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Climate risk insurance in developing countries

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Title	Climate insurance in developing countries
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Abstract	CICERO Center for International Climate Research and Vista Analyse have been commissioned by Norad to undertake a mapping of relevant literature to gather knowledge about insurance arrangements aimed at climate change. The focus has primarily been on sovereign level insurance arrangements, but also arrangements aimed at small-scale food producers, and mainly in Sub-Saharan Africa. The project has been carried out by Andreas Hoel-Holt and Haakon Vennemo at Vista Analyse, and Sofie Skjeflo at CICERO Center for International Climate Research. Quality Assurance has been carried out by Asbjørn Torvanger at CICERO. We would like to thank Norad for an interesting assignment. Lauren Naville Gisnås has been our contact person at Norad. We are grateful for useful input from Norad to an earlier draft of this report.
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Partners

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Summary

As part of its portfolio work on climate adaptation and expansion of the portfolio, Norad needs to gather knowledge about insurance arrangements aimed at climate change. There is a need to answer overarching questions about insurance arrangements based on relevant literature, research, evaluations, etc. In this report, we primarily look at insurance arrangements aimed at larger actors such as national states, city/state authorities or aid organizations, but also at insurance arrangements for individuals, especially food producers.

We do not go into details about every insurance scheme, especially the smaller schemes aimed at individuals and smallholder farmers. The exception is the sovereign risk pool African Risk Capacity, which we discuss in detail.

The report answers seven main questions, based on the questions asked in the Terms of Reference:

1. What is a good/best model for subsidizing insurance arrangements? When is the arrangement profitable?
2. If the need is security for vulnerable populations, are insurance policies the most effective (or an effective) use of aid funds? Do insurance arrangements have a security effect on individuals and at the national level?
3. Is there an economic basis for such weather-related insurance arrangements? That is, is the risk insurable? If so, is it likely that losses and damages from climate change will continue to be insurable in a scenario of accelerating climate change and more unpredictable extreme weather events?
4. Do the arrangements contribute to risk assessment and risk reduction, e.g. by offering lower premiums for actors who implement risk-reducing measures such as building flood protection, etc.?
5. What challenges are there regarding moral hazard, and how can these be reduced?
6. Which arrangements in sub-Saharan Africa have had the most promising results and what do they cover? Are there arrangements that cover coastal populations and workers in the informal sector?
7. Would it be possible with public, international aid efforts to build a market for such insurance arrangements (with private insurance companies) aimed at developing countries?

This summary is organized in paragraphs addressing each question, and the main text provides more detailed information and literature supporting the arguments in the summary.

What is a good/best model for subsidizing insurance arrangements? When is the arrangement profitable?

Disaster risk is best managed by a combination of different financial and non-financial instruments and **cannot rely on insurance alone**. Insurance has low penetration in developing countries and is only one part of a larger system of financial products that should be used in combination in a risk-layering approach. When subsidizing insurance arrangements, donors should be aware of the risk-layered context in which the insurance arrangement is used by policyholders.

Insurance arrangements can either be supported directly or indirectly. Direct financial support entails, for example, capital injections, grants for capacity building, or premium subsidies to policyholders. Indirect support, on the other hand, consists of partnering with international initiatives that aim to improve cooperation, develop risk models, secure more financing, perform research, disseminate best practice, and so on.

Which subsidy model is most suited **depends on the needs of the insurance arrangement** in question and the goal(s) of the donor, and **there is no single best model**. For example, new sovereign risk pools should be supported with capital injections, while premium subsidies usually have a higher benefit in established pools. A growing risk pool may need both. In the context of agricultural index insurance (micro), assistance in designing impactful and needs-based products can be more important than supporting e.g., premiums at this stage of development.

Climate insurance arrangements in developing countries are usually **not profitable for the private sector**, and often rely on concessional financing. Even established insurance companies in advanced economies worry that their profits will fall in the face of climate change, because of a decreased ability to confidently predict weather patterns.

In the context of subsidies to disaster risk finance instruments, **a common measure of profitability is Value for Money (VfM)**. This concept is usually operationalized as a cost-benefit analysis or a cost-effectiveness analysis. However, VfM is only one part of the equation, and other considerations could be made.

Donors should consider methodological guidelines when deciding on premium and capital support recipients and allocations. These guidelines explain in detail how to assess the VfM and other considerations for concrete projects. One example is to use the **SMART principles for premium and capital support**, developed by InsuResilience Global Partnership, that include metrics of sustainability, accessibility, resilience and transparency.

For insurance aimed at households, low take-up is a key issue, with affordability, high basis risk, lack of information and trust as important barriers. The research literature points to several avenues for improving index insurance products to overcome barriers, and **ways in which donors can support this work:**

- Improve the quality of index insurance products through investments in crop modeling, remote sensing, and contract enhancements.
- Support the establishment of reinsurance mechanisms to reduce insurance providers' exposure to high-risk events and enhance their capacity to offer affordable coverage.

- Establish and support the use of safe minimum standards for index insurance products to ensure high quality and promote trust.
- Explore alternative approaches to direct premium subsidies, such as offering free insurance coverage to high-risk farmers for projected low yields or catastrophic losses, creating a minimum market size and reducing overall insurance costs.

In line with these recommendations, **we recommend supporting index insurance aimed at households more broadly** (supporting capacity development, regulatory support, support for research and product development in line with the recommendations summarized above), rather than a narrow focus on subsidizing premiums. Our impression is that broad support is the priority of existing donor supported initiatives towards micro-scale insurance arrangements.

If the need is security for vulnerable populations, are insurance policies the most effective use of aid funds? Do insurance arrangements have a security effect on individuals and at the national level?

There is **only sparse literature comparing insurance policies to other types of aid funds**. Existing literature, based on limited evidence, finds that supporting insurance policies is an effective use of aid funds, but not necessarily the most effective.

An example from the literature based on data from Kenya, shows that a parametric sovereign insurance contract would raise social welfare compared to having a fixed budget for supporting vulnerable households. The insurance policy would also reduce the negative impacts of budget volatility on growth.

Because of the positive impacts on longer term productivity, several studies find that supporting insurance for small-scale farmers is a valuable support to vulnerable households, although there are **ongoing discussions about the benefits of subsidizing insurance premiums compared to other mechanisms, such as cash transfers**. There is evidence that access to insurance may have more positive impacts on longer term prospects for poverty reduction through improving investment incentives, compared to cash transfers. On the other hand, some research shows that livestock insurance may protect households that are better off, while poorer households may require other instruments, and may benefit more from cash transfers.

Recent developments in agricultural index insurance may contribute to the value of providing insurance to vulnerable households. The **evolution towards early trigger approaches to protecting assets rather than compensating losses** in IBLI's insurance products for pastoralists is one example. To reduce total global losses from climate change, there is a need to invest in avoiding and reducing risk. While insurance and risk pools split the bill across more actors, they do not necessarily reduce the bill itself. This is emphasized in parts of the literature, where the "anticipatory approach" of some of the index-based livestock insurance schemes are viewed as part of an emerging paradigm in disaster risk financing.

Is there an economic basis for such weather-related insurance arrangements? That is, is the risk insurable? If so, is it likely that losses and damages from climate change will continue to be insurable in a scenario of accelerating climate change and more unpredictable extreme weather events?

There is likely low or no economic basis for **non-concessional** weather-related insurance arrangement in Sub-Saharan countries, in the sense of private-market insurance supply without any governmental support. The premiums for such arrangements would be too high to be financially manageable for low-income countries, and **affordability remains a barrier** for index-based insurance aimed at households.

African Risk Capacity (ARC), the largest sovereign risk pool covering Sub-Saharan African countries, relies on ordinary policyholder premium payments, but also on **significant donor contributions**. So far, it has received over \$250 million USD in donor support, of which \$100 million is a 20-year interest-free loan for seed capital. It is expected that donor support will continue to be required in the foreseeable future.

Climate change will likely increase both the unpredictability of weather-related disasters, and their severity, **making such events harder to insure against**, which may increase needs for concessional financing.

Do the arrangements contribute to risk assessment and risk reduction, e.g., by offering lower premiums for actors who implement risk-reducing measures such as building flood protection, etc.?

Countries that wish to join the ARC risk pool **must undergo several risk assessment and capacity building processes to be approved**, such as customizing the ARC risk model, defining a payout contingency plan, establishing a detailed operational plan, and establishing risk transfer parameters. While ARC has ambitions to help build holistic disaster risk management strategies in a mission to provide ‘harmonized resilience solutions’, there are yet no plans on how to achieve these goals.

Increased risk of weather-related disasters due to climate change will create **additional challenges for the uptake of index insurance for smallholders**. The research literature points to household’s understanding of risk in addition to increasing costs of insurance. For insurance aimed at households, **we recommend supporting the development and diffusion of insurance products with an anticipatory approach**, through e.g., early payouts that enable asset protection, or bundling with risk reducing inputs, to promote adaptation and investment in resilience.

What challenges are there regarding moral hazard, and how can these be reduced?

Moral hazard is a concern in insurance as insured parties may be less motivated to reduce risk knowing that insurance will cover their losses. **Reduced problems of moral hazard and adverse selection are pointed to as important advantages of parametric and index insurance** compared to traditional indemnity-based insurance, since payout is based on an index that cannot be influenced by any individual policyholder.

While the risk of moral hazard is inherently lower in parametric insurance compared to most forms of traditional indemnity insurance, there is **still a risk that governments benefiting from insurance may neglect disaster preparedness activities**. However, sovereign disaster risk insurance primarily provides short-term liquidity for immediate

disaster response and is **unlikely to significantly alter governments' behavior** beyond response functions, funding, and plans. In contrast, members of the ARC have improved their disaster contingency plans **and more African countries have disaster contingency plans than before.**

Providing insurance to developing countries can potentially reduce the risk of moral hazard by offering an alternative to relying solely on post-disaster humanitarian aid. The ARC, for example, emphasizes promoting domestic risk ownership, which enables governments to take responsibility for addressing disaster risks within their countries. This approach aims to reduce dependence on donor support over time, allowing countries to independently finance and manage emergency drought responses.

Premium subsidies may mask the real cost of risk, leading to diminished risk-awareness and consequently, reduced efforts to implement risk mitigation strategies. However, this adverse effect can be mitigated by bolstering risk education for recipient countries and **structuring subsidies to retain transparency about the actual risk costs.** To enhance this, it is recommended that subsidies be contingent upon rigorous risk assessments, risk-reduction activities, and preparedness plans, like in the ARC model. By doing so, countries remain engaged in risk management even while benefiting from premium subsidies.

Which arrangements in sub-Saharan Africa have had the most promising results and what do they cover? Are there arrangements that cover coastal populations and workers in the informal sector?

The African Risk Capacity (ARC)

The largest Sub-Saharan sovereign risk pool is the African Risk Capacity (ARC), and it is the only one that focuses on Africa. **The ARC provides parametric index-based insurance coverage for medium-frequency events such as drought, tropical cyclones, and river flooding.** The ARC continues to expand its offerings and plans to introduce new products such as catastrophe bonds, excess rainfall insurance, and insurance for other perils like locusts and wildfires. The number of countries in the ARC risk pool has varied over the years, with an increase in uptake over the recent years.

The ARC initially faced challenges, including unmet expectations and concerns about the affordability of premiums. Some countries opted out due to the lack of insurance payouts during droughts, which have reduced trust in the drought modelling and increased perceived basis risk. However, **there have been improvements** within the ARC, such as the introduction of the ARC Replica coverage program and efforts to address premium affordability through initiatives like the Africa Disaster Risk Financing (ADRFi) program.

ARC has also **worked on reducing basis risk** by improving the drought model to ensure more accurate payouts. The introduction of new insurance products, such as coverage for tropical cyclones and river floods, has allowed ARC to tailor risk management solutions to specific hazards in different countries.

ARC relies on both policyholder premium payments and donor contributions. Donors have provided over \$250 million USD in support to ARC. Premium support is available through programs like ARC Replica, ADRiFi and bilateral support from donors. However, there have been **concerns** about ARC Agency's (the capacity building part of ARC) funding plan and transparency, leading donors to shift their support to ARC Ltd (the insurance company). **Misaligned incentives** in the approval of operational plans are also a concern, highlighting the need for improved alignment and transparency in the process.

Despite the challenges with ARC Agency, **donors remain interested in ARC's mission** and continue to support countries through ARC Ltd and its subsidiaries.

Start Ready, by Start Network

Start Ready is a recently launched global risk pool. It is only in its second risk pool season, and to our knowledge, no evaluations or assessments of results have been published at the time of writing this report. Therefore, we cannot say whether they have delivered promising results. However, their strength is that their risk pool is in principle global, which may give increased risk diversification benefits and reduce overall insurance costs (Ciullo et al., 2023). Also, Start Ready may to a certain extent complement other insurance facilities, because of their risk-layered approach not relying solely on insurance-based financing.

