve access to markets for the working poor” (Skees, 2013).

2 Limited Natural Disaster Resiliency due to Limited Access to Microfinancial Services

2.1 Importance of access to microfinancial services for natural disaster resiliency

The majority of natural disasters are spread among the different world regions in the global South. Out of the more than 7,000 natural disasters mentioned above 1,145 natural disasters occurred in Africa. They affected 308 million people and caused damages of USD 17 billion. Droughts are responsible for 80 % of the affected people. The 2,977 natural disasters in Asia affected 3.8 billion people and led to damages around USD 1.1 trillion. Earthquakes account for almost half of the damage and floods affected the most people. In Latin America and the Carribean, 1,268 natural disasters affected 146 million people and caused USD 158 billion damage. Drought was the most important disaster-type regarding the number of affected people and storms regarding the monetary damage (Hess & Hazell, 2016, p. 9). Furthermore, climate change is expected to continue worsening the severity and frequency of natural disasters in the future (World Bank, 2017, p. 12).

The worlds poorest suffer the most and recover the slowest from natural disasters (Carter et. al, 2007, p. 836). Additionally, they are more and more located in natural disaster exposed areas. Trying to cope with the situation they are forced to take actions that have negative consequences in the short and long term. To survive they work longer hours if possible, sell assets at low values, take their children out of school and put them in work, reduce their nutrition intake and many other actions (Rockefeller Foundation & GlobalAgRisk, 2016, p. 5; IFAD, 2016, p. 154). These actions raise the danger to be caught in permanent poverty over generations. (Barnett et al., 2008, p. 1768; Becchetti and Castriota 2011, p. 898). The pressure that borrowers only can get new credit, if they have repaid the previous credit timely, adds to the likelihood of taking these destructive actions (Rockefeller Foundation & GlobalAgRisk, 2016, p. 8).

Financial access helps to turn the outlined destructive activities into productive activities which open the chance to escape the poverty trap (Tripathi, 2014, p. 1146). Vision Fund International tested the effects of recovery lending with an internationally funded program of about USD 2.1 million after the occurrence of typhoon Haiyan in 2013 in the Philippines. Around one-third of the borrowers requested an extension of the existing loan and another one-third applied for new credit. 20 months after granting the loans, a survey among 3,000 re-

covery loan recipients illustrated a positive impact of the program. 96 % of the interviewees restored their livelihoods. More than half of them restored their livelihood fully or better. 92 % reported an income increase and 79 % were convinced that the recovery would have been more challenging without the loan. Additionally to the positive effects to the clients, the MFI profited from the recovery lending program itself. The expanded lending activities after the typhoon prevented existing loans from defaulting. The repayment rate of the recovery loans amounted 99 %. Moreover, the profits resulting from the 120 % growth of the MFI's portfolio could be used to offset the higher operational costs due to the recovery lending program partly (Rockefeller Foundation & GlobalAgRisk, 2016, p. 21; Asian Development Bank & Vision Fund International, 2016).

2.2 Current microfinancial inability to serve the demand in times of natural disasters

2.2.1 Microcredit restrictions in times of natural disasters

The evolution of microfinance has proven the sustainable possibility of banking the previously unbanked. For example the concept of joint liability of the borrowers led to high repayment rates of their loans without the necessity of intensive monitoring (Sengupta & Aubuchon, 2008). Also exchange rate and interest rate risks have been reduced by the use of derivatives (Rockefeller Foundation & GlobalAgRisk, 2016, p. 5).

Despite the global expansion of microfinance, 73 percent of the global poor were still unbanked in 2015 (IFAD, 2016, p. 253). In particular, the demand of rural farmers is still met insufficiently (Hess & Hazell, 2016, p. 11; Skees & Barnett, 2006, p. 4 ff.). Unfortunately, especially the economic success of the rural farmers is dependent on the occurrence of natural disasters (Shi & Kasperson, 2015). Farmers developed various strategies to cope with risks. Typical examples are growing a variety of crops, cultivating pieces of lands in different areas of their location or using staggered planting dates plus earning additional income through non-farming activities. Besides the strategies of individual households, whole communities help each other in times of need (Hess & Hazell, 2016, p. 7).

Yet, this traditional risk management fails when many farmers in the same region are affected at the same time which is the case when natural disasters happen (Hess & Hazell, 2016, p. 7). Trying to maintain their livelihood, farmers undertake the outlined negative actions which pro-

voke and are at once exacerbated by fluctuations in e.g. livestock and crop prices. As the incomes of farmers fall the demand for the services of other local enterprises will be reduced simultaneously. A broadly defaulting on credits might be the consequence (Hess & Hazell, 2016, p. 7; Collier, 2015). As an example, Becchetti and Castriota identified an 18 % credit default rate analysing the performance of 767 credits after the 2004 Indian Ocean tsunami that were granted by the Sri Lankan MFI Agro Micro Finance (Becchetti & Castriota, 2011, pp. 899 f.). Furthermore, Dowla detected a high correlation between the repayment rate of credits granted by MFIs and crop production, in spite of MFIs' attempts to limit their agricultural involvement (Dowla, 2009, pp. 10 ff.).

If lenders do not access external financial resources, scarcities in the local credit markets are most likely. Regrettably, acquiring external resources is challenging for MFIs. Lending to the poor and to agricultural customers MFIs are hampered by an information problem regarding the client's creditworthiness. The information that can be transferred to external financial sources is less quantitative in comparison to more developed financial markets what reduces the MFIs' success potential (Rockefeller Foundation & GlobalAgRisk, 2016, p. 7 f.; Hess & Hazell, 2016, p. 7). Instead, a net financial outflow out of the local communities in times of natural disasters is observed (Huttly, 2017).

Without the access to external financial resources, a widespread defaulting on credits impairs the MFIs' balance sheets. A widespread defaulting on credits in one region most probably implies a widespread defaulting on credits for one MFI, since MFIs commonly are not well diversified (Rockefeller Foundation & GlobalAgRisk, 2016, pp 11 ff.; Skees & Barnett, 2006, p. 5; Macharia, 2017). If many credits have to be written off, the MFI's equity and accordingly its capital ratio shrink. The capital ratio is a key indicator of a MFI's solvency and subject to financial supervision. The sensitivity of the capital ratio to credit defaults can be illustrated with an example. If the MFI targets an capital ratio of 10 % and owns USD 1 million as capital, it can grant USD 10 million credits. Thus, a 10 % defaulting on credits reduces the equity to zero and might cause the MFI's insolvency (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 12 f.). The samples of eight financial institutions that were liquidated in Kenya between 1986 and 1989 and six financial institutions that were liquidated in Senegal between 1988 and 1991 proof that this danger exists not only in theory (Collier, 2014, p. 5).

Out of prudence, MFIs usually operate with comparatively high capital ratios. Bearing high risks in the credit portfolio and insecure access to external capital during a crisis are seen as the main drivers for high capital ratios. The resulting cost disadvantages can be explained with figures from the example. A commercial bank with a typical capital ratio of 10 % can make business from lending USD 10 million. The capital ratio that lenders reported to the microfinancial platform MIX Market in 2014 averages 38 %. Hence, only USD 2.6 million credits can be granted in this case (Rockefeller Foundation & GlobalAgRisk, 2016, p. 13).

Collier (2015) analysed the lending behaviour of MFIs in times of natural disasters and used the MFI's capital ratio constraints as the main explanation for the restricted lending he observed at these times. He based his analysis on the data of 500 MFIs in 58 developing countries that reported to Mix Market. He identified a usual MFIs' loan growth of 24 % annually. Natural disasters reduced this growth on average by 11 percentage points in the current year and 8 percentage points in the following year. Collier found that MFIs with low capital ratios reduced their lending activities much heavier and the lending activities of MFIs with high capital ratios were not affected by a natural disaster (Collier, 2015; Rockefeller Foundation & GlobalAgRisk, 2016, p. 12 f.).

A recent investigation of Babich and Collier evaluated the data of 929 financial institutions in 78 low and middle income countries incorporating 18 years. The study concluded that the most severe disasters reduce the annual credit growth by 30 percent on average. This study affirmed the relatively higher lending constraints conducted by low capital ratio institutions. This type of lenders reduced its annual credit growth by 81 percent. However, in countries with a comparatively low insurance penetration even high capital lenders lowered their lending activities in times of natural disasters. Babich and Collier see the cause in a remotely perceived creditworthiness when borrowers lack protection from insurance (Rockefeller Foundation & GlobalAgRisk, 2016, p. 15).

2.2.2 Low microinsurance protection in times of natural disasters

The positive impact of a borrowers insurance protection on its access to credit in times of natural disasters demonstrates the importance of microinsurance to the poor (Rockefeller Foundation & GlobalAgRisk, 2016, p. 15). The risen perceived creditworthiness mirrors the increased

resiliency to shocks that the consumption smoothing function of insurance generates (Morduch, 1995). Instead of being forced to undertake the negative actions that natural disasters might cause as outlined above, a study in Zambia between 2013 and 2016 showed how farmers that were covered by microinsurance were able to continue their productive actions. In spite of being affected by a drought, the farmers were in a position to sustain their consumption, invest in assets and future farming inputs and settle outstanding credits. A comparison of the credit repayment rates with uninsured farmers in the same regions underlines the enhanced natural disaster resiliency of the insured farmers, as figure 1 visualises (Hess & Hazell, 2016, p. 33).

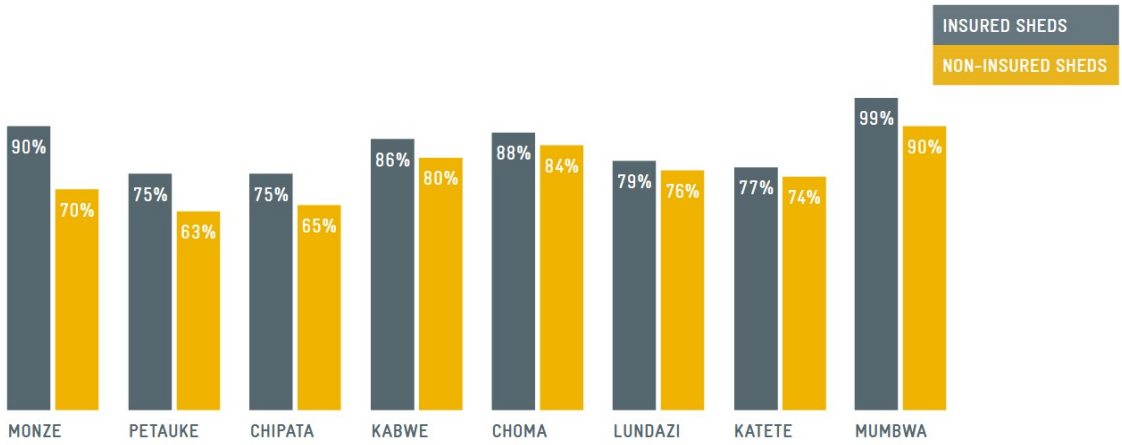

Figure 1: Credit repayment rate for insured and non-insured sheds in a Zambian study (Source: (Hess & Hazell, 2016, p. 33)

Microinsurances already exist in many countries to protect low income households. E.g. weather-index-based microinsurance aims at stabilising the economic success of the farmers (Hess & Hazell, 2016, p. 13). Due to the high dependence of their economic success from weather events, deriving the insurance payout from an index is reasonable (Skees & Barnett, 2006). Index-based microinsurance is not limited to weather events because e.g. seismic events are indexable, either (Dowla, 2009, p. 27 and Ndirangu, 2017).

One crucial advantage of index-based insurance is the reduction of transaction costs that is key in microfinance (Kelly, 2016). Because the effort of the insurance taker has no impact on the payout, there is no moral hazard problem (Skees & Barnett, 2006, p. 9). Moral hazard is a prevalent insurance problem, because insurances that derive the payout from the actual loss of the insurance taker incentivise him to behave in a riskier way which rises the probability of the insured event (Kelly, 2016). In contrast, without the moral hazard problem monitoring be-

comes inconsiderable which reduces the transaction costs (Skees & Barnett, 2006, p. 9). Transaction costs are further reduced, as individual loss assessments will not be necessary (Hess & Hazell, 2016, p. 13). The disadvantage of deriving the payout from an index is the basis risk. For example it is possible for the farmer to receive a payout even though his personal harvest is unaffected as well as to receive no payout in a time where bad weather has destroyed his harvest. (Skees & Barnett, 2006, p. 9; Hess & Hazell, 2016, p. 31).

The importance of index-based microinsurance will rise further, as climate change increases the occurrence of natural disasters (Dowla, 2009, p. 13; Hess & Hazell, 2016, p. 34). Many microfinancial actors have field-tested this type of products supported by the World Bank and other donor agencies and tried to implement them on scale during the last decade (Kelly, 2016; Dowla, 2009, p. 27). However, weather-index-based microinsurance did not reach scale except in countries like China and India where they have been heavily subsidised (Representative 1 of the Microfinance Sector, 2017; Macharia 2017; Representative 1 of the Insurance Sector, 2017; Wilhelm, 2017; Representative of a Finance Think Tank, 2017; Ndirangu, 2017; Hess & Hazell, 2016, pp. 16 f., 25 and 41; Kuhn, 2017; Agrics, 2017). Nevertheless, even in India, only 5 % of the farmers took it up where available (Kelly, 2016). The most frequently mentioned reason for this low penetration is the high costs. Further reasons are seen in the limited understanding and appraisal by the potential insurance takers and mistrust based on past claim disagreements (Representative 1 of the Microfinance Sector, 2017; Representative 1 of the Insurance Sector, 2017; Macharia, 2017; Wilhelm, 2017; Representative of a Finance Think Tank, 2017; Kelly, 2016; Hess & Hazell, 2016, p. 25)

3 Index-based Natural Disaster Risk Pooling to Enhance Financial Access

To reduce the costs of microfinancial services that help low-income households in times of natural disasters innovations regarding the transaction costs have been made – e.g. joint liability in microcredit and index-based products in microinsurance (Sengupta & Aubuchon, 2008; Skees & Barnett, 2006, p. 9; Kelly, 2016). Managing the risks is another essential price component (Skees & Barnett, 2006; Skees, 2007; Rockefeller Foundation & GlobalAgRisk, 2016, pp. 71 f.). In the single regions the natural disaster risks are high unsystemic risks because of the widespread damage they cause and thus cannot be mitigated inside a region (Hess & Hazell,

2016, p. 7; Skees & Barnett, 2006, pp. 2 f.; Liebwein, 2009. pp. 15 and 36; ESRB, 2015, p. 7). Therefore, MFIs and microinsurers cannot manage natural disaster risks themselves unless they operate in many world regions. Yet, the majority of MFIs and microinsurers operate only locally (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 7 ff.; Representative 1 of the Insurance Sector, 2017; Representative of a Finance Think Tank, 2017). One way of self-handling the risks would be the building of reserves in disaster-free times. But this would cause high opportunity costs as explained above. Plus the reserves might not be sufficient to cover the enormous damage natural disasters provoke (Skees & Barnett, 2006, pp. 7 f.).

For a successful risk pooling across the different world regions it is a prerequisite that the natural disasters do not happen in many regions at the same time (Representative of a Climate Think Tank, 2017; Skees & Barnett, 2006, p. 5; Liebwein, 2009, p. 50; ESRB, 2015, p. 7). The risk pooling experience on the sovereign level confirmed the existence of this prerequisite. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) exists since 2007 and currently consists of 15 countries. The African Risk Capacity (ARC) related data starts in 2014. Nowadays 6 countries participate in ARC. The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) insures 5 countries since 2011 (World Bank, 2017, pp. 74 f.).