Smallholder index insurance

Agricultural index insurance aimed at small scale farmers and pastoralists is by far the most common weather-related insurance aimed at households and small-scale food producers in Sub-Saharan Africa. Availability and uptake of insurance in fishing and aquaculture is low. Microinsurance aimed at workers in the informal sector mainly focuses on health-, life and accidents, while weather related insurance is highly relevant for small-scale agribusinesses.

Robust impact assessment studies of agricultural index insurance show promising results on welfare (both economic and subjective) through **reducing the negative impacts of severe shocks, and ex ante, through enabling investments in higher yielding activities and increasing productivity**, and through offering the insured households "peace of mind". Examples of arrangements that have shown promising results include index-based livestock insurance, and insurance offered by ACRE Africa. On the other hand, the heterogeneity of the impacts found in the literature and concerns over the external validity of results imply that new products and expansion to new settings and areas should be accompanied by rigorous testing and evaluation. Our impression is that this is already an important part of ongoing work on agricultural index insurance in Sub-Saharan Africa.

Low uptake of unsubsidized insurance remains a key challenge for the expansion of these products. Important barriers include affordability, product quality (basis risk) and barriers related to information. Rather than pointing at specific products with promising results, we therefore point at promising developments to overcome these barriers:

- Improved indices and contracts: Enhancing measurement accuracy and reducing basis risk through improved indices and contract designs.

- Bundled products: Combining insurance with other services to increase take-up and lower costs.
- Flexible payments mechanisms: Offering flexible timing and modes of payments to overcome liquidity constraints and promote uptake.
- Information and behavioral interventions: Increasing awareness and demand through education, information provision, and addressing risk perceptions.
- Farmer participation: Involving farmers in product design and verification to enhance trust and reduce basis risk.
- Offering insurance to groups: Leveraging existing community groups to build trust and reduce costs.
- Promoting loss prevention: Early payouts and mitigation strategies to prevent losses and improve insurance effectiveness.

Would it be possible with public, international aid efforts to build a market for such insurance arrangements (with private insurance companies) aimed at developing countries?

There are **already several international initiatives in disaster risk finance in place**, that play an important role in improving cooperation, securing financing, conducting research, disseminating best practices, and collecting data. Some important examples include the InsuResilience Global Partnership, the World Bank Disaster Risk Financing and Insurance Program (DRFIP), the World Bank Global Index Insurance Facility (GIIF), and the Global Shield against Climate Risk. Several of these initiatives are partnered with insurance providers and indicate that stakeholders believe a market can be built. However, as emphasized previously there is likely low or no economic basis for non-concessional weather-related insurance arrangement in Sub-Saharan countries.

The **Global Shield against Climate Risk**, launched jointly at COP27 by the V20 Group and the G7 countries, aims to enhance pre-arranged financing to address climate-related risks on a larger scale. It utilizes existing financing structures and instruments to effectively respond to climate risks. Its aim is to **gather existing disaster risk finance and preparedness under 'one roof'**.

The **InsuResilience Global Partnership** focuses on increasing the resilience of poor and vulnerable people and countries to climate change impacts through insurance and risk management. It aims to make insurance coverage more accessible to those most affected by climate change.

The **DRFIP** aims to enhance the financial resilience of countries and communities to natural disasters and catastrophic events. It helps countries develop and implement disaster risk financing strategies, including financial instruments such as insurance and risk transfer, to provide financial protection against disasters.

The **GIIF**, a World Bank program, facilitates access to finance for smallholder farmers and micro-entrepreneurs in developing countries through catastrophic risk transfer solutions and index-based insurance. It provides financial education, capacity building, technical advice, and policy dialogue to support the implementation of insurance programs.

These international initiatives contribute to the advancement of disaster risk finance by promoting collaboration, knowledge-sharing, and the implementation of innovative solutions to enhance resilience and financial protection against disasters.

Three relevant recommendations from the literature on agricultural index insurance include supporting **reinsurance** for insurance providers, **"smarter subsidies"** (for instance by subsidizing insurance for the most catastrophic events) to help build markets, as well as **supporting minimum quality standards**.

1. Introduction

Insurance instruments are increasingly emphasized as an important part of the solution for funding loss and damage from climate change, with the launch of the Global Shield against Climate Risks as a recent example (see, e.g., Worley, 2023).

Disaster risk financing changes the way financing is secured during crises. Instead of a reactive approach (ex-post financing), which is often unreliable, insufficient, slow, and relies on ad-hoc measures (Poole, 2014), disaster risk financing implies using a proactive approach (ex-ante financing). This means preparing and securing financing using a risk-informed strategy before a crisis happens, rather than just responding after it has occurred.

Using a forward-looking strategy may help those exposed manage the financial impact of risks, by enabling people to avoid taking short-term actions that could hurt their future long-term financial (and personal) health. For vulnerable households, these actions could include taking children out of school, skipping meals, selling off possessions or assets, taking on emergency debt and engaging in low-risk, low-yield activities. Furthermore, disaster risk financing can make both households, lenders and investors feel more secure as they sense their investments are protected.

The large number of disaster risk finance instruments can be sorted into three main categories:

1. Insurance
2. Catastrophe ('cat') bonds
3. Contingent credit facilities and reserve funds

In this report, we focus mainly on insurance and, in particular, parametric (or index) insurance (see section 2.5) at the sovereign level, but also (agricultural) index insurance aimed at households.

Since insurance is only a small part of a broader context of financing instruments, we briefly explain other instruments and how they should be combined to fit in a holistic risk-layered approach.

We begin in Chapter 2 by placing insurance in the broader context of climate and disaster risk financing. We also discuss insurability in the face of climate change, pros and cons of different types of insurance, and performance indicators of parametric insurance. In Chapter 3, we provide results from mapping insurance arrangements in Sub-Saharan Africa, before we discuss the role of development assistance in supporting climate insurance and the mechanisms through which climate insurance can be supported in Chapter 4.

2. Concepts in climate risk insurance

In this chapter, we very briefly explain the concept of insurance (section 2.1), how it fits in a broader risk-layering approach to disaster risk management and finance (section 2.2) and the relatively low use of such strategies in developing countries (section 2.3). Then, we discuss how climate change may affect the insurability of weather-related disaster risks (2.4). We also compare parametric insurance to traditional insurance (section 2.5) and discuss the strengths and weaknesses of parametric insurance (section 2.6), including its basis risk. We conclude the chapter by presenting sovereign risk pools and discussing their advantages (section 2.7).

2.1 Risk pooling and insurance

Insurance is fundamentally based on the concept of risk pooling. It involves collecting small premiums from many policyholders to cover the costs of periodically large claims from only a few members.

Risk pooling is a concept that applies to various scales and sectors. It is used by different groups, such as smallholder farmers and local governments, as well as sovereign risk transfer facilities. Regardless of the context, the objective remains the same: to share the financial burden of unexpected events among a larger set of actors. By sharing risks, individuals and organizations can better handle the financial impacts of unforeseen circumstances, promoting stability and resilience.

2.2 Insurance is only a part of a broader risk layering approach

Effective financing of disaster risk management entails combining risk retention strategies with risk transfer strategies (Poole, 2014). This concept is called 'risk layering'. Figure 1 illustrates a hypothetical risk layering approach, where risk retention strategies are combined with risk transfer strategies in order to cover the spectrum of risk characteristics in a cost-effective manner. Risk retention and risk transfer strategies are explained below.

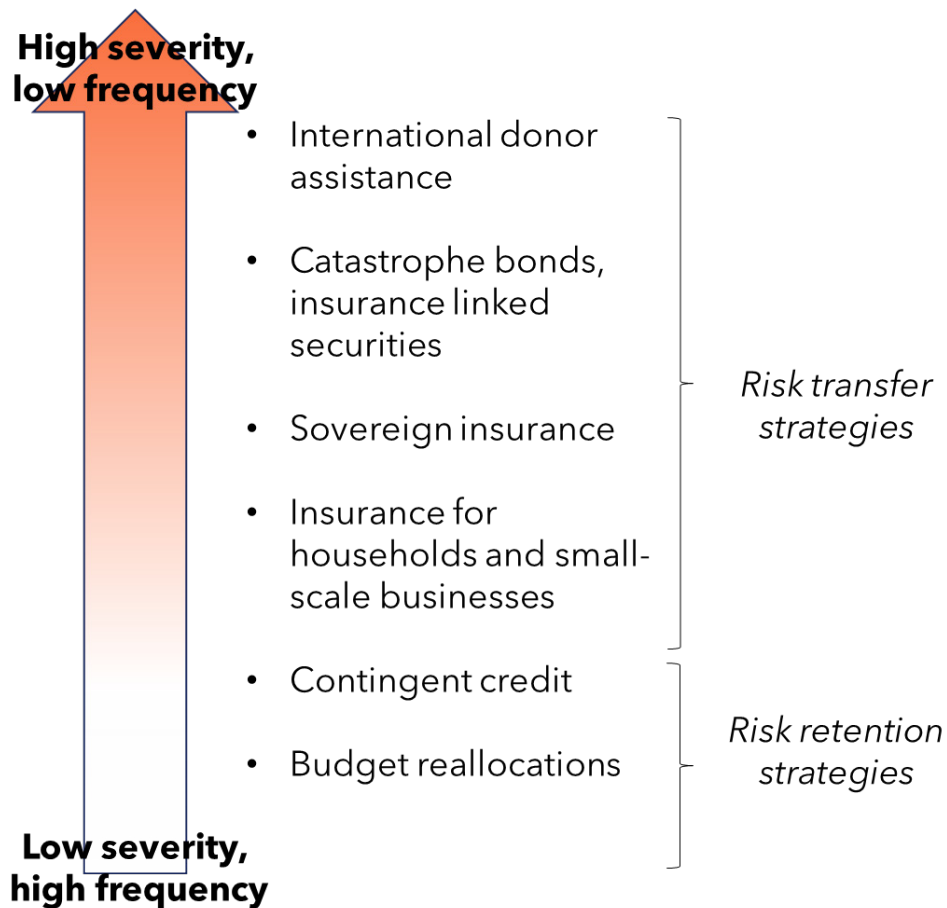


Figure 1 Hypothetical risk layering approach. Figure based on ADB (2013) and World Bank (2021a).

Governments might (and should) set aside emergency funds and create backup budgets for common, low-impact risks. For medium-level risks, they might rearrange budgets or plan for emergency credit or loans. These two represent a **risk retention** strategy, where the risk is kept by the entity at risk, and not transferred to others. In such low-impact cases, markets will likely charge excessive premiums and those exposed are therefore economically and practically better off handling their own risk financing (Poole, 2014).

For less frequent but higher-impact risks, however, where it is not practical to keep sufficient reserves, governments (and other actors) might decide to pass the risk on to insurance companies and/or private capital markets through catastrophe bonds (see section 2.8) to spread the cost of risk over time. This represents a **risk transfer** strategy, in which risk is shifted from those exposed to risk-takers, for a premium.

2.3 Developing countries have low insurance uptake and rarely use risk layering strategies

Insurance uptake is generally low in developing countries (Panda, Lambert & Surminski, 2020). The use of risk layering strategies and disaster risk financing instruments is also more common in high-income countries than in low-income countries: According to WRI (2019), countries using disaster financing tools usually have a higher gross national income per capita, less debt compared to the size of their economy, and their governments are often more effective than comparable countries. See Figure 2.

	PERCENT OF COUNTRIES WITH					
	GNI per Capita above Median	Average Annual Humanitarian Aid per Capita below Median	Central Government Debt as a Percentage of GDP below Median	Government Effectiveness above Median	Share of Population Affected Annually by Disasters above Median	Total Annual Disaster Damage per Capita above Median
Countries Using All Three Instruments	83%	67%	83%	83%	83%	100%
Countries Using Two Instruments	80%	67%	53%	80%	60%	80%
Countries Using One Instrument	63%	38%	44%	69%	63%	56%
Countries Using No Instruments	23%	42%	42%	16%	32%	23%

Figure 2 Characteristics of countries using disaster financing tools. Figure reproduced from WRI (2019)

While there are several examples of middle- and high-income countries using systematic risk layering strategies, such strategies are little used in the poorest countries and affordability remain an important barrier to uptake (World Bank, 2017; Scott et al., 2022). For example, of the countries that have signed first step to purchase insurance from the African Risk Capacity (ARC), 75 percent use no disaster risk finance instruments. The few countries that do use such instruments mostly rely on a single instrument, and no country in the ARC uses all three types of instruments (WRI, 2019). See Figure 3.

	ARC
No instruments	75%
Disaster fund only	9%
Contingent credit only	3%
Insurance only	6%
Disaster fund + contingent credit	3%
Disaster fund + insurance	3%
Contingent credit + insurance	0%
All three instruments	0%

Figure 3 Use of disaster financing tools among ARC countries. Figure reproduced from WRI (2019)

2.4 Un-insurability and climate-related disasters

An event is typically insurable when it is considered ‘calculable’, meaning that actuaries can assess and quantify the risk based on data and probabilities (Kagan, 2021).