Figure 2 shows the annual aggregated insurance payouts in relation to the annual aggregated insurance premium volume for each of the three risk pools. The correlation of the natural disaster events between the three risk pools that can be derived from this data is low. For example in 2014/15 the participating countries of ARC and PCRAFI received high payouts and the participating countries of CCRIF received low payouts. And when the CCRIF payouts where high in 2016/17 there were no payouts in the other two risk pools. There was no single year where all risk pools had high payouts. Only between ARC and PCRAFI a higher correlation is observable. In 2014/15 the participating countries of both risk pools received high payouts which decreased in the two following years.

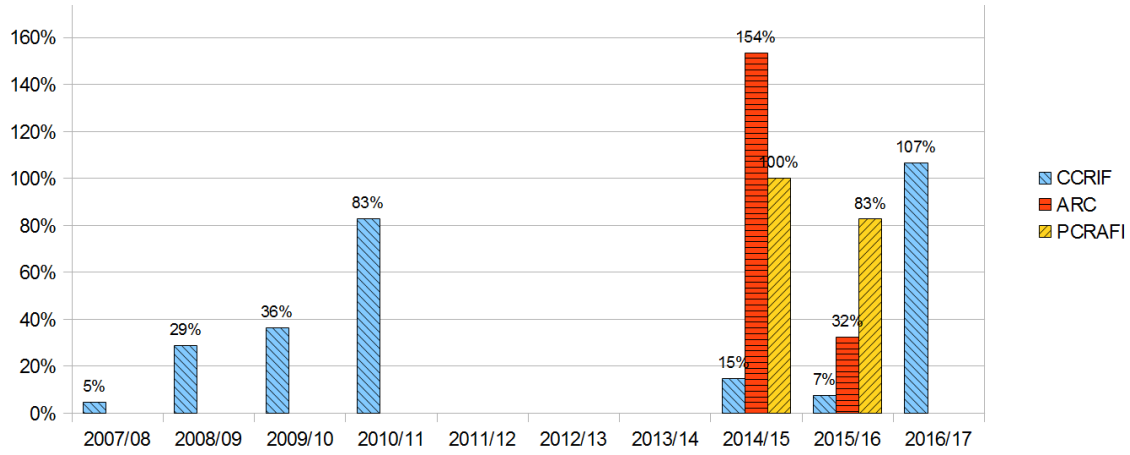

Figure 2: Relative insurance payouts in sovereign catastrophe risk pools (Source: Own illustration based on World Bank, 2017, pp. 74 ff.)

In addition, Skees (2007, p. 4) investigated the distribution of natural disasters within a year using the El Niño floods. Between January and March, the risk is high in Peru and Vietnam might be affected in June and July.

Thanks to the existence of this prerequisite MFIs and microinsurers can profit from pooling natural disaster risks among themselves (Skees & Barnett, 2006, p. 14; Rockefeller Foundation & GlobalAgRisk, 2016, pp. 71 f.; Cook, 2017). The risks of the interregional pools can be reduced by spreading the risks over many regions. This way, the high unsystemic risks for single regions can be mitigated by bearing it collectively (Hess & Hazell, 2016, p. 7; Skees & Barnett, 2006, pp. 17 f.; Berger et al., 1992, p. 256). Shareholders follow the same principle by diversifying their wealth (Kaplan Financial Knowledge Bank, 2012). Figure 3 visualises this benefit from pooling risks.

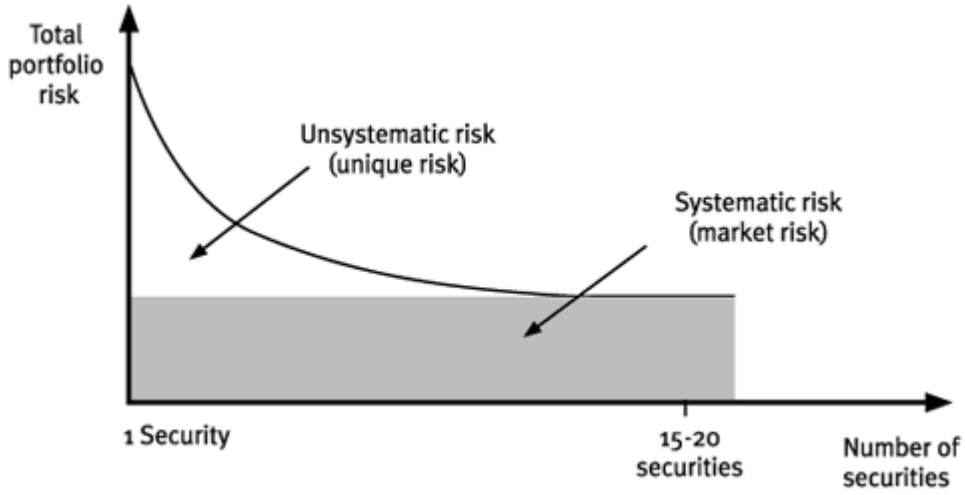

Figure 3: Risk reduction through diversification (Source: Kaplan Financial Knowledge Bank, 2012)

The reason behind the risk reduction is a balancing effect between the different regions of the pool. A natural disaster in region A can be offset by a very successful performance in region B. This way the performance of the pool can be smoothed in comparison to the performance of the single regions as the schematic diagram in Figure 4 illustrates (Kaplan Financial Knowledge Bank, 2012).

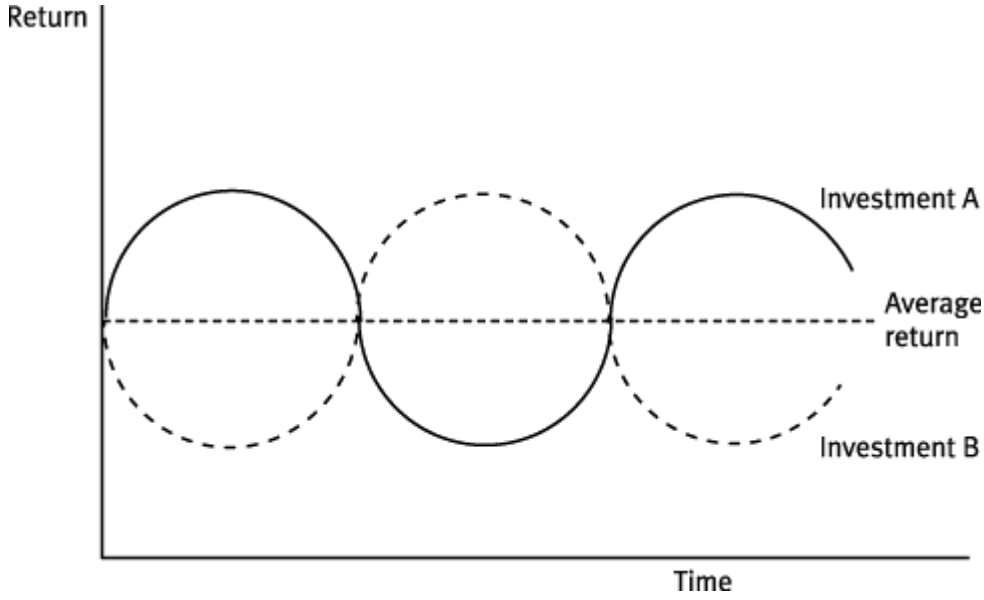

Figure 4: Performance smoothing through diversification (Source: Kaplan Financial Knowledge Bank, 2012)

GlobalAgRisk simulated the benefits from pooling risks between MFIs. The performance of the different MFIs of the Vision Fund International network was examined. Accordingly, a synthetic portfolio of a hypothetical microfinance network was created. This portfolio is 40 % larger then the Vision Fund International network portfolio and has a different geographic profile. In a next step, the common performance was simulated when both portfolios pool their risks. Figure 5 demonstrates the capital that was needed to cover the portfolio losses on an annual basis between 1979 and 2015 for the two portfolios individually and for the pooled portfolio. For the Vision Fund International network USD 20 million was needed to cover the portfolio risk. The synthetic portfolio must have been covered by USD 23 million. To cover both portfolios individually USD 43 million would have been required. For the pooled portfolio only USD 30 million would have been needed. This equals a 31 % reduction. Consequently, both networks could have saved costs by insuring their risks in a pooled way in comparison to insuring their risks individually (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 71 f.).

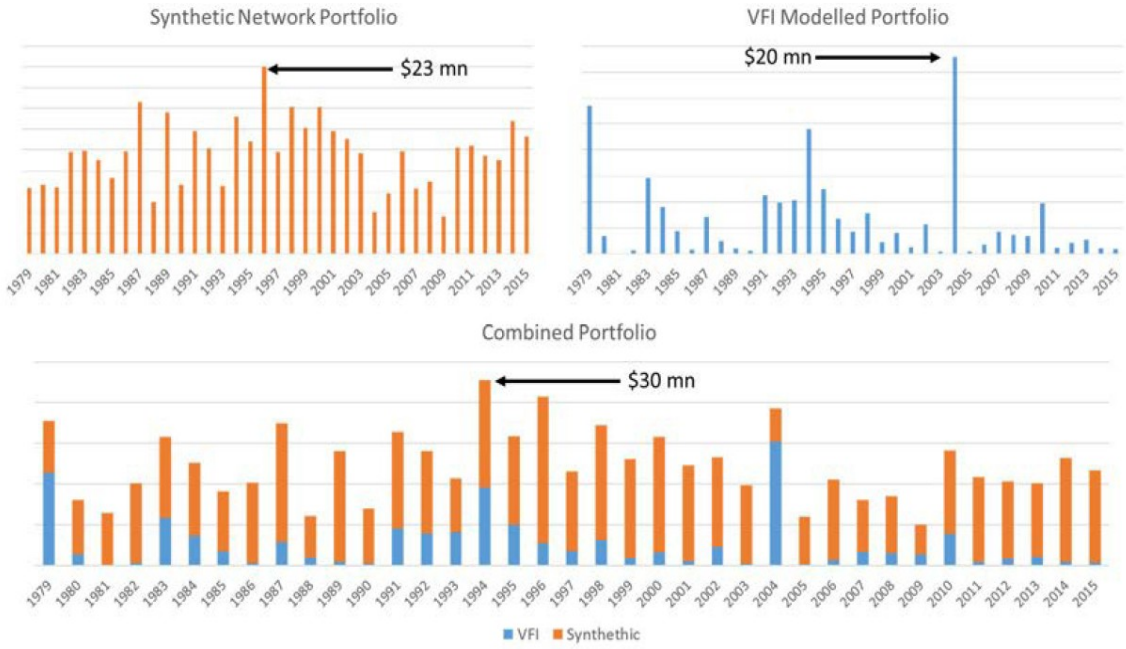

Figure 5: Pooling Risks lowers Risk Funding Needs (Source: Rockefeller Foundation & GlobalAgRisk, 2016, pp. 71 f.)

As index-based microinsurance for end users entails essential advantages index-based risk pools among MFIs and microinsurers seem advisable, as well. For every participating MFI and microinsurer an aggregated index can represent the economic environment of its clients. In order to decide how much risks the participant likes to transfer, the expected impact on the participant of specific natural disasters can be calculated based on historic data (Collier & Skees,

2011, pp. 8 ff.). Again, the moral hazard problem can be zeroed out. This might be an important factor for the potential participants, since they might not always trust the business quality of their counterparts (Representative of a Finance Think Tank, 2017; Representative 1 of the Microfinance Sector, 2017). Moreover, an index-based risk pooling allows for compensation payouts even before the natural disaster related damages materialise. For example measuring the surface temperature of the ocean allows identifying an El Niño disaster months in advance (Skees, 2013). A fast disaster response is key to a quick and complete recovery. (Rockefeller Foundation & GlobalAgRisk, 2016, p. 21; Collier & Skees, 2011; Skees, 2013).

Turning to reinsurers individually are the only existing possibilities for MFIs and microinsurers to transfer their natural disaster risks out of their regions already exist (Skees & Barnett, 2006, pp. 8 ff.). MFIs usually do not make use of these possibilities to transfer their credit risks (Skees & Barnett, 2006, p. 8; Luckja, 2017; Representative 1 of the Microfinance Sector, 2017; Representative 1 of the Insurance Sector, 2017; Huttly, 2017; Representative of a Financial Consultancy, 2017; Representative of a Finance Think Tank, 2017). The premiums that reinsurers charge are often double as high as the expected loss for the reinsurer from taking the risk. The interest rates borrowers need to pay for the credit to the MFIs contain the reinsurance premium. In a calculation example of Skees and Barnett the premium boosts the interest rate from 28 % to 36 %. (Skees & Barnett, 2006, p. 5).

Most MFIs and microinsurers transfer their insurance risks to reinsurers (Representative of a Climate Think Tank, 2017). Reinsurance for natural disasters is costly. If a disaster occurs every five years, the annual reinsurance premium needs to amount 20 % of the disaster's damage plus administration costs and a profit margin. Microinsurance is a comparatively unknown market. These risk uncertainties stir up extra margins (Wrede & Phily, 2016, p. 15; Representative of a Climate Think Tank, 2017). Additionally, the market for reinsurance for agricultural microinsurance might be not perfectly competitive which leads to inefficient price increases (Stole, 2003). For example in Africa Swiss Re reinsures the vast majority of agricultural microinsurance (Representative of a Finance Think Tank, 2017; Representative 1 of the Insurance Sector, 2017). As a potential competitor, Africa Re does not aim at expanding its agricultural portfolio, because it does not assess agricultural insurance as a profitable business (Representative 1 of the Insurance Sector, 2017).

To offer more affordable products to the clients, cost reductions in transferring the risks play an important role. Pooling the insurance risks among the MFIs and microinsurers at first and reinsuring the minimised remaining risks of the total pool externally is expected to save costs (Ndirangu, 2017; Wrede, 2017; Cook, 2017)

4 Ex-ante Evaluation of the GlobalAgRisk Microfinancial Risk Pooling Concept

4.1 Identification of GlobalAgRisk's microfinancial risk pooling concept`s aims

As a precondition to evaluate the concept its aims need to be known. The overall goal of GlobalAgRisk's risk pooling concept is to enhance the natural disaster resiliency of low-and-middle income households (Rockefeller Foundation & GlobalAgRisk, 2016, p. i). As a means to achieve this goal GlobalAgRisk's objective by implementing the concept is to increase the access to microfinancial services in times of natural disasters (Rockefeller Foundation & GlobalAgRisk, 2016, p. i). The objective's realisation should be ensured via two targets. Firstly, the concept should offer a cheap solution to transfer risks in order to overcome the obstacles of utilising the existing risk transfer opportunities that were outlined in chapter three (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 1 and 56). Secondly, the concept should guarantee a reliable access to external financial resources for microfinancial actors in times of natural disasters. In that regard, a fast and sufficient access is seen as a key requirement (Rockefeller Foundation & GlobalAgRisk, 2016, pp. i f. and 56).

4.2 Establishment of evaluation criteria

4.2.1 Attacking of relevant bottlenecks

Attacking the relevant bottlenecks of a problem is fundamental to solve a problem effectively. It is important to confirm, if the cause of a problem that can be observed at the surface is really a relevant cause. Often, easy to identify causes dominate the analysis and deeper causes are paid too little attention to. Therefore, it is important to examine the causal background of a problem that should be solved (Rooney & Vanden Heuvel, 2004; Robinson et al., 2015, p. 140).

4.2.2 Sufficient pool size

For insurance solutions the size of the pool is a typical success determinant. The larger the collective the higher is its risk bearing capacity. Furthermore, implementing new solutions is costly (Wilhelm, 2017). Usually, reinsurers are the actors that implement innovations in insurance. Before a new product can be rolled out, enormous investigations have been made. These costs have to be offset by premiums that exceed the amount that would have been necessary to cover the pure risks. A critical mass of insurance takers needs to participate in order to bear the costs collectively and keep the costs for every single participant at a moderate level. Similarly, the running administration costs can be lowered per participant, if a large collective is ensured (Wrede, 2017; Representative of a Climate Think Tank, 2017). The small number of participating countries in the sovereign catastrophe risk pools accentuate the relevancy of this success determinant for natural disaster insurance solutions (World Bank, 2017, p. 63).

4.2.3 Sufficient diversification

In chapter three the benefits from diversification were addressed. The higher the extent of diversification the more risks can be reduced. In the case of a low level of diversification, one natural disaster would be likely to cause a widespread damage for the pool. This diminishes the risk bearing ability of the pool and increases the dependency on comparatively costly reinsurance. To increase the level of diversification in a natural disaster risk pool, the participants should originate from different world regions and preferably are exposed to different natural disaster types (Representative of a Climate Think Tank, 2017; Rockefeller Foundation & GlobalAgRisk, 2016, pp. 27 ff.).

4.2.4 Accurate underlying index

To reduce the basis risk the index should coincide with the actual damage. If the basis risk cannot be marginalised, participants might get frustrated and withdraw from the concept. Further mechanisms that determine the payouts besides the index can avoid the consequences from too high basis risks, but these alternatives alleviate the advantages index-

based solutions imply. Thus, the first-best solution is to model an accurate underlying index (Rockefeller Foundation & GlobalAgRisk, 2016, p. 26; Representative of a Climate Think Tank, 2017; Representative 2 of the Insurance Sector, 2017).

4.2.5 Sufficient payout size

The payouts a concept's participant receives when hit by a natural disaster support the participant's survivability and on this ground its ability to provide microfinancial services as demonstrated in chapter two. Consequently, if the payout is too low, the desired outcome cannot be obtained. Thence, a sufficient payout size needs to be available for every participant that offsets the capital erosion the most severe natural disasters might provoke (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 9 ff.). The illustrated impact that climate change is anticipated to have on the future natural disaster severity highlights the relevance of the payout size' sufficiency (World Bank, 2017, pp. 11 ff.; Dowla, 2009, pp. 10 ff.).

4.2.6 Regulatory accepted payouts

As indicated in chapter two the capital-ratio of a MFI is subject to financial supervision. If the capital-ratio is depleted which is most likely when affected by a natural disaster the regulatory authorities are expected to be concerned about the restoration of this ratio. Receiving a credit payout lowers the capital-ratio further as it adds to the MFIs liabilities. As a result, the accumulation of debt in times of a natural disaster might be prohibited by the regulatory authorities (Wrede, 2017; Rockefeller Foundation & GlobalAgRisk, 2016, p. 60). This reveals the requisiteness of capital payouts in these situations. Accordingly, the concept is obliged to assure the access to financial resources that the regulatory authorities classify as regulatory capital (Rockefeller Foundation & GlobalAgRisk, 2016, p. 82).

4.2.7 Exploitation of the pool's risk bearing ability

The cost advantages from pooling risks originate from the opportunity to diminish the funds that are necessary to cover the risks, as illustrated in chapter three. This allows a reduction of

externally needed reinsurance and thus, costs can be saved (Cook, 2017; Rockefeller Foundation & GlobalAgRisk, 2016, pp. 71 ff.). Therefore, to cover the payouts to the participants when affected by a natural disaster, first, the resources of the pool should be entirely exploited and external reinsurance should only be used for the required resources that exceed the pool's capacity (Representative of a Climate Think Tank, 2017).

4.2.8 Narrowed profit extraction

Profit margins can heighten insurance premiums (Representative of a Climate Think Tank, 2017). In perfect competition the producers are price takers and make zero profits. This leads to the highest possible consumer surplus. Yet, if there are only one or a few producers, they can set the prices at a higher level and gain from profits. Accordingly, the consumer surplus declines (Frank, 2008, pp. 333 ff., 371 ff. and 413 ff.). Chapter three depicted the limited number of competitors in agricultural reinsurance and observed reinsurance premiums that considerably surmount the level that would be necessary to cover the transferred risks. This context points out the importance that the risk pool will be established in a way that does not jeopardise the benefits from pooling risks for the participants by paying exaggerated contributions.

4.2.9 Minimal licence acquisitions

Insurance is a heavily regulated business (Wilhelm, 2017). If insurances or insurance-like products are offered to local institutions, the insurers often are required to acquire the licences to operate as an insurer in the single countries (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.). The acquisition of insurance licences takes time and can be a cost factor. Thus, the concept should preferably be designed in a way that avoids the obligation of acquiring numerous licences (Wrede, 2017).

4.3 Exposition of GlobalAgRisk`s microfinancial risk pooling concept`s design

GlobalAgRisk is developing a concept in collaboration with BlueOrchard and Vision Fund International to pool the natural disaster related credit risks between MFIs on a global scale. In September 2016, GlobalAgRisk published a detailed description of what have been developed so far (Rockefeller Foundation & GlobalAgRisk, 2016).

To connect natural disaster severities with the resulting risks for the single MFIs the concept modelled the impact of changes in certain indicator's values on the expected portfolio loss for the single MFIs based on historic data. The indicators *wind* to recognise a storm, *rainfall* to identify a flood and *soil moisture* to detect a drought have been considered. How intensely a borrower is affected by a given disaster severity depends on the region. Consequently, the concept divides a MFI's area of operation into many administrative units. On the back of this, the time during the year of the natural disaster's occurrence matters. For instance, the type of crops that farmers cultivate vary interregional as well as the decisive weeks for a crop to grow successfully (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 32 ff.). Thereupon, the weighted portfolio of a MFI across the administrative units needs to be considered. On this basis, the probability of a disaster's severity and frequency can be used to derive the contributions and payouts a MFI receives and is obligated to in order to transfer a particular extent of natural disaster risks (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 36 ff.). In addition to deriving the payouts based on the indexes, GlobalAgRisk recommends establishing a committee that can decide payout adjustments for cases high basis risks materialise (Rockefeller Foundation & GlobalAgRisk, 2016, p. 60).

Vision Fund International and BlueOrchard are potential users of the concept. Vision Fund International manages a microfinance network and BlueOrchard is a microfinance investor (Rockefeller Foundation & GlobalAgRisk, 2016, p. i). Vision Fund International owns or co-owns most of the network's MFIs and has management control over every MFI (Rockefeller Foundation & GlobalAgRisk, 2016, p. i;). The linkages between a microfinance investor and the MFIs are less intense (Rockefeller Foundation & GlobalAgRisk, 2016, p. i).

GlobalAgRisk designed the concept based on a detailed analysis of the Vision Fund International microfinance network. As a key institution for the disaster risk management the microfinance network manager, Vision Fund International in this case, launches and maintains a disaster recovery fund (DRF) (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 57 ff.). In the case of a microfinance investor a fund equivalent to the DRF will be established by the microfinance investor (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 65 ff.). The DRF receives the contributions of the network's MFIs and allocates the payouts to the MFIs. The payouts consist of two elements. The majority of the payout is made up by a credit payout. Its purpose is to enable the MFI meeting the risen demand for credit in times of natural disasters. The second part of the payout is named capital payout (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 57 ff.). This capital is assigned to be classified as equity by the respective regulatory authorities[3] in order to restore the narrowed MFI's capital ratio (Rockefeller Foundation & GlobalAgRisk, 2016, p. 82).

3 In Kenya, for example, the MFI-regulating authority is the central bank (Central Bank of Kenya, 2017)

The conditions for both forms of payouts will be fixed in advance of potential disasters between the MFIs and the DRF as well as between the DRF and global financial actors (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 27 ff.). Covering a part of the credit payout the DRF sets up own capital reserves. For the exceeding amount of credit payouts to the MFIs the DRF makes a contract on contingent credit with external credit providers. In times of natural disasters, it is typically difficult for MFIs to receive additional credits. To cover the capital payouts to the MFIs the DRF acts as an intermediary between the MFIs and an external insurance-like institution. GlobalAgRisk proposes to use Global Parametrics[4] as this insurance-like institution. Figure 6 and 7 exemplify the mode of functioning of GlobalAgRisk's Financial Disaster Risk Management (FDRM) (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 57 ff.).

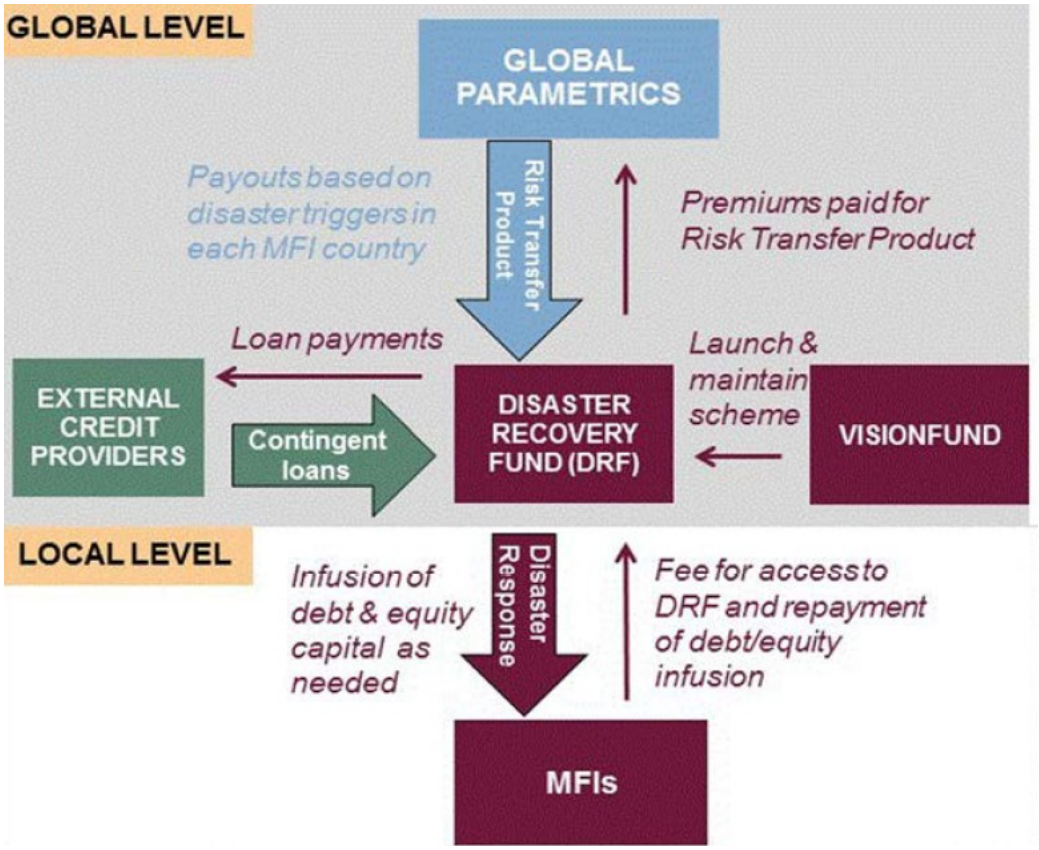

Figure 6: FDRM design for a microfinance network (Source: Rockefeller Foundation & GlobalAgRisk, 2016, p. 58)

4 Global Parametrics is a newly established for-profit company to pool natural disaster risks by providing the capital payouts (Rockefeller Foundation & GlobalAgRisk, 2016). It is sponsored by GlobalAgRisk's president Jerry Skees (Artemis, 2016; Skees, 2013).

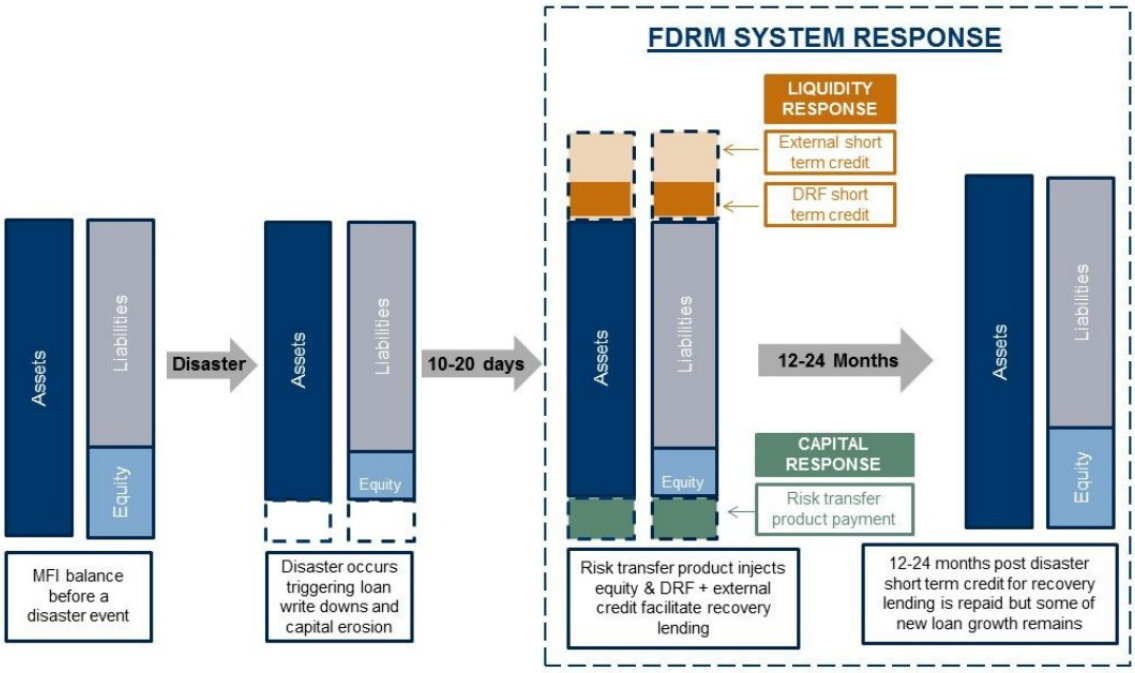

Figure 7: FDRM implications on MFIs' balance sheets (Source: Rockefeller Foundation & GlobalAgRisk, 2016, p. 57)

Analysing the situation of the Vision Fund International microfinance network GlobalAgRisk modelled a prototype for the FDRM. In this prototype the DRF covers 15 % of the credit payout with its own reserves and 85 % arises from external credit providers. The capital needs of a single MFI will directly trigger a payout from Global Parametrics that the DRF passes on to the MFI. The MFI will receive a credit payout, if the disaster has a 1-in-7 years or higher severity on the country level. The capital payout will be triggered by a minimum severity of 1-in-10 years. Keeping the amount of capital payouts as low as possible the FDRM costs can be minimised. The credit payout a MFI receives is limited to 15 % of its credit portfolio and the maximum capital payout amounts 5 % of the MFI's credit portfolio. For the concept's usage by a microfinance investor, like BlueOrchard, GlobalAgRisk proposed a solely provision of credit to the MFIs. However, if the MFIs suffer from capital constraints, GlobalAgRisk advocates the consideration of capital injections, either (Rockefeller Foundation & GlobalAgRisk, 2016, p. 57 ff.).