If an event is highly unpredictable, it becomes challenging to confidently assess and quantify the risk, and thus determine appropriate premiums. Decreasing the ability to confidently predict losses will increase premiums or even cause insurers to exit (or not enter) some high-risk markets, in effect making the event uninsurable (Frank, 2023).

Examples of uninsurable events are catastrophic events that are correlated across many policyholders, such as earthquakes, hurricanes, wildfires, and pandemics. Insurability thus depends on the ability to assess, manage, and diversify risks effectively (Chamberlain, 2022).

Climate change will likely increase both the unpredictability of weather-related disasters, and their severity, making such events harder to insure against (Collier et al., 2009).

If private insurance companies are unwilling or unable to insure against risks, then individuals must bear the risk themselves, or the government must step in to make the privately uninsurable insurable by the state, by acting as a 'residual' insurer (Chamberlain, 2022; Schanz, Schmeiser & Braun, 2020). The role of national governments can for instance be to provide tax-financed reinsurance to offload intolerable risk from private insurance companies, or by using regulations to reduce risk correlation. One example can be to use zoning codes to reduce the risk of wildfires spreading between houses (Chamberlain, 2022).

The private insurance industry is small in developing countries, however, and there is low insurance uptake. Furthermore, governments in developing countries have less resources to offload private insurance risk, which could result in severe and long-lasting losses following disaster events, without significant humanitarian aid. To overcome this, donor countries could provide concessional premium support or offer capital support or partial guarantees to insurers, to help alleviate some of the issues of un-insurability, or at least make these insurance mechanisms more accessible (Richmond et al., 2021). For example, ARC have several mechanisms by which donor countries can assist in increasing coverage in African countries, such as ARC Replica and AdRiFi (see section 3.1.3)

2.5 Parametric insurance versus traditional insurance

There are two main types of insurance: indemnity insurance and parametric (or index) insurance. We mainly consider parametric insurance in this report because it is seen as a key tool in closing the protection gap for natural disasters (Dyson, 2020). However, we also describe traditional indemnity insurance to highlight their differences.¹

Indemnity insurance is the "traditional" form of insurance. It is based on reimbursement: After a loss occurs, the insurer compensates the insured party for the actual loss incurred, up to the limit of the insurance policy. This typically requires an assessment of the damage value. The goal is to restore the insured to the financial position they were in before the loss. However, indemnity insurance can sometimes be a lengthy and costly process due to the need for damage assessment and claim validation.

Parametric insurance is a different and more modern approach, often used in disaster risk financing at both micro and macro scales. Instead of reimbursing actual losses, payouts under a parametric insurance policy are triggered by predefined parameters related to a disaster event, such as inches of rainfall or the wind speed of a hurricane. Once these parameters are met or exceeded, the insurance pays out a predetermined amount. The amount to be paid out is determined by the insurance premium: As in all insurance schemes the insurance premium exceeds expected pay-out by some amount. The exceedance is the expected payment to the insurer for transferring risk.

¹ The terms parametric insurance and index insurance are used interchangeably. In the literature on sovereign insurance, parametric insurance is used more often, and index insurance is commonly used when referring to insurance aimed at small-scale food producers and households. We will follow this tradition in this report, while leaning to using parametric insurance when referring to the concept in general.

The two types of insurance could (and should) be used to complement each other, depending on how quickly the beneficiary requires funds and how precise the reimbursement should be. One example of this is the Philippines' risk layering strategy, where a sovereign (parametric) risk transfer facility is used to finance short-term needs, while public asset indemnity insurance is used at longer time scales (World Bank, 2021a).

2.6 The strengths and weaknesses of parametric insurance

An important strength of parametric insurance is that the payout is typically quick and does not require a detailed assessment of damage. This makes parametric insurance particularly useful in situations where rapid access to funds is needed for recovery and reduces costs compared to traditional indemnity-based insurance which pays out based on verified losses.

Parametric insurance offers not only fast payments but also simpler mechanisms compared to traditional indemnity insurance contracts. This simplicity makes parametric products easier to comprehend for capital market investors and buyers alike, thereby attracting financial support and investment from sources beyond the traditional insurance and reinsurance sectors (Dyson, 2023). Furthermore, parametric insurance allows coverage that would be previously uninsurable.

An important advantage of parametric insurance products aimed at households and small-scale businesses is the avoided cost of monitoring and verifying losses, which may be prohibitively high for, e.g., small scale farmers. This is further discussed in section 2.6.3.

Its other strengths and weaknesses aside, parametric insurance may not cover all losses because it does not consider the specific circumstances of each individual case *ex post*, resulting in relatively high basis risk. This is further discussed in the next section.

2.6.1 Different forms of basis risk

When comparing insurance policies, one should consider their 'basis risk'. Basis risk refers to the potential difference between the actual loss suffered and the insurance payout received - or the difference between the expected payout and the actual payout.

All types of insurance are exposed to basis risk, but the cause of basis risk varies. In indemnity insurance, the basis risk is relatively low. This is because the insurer's payout, albeit slower, is directly tied to the actual loss sustained. In other words, the payout is designed to closely match the actual damage or loss.

The basis risk in indemnity insurance emerges when the policy only covers losses up to a policy limit, or the claim might be rejected due to policy exclusions, exceptions, legal mis-wordings, or other such factors.

In parametric insurance, the basis risk can be higher. Because the payout is determined by predefined triggers or parameters, and not losses directly, there is a chance that the payout may not match the actual loss. For example, if the event's parameters are met but the damage to the insured is minimal, the payout could exceed the actual loss. In this case the basis risk is negative (an overpayment). On the other hand, if the event doesn't

meet the set parameters but still causes damage, the insured may receive no payout, even though they suffered a loss – a positive basis risk (a shortfall).

In agricultural index insurance, geographic/spatial basis risk refers to the distance between farmer's plots and measurement points, design basis risk may result from the models and variables used to construct the index, and temporal basis risk is related to the timeframe over which the index is measured (Nshakira-Rukundu et al., 2021).

While parametric insurance can provide quicker payouts and simpler processes, it tends to have a higher basis risk compared to indemnity insurance because payouts are based on predetermined parameters and not actual losses. Lack of access to, e.g., weather data from measuring stations may particularly be a problem in developing countries, thereby increasing the basis risk in parametric insurance products compared to areas with better data. On the other hand, a quick and speedy process saves costs for insurers. Parametric insurance therefore tends to be cheaper, everything else equal, than a comparable indemnity insurance. In the end, choosing between the two often involves balancing the need for speed, simplicity, and low cost against the risk of the payout not fully covering the loss.

2.6.2 Managing and reducing parametric insurance basis risk

Reducing basis risk in parametric insurance can be achieved through several methods (Meenan, 2017). One approach involves **adjusting the attachment level**². For instance, if a policyholder requires a payout after every significant event, the index attachment level can be lowered. However, this adjustment usually means higher premiums. An alternative, more affordable strategy could be to **implement phased payouts**. This includes a small initial payout at a lower threshold, with the remaining payout more closely tied to ex post parameter realizations, helping manage the reputational risk tied to parametric insurance and speeding up access to relief.

A more technical method to mitigate basis risk requires in-depth understanding of idiosyncratic sources of uncertainty (Meenan, 2017). These primarily include the distance of the insured from the measurement stations, and the parameters' or index formula's capacity to accurately represent the insured's vulnerabilities. Reducing basis risk could involve **increasing the number of measurement stations** and assigning exposure to the station that best approximates the hazard at the exposure site. Alternatively, **enhancing the index formula** to capture a range of vulnerabilities more accurately can also be beneficial, for instance through combining multiple, satellite-based variables to design insurance products with lower basis risk (Enekel et al., 2019).

The **increasing availability of low-cost, high-resolution satellite data** and improved remote sensing of crop yields are pointed to as promising developments to reducing basis risk and improving the quality of index insurance products (see for instance Benami et al, 2021).

Morsink et al. (2016) propose two monitoring indicators to **assess the performance of parametric insurance**. Two types of basis risk are captured by the monitoring indicators: The extent to which the insurance contract captures losses caused by the peril covered

² The attachment level (or 'point'), in the context of insurance, refers to the coverage threshold. It is the level at which the financial liability shifts from the insured to the insurer.

by the contract, and the extent to which the insurance covers losses from agricultural production (which may result from other perils than the one covered). For both types of basis risk, they propose to monitor the probability of catastrophic basis risk and the catastrophic performance ratio. Both indicators rely on data from farm level surveys, triangulated with other data sources to assess losses, and historical claims data. A related approach to assessing the performance of sovereign level insurance is proposed and tested in Carter et al. (2021).

2.6.3 Agricultural index insurance

There are several types of weather-related insurance products aimed at households in developing countries, covering properties, business interruptions, health impacts, crops and livestock. The focus of this section of our mapping is insurance against climate risk for small-scale farmers and pastoralists. Of about 51 million smallholder farmers in Sub-Saharan Africa, only about 3,5 percent have agricultural insurance, which is significantly lower than rates in Asia and Latin-America (Nshakira-Rukundo et al., 2021).

Box 1 Types of indices in agricultural index insurance

Source: Index Insurance Forum, 2023

- Average yield index: Payout if harvested average yield in a given area is lower than the insured level of yield (typically 50-90 percent of average historical yields in the area).
- Weather index: Payout if realized rainfall and/or temperatures at a given weather station or for a given satellite grid falls below/above a pre-specified level.
- Normalized difference vegetation index (NDVI): Payout based on an index created by time-series of remote sensing imagery to measure the density of plant growth (e.g. on pasture)

The accuracy of these measures for predicting individual farmers losses (and thereby the basis risk in the insurance contract), and the costs associated with verification, differ.

Lack of (affordable) insurance against risk for small-scale farmers and pastoralists can have severe consequences in the form of negative health- and life impacts, and longer term impacts on the ability to escape poverty (Maccini and Yang, 2009, Carter and Lybbert 2012, Barrett and Santos 2014). Not being able to insure risk may bias farmer's decisions in the direction of low risk, low-return technologies (Suri and Udri, 2022).

The idea of index-based insurance appeared as a potential solution for providing affordable insurance for farmers in developing countries in the 1970s (MRR Innovation Lab, 2022). Payout based on an index (typically rainfall, vegetation growth or average yield, see Box 1) decreases the cost of monitoring and verification of losses, and thereby decreases the cost of insurance. This also reduces problems of adverse selection and moral hazard (see Box 2) since payout is based on an index that cannot be influenced by any individual farmer.

Box 2 Moral hazard and adverse selection in agricultural insurance

Asymmetric information between the insured and the insurance company can cause problems of moral hazard and adverse selection. Moral hazard occurs when insurance causes farmers to change their behavior in a way that increases the chance of collecting an indemnity payment. Adverse selection occurs when farmers have private information about the probability of a loss on their own plot, which means that higher risk farmer are more likely to purchase coverage. This may be a particularly important problem for insurers in developing countries with limited production records for individual farmers (Miranda and Farrin, 2012)

Since they payout from an index insurance contract is based on an objective index that cannot be influenced by any individual farmer, index insurance largely eliminates problems of moral hazard and adverse selection. Payouts do not depend on the personal characteristics or actions of those who purchase the insurance.

Box 3 Index-based financial tools for household risk management

Agricultural index insurance for smallholders and pastoralists has been pointed to as a promising instrument for providing affordable insurance to agricultural households in developing countries. Recently, other financial instruments based on indices have been developed to provide blended financial instruments to improve household resilience to weather-related disasters (Carter and Chiu, 2022).

A Contingent Line of Credit (CLOC) is an indexed loan that is paid out to a borrower in the event of a disaster, where the concept of disaster is defined by an index (e.g., rainfall or flood level). The advantage of this product compared to traditional index insurance is that there is no up-front cost. A CLOC product in Bangladesh has shown promising results on household investments and post-disaster consumption (Lane et al., 2023).

A Contingent Savings Account (CSA) is a savings account that only releases savings with full interest rate when an index predicts a bad agricultural season. Savings can be withdrawn if the index is not triggered, but with a reduced interest rate.

Offering multiple indexed financial instruments allows farmers different options depending on the ability to provide up-front cash payments for purchasing an insurance or savings for a CSA, or credit worthiness to access a CLOC instrument. Blending instruments allows farmers to layer risk and manage risk dynamically over time, e.g., by increasing creditworthiness over time through a contingent savings account, thereby providing access to credit (CLOC).

In addition to insurance, CLOC and CSA products, there are also other climate risk financial mechanisms aimed at households based on indices, for instance the Hunger Safety Net Program (HSNP) in Northern Kenya and parts of the Northern Uganda Social Action Fund (NUSAF), which provide emergency cash transfers based on an NDVI index.

On the other hand, if the index is poorly correlated with actual losses, the basis risk will be high. Note that when farmers respond to insurance by investing in higher yielding (but higher risk) varieties, this is not an example of moral hazard, since these investments are on average productivity increasing. Examples of this are discussed in section 4.4.

Over time, indices have evolved from being based on field-sampling to increasingly being based on weather data from automated weather stations, higher resolution satellite data and remote sensing techniques (Benami et al., 2021). Other index-based risk management tools have also evolved (see Box 3).

2.7 Sovereign risk pools

2.7.1 How do sovereign risk pools work?

A sovereign risk pool is a parametric risk management mechanism designed to help countries collectively manage some of the risks that they face. The sovereign risk pool is typically applied to large-scale risks such as natural disasters, pandemics, or economic shocks.

The concept is broadly similar to how insurance works, but on a larger, international scale. See Figure 4 for a simplified diagram explaining the stakeholders and payment streams in a sovereign risk pool. An insurance company collects premiums from the insured member states, who receive a payout in case the insurance triggers. The premiums are kept as capital by the insurance company, in addition to its seed capital, which is usually based on grants or concessional capital injections, for example in terms of an interest free loan. The insurance company offloads parts of its risk exposure to the international reinsurance market, for a premium. All stakeholders rely on access to data to inform the likelihood of triggering events. This data is used to assess individual risk profiles and attachment levels (parameter triggers), which in turn affects the sizes of premiums.

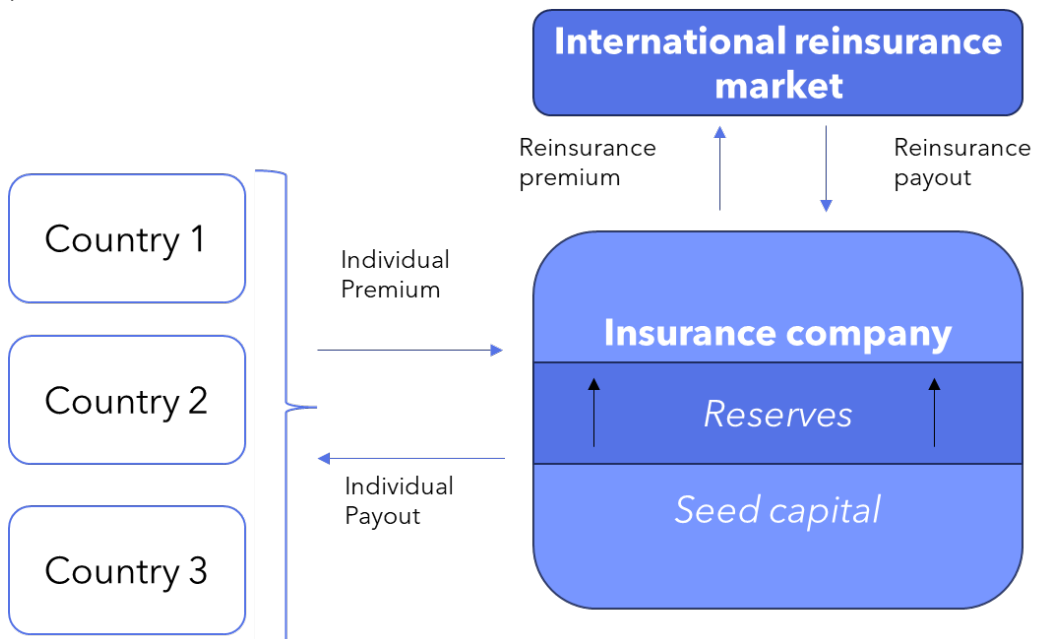


Figure 4 Illustration of stakeholders and payment streams in a sovereign risk pool. Figure redrawn from Poulter et al. (n.y.)

We discuss how donors can support different parts of the sovereign risk pool in section 4.1.

Currently, there are four major sovereign regional risk pools, and one recently launched but smaller global pool. The regional ones are: African Risk Capacity (ARC), Southeast Asia Disaster Risk Insurance Facility (SEADRIF), Caribbean and Central America's Caribbean Catastrophe Risk Insurance Facility (CCRIF-SPC), and the Pacific Catastrophe Risk Insurance Company (PCRIC). Three of the risk pools have recently signed a Memorandum of Understanding (MOU) aimed at strengthening their reach and impact.³ The MOU was signed along with the Global Shield against Climate Risks at COP27. Start Ready is a global risk pool that is currently in its second season.

2.7.2 Advantages of sovereign risk pools

Sovereign risk pools offer a number of advantages. They can provide fast, reliable funding when disasters strike, allowing countries to respond more quickly and effectively. They can also help countries manage financial risks in a more predictable way, by turning uncertain disaster-related costs into predictable insurance premiums. Furthermore, by pooling risks, countries can often secure better terms than they would be able to individually and get improved access to international capital and reinsurance markets.

Carter et al. (2021) have developed a tool for evaluating the case for sovereign disaster risk insurance, and test the tool using data from Kenya. They investigate whether disaster risk insurance reduces foregone GDP growth compared to paying the full cost of supporting affected households over regular budgets, and whether it generates greater social welfare. In the case of Kenya, they find that a disaster risk insurance contract would raise social welfare compared to having a fixed budget for supporting vulnerable households. The insurance policy would also reduce the negative impacts of budget volatility on growth. The tool provided makes it possible to test disaster risk insurance contracts, and improve contract design, by comparing hypothetical payouts to actual disaster impacts based on historical data (although data availability and quality may be an issue).

Surminski, Barnes & Vincent (2022) examine how climate risk information generated through insurance activities, including parametric sovereign risk pools in Africa (ARC), can support climate adaptation. They explore the use of climate risk data in insurance processes and the potential of the insurance industry to promote the use of such information. Despite barriers like limited trust, unclear risk ownership and potentially perverse incentives (see section 4.1.4 for a discussion of some of these), there is potential for collaborative efforts to enhance the utilization of climate risk information in insurance-related activities. Sustained cross-sectoral collaboration and capacity building are crucial for increasing awareness and utilization of such information.

The main existing sovereign risk pools have a regional focus and were not designed to maximize risk diversification. Ciullo et al. (2023) find that pooling risk globally instead of only regionally will have several benefits: it will increase risk diversification, improve the distribution of countries' risk share within the pool, and increases the number of

³ Source (press release): <https://reliefweb.int/report/world/ground-breaking-mou-signed-cop27-sees-global-risk-pools-join-forces-raise-visibility-and-influence>

countries benefiting from risk sharing. The START Network's Start Ready risk pool is a cross-regional risk pool that may have such benefits from its global approach.

2.8 Catastrophe bonds

Catastrophe bonds, also known as 'cat' bonds, are financial instruments designed to transfer risk from the bond issuer (for example a government) to risk-taking investors, mainly institutional investors. These bonds provide an opportunity to obtain financial protection against potential losses from disaster events. The structure of catastrophe bonds makes them similar to parametric insurance instruments.

The issuance of catastrophe bonds involves three parties (see Figure 5): the risk-exposed ("cedent" or "sponsor"), the investor and an independent broker (a "special purpose vehicle", or SPV). The World Bank is an example of an SPV. Through the issuance of bonds, the SPV raises capital from investors, which is invested in secure securities held in a collateral trust. Sponsors pay a regular premium to the SPV, which is periodically transferred to investors as a bond coupon, along with returns on the invested collateral assets. The occurrence of a predefined disaster triggers the liquidation of the collateral, which is then paid out to the sponsor. Alternatively, in the absence of such an event, investors receive their funds upon the bonds' maturity.

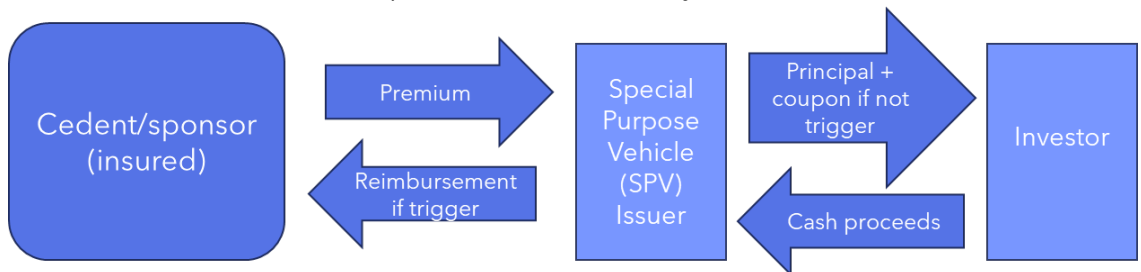


Figure 5 Illustration of legal structure of catastrophe bonds and parties involved. Figure redrawn from Ando et al. (2022).

Catastrophe bonds are mainly used for disaster risk management by high- and middle-income countries⁴, but there are some early signs of interest by low-income governments as well.

The Extreme Climate Facility (XCF) is a multi-year and multi-hazard index-based catastrophe bond launched by the African Risk Capacity in 2014, aiming to aid in risk transfer from Sub-Saharan countries to international capital markets. The bond had initial issuance planned for 2016⁵, but since then issuance has been postponed¹ several times⁶ and its development by ARC is 'very slow' (Oxford Policy Management, 2022). The ARC Group Strategy 2020-2024 expects a transition from research and development to establishment and operational phase over the 'medium term' (ARC, 2020).

⁴ Ando, S., Roch, F., Wiriadinata, U. (2022) gives a comprehensive overview over the catastrophe bond market.

⁵ Source: <https://www.artemis.bm/news/climate-change-catastrophe-bonds-for-africa-to-be-launched-by-arc/>

⁶ Source: <https://www.artemis.bm/news/arc-progresses-climate-cat-bond-facility-xcf-signs-up-un-support/>

3. Mapping insurance arrangements

This chapter presents the results from mapping insurance arrangements in Sub-Saharan Africa. The African Risk Capacity is by far the largest sovereign level insurance arrangement operating in Sub-Saharan Africa and is described in detail in section 3.1. In section 3.2, we briefly present Start Ready – a recently launched global risk pool that also includes some African countries. Based on a review of the literature on insurance aimed at households, and in particular small-scale food producers, we provide a summary of impacts and barriers related to these insurance arrangements in section 3.3. Section 3.4 provides a brief overview of the large number of international initiatives related to disaster risk finance and climate risk insurance.

3.1 African Risk Capacity (ARC)

3.1.1 What is the ARC?

The African Risk Capacity (ARC) is a specialized agency of the African Union (AU), established to help African countries respond to natural disasters and other climate-related risks, and to promote proactiveness in the face of climate change and natural disasters. It was launched in 2012 as an innovative and pan-African approach to managing climate and natural disaster risks on the continent.⁷

The ARC Group operates through two main components: the ARC Agency and the ARC Insurance Company Limited (ARC Ltd). The ARC Agency is responsible for providing technical assistance and capacity building to AU member states in the areas of risk assessment, access to early warning systems, contingency planning, and response coordination. The ARC Ltd, on the other hand, is a financial affiliate of the ARC that offers parametric index-based insurance coverage for sovereign nations in Africa against several climate-change linked disaster risks.

ARC Ltd is set up to cover a proportion of the expected financial loss from a medium frequency event (1 in 5-10 years), thus being part of a risk-layered approach (ARC, 2021). The maximum coverage for a risk pool member is 30 million USD, which is unchanged since the inception. Its seed capital was given as a 20-year interest-free loan by Germany and the United Kingdom. The long-term ambition is for ARC Ltd to be fully owned by African countries.

⁷ See <https://www.arc.int/about> for official information.

The ARC currently covers three climate-change related natural disasters: drought, tropical cyclones, and river flooding.⁸ In the coming few years, ARC plans to launch several new products, including cat bonds, excess rainfall insurance, contingency credit and fund, and insurance products for other perils, such as locust and wildfires (Oxford Policy Management, 2022).

3.1.2 Membership process

Countries must go through several steps to join the risk pool. The first step is to become an ARC Member State. Currently, there are 35 member states, all having signed the ARC Establishment agreement.⁹ Member must undergo several other processes, such as customizing the Africa RiskView software¹⁰, signing Memorandums of Understanding for domestic capacity building, preparing a detailed operational plan¹¹, defining a payout contingency plan, and establishing risk transfer parameters. After successfully completing these steps, countries receive a 'Certificate of Good Standing' and pay a parameter-dependent premium to ARC Ltd, subsequently joining the risk pool.