In order to gain access to the FDRM payouts the MFIs are required to pay regular access fees. Under the modelled prototype conditions the average MFIs contributions aggregate 1.10 % - 1.25 % of its credit portfolio annually (Rockefeller Foundation & GlobalAgRisk, 2016, p. 63). Deriving the MFIs' individual contribution obligations individual risk assessments play an import-

ant role. MFIs operating in a relatively risky region are obliged to pay higher access fees than MFIs that operate in safer regions for the same extent of potential payouts. This handling ensures that safe MFIs do not cross-subsidise risky MFIs (Huttly, 2017).

On the global level the DRF will agree on contracts with the external credit providers and Global Parametrics. The contingent credit contract is a widespread tool in global financial market and most likely not subject to regulatory control. Avoiding regulatory control is important to save costs. Global Parametrics intends to sell the risk transfer product as an insurance-like derivative. This probably provokes Global Parametrics' obligation to acquire an insurance licence. The DRF as a user of the derivative most probably will not be controlled by regulatory authorities (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.).

On the local level the situation will be more complicated. The several jurisdictions of the countries the MFIs operate in need to be considered and they tend to differ from each other. In addition, the MFIs of the Vision Fund International microfinance network have various legal forms and ownership structures. The contingent credit contracts between the DRF and its MFIs will far from likely be subject to regulation. Contracting the capital provision as a derivative could force the DRF to obtain insurance licenses in the several countries. Therefore, the capital payouts have to be designed differently in order to get around regulatory control. Yet, they need to be classified as a form of capital that can increase the MFIs' capital-ratio, if the MFIs are regulated. For MFIs that are companies, GlobalAgRisk suggests the DRF to buy shares of the MFIs as a way of capital infusion. For non-company MFIs payouts in the form of unsecured subordinated debt are seen as a straightforward solution. However, it is not clear with how many of the countries' legal frameworks this handling will comply (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.).

4.4 Application of the evaluation criteria

4.4.1 Attacking of relevant bottlenecks

At first, the causality between the concept's goal, objective and targets will be examined. As outlined in chapter two access to microfinancial services can help the affected poor to better

cope with natural disasters. Investigations observed that their destructive actions could have been avoided through the provision of microfinancial services. Thus, the dependency of the goal on the objective can be confirmed. Chapter 3 identified the lack of a cheap solution for microfinancial actors to transfer their risks as the main explanation for the low usage of these opportunities. Furthermore, the utilisation of transferring risks enables the microfinancial actors to provide their services. Hence, the first target appears relevant. Chapter two depicted a microfinancial access immediately after the occurrence of a natural disaster as a driver for a fast and exhaustive restoration from the natural disaster caused damages. In addition, the MFI's access to sufficient external financial resources needs to be ensured in order to counteract the widespread credit defaults and to be capable enough to restore the MFI's capital-ratio. Accordingly, the pursuit of reasonable targets can be affirmed.

Secondly, it will be explored whether the concept's approach is appropriate to achieve the targets. The investigations that have been portrayed in chapter three demonstrated the cost advantages from pooling risks among the microfinancial actors. Because the existing opportunities to transfer risks do not comprise a pooling of risks among these institutions, GlobalAgRisk's concept can be appraised as a promising innovation to fill this gap. Moreover, the usage of indexes to determine the payouts and ensuring the availability of financial resources in advance contributes to fast and sufficient financial responses.

However, the concept exclusively focuses on pooling natural disaster related credit risks. Chapter three pointed out that the penetration of microinsurance suffers from a lack of cost-efficient risk transfer solutions, either. In addition, the positive impact of microinsurance on the repayment rates in microcredit has been pointed out. Consequently, the absence of microinsurance can be seen as a deeper root for the challenges microlenders face in times of natural disasters. As a result, limiting the concept on microcredit neglects a relevant bottleneck and prevents the concept to unfold its potential to achieve its targets.

4.4.2 Sufficient pool size

The establishment of a sufficient size depends besides the design of the concept itself on e.g. how it is marketed. It will be key to increase the awareness of possible participants about the

concept's benefits (Hess & Hazell, 2016, p. 22). Focusing on the design of the concept itself it can be affirmed that it is tailored to a global roll-out. For example the open-access platform “Morrigu” that has been used to model the impact of natural disasters on the MFI's portfolios comprises global data (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 37 ff.). Additionally, the concept aims at complying with the heterogeneous ownership situations and legal forms of the potential participants as well as the various legal frameworks of the different countries (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.). The previous investigations to design the concept have been sponsored by e.g. the Rockefeller Foundation, UK's Department for International Development and the Kreditanstalt für Wiederaufbau (Rockefeller Foundation & GlobalAgRisk, 2016; Global Paramterics, 2017). This facilitates future participant's contributions that do not entail the pre-implementation costs and thus, makes the participation easier to afford. Several beneficial concept's features support the achievement of a sufficient pool size. As previously described, participants can benefit from the cost advantages from pooling risks and expand their business in times of natural disasters which already made positive recovery lending experiences tested. Moreover, the pool's size can be supported, if microfinancial investors make a participation in the global risk pool a condition for general capital access (Representative of a Finance Think Tank, 2017).

Nevertheless, the concept modelled only the effects of drought, wind and rainfall to derive the payouts. This investigation considers the majority of the in 2.1 highlighted natural disasters. However, significant natural disasters cannot be captured by this approach. As outlined in 2.1 in Asia almost half of the natural disaster related damage is caused by earthquakes. To measure flood in Bangladesh, water levels are common indicators (Hess & Hazell, 2016, p. 48). The rainfall index might not be accurate because many floods in Bangladesh are caused by rainfalls in India (Upali, 2008, p. 391). In chapter three measuring the ocean surface temperature has been introduced as a convenient indicator. These are examples that illustrate high basis risks for certain world regions and potentially discourage microfinancial actors from participating in the concept and thus, limit the potential size of the risk pool, if the concept will be implemented only considering the already modelled indicators. Moreover, the limitation on microcredit as portrayed in the previous sub-chapter further restricts the concept's potential size.

4.4.3 Sufficient diversification

The concept's prototype that is modelled based on an analysis of Vision Fund International's portfolio incorporates the 11 countries Ecuador, Honduras, Cambodia, Myanmar, Philippines, Sri Lanka, Kenya, Malawi, Tanzania, Uganda and Zambia (Rockefeller Foundation & GlobalAgRisk, 2016, p. 62). In contrast, only the three countries Ecuador, Cambodia and Sri Lanka are among the top ten countries where a microfinance fund of BlueOrchard is invested in (BlueOrchard, 2017). This comparison demonstrates a certain level of diversification already among the first two potential clients of Global Parametrics.

As described in the previous sub-chapter the concept is designed to consist of participants from the different world regions. Figure 8 shows the regional distribution of microfinancial actors among the world regions. The distribution is relatively balanced between the world regions. As the concept's pool might grow in size this distribution demonstrates the potential for a well diversified risk pool among the different world regions.

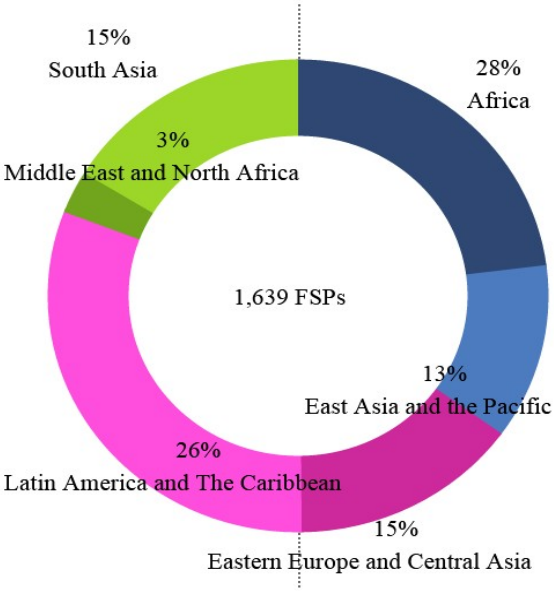

Figure 8: Regional distribution of Financial Service Providers (FSPs) (Source: MIX Market, 2017)

However, like in the previous sub-chapter the limited incorporation of underlying indicators can be assessed as a constraint. A limited consideration of indicators implies a limited consideration of disaster types which narrows the concept's diversification (Rockefeller Foundation & GlobalAgRisk, 2016, p. 28; Representative of a Climate Think Tank, 2017).

Similarly, as the exclusive focus of the concept on microcredit restricts the concepts expansion it can restrict the concept's diversification, as well. In particular, the regions in that microinsurance is comparatively widespread in will be less represented in the pool's portfolio, if the concept solely comprises credit risks.

4.4.4 Accurate underlying index

To ensure an accurate underlying index GlobalAgRisk' concept incorporates several innovations. For the first time a relation between weather data and the MFIs' credit portfolio impact has been modelled (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 32 ff.). Because the harvesting conditions can vary enormously within kilometres, the area that e.g. one weather station covers should not be too large. For this purpose the platform “Morrigu” contains data of compartmentalised units on a global scale. One further innovation has been made regarding the drought index. GlobalAgRisk introduced soil moisture as a comparatively unfailing indicator (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 45 ff.).

However, as outlined in 4.4.2 the consideration of underlying indicators at the current stage is too narrow to take all relevant natural disaster risk types into account. Therefore, the basis risk remains at an undesired high level for potential participants that operate in regions that are especially exposed to the not yet modelled disaster risk types.

4.4.5 Sufficient payout size

For risks that exceed the risk bearing capital of a DRF or Global Parametrics a further risk transfer to external credit providers and reinsurers should ensure a sufficient payout size (Rockefeller Foundation & GlobalAgRisk, 2016, p. 6; Huttly, 2017). In order to reduce the access fee the MFIs have to pay, the credit and capital payouts have been limited (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 57 ff.). These limits jeopardise a sufficient payout size for the most severe disasters. The capital payouts are essential to restore the MFI's capital-ratio (Rockefeller Foundation & GlobalAgRisk, 2016, p. 56). In the light of the 18 % credit default rate that Becchetti and Castriota observed after the 2004 Indian Ocean tsunami the limitation of the capital payout to 5 % of the MFI's credit portfolio appears to be insufficient (Becchetti & Castriota,

2011; Rockefeller Foundation & GlobalAgRisk, 2016, pp. 18 and 59). Assuming that the 18 % credit defaults lead to a complete exploitation of the prototype's payout limits, an MFI operating with the typical capital-ratio of 38 % (that was reported to Mix market in 2014 (Rockefeller Foundation & GlobalAgRisk, 2016, p. 13)) would experience a drop of the capital-ratio to about 24.5 %. Figure 9 illustrates this effect. Considering a MFI's asset base of USD 10 million, like in the example in chapter two, the 18 % credit defaults would lessen the capital from USD 3.8 million to USD 2.0 million. The capital infusion would heighten the capital to USD 2.5 million and the credit infusion amounting 15 % of the MFI's pre-disaster portfolio would increase the liabilities to USD 7.7 million. Because MFIs strive to restore their capital-ratio in times of a natural disaster, it can be doubted that these terms for capital and credit payouts will boost the MFIs lending activities (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 13 ff.).

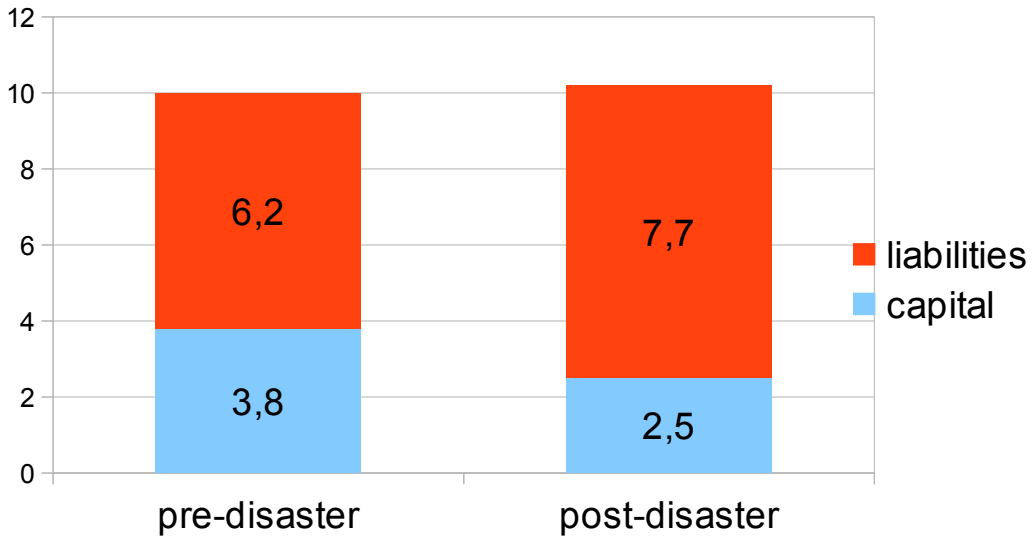

Figure 9: Modelled effect of 18 % credit defaults to a MFI's liabilities and capital with a pre-disaster capital-ratio of 38 % (in USD million) (Source: Own illustration)

Simulating the 18 % credit defaults under the same conditions for a MFI that operates with a 10 % capital-ratio that is typical for commercial banks would cause the MFI's insolvency. As figure 10 shows, the 5 % capital infusion would be too small to prevent the USD 1.8 million credit defaults leading to a negative capital.

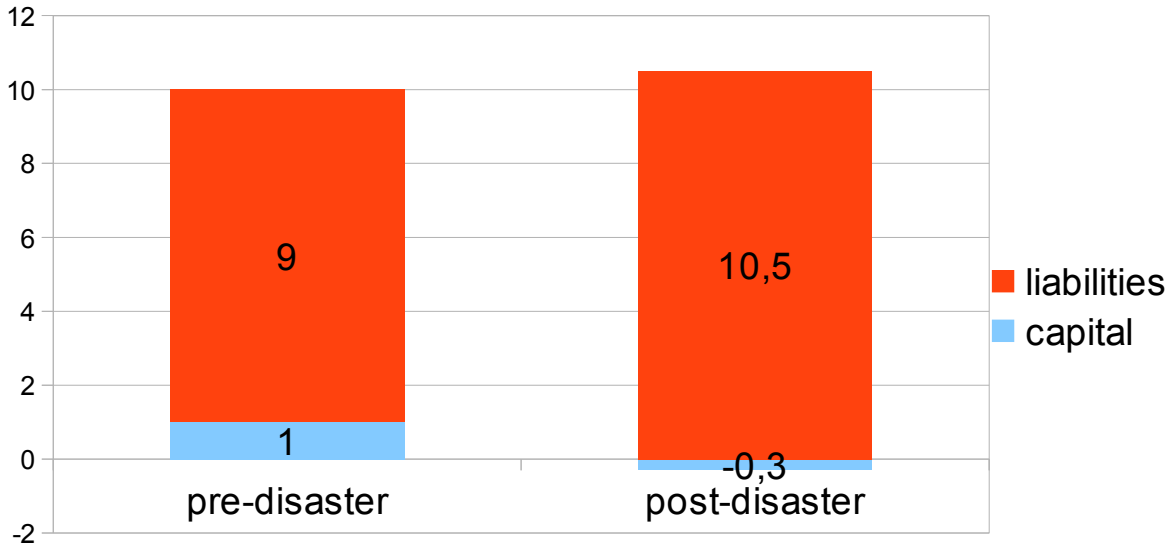

Figure 10: Modelled effect of 18 % credit defaults to a MFI's liabilities and capital with a pre-disaster capital-ratio of 10 % (in USD million) (Source: Own illustration)

Under the assumption that the regulatory authorities require a 10 % capital-ratio, a MFI needs a 23.2 % capital-ratio before the 18 % credit default causing natural disaster occurs just to fulfil the capital-ratio requirements post the natural disaster – ceteris paribus. Figure 11 visualises this effect. The USD 7.68 million liabilities would be increased by the USD 1.5 million credit payout. The post-disaster USD 1.02 million regulatory capital results from a USD 1.8 million decrease that would be partly offset by the USD 0.5 million capital infusion.