The number of countries in the risk pool has varied since the inception (see Figure 6). The inaugural risk pool for the 2014/2015 agricultural season consisted of four countries. The year after, the pool had increased in size to seven members, before falling each year to a low point in the 2018/2019 season, when only three countries participated. Recently, there has been an increase in uptake, with more countries joining and more areas within a single country being covered. The most recent season with available data shows 12 countries in the risk pool, covering over 18 million people in a total of 20 geographical areas, for a total value of 182 million USD (some countries only have ARC Replica coverage, see the next section.)¹²

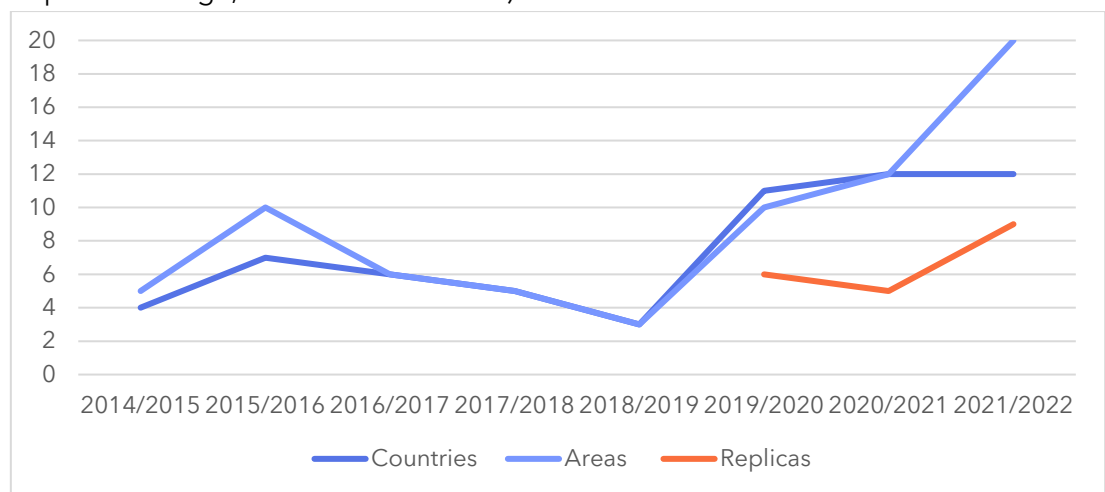


Figure 6 Coverage of the African Risk Capacity (ARC). Figure based on data from <https://www.arc.int/risk-pools>

⁸ The ARC also has an outbreaks and epidemic product, see: <https://www.arc.int/outbreaks-and-epidemics>.

⁹ For the list of member states, see <https://www.arc.int/countries>.

¹⁰ Africa RiskView is satellite weather surveillance and modelling software developed by the UN World Food Programme (WFP). It is the 'technical engine' of the ARC. This tool enables stakeholders to estimate the level of damage caused by a disaster.

¹¹ The operational plans (OPs) contain information about the country's natural disaster risk profile, risk transfer parameters (RTP), proposed interventions that meet ARC eligibility criteria, implementation plans for each intervention, details of implementing partners, fund flow processes, targeting mechanisms, procurement requirements, and monitoring and evaluation (M&E) strategies. (Oxford Policy Management, 2022)

¹² For the complete list of risk pool countries and coverage, see <https://www.arc.int/risk-pools>.

3.1.3 ARC shows signs of improvement after early problems, but some issues still remain

The ARC encountered some early problems (WRI, 2019). One major challenge was **unmet expectations**, which resulted in some countries opting out of the arrangement. For example, Kenya opted out in the 2016/2017 season after experiencing droughts in two consecutive years without triggering insurance payouts. Malawi experienced similar unmet expectations (Reeves, 2017). This raised some questions about basis risk, poor reliability and low effectiveness of the contractual agreements established by the ARC. Another problem identified by WRI (2019) was poor affordability of premiums.

Box 4 ARC Replica

The ARC Replica is an insurance product that allows UN agencies (such as the World Food Programme) and other humanitarian actors (such as the Start Network) to match insurance policies by ARC member countries (WFP, 2018). Doing so, humanitarian actors can also secure financial capacity ex-ante, used to complement sovereign relief efforts.

In practice, ARC replica enables international organizations to purchase insurance policies from ARC Ltd. These policies can match the terms and conditions in the policies already taken out directly by ARC risk pool members (replica policies), but replica policies can also be delinked from sovereign policies.

The international organization pays a (donor-supported) premium for holding the policy and will receive an insurance payout from ARC if the pre-determined event triggers. The insurance payout is then used to finance humanitarian actors' work in the insured areas and must follow a pre-agreed operation plan. The efforts of humanitarian actors are coordinated with government-led relief in disaster-struck areas.

The introduction of ARC Replica has helped increase coordination between governments and non-government organizations and has been 'critical' in local capacity building (Oxford Policy Management, 2022).

About half of the insurance policies have been "matched" since the inception of ARC Replica, and its introduction coincides with increased risk pool uptake (see Figure 7 above).

Despite the early challenges mentioned above, there have been positive signs of improvement within the ARC, even if some issues remain. One notable development is the introduction of the **ARC Replica** coverage program, implemented in 2019/2020.¹³ See Box 4.

Furthermore, efforts have been made to address premium affordability issues through initiatives like the **Africa Disaster Risk Financing (ADRFi)** program, the **Multi Donor Trust Fund (MDTF)** and a **premium support facility (PSF)**. These programs provide premium subsidies to make ARC insurance more affordable, thereby improving coverage.

The ADRFi program was initiated by the African Development Bank (AfDB) in partnership with the ARC in 2018.¹⁴ It is set up to subsidize insurance for ARC members,

¹³ See <https://www.arc.int/arc-replica> for official information.

¹⁴ Source (press release): <https://www.afdb.org/en/news-and-events/african-development-bank-rolls-out-programme-to-boost-climate-risk-financing-and-insurance-for-african-countries-18618>

among other aims¹⁵, and is the main source of premium subsidies that member states can access (ARC, 2021). ADRiFi is funded by concessional financing through the African Development Fund (which is also managed by AfDB), the World Bank IDA and the aforementioned MDTF, which was established by AfDB with contributions from the UK, Switzerland (AfDB, 2021) and later USA.¹⁶

The ARC countries can also access a separate premium support facility (PSF), supported by Germany, but the channel is also open for other countries.

ARC is wary, however, of maintaining too many separate sources of external funding, to avoid increasing administrative burdens for member states and potential moral hazard issues. They hope to ensure that PSF operates in collaboration with the ADRiFi/MDTF programs, suggesting that PSF finance may go through the ADRiFi program to the member states (ARC, 2021).

ARC has also worked on **reducing basis risk** through improvements in the drought model, trying to ensure that the payouts align more accurately with the actual losses suffered. By minimizing basis risk, ARC hopes to enhance its ability to provide timely and fair payouts to policyholders, thereby increasing trust and reliability in their insurance offerings. However, member states still have worries about basis risk, partially as a result of difficulties in customizing their drought risk model (Oxford Policy Management, 2022).

The ARC has **expanded its range of insurance products** since 2014, to include coverage for tropical cyclones (2020) and river floods (2022), in addition to the original drought coverage. By introducing these new products, the ARC aims to provide risk management solutions tailored to the specific hazards prevalent in some countries.

3.1.4 Donors are still in favor of ARC's insurance products but are unhappy with how the Agency-part is managed

The ARC relies on ordinary policyholder premium payments, but also donor contributions. So far, it has received over \$250 million USD in donor support (US\$ 100 million for ARC Agency, US\$ 100 million as a 20-year interest-free loan for seed capital, and US\$ 46 million in premium subsidies). It is likely that the ARC will need significant subsidies in the future as well, both in the form of premium support and as grants to ARC, especially ARC Agency (Oxford Policy Management, 2022).

Donors that have supported the ARC from the beginning, such as the UK, USAID, KfW, and SDC, no longer provide funding to the ARC Agency due to a loss of confidence (Oxford Policy Management, 2022). However, they still support ARC Ltd's insurance products and have shifted their donations to ARC Ltd through capital, premium financing, or premium purchases (through ARC Replica). Donors were unhappy with the ARC Agency's lack of a viable funding plan (until recently), transparency issues, and unresponsiveness to donor requests.

The ARC Agency's current funding relies on recent short-term donations, creating a significant funding gap and posing a threat to its future. Some donors take partial responsibility for the fragmented relationship, but they expect ARC to provide better

¹⁵ See the Sharm El Sheikh Guidebook for Just Financing's fact sheet on ADRiFi:

https://guidebookforjustfinancing.com/wp-content/uploads/2022/11/25_-ADRiFi.docx.pdf

¹⁶ Source (press release): <https://www.afdb.org/en/news-and-events/press-releases/african-development-banks-africa-disaster-risk-financing-program-receives-25-million-pledge-united-states-46718>

leadership and vision. Donors emphasize the need for a clear business plan and improved management of donor relations (Oxford Policy Management, 2022). Despite dissatisfaction with the ARC Agency, donors remain interested in ARC's mission to help countries manage disaster risks (Oxford Policy Management, 2022). They are now supporting countries more directly through ARC Ltd and its subsidiaries, such as ADRiFi.

The 2022 independent evaluation of ARC (Oxford Policy Management, 2022) proposes several **ARC donor recommendations**:

- In order to enhance the effectiveness and sustainability of ARC, donors are advised to actively engage in discussions on ARC's core value proposition and **determine alternative ways to deliver services not covered by ARC** (like providing broader disaster risk management capacity).
- It is important to **coordinate funding efforts to avoid conflicting priorities**.
- Donors **should closely monitor the performance of the new Board**, ensuring increased levels of accountability, transparency, and communication.
- If the ARC presents a credible plan for priority reforms, **donors should provide sufficient and predictable financing** for the next two years, enabling ARC to implement the plan and develop a coherent strategy for the future (noting that the evaluation was written in 2022). Long-term funding commitments and streamlined channels are essential for ARC's stability.
- Donors should also **facilitate collaboration between the ARC Group and World Bank operations** to promote synergy in addressing disaster risks in Africa.

Finally, according to ARC (2021), while the initial \$100 million capital from external partners, given as an interest-free loan over 20 years in its establishment, has been sufficient for its current growth and future stability, the anticipated increase in demand for ARC products over the next 5-10 years will constrain its growth unless additional external capital is injected. The independent evaluation of ARC, however, questions the unnecessarily high levels of reinsurance used by the ARC, given the amount of cheap capital they have access to, and also points out that ARC's growth targets might be too ambitious given their implemented strategies. (See Figure 4 in section 2.7.1 for a general picture of the role of reinsurance. Reinsurance is used for risks that the insurance company wishes to share with other companies. Typically, these are large risks relative to the capital base.) This means that capital support should not be ruled out, but that donors should be cognizant of current capital structures and needs before contributing additional capital injections.

3.2 Start Ready sovereign risk pool, by Start Network

3.2.1 What is Start Network

Start Network is a coalition of over 80 humanitarian agencies from five continents, including international organizations and national NGOs. It is registered as a charity in the United Kingdom. The Start Network aims to create a proactive, innovative, and locally driven humanitarian system that delivers better quality assistance and builds resilient communities in the face of increasing climate change and humanitarian challenges (Start Network, 2022a). To achieve this, Start Network has established a financing facility that houses different crisis financing mechanisms, enabling faster and more efficient global humanitarian action.

3.2.2 What is Start Ready?

Start Ready is a global disaster risk financing initiative launched by Start Network at the COP26 in 2021. Start Ready focuses on organizing ex ante funding for crises that exhibit recurring patterns such as floods, droughts, and heatwaves. The Start Ready program utilizes the concepts of risk retention, risk sharing, and risk transfer (i.e., risk-layering), aligning them with the severity levels of specific risks to deliver optimal financing solutions for humanitarian needs in each context (Start Network, 2022b).

The three layers of Start Ready include (Start Network, 2022b):

1. National reserves: These reserves aim to cover mild severity scenarios, which have lower assistance needs and a certain level of predictability due to their regular occurrence.
2. Risk pool: Designed to cover moderate severity scenarios, the risk pool optimizes the utilization of available funds by spreading them across multiple country-specific risks.
3. Insurance: This layer is intended to cover severe scenarios. Insurance ensures that a substantial amount of funding can be rapidly accessed by members in the event of rarer occurrences.

Currently, Start Ready is in its second risk pool, which launched in May 2023 covering the 2023/24 season. The total funding available is £7.3 million (Klassen, 2023). The countries and hazards covered by this second pool are Bangladesh (Cyclones, Riverine/Fluvial Flood), the Democratic Republic of the Congo (Riverine/Fluvial Flood), Madagascar (Cyclones, Drought), Pakistan (Heatwaves, Riverine/Fluvial Flood, and Drought), the Philippines (Cyclones), Senegal (Drought), and Somalia (Drought).

Start Ready is funded by (Klassen, 2023): UK Foreign, Commonwealth and Development Office, Margaret A. Cargill Philanthropies, IKEA Foundation, Irish Aid, French Ministry for Europe and Foreign Affairs, Netherlands Ministry of Foreign Affairs, Swiss Re Foundation, Howden Group Foundation and German Federal Foreign Office.

3.2.3 Relations to other risk pools and insurance arrangements

Start Ready can complement existing programs like ARC Replica by covering risks and risk layers that may not be addressed by these programs, providing additional protection. Then, those affected by smaller-sized events, who do not meet the insurance payout threshold, can receive support.

Additionally, Start Ready can match existing ex ante funding in systems like the ARC Replica, enabling enhanced protection for a larger population against climate hazards. Start Network is partnered with ARC and has purchased several ARC Replica portfolios, for example in Senegal, Somalia and Zimbabwe¹⁷.

3.2.4 Results

Start Ready is only in its second risk pool season, and there has not yet been published any evaluations of their results, to our knowledge. Therefore, we cannot say whether they have delivered promising results. Compared to ARC, their coverage is fairly small, covering £7.3 million versus \$182 million by the ARC¹⁸. However, their strength is that

¹⁷ See <https://startnetwork.org/funds/disaster-risk-financing-support/arc-replica>.