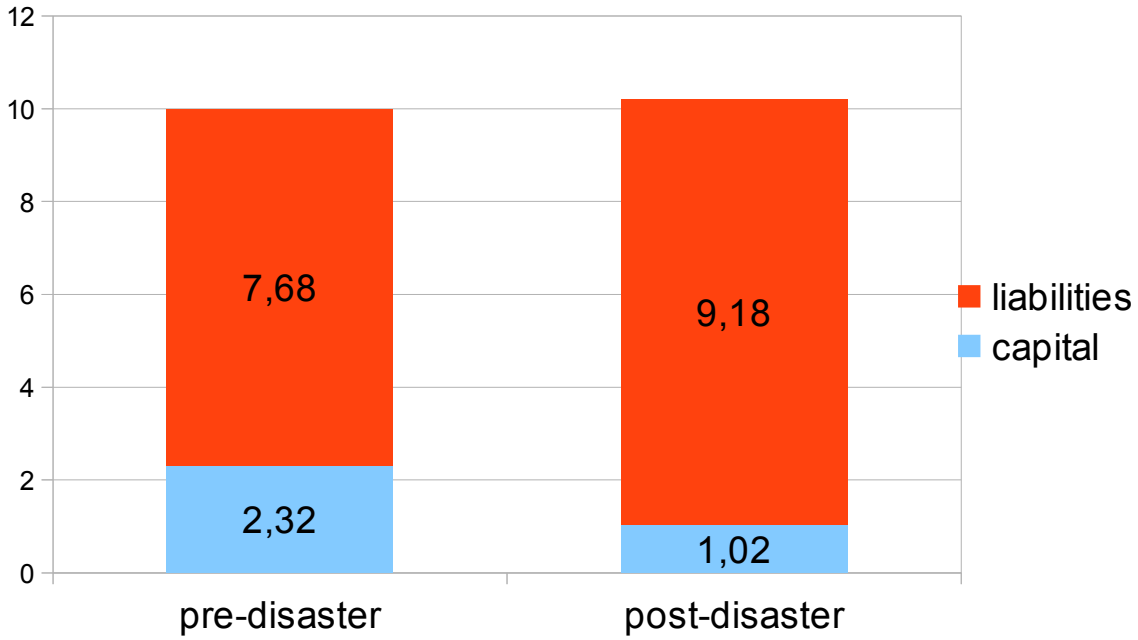

Figure 11: Modelled effect of 18 % credit defaults to a MFI's liabilities and capital with a pre-disaster capital-ratio of 23.2 % % (in USD million) (Source: Own illustration)

As the theoretical examples showed, the limitation of the capital payout terminates the risks that a MFI can transfer and thus, makes it vulnerable to the most severe natural disasters and potentially unable to provide financial services in times of natural disasters.

4.4.6 Regulatory accepted payouts

The concept envisions capital payouts to restore the capital-ratios. However, between 1-in-7 years and 1-in-10 years severities MFIs solely receive credit payouts to support recovery lend-

ing. As the examples in 4.4.5 outlined in such a situation the MFIs' capital-ratios will be decreased by the credit defaults the disaster yields and the risen liabilities due to the credit payout (Rockefeller Foundation & GlobalAgRisk, 2016. pp. 56 ff.). The common behaviour of MFIs to restore their capital-ratio is to limit their lending activities (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 13 f.).

This raises doubts, if the intended limitation of capital payouts is appropriate. Moreover, regulatory authorities and the MFIs' investors might not accept a further accumulation of debt when the capital-ratio is hit by natural disaster related credit defaults. GlobalAgRisk is aware of this difficulty. Their suggestion is that capital payouts must be available already at lower than standardly designed disaster severities when the regulatory authorities or investors so require (Rockefeller Foundation & GlobalAgRisk, 2016, p. 60).

However, the access fee every MFI has to pay is derived from an individual risk assessment (Huttly, 2017). In a global concept the participating MFIs do not know their counterparts. Their worry to cooperate with unreliable counterparts can be eliminated by setting the payment dates for the access fee at the beginning of a risk transfer period (Representative of a Finance Think Tank, 2017; Representative 1 of the Microfinance Sector, 2017). An additional capital payout that was not considered in the initial access fee has to be compensated by higher future contributions of the impacted MFI. The potential inability of the MFI to make these contributions or withdrawal from the risk pooling concept jeopardises the conflict-free procedure of the system (Representative 1 of the Microfinance Sector, 2017; Representative of a Climate Think Tank, 2017; Representative 2 of the Insurance Sector, 2017). Another unintended consequence of the original planned concept design can be seen in MFIs' potentially uneconomic high capital-ratios in disaster-free times to protect against disasters that trigger a credit, but not a capital payout (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 56 ff.).

4.4.7 Exploitation of the pool's risk bearing ability

The benefits from pooling risks have been described in chapter three. A natural disaster as a high unsystemic risk for a single MFI can be transferred into low unsystemic risks for the DRF. External reinsurance is a cost factor. The global risk pool, e.g. Global Parametrics operates as a

resinsurance for the DRF. Pooling risks reduces the needed financial resources to cover the risks and thus, diminishes the needed extent of external reinsurance. However, the designed payout patterns of the concept do not fully make use of the benefits from pooling risks from the perspective of a MFI or microfinance network. Regarding the capital payouts the ability of a DRF to cover the damage of a single or a few affected MFIs is not fully exploited. Whether a capital payout from Global Parametrics is triggered, depends completely on the severity of the natural disaster for the affected single MFI. The DRF only passed on the capital from Global Parametrics to the MFIs. The performance of the other MFIs is not considered (Rockefeller Foundation & GlobalAgRisk, 2016, p. 61).

The process can be illustrated with a simplified numeric example: A DRF consists of 20 MFIs. To cover the capital payouts every MFI pays a contribution to the DRF for one period amounting 5 monetary units. The DRF passes the collected 100 monetary units on to Global Parametrics as an insurance premium. In the following period one MFI is affected by a natural disaster that is more severe than a 1-in-10 years event for this MFI. The index of the affected MFI indicates an expected portfolio loss of 80 monetary units. The other 19 MFIs were not hit by a natural disaster during this period. In GlobalAgRisk's concept a capital payout from Global Parametrics will be triggered (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 56 ff.). In this period Global Parametrics earns 20 monetary units. So, Global Parametrics made a profit from pooling risks. The microfinance network as a whole lost financial resources from the reinsurance. The reinsurance would not have been necessary in this case, because the microfinance network would have been able to cover the damage internally. Therefore, the concept`s capital payout patterns are not fully designed in a way that makes the best use of the risk pooling benefits from the perspective of the microfinance networks (Cook, 2017).

The credit payout patterns are similar. According to GlobalAgRisk's concept it solely depends on the severity of the natural disaster from the perspective of a single MFI which amount of financial resources the DRF accesses from the external credit provider. 15 % of the credit payout a MFI receives is covered by the reserves of the DRF. The remaining amount is accessed externally (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 56 ff.). The risk bearing ability of the DRF is not fully exploited to reduce the needed level of reinsurance for the DRF. For e.g. very severe natural disasters the DRF's financial capability might be completely exhausted covering 15 % of the credit payout. In contrast, the DRF balances might be able to cover a higher share of the credit payout in times of less severe natural disasters.

Another feature of the concept does not fully exploit the cost reducing potential of pooling risks. The concept intends that many DRFs of various microfinance networks use the services of Global Parametrics. Pooling the risks among different microfinance networks elevates the level of diversification further and yields the typical cost advantages as depicted with the help of figure 5. This allows Global Parametrics to alleviate the necessary magnitude of further external reinsurance (Cook, 2017). As opposed to this, the DRFs are planned to directly make contracts with external credit providers (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 56 ff.). Due to the comparatively low level of diversification this leads to higher prices for the contracts with external credit providers equivalent to the high premiums that need to be paid when microfinancial actors turn to reinsurers individually as demonstrated in chapter three.

4.4.8 Narrowed profit extraction

The benefits from pooling risks for the concept's participants can materialise in reduced access fees for a certain extent of risk transfer. Global Parametrics is planned to operate as a for-profit company (Artemis, 2016). The key objective of a for-profit-company is to make profits (Wallerstein, 1979). In perfect competition the producers are price takers and make zero profits. This leads to the highest possible consumer surplus. Yet, if there are only one or a few producers, they can set the prices at a higher level and gain from profits. Accordingly, the consumer surplus declines (Frank, 2008, pp. 333 ff., 371 ff. and 413 ff.). Chapter three depicted the imperfect competition regarding transferring microfinancial risks out of a region represented by a lack of cost-efficient solutions. Global Parametric's competitors in this risk transfer market are restricted in number and often charge premiums that are double as high as the expected losses from taking the risks.

In order to be attractive for the potential participants Global Parametrics only need to offer slightly cheaper services than its competitors. Additionally, in particular in the field of index-based risk pooling that is tailored to the needs of MFIs Global Parametrics can potentially gain from the even higher post-innovation rents (Aghion et al., 2000). Being sponsored by GlobalAgRisk's president Jerry Skees (Artemis, 2016; Skees, 2013) it possesses all the natural disaster risk pooling knowledge that GlobalAgRisk gathered so far and that the potential participants are dependent from (Huttly, 2017). Under these circumstances it can be doubted that a high share of the cost advantages from pooling risks will be transmitted to the low-income

households as conceptualised and thus, increases their natural disaster resiliency. Contrariwise, Global Parametrics has the bargaining position to extract the majority of the concept's cost advantages. This initial setting can potentially annul the promises partly that the risk pooling concept for the natural disaster resiliency of low-income households gives.

4.4.9 Minimal licence acquisitions

The concept investigated various legal implications the activities between the different actors might cause. On the global level, only Global Parametrics might need to acquire an insurance licence. In contrast, the operations on the local level between e.g. the DRFs and the MFIs might require more attention. The credit payouts could most likely be designed easily to comply with the regulatory requirements without forcing any actor to acquire formal licences. However, handling the capital payouts might be more complicated (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.).

To raise an MFI's capital-ratio capital payouts need to be classified as regulatory capital by the regulatory authorities. For this purpose GlobalAgRisk intends to transact these payouts in the form of subordinated debt in the case of non-company MFIs. However, an uncertainty remains, whether this procedure is accepted by the countries' legal frameworks (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.). At worst, the DRF (or Global Parametrics in the absence of a DRF) needs to acquire an insurance license in every country the participating MFIs are located in which implies high costs. (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 78 ff.; Wrede, 2017). The concept does not offer a solution for this scenario (Rockefeller Foundation & GlobalAgRisk, 2016).

5 Improving GlobalAgRisk's Microfinancial Risk Pooling Concept – Requirements and Constraints

5.1 Inclusion of more indicators to model the underlying index

In 4.4.2, 4.4.3 and 4.4.4 the evaluation came to the result that the limited incorporation of indicators prevents the concept from unfolding its potential regarding size, level of diversification and index accuracy. GlobalAgRisk is aware of the necessity for further research to improve the accuracy of the underlying index (Rockefeller Foundation & GlobalAgRisk, 2016, p. 2). However, since e.g. earthquakes are among the core causes of natural disaster related damages in Asia and South America, the modelling of the underlying indicators for earthquakes and potentially other essential factors that are connected to natural disasters should be completed before the concept will be implemented. The experience with sovereign risk pools has shown that the existence of basis risks might keep potential participants from participating in the pool (World Bank, 2017, p. 63). Because potential frustrated participants might withdraw from the concept after they suffered from a high basis risk, the future acceptance of the concept might be endangered (Representative of a Climate Think Tank, 2017). To benefit from index-based solutions and broad diversification the modelling of further essential indicators is seen as a key precondition for a successful concept's implementation.

Constraints for the modelling of these indicators are the availability of historic data that is essential to analyse how the damages are correlated to the indicators (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 44 and 53; Huttly, 2017). Another precondition is the availability of financial resources for the analytical effort like the grant of the Rockefeller foundation facilitated the previous modelling (Rockefeller Foundation & GlobalAgRisk, 2016, p. 1).

5.2 Elimination of capital payout limits

Using stop-loss-covers at least for the capital payouts is a potential improvement to ensure the restoration of the capital-ratio in times of a natural disaster. Stop-loss-covers are a common financial product to limit the risk for the insurance takers and transfer the exceeding risk to the

insurance providers (Aase, 2001, pp. 40 ff.). Retentions about 5 % are common in insurance markets to ease the insurance premium (Representative of a Climate Think Tank, 2017). The application of such a loss cover in the previous example is portrayed by figure 12. A MFI would bear a 5 % loss of the pre-disaster credit portfolio itself. Consequently, the capital infusion would amount USD 1.3 million. The original amount of total assets would be downscaled by the USD 1.8 million credit defaults and enlarged by the capital infusion and the USD 1.5 million credit payout that is envisioned in GlobalAgRisk's prototype. Obtaining a 10 % post-disaster capital-ratio the post-disaster regulatory capital's size needs to be USD 1.1 million. As a result, the MFI's pre-disaster capital-ratio would have been 16 %.

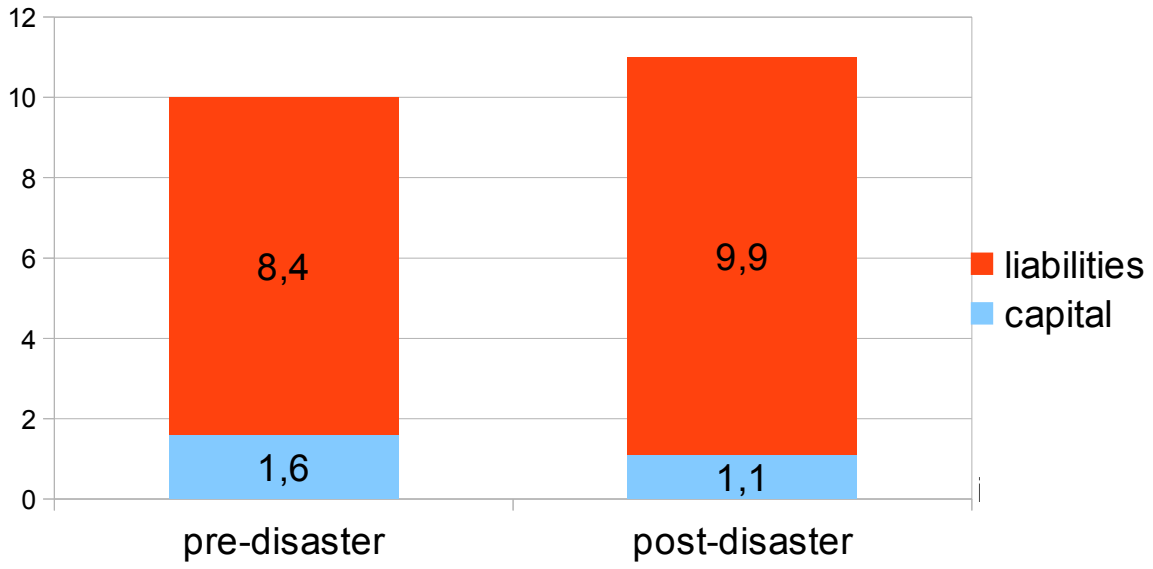

Figure 12: Modelled effect of 18 % credit defaults to a MFI's liabilities and capital with a pre-disaster capital-ratio of 16 % and an unlimited capital payout (in USD million) (Source: Own illustration)

One key benefit for the MFIs in structuring the capital infusion as a stop-loss-cover is lower uncertainty when deciding on how high the capital-ratio in disaster-free times should be. Agreeing on contracts with the DRF that fix the 15 % limit for credit payouts and a capital infusion that is USD 0.5 million lower than the loss from credit defaults (for a USD 10 million asset base) the pre-disaster capital-ratio needs to amount 16 % in order to induce a 10 % post-disaster capital-ratio. This coherence will not be changed by more severe disasters than modelled, because the capital infusion would rise accordingly.