¹⁸ Comparing the most recent years with available data.

their risk pool in principle is global, which may give increased risk diversification benefits, reducing overall insurance costs (Ciullo et al., 2023).

3.2.5 Insurance arrangements aimed at households and small-scale businesses.

There are several types of insurance products aimed at low-income households in developing countries, covering health, life and accident, agriculture, livestock, aquaculture, property and income, with life, credit and health as the most prevalent (Microinsurance network, 2023).

Based on our mapping of arrangements through reviews of research literature and reports from international initiatives for disaster risk finance, agricultural index insurance aimed at small scale farmers and pastoralists is by far the most common *weather-related* insurance aimed at households and small-scale food producers in Sub-Saharan Africa. This finding is supported by a recent mapping of microinsurance (Microinsurance network, 2023), as shown in Figure 7.

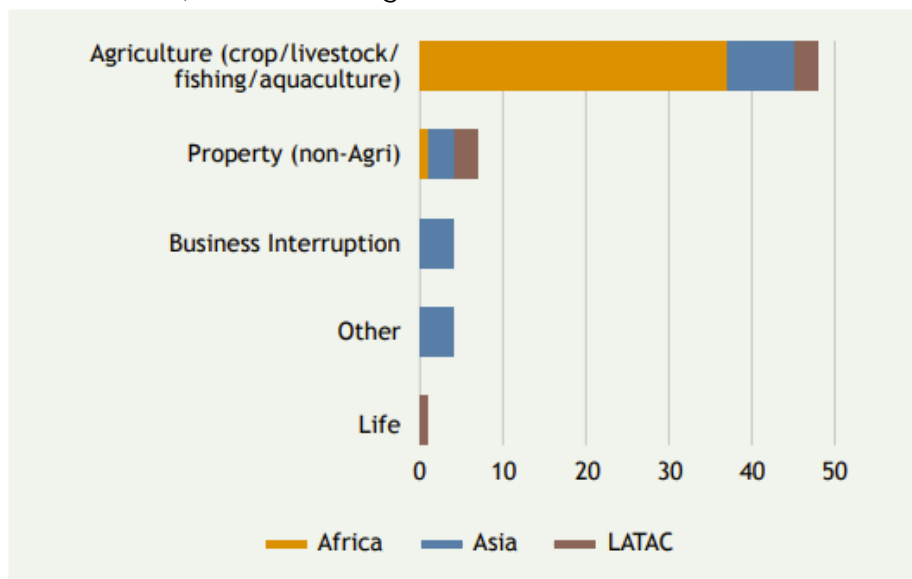


Figure 7 Number of products including climate covers in Africa, Asia and Latina America and The Caribbean (LATAC) from mapping by the Microinsurance network (2023)

Availability and uptake of insurance aimed at individuals and small-scale businesses in the fisheries and aquaculture sector is low, especially in Africa (FAO, 2022). Insurance in this sector typically covers natural disasters, extreme weather events, accidents and disease. A recent mapping by FAO shows that there are ongoing efforts to scale up insurance through subsidies to premiums, and pilot programs for small-scale producers in some Asian countries, such as Vietnam and Indonesia, but no specific initiatives in African countries are mentioned (ibid).

There are insurance arrangements aimed at the informal sector, but outside the agricultural sector, these insurances are typically not weather-related, and the literature mainly focuses on life, accident and health insurance for informal sector workers. The V20 led Sustainable Insurance Facility is specifically aimed at developing and promoting insurance aimed at Micro-, Small- and Medium Sized Enterprises.

3.3 Agricultural index insurance shows promising impacts, but low uptake remains a challenge

Access to agricultural insurance is expected to have impacts both *ex ante* through enabling investments in productivity, such as higher risk and higher yield production technologies, and *ex post* through acting as a safety net, reducing the need to cope with shocks through selling productive assets, skipping meals or taking children out of school (Jensen and Barrett, 2016).

A few rigorous impact assessments of agricultural index insurance schemes exist, mostly based on randomized controlled trials. The findings largely support the hypotheses of positive impacts both *ex ante* and *ex post*, as summarized in the review by Jensen and Barrett (2016). First, agricultural index insurance has been shown to reduce negative impacts of severe shocks and reduce the use of coping strategies that may have long term negative impacts on households. Janzen and Carter (2019) find that insurance payouts from IBLI (see Box 5) following a drought caused wealthy households with insurance to sell fewer livestock, and poorer households with insurance to reduce their food consumption less than those without insurance. Similar results from the same insurance scheme are shown by Jensen et al. (2017).

Second, index insurance enables productivity increasing investments. Jensen et al. (2017) find that IBLI increases livestock investments. Karlan et al. (2014) find increased investments in agriculture, resulting in increased crop revenues and fewer meals skipped among Ghanaian farmers with rainfall index insurance.

Box 5 The Index-based Livestock Insurance program (IBLI) and Kenya Livestock Insurance Company (KLIP)

Index-based livestock insurance (IBLI) is a donor-funded program aimed at designing, developing and implementing market-mediated, index-based insurance products to protect livestock keepers from drought-related asset losses. The program operates under the International Livestock Research Institute (ILRI). IBLI has provided retail micro-insurance for asset protection based on NDVI-indices to approximately 13 000 pastoral households in northern Kenya and Ethiopia (Fava and Vrieling, 2021). Based on the experiences of IBLI and following the 2008-2011 droughts, a public-private partnership between IBLI and the government of Kenya resulted in the Kenya Livestock Insurance Company, which offers subsidized insurance to targeted vulnerable pastoralists and is expected to reach 125 000 households through a new financing scheme.¹

The IBLI products have evolved from payout after drought events based on an index, to payout at the onset of a drought to protect assets, with the sum insured based on the cost of feeding and keeping the animals alive during the drought (Fava et al., 2021).

¹ See <https://www.preventionweb.net/news/climate-cover-140-million-insurance-scheme-kenya-protect-herders-against-frequent-droughts>

Sibiko and Qaim (2020) find positive impacts on fertilizer and improved seed use, and thereby increased yields from index insurance from *Kilimo Salama*, the precursor to ACRE Africa (see Box 6). Elabed and Carter (2014) find positive impacts of index insurance on investment in cotton production in Mali. Research from the AMA Innovation Lab find that insurance coverage at a cost of US \$48 generates additional cotton

cultivation worth roughly \$300 at harvest, at a cost/benefit ratio of 6.25 in Mali (Russell, 2018). Stoeffler et al. (2022), on the other hand, find no impacts of insurance on the insured crop for farmers in Burkina Faso (cotton), but significant spillover effects on investments in other agricultural activities.

Castaing and Gazeaud (2022) aggregate existing experimental evidence on impacts of index insurance and find positive, but highly heterogeneous impacts of index insurance on investments. Interventions expanding access to index insurance typically boost productive investments by 0.06–0.11 standard deviation on average.

Tafere et al. (2015) look at impacts of being covered by index insurance for livestock herders in Ethiopia, and find increased subjective welfare, and that the welfare gains are significantly higher than the buyer's remorse effect from buying insurance that never paid out. This means that the peace of mind of having insurance coverage increases welfare even in cases when there have been no payments.

Box 6 The Agriculture and Climate Risk Enterprise (ACRE)

ACRE Africa carries out risk assessment, product development and risk monitoring to facilitate access to crop and livestock insurance products for smallholders. The company links farmers to insurance products in Kenya, Rwanda and Tanzania, and has provided access to insurance to 1,7 mill. farmers across the three countries since 2009. The company was one of the first to use mobile payment solutions in their insurance products. ACRE originates from the Kilimo Salama project, established in 2009 and funded by the Syngenta Foundation and the Global Index Insurance Facility (GIIF). The crops insured include maize, sorghum, coffee, sunflower, wheat, cashew nuts and potato, with coverage against drought, excess rain and storms. ACRE products include weather index insurance based on daily rainfall data monitored by satellites or automated weather stations, but also more recent innovations such as crop insurance based on Soil Moisture Index (SMI) measured using satellites and picture-based insurance, using a combination of farmer-issued smartphone photos, satellite imagery, weather station data, agronomic records and other data.

Despite the promising findings from impact assessments, take-up of index insurance aimed at small-scale farmers and pastoralists remains low across developing countries, and current research and implementation focuses on identifying and alleviating barriers to uptake. Barriers to uptake identified in the literature (see for instance the review in Carter et al., 2017 a) include high basis risk, high prices, liquidity constraints related to upfront payments, lack of trust, and behavioral constraints, such as ambiguity aversion, preferences for certainty and time consistency problems (related to setting aside cash for upfront payments).

Other issues discussed in the literature include potentially negative impacts of (heavily subsidized) index insurance on farmer's adaptation to climate change. Dougherty et al. (2020) analyze impacts of climate change (modelled as increasing drought probabilities) on the demand for agricultural index insurance in a framed field experiment and find decreased demand for insurance compared to a scenario without climate change due to a number of behavioral factors. On the one hand, increased uncertainty about future drought risk increases insurance demand. On the other hand, farmers place too much weight on prior beliefs and underestimate the true drought probability and thereby

underestimate the value of insurance, which leads to a net decreased in insurance demand compared to a situation without these behavioral constraints. An important question discussed by the authors is how to channel the increased investments resulting from access to insurance towards more climate sustainable activities, and whether insurance can be seen as a complement or substitute to other adaptation strategies, such as climate smart agriculture, migration, or income diversification.

The “anticipatory approach” of some of the index-based livestock insurance schemes, where payout is made at the onset of a drought to protect assets, is viewed as part of an emerging paradigm in disaster risk financing that emphasizes the need for preventive measures and investment in resilience as cost effective, and therefore more sustainable, approach to disaster risk finance (Fava et al., 2021).

3.3.1 Promising developments

We here point to some promising developments in agricultural index insurance products, that have potential for alleviating some of the current barriers to uptake.

Reduced basis risk through improved indices and contracts

There is continuous work to improve indices using new and improved sources of data, improved estimation techniques and new combinations of data (see the review in Benami et al., 2021). These developments have the potential to reduce basis risk, but also to reduce costs as high-resolution satellite data and remote sensing techniques become available at lower cost.

Other developments include designing contracts to minimize exposure to contract failures and basis risk events (Carter et al., 2017 a). In a study by Flatnes et al. (2018), findings indicate that willingness to pay for an audit-incorporated contract was 64% higher compared to a non-audit contract. This suggests that when measurement accuracy is improved and basis risk reduced, it increases trust in insurance products and leads to higher demand. Other contract design improvements are discussed in Carter et al. (2017 a).

Bundled products

Promoting insurance through bundling with credit or input has been explored and shows promising results in several programs. The rationale for bundling is that providing more than one service through the same contract will increase take-up and can also lower the unit cost of products through decreasing transaction costs for providers. Bundling insurance with credit also removes the need for upfront cash payments. Insurance has been combined with agricultural inputs such as drought-tolerant seeds, high-yielding seeds, fertilizer, and irrigation as part of bundled risk management solutions. Notable examples include the Zambia Farmer Input Support Programme, where farmers pay insurance premiums when receiving inputs from a government program. In the event of triggers, insurance companies, facilitated by the Ministry of Agriculture, provide farmers with e-vouchers to access inputs for the next cropping season. This program reached over 900,000 farmers in the 2017/18 Zambian financial year. ACRE Africa collaborates with input service providers through One Acre Fund, an organization offering farm inputs and credit, to provide bundled insurance and input and to access farmers through existing networks and channels.

Some disadvantages pointed to in recent research (see the review by Nshakira-Rukundu et al., 2021) include the lack of freedom to choose individual products by farmers, which in some cases have been shown to decrease demand, and the complexity of bundled products, which may also provide a challenge for choosing optimal packages.

Flexible payments mechanisms

Flexible *timing of payments* (e.g., pay-at-harvest contracts) to reduce liquidity constraints have been shown to promote uptake in e.g. Ethiopia (Belissa et al., 2019). Flexible *modes of payment* (e.g., payment through labor) have also shown promising results in programs linked with other social protection programs (Tadesse et al., 2017, Vasilaky et al., 2020). Mobile-based insurance policies are a final promising development that reduces transaction costs. All insurance policies by ACRE Africa are provided over mobile-based payment services.

Information and behavioral interventions

Insurance uptake has been shown in a large number of studies to be positively correlated with education levels, and information provision through brochures, games and training sessions have been shown to increase demand (see the literature review in Nshakira-Rukundu et al., 2021). Risk perceptions and attitudes also influence insurance uptake, and research has shown that appropriate framing of contracts can overcome some issues of risk attitudes and increase demand (ibid.). Information and interventions, for instance through well-known channels and community groups, can contribute to increasing trust, but trust is also strongly related to basis risk.

Farmer participation

Recent research points to farmer-driven product design and other forms of farmer participation to increase trust, improve product design and reduce basis risk. An example is the evolution of picture-based insurance by ACRE (see Box 7), which involves farmer participation in monitoring and loss verification, which both reduces basis risk and increases farmer trust through participation (Nshakira-Rukundu et al., 2021).