A potential constraint for the heightened risk transfer is the non-warranted willingness of another actor to bear these risks (Representative of a Climate Think Tank, 2017). As described in 4.2.2 and 4.2.3 a large and well diversified pool enhances the risk bearing ability of the pool itself. Insuring the exceeding risks reinsurers need to be found. Generally, this should be possible, but again the size and diversification of the pool are factors that increase the likelihood and reduce the price of this reinsurance (Wrede, 2017).

5.3 Standardised combination of credit payouts with capital payouts from low natural disaster severities onwards

In 4.4.6 several difficulties have been illustrated that might arise from the concept's design that envisions solely credit payouts within a certain range of disaster severity. Even the optional availability of capital payouts when affected by a natural disaster potentially provokes conflicts among the participants as described. Hence, combining the credit payouts with capital payouts also for this certain range of disaster severity constitutes a potential improvement of the concept's design. Defining the amount of the capital payout in advance and incorporating its price in the regular access fees ensures that no participant will receive a payout at first and later needs to repay the payout by a risen access fee. In the optimal case, the relation between capital and credit payout will be set at a level that guarantees a full restoration of the capital ratio. This handling safeguards that no natural disaster diminishes the capital-ratio below the required minimum (the basis risk is excluded in this contemplation) and allows an operation with lower capital-ratios in disaster-free times.

Raising the utilisation of capital payouts implies higher costs, in return, because the risen risk transfer needs to be financed (Representative of a Climate Think Tank, 2017). Depending on how much the access fee will rise constraints this potential improvement much or less. If this potential improvement causes uneconomic high costs, the level of the capital payout can be slightly reduced. However, this again makes it possible for a natural disaster to push the capital-ratio below the required minimum which is an entry point for the identified difficulties in 4.4.6. Nevertheless, the potential difficulties will be lowered compared to GlobalAgRisk's intended handling of solely triggering credit payouts for this certain range of disaster severity.

5.4 Exclusive transfer of the DRF's risk bearing capacity exceeding risks to the next higher level

In the numeric example regarding the capital payouts in 4.4.7 the DRF could have covered the capital payout to the affected MFI by the collected contributions instead of passing them completely on to Global Parametrics. As a result, a part of the profits would have stayed inside the microfinance network. In this alternative, the DRF would pass 5 monetary units out of the collected contributions on to Global Parametrics as a reinsurance premium to protect the not manageable risks of the DRF itself. The remaining 15 monetary units would be a profit of the DRF. The external reinsurance of the DRF is important for a case when another MFI would be hit by a natural disaster additionally. If the second MFI for example suffers from a disaster that would trigger a 20 monetary units capital payout, the total capital payouts would exceed the DRF's reserves by 5 monetary units. Consequently, a capital payout from Global Parametrics should depend on whether the DRF can cover the total capital payouts to the MFIs by its own reserves. The ratio between the DRF's reserves and the extent of external reinsurance can be set at the most cost-efficient ratio.

Defining the extent of external reinsurance regarding the credit payouts should be done equally. Again, reducing the amount of externally accessed financial resources can save costs by determining the required amount based on the financial capability of the DRF and not based on the isolated situation of a single MFI. This handling induces an elimination of the 15 % share of the total credit payout the DRF covers. Instead, the DRF covers as much of the credit payout as it is able and the remaining part of the payout that exceeds a certain absolute amount will be covered externally.

A potential way to better diversifying the risks among different microfinance networks in the credit payout management is to shift the responsibility of making contracts with external credit providers to Global Parametrics. Because the contract between Global Parametrics and the external credit providers will comprise a larger and better diversified collective, the prices might be lower (Cook, 2017). Following this, the different DRFs turn to Global Parametrics regarding the capital and credit payouts. Figure 13 shows the resulting structural FDRM changes for a microfinance network in contrast to figure 6.

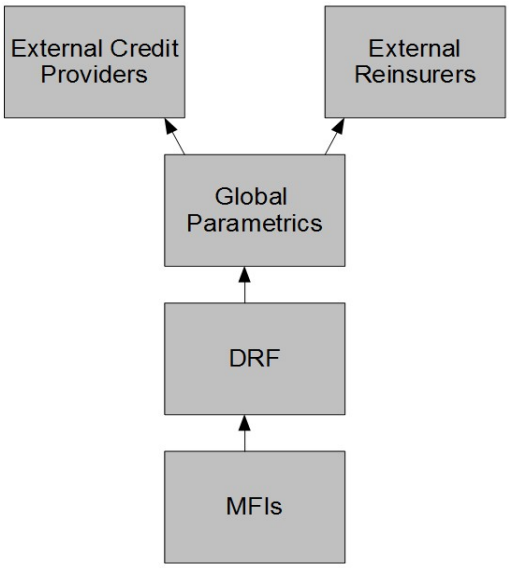

Figure 13: Risk transfer chain considering the potential improvements of sub-chapter 5.4 (Source: Own illustration)

Whether the shift in responsibilities between the DRFs and Global Parametrics can be conducted smoothly, might constrain these potential improvements. The administrative costs of making contracts with the external credit providers will be shifted from the DRFs to Global Parametrics. Eventually, this might leverage synergies due to the centralised administration. In return, certain administrative tasks might increase for the DRFs. Covering a part of the capital payout instead of just passing the financial flow through needs to be considered in the DRFs financial management. On the contrary, the DRFs can easier manage the extent of self-covered payouts in total and can reduce the uncertainty regarding the necessary reserves to cover the payouts by limiting the payouts to an absolute border. Eventually, consolidated cost effects these changes might imply need to be calculated in order to adequately assess the constraints for the potential improvements of this sub-chapter.

5.5 Inclusion of microinsurance

GlobalAgRisk's concept's exclusive focus on microcredit was among the reasons why the evaluated criteria in 4.4.1, 4.4.2 and 4.4.3 could be only fulfilled partly. Thus, the incorporation of microinsurance is a potential improvement of the concept. The importance of microfinance for the natural disaster risk resiliency of low-income households has been outlined in 2.2.2. As it can be derived from figure 5, insurance concepts become the more remunerative the larger and the better diversified they are. Administrative costs and losses can be better absorbed by a large collective. Both risk types can benefit from these effects by pooling the risks in the same pool (Boelsterli, 2017; Kuhn, 2017; Representative 1 of the Microfinance Sector, 2017; Wrede, 2017; Lehnert, 2017; Cummins et al., 1998; Frank, 2008, pp. 278 ff.).

The consolidation of both risks types in one concept could be feasible, because the concept's capital payout patterns are similar to the reinsurance microinsurers already are protected with. The concept's access fee is equivalent to a reinsurance premium and a payout is triggerred, if an insurance taker suffers from a damage. (Rockefeller Foundation & GlobalAgRisk, 2016, pp. 56 ff.; Munich Re, 2010). As portrayed in 4.3, based on thorough investigations GlobalAgRisk modelled correlations between natural disaster severities and the impact on MFIs credit portfolios in order to facilitate an index-based risk pooling. Index-based microinsurance is already prevalent. This allows for an aggregated adoption of the payout algorithms that are already existent in the microinsurance contracts with the end customers.

Constraints can be seen in the administrative costs to unify the pooling of both risks types within one system. The compliance with regulatory requirements is not ensured, but appears feasible according to the majority of experts (van den Broeke, 2017; Boelsterli, 2017; Kaiser, 2017; Lehnert, 2017; Representative of a Financial Consultancy, 2017). For an inclusion of natural disaster related insurance risks that evolve from non-index-based microinsurance products, a similar investigation as GlobalAgRisk conducted regarding the natural disaster related credit risks needs to be carried out. This analysis would account for the coherences e.g. between natural disasters severities and the resulting payouts in life, accident, health or property insurance (Churchill, 2008, slide 16; World Health Organisation, 2006). Equally to 5.1, this investigation is constrained by the availability of historic data and financial resources.

5.6 Implementation of the risk pool as a mutual or cooperative company

The issue of profit extraction as outlined in 4.4.8 can be solved changing the global risk pool's legal form. Cooperative and mutual insurance companies are common and aim at insuring their policyholders at the lowest possible price through the elimination of profit extraction. (Birchall, 2011; Greene & Johnson, 1980). The company's co-owners are its policyholders (ICMIF, 2017a; ICMIF, 2017b; Wrede, 2017; Lehnert, 2017; van den Broeke, 2017). Transferring this structure to the FDRM is a potential improvement for the demonstrated shortcoming of potential profit extractions. Instead of as a for-profit company, the global risk pool, e.g. Global Parametrics, should be established as or changed into a cooperative or mutual insurance company. The different DRFs would become its co-owners. In case the sum of the collected access fees is higher than the payouts that need to be covered and the administration costs, the remaining profits can be returned to the DRFs and be transmitted via the credits of the MFIs to the low- income households unless it is more advisable to retain such earnings to remain suitably capitalised as the business grows. (Lehnert, 2017; Wrede, 2017). To reduce the possible losses that result from the co-ownership the global risk pool itself needs to be reinsured as already planned.

The realisation of this potential improvement might not be easy for every potential co-owner. Many MFIs do not possess comprehensive banking licences. Their particular licences allow them to exclusively lend money. Most probable these limited licences entail restrictions regarding co-ownership possibilities which might apply to MFIs that do not belong to a microfinance network (Wrede, 2017). As an alternative the contracts between the MFIs and the global risk pool can be designed in a way that the MFIs participate on the performance of the risk pool without being a formal co-owner. These contracts are common and standardised in mutual business (Representative of a Climate Think Tank, 2017).

For an overview, figure 14 illustrates how the FDRM structure will be affected by an implementation of the previously outlined potential improvements. MFIs that do not belong to a microfinance network directly contract with the global risk pool.

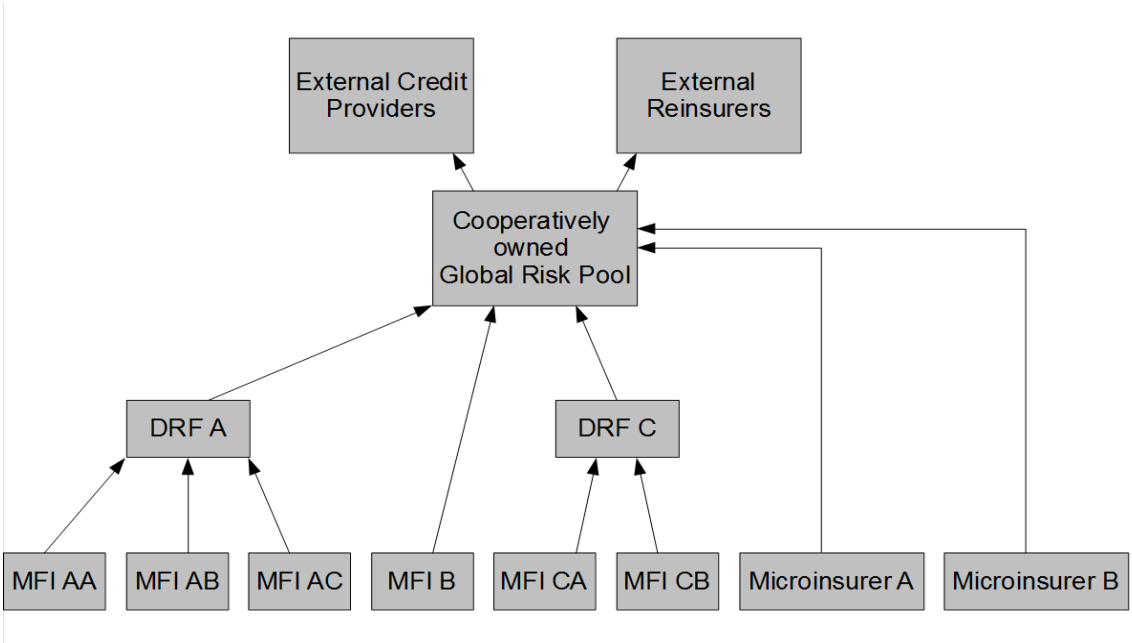

Figure 14: FDRM structure considering the potential improvements from sub-chapter 5.4 to 5.6 (Source: Own illustration)

5.7 Utilisation of fronting to avoid numerous licence acquisitions

To circumvent the necessity of acquiring many licences in various countries the insurance market already found a respective solution. Local insurers that possess the required licences in the various countries operate as fronting companies. Doing so they act as an insurer in their country and pass the complete risk on to a global (re)insurer that does not possess a insurance licence in the particular country. (Wrede, 2017; Representative of a Climate Think Tank, 2017; Carranza-Kopper, 2011).

Accordingly, a potential improvement for GlobalAgRisk's concept is to use fronting in case the intended form of capital payouts does not comply with the countries' legal frameworks. If insurance risks will be included in the concept as proposed in 5.5, the DRF (or the global risk pool in the absence of a DRF) can use microinsurers that are co-owners of the global risk pool as fronting companies at best. Consequently, the DRFs and the global risk pool do not need to

acquire insurance licences in the various countries (Wrede, 2017; Representative of a Climate Think Tank, 2017; Carranza-Kopper, 2011).

A constraint of this potential improvement is the causation of different costs. Insurers that act as fronting companies charge fees for their effort (Representative of a Climate Think Tank, 2017). If these insurers are participants of the pool, they could be obliged to charge tolerable fees. However, if in a specific country no insurer that simultaneously participates in the risk pooling concept can be found, it cannot be precluded that another insurer charges excessive fees.

6 Conclusion

The implementation of GlobalAgRisk's index-based natural disaster risk pooling concept can fill the gap of lacking convenient natural disaster risk transfer solutions for microfinancial actors. Pooling risks among themselves before reinsuring them at the global financial market can save costs and therefore enhance the access to external financial resources for microfinancial actors. This enables them to better meet the financial demand of low-income households in times of natural disasters which is important for the natural disaster resiliency of these households.

Whether the concept is designed in a way to optimally contribute to microfinancial access in times of natural disasters has been evaluated in this thesis. The evaluation detected certain shortcomings that might limit the concept achieving its aims. To increase the concept's likelihood of achieving the aims the thesis portrayed several potential improvements that should be considered before implementing the concept and depicted constraints for the implementation of the potential improvements.

The most pivotal field for future research can be seen in further modelling the MFIs natural disaster related indexes, because these models determine the concept's access fee and payout patterns and facilitate the incorporation of many natural disaster risk types and world regions. Besides the concept's design, its success can be demand-side restricted which highlights the importance of promoting awareness and understanding of the risks and risk transfer solutions among the microfinancial actors and its clients (World Bank, 2017, p. 63).

V References

- Aase, K. K. (2001): A Markov Model for the Pricing of Catastrophe Insurance Futures and Spreads, The Journal of Risk and Insurance, Vol. 68, No. 1, 25-50, Retrieved 30 June 2017, https://pdfs.semanticscholar.org/2027/999da84e1cdd50652823f153f0f798f09066.pdf
- Aghion, P. et al. (2000): Competition, Imitation and Growth with Step-by-Step Innovation, Review of Economic Studies Vol. 68 No. 3, 467–492, Retrieved: 4 July 2017, https://dash.harvard.edu/bitstream/handle/1/12375013/Competition%2C%20Imitation%20and%20Growth%20with%20Step-by-Step%20Innovation.pdf?sequence=1
- Agrics (2017): Affordable crop insurance for smallholder farmers, Retrieved 28 June 2017, http://www.agrics.org/news/120/affordable-crop-insurance-for-smallholder-farmers/
- Artemis (2016): Global Parametrics to bring third-party capital to disaster risk transfer, Retrieved 8 July 2017, http://www.artemis.bm/blog/2016/06/13/global-parametrics-to-bring-third-party-capital-to-disaster-risk-transfer/
- Asian Development Bank & Vision Fund International (2016): Disaster Resilient Microfinance: A New Model for Disaster Preparation and Response for Microfinance Institutions, Retrieved 30 June 2017, www.reliefweb.int/sites/reliefweb.int/files/resources/disaster-resilient-microfinance.pdf
- Barnett, B. et al. (2008): Poverty Traps and Index-Based Risk Transfer, Retrieved 26 June 2017, http://globalagrisk.com/Pubs/2007%20Poverty%20Traps%20Index-Based%20Risk%20Transfer.pdf
- Becchetti, L., and S. Castriota (2011): Does Microfinance Work as a Recovery Tool After Disasters? Evidence from the 2004 Tsunami, Retrieved 26 June 2017, https://www.researchgate.net/publication/227427500_Does_Microfinance_Work_as_a_Recovery_Tool_After_Disasters_Evidence_from_the_2004_Tsunami
- Berger, L. A. et al. (1992): Reinsurance and the Liability Insurance Crisis, Journal of Risk and Uncertainty, Retrieved 29 June 2017, https://www.researchgate.net/profile/J_Cummins2/publication/5152557_Reinsurance_and_the_Liability_Insurance_Crisis/links/58176bcd08aeffbed6c331c6.pdf

- Birchall, J. (2011): A 'Member-Owned Business' Approach to the Classification of Co-operatives and Mutuals, Journal of Co-operative Studies, Vol. 44, No. 2, 4-15, Retrieved 4 July 2017, https://www.thenews.coop/wp-content/uploads/s2-Birchall-132.pdf
- BlueOrchard (2017): BlueOrchard Microfinance Fund Class P Shares, Investor Update as of 31 May 2017, Retrieved 7 July 2017, http://www.blueorchard.com/wp-content/uploads/report/bomf/BOMF_EN_P.pdf
- Boelsterli, C. (2017): CEO, Microinsurance Catastrophe Risk Organisation, Correspondence from 15 June 2017, see Annex N
- van den Broeke, P. (2017): Senior Policy Advisor, International Association of Insurance Supervisors, Correspondence from 19 June 2017, see Annex P
- Carranza-Kopper, E. (2011): Fronting Arrangements: Industry Practices and Regulatory Concerns, Connecticut Insurance Journal, Vol. 17, No. 1, pp. 227-252, Retrieved 8 July 2017, http://insurancejournal.org/wp-content/uploads/2011/08/7-Carranza-Western.pdf
- Carter, M.R. et al. (2007): Poverty Traps and Natural Disasters in Ethiopia and Honduras, World Development Vol. 35, No. 5, pp. 835-856.
- Central Bank of Kenya (2017): List of Licenced Microfinance Banks, Retrieved 8 July 2017, https://www.centralbank.go.ke/lists__trashed/microfinance-banks/
- CGAP (2017): Microfinance FAQs, Retrieved: 25 June 2017, https://www.microfinancegateway.org/what-is-microfinance
- Churchill, C. (2008): Microinsurance Products and Delivery Channels, Presentation at the Microinsurance Conference in Cartagena, Colombia, Retrieved 5 July 2017, www.ilo.org/public/english/employment/mifacility/download/presentations/mconf2008_churchill.pdf
- Collier, B. L. (2015): Credit Access and Severe Climate Risks: Implications of Information and Geography for Lending in Vulnerable Communities, Risk Management and Decision Processes Center Working Paper, the Wharton School, University of Pennsylvania, cited from: Rockefeller Foundation & GlobalAgRisk, 2016, p. 13
- Collier, B. L. (2014): Natural Disasters and Credit Supply Shocks, Wharton Risk Management Center, University of Pennsylvania, Working Paper 2014-02, Retrieved 27 June

2017, http://opim.wharton.upenn.edu/risk/library/WP201402_BLC_Disasters+Credit-Supply.pdf

- Collier, B. L. & Skees, J. R. (2011): Increasing the Resilience of Financial Intermediaries through Portfolio-Level Insurance against Natural Disasters, GlobalAgRisk, Retrieved 27 June 2017, http://globalagrisk.com/Pubs/2011%20Natural%20Disaster%20Portfolio%20Insurance%20Collier,%20Skees.pdf
- Cook, S. (2017): Senior Disaster Risk Financing Specialist, World Bank, Interview on 15 June 2017, see Annex L
- Cull, R. et al. (2009): Microfinance meets the market, Journal of Economic Perspectives, Vol. 23, No. 1, pp. 167–192, Retrieved 30 June 2017, https://www.aeaweb.org/articles?id=10.1257/jep.23.1.167
- Cummins, J. D. et al. (1998): Efficiency, Scale Economies, and Consolidation In the U.S. Life Insurance Industry, Wharton School, Retrieved 5 July 2017, http://s3.amazonaws.com/academia.edu.documents/45047377/Consolidation_and_Efficiency_in_the_U.S.20160424-9187-gq06gg.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1499299711&Signature=YUIduKBTNi6Y1k9xodqWnQQoJyk%3D&response-content-disposition=inline%3B%20filename%3DConsolidation_and_efficiency_in_the_US_l.pdf
- Dowla, A. (2009): Climate Change and Microfinance, Grameen Foundation Publication Series, Retrieved 26 June 2017, http://www.grameenfoundation.org/sites/default/files/resources/Climage-Change-and-Microfinance_Asif-Dowla.pdf
- ESRB (2015): Systemic Risk of Reinsurers, Report on systemic risks in the EU insurance sector, Annex 4, Retrieved 19 June 2017, https://www.esrb.europa.eu/pub/pdf/other/2015-12-16_esrb_report_annex_4.pdf?e3b4c0cc14c3fb4edb0eb0672e4ea72b
- Global Parametrics (2017): Official Website, Retrieved 7 July 2017, http://www.global-parametrics.com/
- Greene, M. R. & Johnson, R. E. (1980): Stocks vs Mutuals: Who Controls?, The Journal of Risk and Insurance Vol. 47, No. 1, pp. 165-174
- Hallegatte, S. et al. (2017): Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters, World Bank, Retrieved 10 June 2017, https://openknowledge.worldbank.org/bitstream/handle/10986/25335/211003ovEN.pdf?sequence=3

- Hess, U. & Hazell, P. (2016): Innovations and Emerging Trends in Agricultural Insurance, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Retrieved 25 June 2017, http://p4arm.org/app/uploads/2016/07/GIZ_DinA4_web-7MB-20160707.pdf
- Huttly, K. (2017): Insurance Professional, Vision Fund International Interview on 7 June 2017, see Annex J
- ICMIF (2017a): Introducing ICMIF, Retrieved 8 July 2017, https://www.icmif.org/introducing-icmif
- ICMIF (2017b): Member Organisations, Retrieved 8 July 2017, https://www.icmif.org/member-organisations
- IFAD (2016): Rural Development Report 2016, Retrieved 26 June 2017, https://www.ifad.org/documents/30600024/30604583/RDR_WEB.pdf/c734d0c4-fbb1-4507-9b4b-6c432c6f38c3
- Kaiser, M. (2017): Director, Finance in Motions, Interview on 8 June 2017, see Annex K
- Kaplan Financial Knowledge Bank (2012): Capital Asset Pricing Model, Retrieved 31 May 2017, http://kfknowledgebank.kaplan.co.uk/KFKB/Wiki%20Pages/The%20Capital%20Asset%20Pricing%20Model%20(CAPM).aspx
- Kelly, S. (2016): Weather-Indexed Insurance: Why Isn´t It Working?, Center for Financial Inclusion, Retrieved 30 June 2017, https://cfi-blog.org/2016/09/07/weather-indexed-insurance-why-isnt-it-working/
- Kuhn, S. (2017): Junior Advisor, Gesellschaft für Internationale Zusammenarbeit, Interview on 31 May 2017, see Annex F
- Lehnert, M. (2017): Director, Oikocredit Germany, Interview on 31 May 2017, see Annex H
- Liebwein P. (2009): Klassische und moderne Formen der Rückversicherung, Verlag Versicherungswirtschaft
- Ling, J. (2017): Microinsurance Actuary, Microinsurance Catastrophe Risk Organisation, Correspondence from 23 June 2017, see Annex Q
- Luckja, A. (2017): Vice President International Project Coordination, Opportunity International, Interview on 31 May 2017, see Annex G
- Macharia J. (2017): Country Director Kenya, Compassion International, Interview on 8 May 2017, see Annex A

- MIX Market (2017): Official Website, Retrieved 7 July 2017, http://www.themix.org/mixmarket
- Morduch, J. (1995): Income Smoothing and Consumption Smoothing Journal of Economic Perspectives, Vol. 9, No. 3, pp. 103-114, Retrieved 28 June 2017, https://www.aeaweb.org/articles?id=10.1257/jep.9.3.103
- Munich RE (2010): Reinsurance: A Basic Guide To Facultative and Treaty reinsurance, Retrieved 5 July 2017, https://www.munichre.com/site/mram/get/documents_E96160999/mram/asset-pool.mr_america/PDFs/3_Publications/reinsurance_basic_guide.pdf
- Ndirangu, S. (2017): Financial Liaison, ACRE Africa, Interview on 11 May 2017, see Annex C
- Representative of a Climate Think Tank (2017): Interview on 27 June 2017, see Annex R
- Representative of a Finance Think Tank (2017): Interview on 10 May 2017, see Annex B
- Representative of a Financial Consultancy (2017): Interview on 7 June 2017, see Annex I
- Representative 1 of the Insurance Sector (2017): Interview on 18 May 2017, see Annex E
- Representative 1 of the Microfinance Sector (2017): Interview on 12 May 2017, see Annex D
- Representative 2 of the Insurance Sector (2017): Interview on 30 June 2017, see Annex S
- Representative 2 of the Microfinance Sector (2017): Interview on 12 May 2017, see Annex T
- Robinson, D. G. et al. (2015): Performance Consulting: A strategic process to improve, measure and sustain organizational results, Retrieved 7 July 2017, https://books.google.de/books?id=Ptk_BgAAQBAJ&pg=PA140&lpg=PA140&dq=focus+on+root+not+symptoms&source=bl&ots=rf-BUpRGYG&sig=OcK9PGteKeexwDS_MMoXWphz9kk&hl=de&sa=X&ved=0ahUKEwjrx6jvyPjUAhVHsBQKHeUaB584ChDoAQhdMAc#v=onepage&q=focus%20on%20root%20not%20symptoms&f=false
- Rockefeller Foundation & GlobalAgRisk (2016): Recovery Lending to Build Resilience for Households, SMEs, and Communities: Designing Financial Disaster Risk Management Solutions to Support Recovery Lending via Microfinance Networks and Microfin-

ance Investment Vehicles, Retrieved 20 June 2017, http://globalagrisk.com/wp-content/uploads/Recovery-Lending.pdf

- Rooney, J. J. & Vanden Heuvel, L. N. (2004): Root Cause Analysis for Beginners, Retrieved 7 July 2017, https://servicelink.pinnacol.com/pinnacol_docs/lp/cdrom_web/safety/management/accident_investigation/Root_Cause.pdf
- Rosenberg, R. (2009): Does Microfinance really help poor people?, CGAP, World Bank, Retrieved 10 June 2017, https://www.cgap.org/blog/does-microcredit-really-help-poor-people
- Sengupta, R. & Aubuchon, P. (2008): The Microfinance Revolution: An Overview, Federal Reserve Bank of St. Louis, Retrieved 10 June 2017, http://www.mikrofinanzwiki.de/file/512/sengupta_aubuchon_the_microfinance_revolution.pdf
- Shi, P. & Kasperson, R. (2015): World Atlas of Natural Disaster Risk, Springer-Verlag
- Skees, J. R. (2013): First-Ever "Forecast Insurance" Offered for Extreme ElNiño in Peru, GlobalAgRisk, Retrieved 15 June 2017, http://globalagrisk.com/Pubs/2013%20Press%20Release_First_Ever%20_Forecast%20Insurance%20Peru.pdf
- Skees, J. R. (2017): Introduction to Global Parametrics, Global Parametrics, Retrieved 31 May 2017, https://de.slideshare.net/JerrySkees/intoduction-to-global-parametrics
- Skees, J. R. (2007): Using Index-based Risk Transfer Products to Facilitate Micro Lending in Peru and Vietnam, Munich Re. Foundation, Retrieved 10 June 2017, http://www.munich-re-foundation.org/dms/MRS/Documents/UsingIndex-basedRiskTransferProductstoFaciliateMicroLendinginPeruandVietnam.pdf
- Skees, J. R. & Barnett, B. J. (2006): Enhancing microfinance using index-based risk-transfer products, Agricultural Finance Review, Vol. 66, Issue: 2, pp. 235-250, Retrieved 20 June 2017, http://www.emeraldinsight.com/doi/abs/10.1108/00214660680001189
- Stole, A. (2003): Price Discrimination and Imperfect Competition, University of Chicago, Retrieved 28 June 2017, http://web.mit.edu/14.271/www/hio-pdic.pdf
- Tripathi, V. K. (2014): Microfinance – Evolution and microfinance-growth of India, International Journal of Development Research, Vol. 4, Issue 5, pp. 1133-1153, Retrieved 25 June 2017, http://www.journalijdr.com/sites/default/files/issue-pdf/1755.pdf

- UAP (2017): Crop Insurance, Retrieved 30 June 2017, https://www.uap-group.com/sites/kenya/pages/Individual-Crop-Insuranc-Kenya.aspx
- Upali, A. et al. (eds.) (2008): Strategic Analyses of the Natural River Linking Project (NRLP) of India Series 2, International Water Management Institute, Retrieved 7 July 2017, https://books.google.de/books?id=zWPfBFEEfgIC&pg=PA391&lpg=PA391&dq=flood+bangladesh+river+form+india&source=bl&ots=r_Dym-Rh5I&sig=IbBNXFWZHqFanpWpsW2kfqZMmaw&hl=de&sa=X&ved=0ahUKEwjv7MnSyPnUAhVBLlAKHaXoDo0Q6AEIPDAH#v=onepage&q=flood%20bangladesh%20river%20form%20india&f=false
- Wallerstein, I. (1979): The capitalist world-economy, Cambridge University Press, Retrieved 6 July, http://sttpml.org/wp-content/uploads/2014/08/capitalist-world-economy- wallerstein-9780521220859ws.pdf
- Wilhelm, M. (2017): Senior Microinsurance Specialist, Vice President Global Partnerships, Swiss Re, Correspondence from 19 June 2017, see Annex O (please note that the statements in the correspondence reveal the personal views of Mario Wilhelm and do not necessarily match with the views of Swiss Re)
- World Bank (2015): FAQs: Global Poverty Line Update, Retrieved 8 July 2017, http://www.worldbank.org/en/topic/poverty/brief/global-poverty-line-faq
- World Bank (2017): Sovereign Climate and Disaster Risk Pooling, World Bank Technical Contribution to the G 20, Retrieved 25 June 2017, https://www.bmz.de/de/zentrales_downloadarchiv/themen_und_schwerpunkte/klimaschutz/DFRI_G20.pdf
- World Bank (2016): Taking on Inequality, Retrieved 25 June 2017, https://openknowledge.worldbank.org/bitstream/handle/10986/25078/9781464809583.pdf
- World Health Organisation (2006): Communicable diseases following natural disasters, Risk assessment and priority interventions, Retrieved 5 July 2017, http://www.who.int/diseasecontrol_emergencies/guidelines/CD_Disasters_26_06.pdf?ua=1
- Wrede, P. (2017): Senior Financial Sector Specialist, World Bank, Interview on 15 June 2017, see Annex M
- Wrede, P. & Phily, C. (2016): Pricing for Microinsurance: A Technical Guide, Impact Insurance & ILO, Retrieved 28 June 2017, http://www.impactinsurance.org/sites/default/files/MI%20Pricing%20Guide%20FINAL.pdf

VI Annex

Annex A

Interview with Joel Macharia, Country Director Kenya, Compassion International on 8 May 2017

Overview over asked questions

Johannes Wissel:	Are many of your clients microfinancial borrowers?
Johannes Wissel:	Do many microcredits default after a natural disaster?
Johannes Wissel:	Do your clients have enough credit access after a natural disaster?
Johannes Wissel:	Are your clients insured against the natural disaster related risk?
Johannes Wissel:	What is the reason behind this little use of microinsurance?