Offering insurance to groups

Offering insurance to groups could increase uptake by building on existing informal community groups to increase trust and reduce costs, and there is some evidence to support this hypothesis, but also some concerns over crowding out existing informal systems (see the review in Nshakira-Rukundu et al., 2021).

Promoting loss prevention

Providing payouts early at the onset of e.g., a drought event will allow farmers to use mitigation strategies to prevent losses, rather than receiving a payout to compensate for losses after the event. This approach is used by various index-based livestock insurance schemes (see Box 5 on IBLI and KLIP). On the other hand, this could increase the cost of insurance, and could also increase basis risk. There are examples of positive impacts from earlier payouts based on optimized remote sensing data in the review by Nshakira-Rukundu et al. (2021).

A review of the research on barriers to insurance uptake suggests that revised contract designs, advanced technology for better measurement, improved marketing, and better policy support can overcome some of the barriers (Carter et al., 2017 a). However, the

authors also suggest that improved index insurance should be combined with stress tolerant seed varieties and new risk-oriented savings and credit products that build on the complementarities between what can be offered by index insurance and these other instruments to cope with shocks and manage risk (ibid.).

3.4 International initiatives in disaster risk finance

There is a large number of international initiatives in disaster risk finance that, while not always offering insurance directly, are crucial in improving cooperation, securing financing, performing research, disseminating best practices, collecting data, improving models, and so on. The list below is not complete, but some important examples are:

- The Global Shield Initiative
- The InsuResilience Global Partnership
- The World Bank Disaster Risk Financing and Insurance program (DRFIP)
- The World Bank Global Index Insurance Facility (GIIF)
- The World Bank Global Risk Financing Facility (GRiF)
- The World Bank Global Facility for Disaster Reduction and Recovery (GFDRR)
- The World Bank Agricultural Insurance Development Program (AIDP)
- V20 Sustainable Insurance Facility
- UNICEF Today and Tomorrow
- UNDP Insurance and Risk Finance Facility (IRFF)
- Insurance Development Forum
- Natural Disaster Fund
- EU's Africa Disaster Risk Financing (ADRF)
- World Food Programme R4 Rural Resilience Initiative

In this section, we briefly describe some of these international initiatives.

3.4.1 The InsuResilience Global Partnership

The InsuResilience Global Partnership is a global initiative aimed at increasing the resilience of poor and vulnerable people and countries to the impacts of climate change through the use of insurance and risk management. The partnership was launched in 2017 and is supported by the German Federal Ministry for Economic Cooperation and Development (BMZ), as well as other public and private sector partners.

The overall goal of the InsuResilience Global Partnership is to increase the availability and accessibility of insurance coverage to vulnerable people and countries that are most affected by climate change. The partnership aims to achieve this by working with governments, insurers, development organizations, and other stakeholders to promote the development and implementation of climate risk insurance and other risk management tools.

3.4.2 The World Bank Disaster Risk Financing and Insurance Program (DRFIP)

The Disaster Risk Financing and Insurance Program (DRFIP) is a global initiative aimed at increasing the financial resilience of countries and communities to the impacts of natural disasters and other catastrophic events. The program is a joint initiative of the World Bank Group's Finance and Markets Global Practice and the Global Facility for Disaster Reduction and Recovery (GFDRR).

The DRFIP focuses on helping countries to develop and implement disaster risk financing strategies and mechanisms that can be used to provide financial protection against the impacts of disasters. These strategies may include a range of financial instruments such as catastrophe bonds, insurance, contingent credit facilities, and other forms of risk transfer. Objectives include building the capacity of governments, financial institutions, and other stakeholders to design, implement, and manage effective disaster risk financing programs. Additionally, it aims to support the development of innovative financial instruments and tools that can assist countries in better managing and transferring risk associated with disasters.

A report from DRFIP engagements in 2022 African countries summarizes experiences and provides advice on planning and implementing risk financing projects (World Bank Group, 2021).

3.4.3 The World Bank Global Index Insurance Facility (GIIF)

The Global Index Insurance Facility (GIIF) is a World Bank program that aims to facilitate access to finance for smallholder farmers, micro-entrepreneurs, and microfinance institutions through the provisions of catastrophic risk transfer solutions and index-based insurance in developing countries. The facility is funded by the European Union/ACP, the governments of Germany, Japan, and the Netherlands. GIIF has facilitated more than 4.6 million contracts, with \$730 million in sums insured, covering approximately 23 million people, primarily in Sub-Saharan Africa, Asia, and Latin America and the Caribbean.

The GIIF provides:

- 1) Financial education aimed at farmers, small businesses, MFIs, banks, etc.
- 2) Capacity building and subsidies through grants to research institutions, brokers and NGOs for support training of local insurers,
- 3) Technical Advice on Products and Pricing,
- 4) Public policy dialogue and regulatory environment facilitation (specific programs in Uganda and Kenya).

Supported programs in Sub-Saharan Africa include Mayfair insurance Zambia, Hollard Mozambique Project, ACRE Africa, ILRI Kenya, Guy Carpenter and Company Mozambique and MicroInsure Rwanda.

The Climate Insurance Database is a joint project between the Global Index Insurance Facility (GIIF), Munich Climate Insurance Initiative (MCII) and the German Corporation for International Cooperation commissioned by the German Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The database consists of factsheets that show the experiences of international organizations with climate risk insurance projects to identify lessons-learned, challenges, best practices and innovative solutions. There are also reports focusing on specific topics within a climate risk insurance project, looking at barriers, necessary actions and overall recommendations. Most of the projects currently in the database are GIZ-projects, but other organizations are encouraged to contribute. The projects in Sub Saharan Africa in the database are categorized as market development (9), enabling policy environment (8), financial literacy (3) and innovation and technology (3), as well as one project on public-private partnership.

3.4.4 The Global Shield against Climate Risks

The Global Shield against Climate Risks (GS) is an initiative that was launched jointly by the V20 Group of climate-vulnerable economies and the Group of Seven (G7) countries, with Germany taking the lead, at the COP 27. It aims to enhance pre-arranged financing to address climate-related risks more effectively and at a larger scale, leveraging existing structures and initiatives.

GS gathers climate risk finance and preparedness activities under 'one roof'¹⁹. It aims to develop quick and effective solutions for providing protection in case of climate-related damage. These solutions are connected to contingency plans of developing countries, making it easier and faster for people and authorities to access the assistance they need during disasters. Additionally, GS will mobilize additional funds to meet the increasing demand for financial support.

GS will operate through three funds: the Global Shield Solutions Platform, which builds on the InsuResilience Solutions Fund; the Global Shield Financing Facility at the World Bank; and the Climate Vulnerable Forum and V20 Joint Multi-Donor Fund. The initiative utilizes existing financing structures and instruments, avoiding the need to create new infrastructure.

¹⁹ See <https://www.bmz.de/en/issues/climate-change-and-development/global-shield-against-climate-risks>

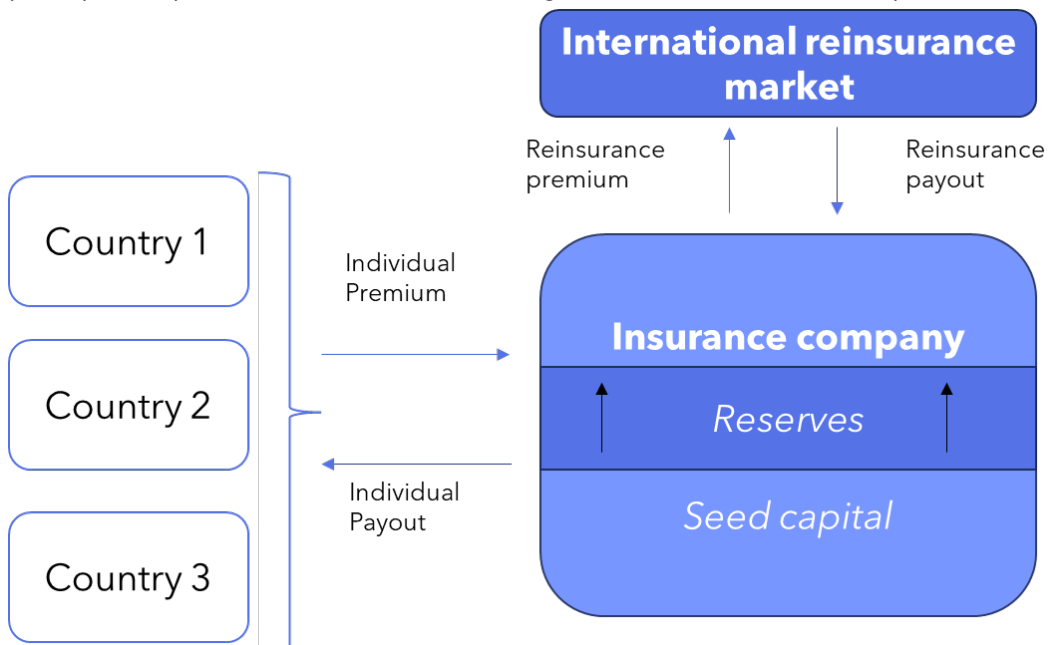
4. Development assistance and climate insurance

In this chapter, we discuss the role of development assistance in supporting disaster risk finance, mechanisms through which insurance schemes can be supported, and what donors should be aware of when considering projects to support. We start by focusing on sovereign level arrangements in section 4.1, before looking at support for insurance aimed at households in section 4.2. Finally, in section 4.3, we briefly compare aid support to insurance policies against other aid mechanisms.

4.1 Supporting sovereign risk pool insurance arrangements

4.1.1 Possible support paths and examples

We reprint Figure 4 here to illustrate how and where to subsidize sovereign risk pools. In principle, all parts of the structure in this figure can be subsidized or sponsored.



Akin to traditional international aid, donor countries could **contribute directly to member states**, increasing their state budget, which makes premiums easier to afford.

The subsidy can also be tied directly to the premium, in effect **paying a share of the premium** for the member state²⁰. In case of a triggering event, donor countries can also **match the insurance payout**, increasing the coverage for one or more member states (the ARC Replica is one such facility²¹).

Another path is to support the insurance company by **grant donations**. Two recent examples of this, for the ARC, are grant donations by the EU Commission²² and by Canada²³.

Alternatively, countries can give donations to seed or **increase the capital stock**. This can be done by, for example, providing interest-free loans (as is the case for the ARC) or by direct capital grants. Alternatively, the insurance company can get support in underwriting clients²⁴.

A more indirect approach is for countries to act as **reinsurers**, for example by purchasing insurance company cat bonds at concessional prices or at risk-levels the private capital market does not wish to take on.

Finally, countries could contribute to **capacity building, research, and data collection and other similar improvements**. Such contributions can either be financial²⁵ or of a more practical nature²⁶.

4.1.2 Premium and capital support (PCS), affordability and uptake

Premium or capital support?

Whether capital donations or premium subsidies is the appropriate type of support depends on which phase the risk pool is in, and the two types of support can complement each other (World Bank, 2017).

In the set-up and initial phases of a new risk pool, capital support is important to build up reserves, which makes the pool sustainable without relying too heavily on reinsurance markets (which would increase premia). However, when the pool is established, the

²⁰ For example, Togo gets premium support contributions from the ADRiFi, funded through the French Development Fund: <https://reliefweb.int/report/togo/arc-group-announces-usd-25-million-insurance-payout-togolese-republics-recovery-drought>

²¹ Madagascar recently received a payout from an ARC Replica policy, financed by the World Food Programme: <https://reliefweb.int/report/madagascar/government-republic-madagascar-and-world-food-programme-receive-15-million-insurance-payout-tropical-cyclone-freddy-recovery-efforts>

²² The ARC received grant funding of EUR 9 million from the EU Commission: <https://reliefweb.int/report/world/african-risk-capacity-receives-grant-funding-eur-9-million-european-union-commission>

²³ The ARC received \$17 million in funding from the Canadian Government: <https://reliefweb.int/report/world/african-risk-capacity-group-arc-receives-17-million-funding-canadian-government>

²⁴ The World Bank and the Global Risk Financing Facility multi-donor fund recently provided financial support to the ARC to underwrite the insurance policy of Djibouti: <https://reliefweb.int/report/djibouti/african-risk-capacity-group-and-djibouti-government-sign-first-multi-year-multi-peril-agreement-africa-protect-most-climate-vulnerable-communities>

²⁵ For example, the Arab Bank for Economic Development in Africa recently made a donation to the ARC, for capacity building purposes: <https://reliefweb.int/report/world/arab-bank-economic-development-africa-announces-funding-usd-500-00000-african-risk-capacity>

²⁶ For example, the Global Center on Adaption (GCA) have partnered with ARC to improve disaster risk financing practice: <https://gca.org/news/african-risk-capacity-arc-group-and-global-center-on-adaptation-gca-partner-to-promote-climate-resilience-and-disaster-risk-finance/>

gains from additional capital support diminish, and premium affordability is then improved more cost-effectively by premium support (World Bank, 2017).