Annex B

Interview with a Representative of a Finance Think Tank on 10 May 2017

Overview over asked questions

Johannes Wissel:	Do Kenyan MFIs limit their lending activities after natural disasters?
Johannes Wissel:	Do MFIs reinsure their credit risks?
Johannes Wissel:	In what regions is the portfolio of the microinsurers diversified that operate in Kenya?
Johannes Wissel:	Do the microinsurers reinsure their risks?
Johannes Wissel:	Do they turn to reinsurers individually?
Johannes Wissel:	How costly is this reinsurance?
Johannes Wissel:	Do the MFIs act as intermediaries between the customers and microinsurers?
Johannes Wissel:	How many of the agricultural borrowers have a weather-index-based microinsurance?
Johannes Wissel:	Would you like more borrowers to be insured?
Johannes Wissel:	What are the reasons for this low level of microinsurance?
Johannes Wissel:	How do MFIs and microinsurers get help after natural disasters?
Johannes Wissel:	What is your view on an inter-MFI risk blending mechanism?
Johannes Wissel:	What questions need to be answered that the MFIs are willing to participate?
Johannes Wissel:	What are your doubts about such a mechanism?
Johannes Wissel:	Do you think many MFIs would participate in this mechanism?
Johannes Wissel:	Would the MFIs be willing to become a co-owner of this mechanism?
Johannes Wissel:	How do you think about pooling credit risks and insurance risks together in this mechanism?

Annex C

Interview with Stella Ndirangu, Financial Liaison, ACRE Africa on 11 May 2017

Overview over asked questions

Johannes Wissel:	What is the business model of ACRE Africa?
Johannes Wissel:	Do the MFIs bring you in touch with their customers?
Johannes Wissel:	Do you experience that MFIs limit their lending activities after natural disasters?
Johannes Wissel:	Do many agricultural borrowers have weather-index-based microinsurances?
Johannes Wissel:	What are the reasons for this low level?
Johannes Wissel:	Do the microinsurers reinsure their risks? And how do they do this?
Johannes Wissel:	In what regions do the microinsurers operate?
Johannes Wissel:	How is a agricultural index-based insurance constructed?
Johannes Wissel:	How do you think about a mechanism that microlenders and microinsurers use to pool their risks index-based?
Johannes Wissel:	What are your doubts about this mechanism?
Johannes Wissel:	Should the participants become co-owners of the mechanism?
Johannes Wissel:	The payout a participant receives out of the mechanism in case of a natural disaster could be a loan or equity – like an insurance payout that does not need to be paid back. What form of payout do you prefer?

Annex D

Interview with Representative 1 of the Microfinance Sector on 12 May 2017

Overview over asked questions

Johannes Wissel:	Do you have many agricultural borrowers? Do their credit default rates rise after a natural disaster?
Johannes Wissel:	Do you limit your lending activities after a natural disaster?
Johannes Wissel:	Do you reinsure your credit risks?
Johannes Wissel:	Do you offer microinsurance? Do you act as an intermediary between your customers and an insurance company?
Johannes Wissel:	Do these insurers reinsure their risks? Do they turn to reinsurers individually?
Johannes Wissel:	How many of your agricultural borrowers have a weather-index-based microinsurance?
Johannes Wissel:	Generally, only very few agricultural borrowers have such an insurance. What are the reasons for this low level?
Johannes Wissel:	Do you get financial aid after a natural disaster?
Johannes Wissel:	How do you think about a global mechanism that pools the risks of microlenders and microinsurers based on indexes?
Johannes Wissel:	How do you think about pooling insurance and credit risks in the same mechanism?
Johannes Wissel:	What questions need to be answered for you to participate?
Johannes Wissel:	Would you participate in such a mechanism?
Johannes Wissel:	Would you like to become a co-owner of such a mechanism?
Johannes Wissel:	The payout a participant receives out of the mechanism in case of a natural disaster could be a loan or equity – like an insurance payout that does not need to be paid back. What form of payout do you prefer?
Johannes Wissel:	The overall performance of the risk pool can be better or worse from year to year. Should the co-owners bear this risk among themselves or do you prefer a reinsurance for the risk of the total pool?

Johannes Wissel: If a participant of the pool is affected by a disaster, should the pool access external finances dependent on the severity of the damage this single MFI suffers from or should it depend on whether the pool is able to cover the payout with the own financial resources. In the second option the performance of the total pool would determine the amount of external finances requested.

Annex E

Interview with Representative 1 of the Insurance Sector on 18 May 2017

Overview over asked questions

Johannes Wissel:	Why is microinsurance so little spread?
Johannes Wissel:	Am I right that microinsurers only are diversified locally and a global diversification only takes place at the reinsurance level?
Johannes Wissel:	Why do not MFIs reinsure their credit risks?
Johannes Wissel:	How do you think about a global mechanism that pools the credit risks of MFIs and the insurance risks of microinsurers and where the pool itself can be reinsured.

Annex F

Interview with Saskia Kuhn, Junior Advisor, Gesellschaft für Internationale Zusammenarbeit on 31 May 2017

Overview over asked questions

Johannes Wissel:	Do the MFIs offer weather index based microinsurances by bearing the risks themselves or do they usually act as an intermediary between the customers and the insurers?
Johannes Wissel:	What is your opinion on pooling the credit risks of MFIs together with the insurance risks of microinsurers based on indexes in the same pool?
Johannes Wissel:	How can a higher market penetration of microinsurance be obtained?

Annex G

Interview with Anke Luckja, Vice President International Project Coordination, Opportunity International on 31 May 2017

Overview over asked questions

Johannes Wissel:	Do the MFIs you know reinsure their credit risks?
Johannes Wissel:	In order to reinsure these risks, do the MFIs turn to reinsurers individually or do they pool the risks among themselves?
Johannes Wissel:	Do the MFIs offer weather index based microinsurances by bearing the risks themselves or do they usually act as an intermediary between the customers and the insurers?

Annex H

Interview with Matthias Lehnert, Director, Oikocredit Germany on 31 May 2017

Overview over asked questions

Johannes Wissel:	Do you experience lending constraints of MFIs after natural disasters?
Johannes Wissel:	What is your opinion on a global pooling of MFIs' credit risks together with the insurance risks of microinsurers based on indexes in the same pool?
Johannes Wissel:	Do you think it will be possible that the participating MFIs and microinsurers will be co-owners of the pool?

Annex I

Interview with a Representative of a Financial Consultancy on 7 June 2017

Overview over asked questions

Johannes Wissel:	Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of the new institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.
Johannes Wissel:	Do the MFIs you know reinsure their credit risks?
Johannes Wissel:	From your perception, how many MFIs offer weather index based microinsurances themselves by bearing the risks and how many act as an intermediary between the customers and the insurers?

Annex J

Interview with Kevin Huttly, Insurance Professional, Vision Fund International on 7 June 2017

Overview over asked questions

Johannes Wissel:	Do the MFIs you know reinsure their credit risks?
Johannes Wissel:	In the recovery lending concept of GlobalAgRisk, can you conclude from the weather changes how MFIs' protfolios will be affected?
Johannes Wissel:	What is your opinion on including the insurance risks of microinsurers in this pool?
Johannes Wissel:	If Global Parametrics operates as a for-profit company, I am afraid they might extract the profits from pooling risks out of the MFIs. Global Parametrics only needs to be slightly cheaper than the reinsurance alternatives at the global financial market. What do you think about a solution where the participating MFIs become co-owners of the risk pooling institution?
Johannes Wissel:	Do all the participating MFIs have to pay an access fee only as a certain percentage of their credit portfolio volumina? I am afraid the MFIs operating in comparatively safe areas would subsidise the MFIs in riskier areas.
Johannes Wissel:	How is Global Parametics protected against the most severe disasters that require high payouts to the DRFs?

Annex K

Interview with Marco Kaiser, Director, Finance in Motions on 8 June 2017

Asked question

Johannes Wissel: Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of an institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.

Annex L

Interview with Samantha Cook, Senior Disaster Risk Financing Specialist, World Bank on 15 June 2017

Overview over asked questions

Johannes Wissel:	Can microlenders and microinsurers save costs by globally pooling their risks in one mechanism in comparison to turning to reinsurers individually?
Johannes Wissel:	If a participant of the pool is affected by a disaster, should the pool access external finances dependent on the severity of the damage this single MFI suffers from or should it depend on whether the pool is able to cover the payout with the own financial resources. In the second option the performance of the total pool would determine the amount of external finances requested.
Johannes Wissel:	Does the risk pooling institution need to have an insurance licence in every single country the participants operate in?

Annex M

Interview with Peter Wrede, Senior Financial Sector Specialist, World Bank on 15 June 2017

Overview over asked questions

Johannes Wissel:	Do you see it as a promising solution that microinsurers and microlenders pool their natural disaster related risks globally and index-based in one mechanism?
Johannes Wissel:	Would a newly established global risk pool be obliged to acquire insurance licences in many countries?
Johannes Wissel:	Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of an institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.
Johannes Wissel:	Would reinsurers be interested to reinsure a possible bad performance of the pool?
Johannes Wissel:	The payout a participant receives out of the mechanism in case of a natural disaster could be a loan or equity – like an insurance payout that does not need to be paid back. What form of payout do you prefer?

Annex N

Correspondence with Carlos Boelsterli, CEO, Microinsurance Catastrophe Risk Organisation on 15 June 2017

Asked question

Johannes Wissel: Do you see it as a promising solution for a microinsurer to pool its risks together with the risks of other microinsurers and the credit risks of MFIs, instead of turning to a reinsurer individually?

Annex O

Correspondence with Mario Wilhelm, Senior Microinsurance Specialist, Vice President Global Partnerships, Swiss Re on 19 June 2017

Overview over asked questions

Johannes Wissel:	Do MFIs reinsure their credit default risks? Do they turn to reinsurers? If the level should be low, what are the reasons? Does the market not offer efficient reinsurance solutions?
Johannes Wissel:	Would you be interested to reinsure such a pool of credit and insurance risks?
Johannes Wissel:	Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of the new institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.

Annex P

Correspondence with Peter van den Broeke, Senior Policy Advisor, International Association of Insurance Supervisors from 19 June 2017

Overview over asked questions

Johannes Wissel: Do you see it as a promising solution for microinsurers to pool their risks together with the risks of other microinsurers and the credit risks of MFIs, instead of turning to a reinsurer individually?

Johannes Wissel: Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of the new institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.

Annex Q

Correspondence with Josh Ling, Microinsurance Actuary, Microinsurance Catastrophe Risk Organisation from 23 June 2017

Overview over asked questions

Johannes Wissel:	From your perception, how many MFIs offer weather index based microinsurances themselves by bearing the risks and how many act as an intermediary between the customers and the insurers?
Johannes Wissel:	Are there studies that show the high costs of e.g. weather index based crop insurance? How much of the price the end user has to pay results from the premium to the reinsurer? Do the reinsurers charge too high premiums (in comparison to the true values of the risks)?
Johannes Wissel:	Do you see it as a promising solution as a microinsurer to pool your risks together with the risks of other microinsurers and the credit risks of MFIs, instead of turning to a reinsurer individually?
Johannes Wissel:	Would it be possible from a legal or regulatory perspective that the MFIs and insurers become co-owners of the new institution that pools the credit and insurance risks based on indexes? I know that the laws are different from country to country, but what is your prediction, how are the chances that this conception might be established in a way that does not violate the regulations? I am concerned, because lending institutions now will be co-owners of a global operating institution that acts like an insurer.

Annex R

Interview with a Representative of a Climate Think Tank on 27 June 2017

Overview over asked questions

Johannes Wissel:	Do MFIs and microinsurers reinsure their insurance risks? How do they do this? Do they turn to reinsurers individually?
Johannes Wissel:	Do you see it as a promising solution to pool these risks among the microfinancial actors?
Johannes Wissel:	What is your opinion on pooling the risks index-based?
Johannes Wissel:	If a remaining risk of the pool should be externally reinsured, how should this reinsurance be constructed? Should a payment be triggered based on the situation of a pool's participant or should the total pool's performance be considered?
Johannes Wissel:	Is it a reasonable approach to save costs by limiting the highest possible payout to the participant?
Johannes Wissel:	I have the idea to establish the risk pool as a co-owned company by the participants. However, previous interviewees informed me about potential legal restrictions of the MFIs. Can the contracts between the MFIs and the risk pool be designed in a way to ensure a participation on the pool's performance? Is this a feasible a feasible alternative to being a co-owner?
Johannes Wissel:	From previous interviews I also learned that the global risk pool can avoid acquiring licences in many countries like reinsurers are connected with local insurers. Can you confirm that the global risk pool can make use of the same principle?

Annex S

Interview with Representative 2 of the Insurance Sector on 30 June 2017

Asked question

Johannes Wissel: GlobalAgRisk intends to implement an index-based natural disaster risk pooling concept among microfinancial actors. What is your opinion on this concept?

Annex T

Interview with Representative 2 of the Microfinance Sector on 12 May 2017

Asked question

Johannes Wissel: Do you see yourself as a MFI?

VII Statutory Declaration

I herewith formally declare that I have written the submitted dissertation independently. I did not use any outside support except for the quoted literature and other sources mentioned in the paper.

I clearly marked and separately listed all of the literature and all of the other sources which I employed when producing this academic work, either literally or in content.

I am aware that the violation of this regulation will lead to failure of the thesis.

Student´s name	Student´s signature
Matriculation number	Berlin, date