A recent report by Scott et al. (2022) emphasizes the current need for premium subsidies (or grant funding for these) rather than capital support. While investment loans for capital support are more readily available, the priority now should be to ensure the growth and sustainability of the risk pools through premium subsidies. In general, which type of support to choose depends on a program-specific combination of factors such as, e.g., portfolio size, capital levels and reinsurance costs (Vivid Economics, 2016).

ARC, for example, is an established pool, and would thus be in a phase where premium subsidies are more helpful, as well as ARC Replica purchases, and long-term grants to help with capacity building, if ARC Agency presents a credible plan for reforms. However, ARC indicate that they will also need capital injections in the coming years to continue their growth (ARC, 2021). An independent review questions this view, pointing out that ARC Ltd currently has relatively high access to cheap capital (Oxford Policy Management, 2022). See section 3.1.4 for a more in-depth discussion. Start Network's Start Ready is in a phase where they need capital to fund their risk pools. They received seed funding in 2021, and are actively seeking other contributors (Start Network, 2021).

It is important that potential donors collect up-to-date and detailed information about the specific needs of the initiative in question, by getting in touch with the organization as well as existing donors and partners.

Increasing insurance affordability

Insurance affordability remains a major challenge to uptake, especially in low-income countries (World Bank, 2017; Scott et al., 2022).

If the aim is to increase immediate insurance affordability, direct premium subsidies have the highest impact on reducing the cost of insurance, because they focus on the demand side and will reduce payments 1-to-1 (Vivideconomics, 2016). However, the long-term benefits of capital injections are increased in cases where a lower discount rate is used (placing a greater value on the future) and with more expensive reinsurance (more capital would increase capacity to retain risk in the pool).

Premium subsidies can help attract new members to the risk pools, but existing members should also be considered for support (Scott et al., 2022). One reason is to avoid countries reducing coverage or withdrawing from the risk pool if the subsidies were to end. Providing subsidies to loyal risk pool members who have been paying premiums from their own budgets can be seen as a reward for their strong risk ownership and performance. Moreover, if governments use the subsidy to expand their policies rather than replacing their own costs, it can lead to increased coverage. While subsidy design can support donor objectives, there is no consensus on the appropriate size and duration of premium subsidies (Scott et al., 2022).

Supply-side measures (such as insurance company grants) may also increase uptake and thus decrease long-term premium levels for all, because of increased risk diversification and economies of scale. While not as effective in increasing immediate affordability,

insurance supply side support can be more effective in other instances, such as setting up and supporting risk pools. (Vivideconomics, 2016). One initiative that use donor contributions to support risk pools is Start Ready, by Start Network, which is currently supported by the governments of United Kingdom, Ireland, France, Netherlands and Germany, in addition to international philanthropies and organizations²⁷.

4.1.3 Moral hazard

Will getting insurance increase the risk of moral hazard?

The issue of moral hazard arises when the insured party's incentive to avoid risk is reduced because they know losses will be partially covered by the insurance payout. Compared to traditional indemnity insurance, the risk of moral hazard in parametric insurance is lower because payouts are not directly tied to the insured's behavior. However, some raise a concern that governments benefiting from parametric insurance may be less motivated to undertake disaster preparedness activities to reduce immediate disaster impacts (Vivideconomics, 2016).

Still, sovereign disaster risk insurance typically offers relatively small payouts compared to actual total damages. Its primary purpose is to provide short-term liquidity for immediate disaster response, so it is unlikely to significantly change governments' behavior beyond immediate response functions, fundings and plans (Vivideconomics, 2016).

In contrast, there are signs that countries with disaster insurance are more prepared for disaster relief than before getting insurance. An independent evaluation of the ARC (Oxford Policy Management, 2022) finds, that, due to the ARC explicit requirements (see below) and influence, more African countries now have disaster contingency plans in place, and the plans are of higher quality than before. There are some reports of newly implemented contingency plans improving government disaster responsiveness even without receiving ARC payouts. Recent experience with the ARC in Madagascar shows that the related capacity building resulted in facilitating better government preparedness (Surminski, Barnes & Vincent, 2022).

A reason for this counter-intuitive effect of disaster insurance on disaster preparedness can be that the alternative for policyholders is not to bear all losses internally, but to rely on other types of external support, like ex post humanitarian aid. Thus, providing insurance may indeed *reduce* moral hazard, depending on the counterfactual situation for the insured countries.

The ARC, for example, places a key emphasis on promoting domestic risk ownership, allowing governments to take responsibility for and effectively address disaster risks within their countries. This, argues the ARC, will reduce reliance on donor support over time, enabling countries to independently finance and manage emergency drought responses (Oxford Policy Management, 2022).

Thus, the effect of getting insurance on disaster preparedness will depend on the alternatives covering losses the countries would otherwise rely on.

²⁷ See <https://startnetwork.org/funds/start-ready>

Can premium support increase the risk of moral hazard for insured countries?

Disaster risk insurance premium support may contribute to decreasing risk-reduction activities compared to a situation where countries get no premium subsidies (Vivideconomics, 2016), depending on how the subsidies are structured.

The main concern is that premium subsidies can 'mask' the true premium level to policyholders, and thus also reduce their awareness of the cost and severity of the risk they face. Reduced risk-awareness will again lead to a reduction in the perceived need to implement risk-reduction measures. This is similar to moral hazard, in that policyholders reduce their risk-reduction activities, but differs in that the adverse effect is caused by a masking of risk costs and not by perverse incentives.

Educating insured countries about risk levels can help mitigate this effect, as countries become more aware of risks 'hidden' by the subsidy. Furthermore, donor countries should make subsidies conditional on the implementation of risk assessments, risk-reducing actions, and disaster preparedness. Such is the case for the ARC, where countries must implement thorough risk assessments and disaster contingency plans to join the risk pool, and thus before any potential subsidies are received. Finally, premium subsidies should be structured in a way to not mask the true premium level, and each recipient should be made aware of the share of their premium that is subsidized.

4.1.4 Other potential issues of misaligned incentives

There is the potential for misaligned incentives concerning the due process when approving ARC countries' operational plans (OPs). Approval of OPs is crucial for obtaining insurance policies, creating pressure on all parties involved (Oxford Policy Management, 2022). The review committee may feel compelled to find positive aspects in the OPs, and countries tend to respond in a way that meets the committee's expectations. ARC staff may intervene to ensure OP approval, especially when a donor offers premium finance. This scenario can expedite capacity building but may compromise the alignment of incentives (Oxford Policy Management, 2022).

Another potential issue is that insurance companies have incentives to sell insurance, the uptake of which isn't necessarily welfare-maximizing for all countries. At-risk countries benefit from having access to a broader set of independent advice on disaster risk management and financing than being provided by the ARC Ltd or other insurance companies, which in the end are companies that sell insurance and are specialized in that respect (Oxford Policy Management, 2022).

While the ARC has ambitions to help build holistic disaster risk management strategies in a mission to provide 'harmonized resilience solutions', there are yet no plans on how to achieve these ambitions. And even if the ARC manages to act impartially, it currently neither has the budget nor the capacity to offer broad and holistic technical advice on all aspects of disaster risk management and financing (Oxford Policy Management, 2022). Thus, there may be a need for donor support for independent initiatives aimed at such ventures, that aren't necessarily focused on providing insurance, but have a more 'neutral' view on a given country's situation.

Start Ready, which relies on a somewhat broader risk-layered approach to disaster risk finance, may be less at risk of such misaligned incentives.

4.1.5 Technical capacities and other factors impeding uptake

Affordability is a significant barrier to insurance adoption, but it is not the only factor. Other factors include a lack of understanding and technical capacity, availability of alternative options, and perceptions of reliability (Scott et al., 2022). The relative importance of these factors varies from country to country, impacting the effectiveness of subsidies.

WRI (2019) lists several other challenges in the support of climate risk finance instrument funding:

- Donations have been earmarked for particular instruments instead of also broadening the scope and looking to help countries develop layered, holistic approaches by scaling up concessional financing for several different instruments.
- The support has been of a one-time ad-hoc nature. Continued, long-term support is needed.
- The pool of donors has been too narrow. Germany and the United Kingdom have been leading contributors, along with contributions from USA, France and the EU Commission.

WRI (2019) proposes three options to increase long-term financing. The first is for IDA to play a larger role in ex ante disaster financing. The second is to leverage regional multilateral development banks (such as the AfDB) to attract recurring donations to dedicated trust funds, which is then used to incentivize adoption of risk-layering approaches in countries. The third and final is to create a new risk solutions incentive fund to drive collaboration between governments, risk pools and development banks. The Global Shield against Climate Risk is a recent initiative in this spirit.

4.1.6 Best practices when supporting disaster risk finance initiatives

The SMART principle for premium and capital support (PCS) is developed by the InsuResilience Global Partnership to help scale up disaster risk finance initiatives (Töpper & Stadtmüller, 2021). Its aim is to ensure effective and sustainable impact for the most vulnerable, maximize value for money, promote accessibility, incentivize resilience-building, and maintain transparency and consistency. The five principles are (Panwar et al., 2022):

- **Sustainable impact:** The focus is on using PCS to fund risk transfer mechanisms and delivery systems that bring lasting change to the lives of the most vulnerable.
- **Value for Money:** Initiatives should aim to maximize the impact of each dollar of premium or capital support.
- **Accessibility:** Smart PCS is designed to be needs-based, risk-adjusted, and aligned with measures that enable access while empowering beneficiaries.
- **Resilience-building incentives:** Only risks that are too costly to reduce further should be covered by risk financing instruments, and insurance should primarily transfer risks from low-frequency, high-severity events. Reducing premiums through PCS should not undermine incentives for risk reduction.
- **Transparency and consistency:** PCS should be provided and utilized in a transparent and accountable manner, fostering coordination and consistency among support providers and promoting the empowerment of recipients and at-risk communities.

ODI has developed methodological and practical guidance reports to use when following the SMART principles, to flesh out and operationalize the indicative formulas used by Töpfer & Stadtmüller (2021). The ODI guidelines can be used to determine the size of PCS support at a macro level (Panwar et al. 2022), and to assess the value for money of PCS towards disaster risk financing (Ward, Weingärtner & Panwar, 2022). These detailed guidelines by ODI are aligned with other methodological guidelines for effective PCS (such as Panda et al. (2021a; 2021b; 2021c))²⁸.

These specialized guidelines should be used when deciding on PCS recipients and when determining support allocations and levels, ideally in combination with more general guidelines for just financing, such as the Sharm El Sheikh Guidebook for Just Financing.²⁹

4.2 Supporting index-insurance for small-scale farmers

Despite the promising results from providing index based agricultural insurance, take-up of unsubsidized insurance remains low. As discussed in Chapter 3, there are significant barriers to uptake, with affordability and basis risk as important examples. In addition to supporting subsidized insurance schemes, such as the KLIP (see Box 5), donors support the development and provision of index based agricultural insurance in a number of ways. The Global Index Insurance Facility (GIIF) is one example of how activities specifically aimed at small-scale farmers are supported.

Parts of the research literature include more critical views on the role of index insurance for small scale farmers adaptation to increasing risk of negative impacts from climate change. For instance, Collier et al. (2009) warn that climate change impacts will increase the price of insurance, exacerbating the affordability issues, but caution against general subsidies of premiums since this could slow household's adaptation to climate change through other strategies. Castaing and Gazeaud (2022) conclude that the existing evidence offers limited insights to predict the impact of index insurance in new settings. They recommend governments and development agencies to remain cautious before investing in the widespread expansion of index insurance.

Carter et al. (2017 b) provide a list of recommendations for policy makers and donors that wish to improve and support agricultural index insurance. Their recommendations provide alternatives to directly subsidizing insurance premiums. Firstly, they recommend **improving the quality of index insurance products** through investing in developments such as advances in crop modelling and remote sensing, as well as contract improvements such as audits and offering index insurance at the meso level, e.g., to farm lending institutions. Donors can also support the establishment of reinsurance mechanisms to provide support to insurance providers, reducing their exposure to high-risk events and enhancing their capacity to offer affordable and sustainable index insurance coverage.

A second recommendation is to **establish safe minimum standards** for index insurance products to ensure high quality products and promote trust. A proposed minimum quality standard framework is presented in Box 7.

²⁸ For a comprehensive list of literature on the topic, see the ODI reports.

²⁹ See <https://guidebookforjustfinancing.com/>

The authors also suggest an alternative approach to subsidizing premiums, which could cost the same, but could promote market development for insurance (called *smarter subsidies*): Offering free insurance coverage to all farmers for cases where their yields are projected to be below 50 percent of their average value or when they experience catastrophic losses beyond a certain threshold. Providing payouts to these high-risk farmers, who are more susceptible to falling into poverty, would have a more significant impact compared to those with smaller losses. By offering free insurance at this level of risk, not only could the overall cost of insurance for each individual be reduced, but it would also create a minimum market size. Individuals and institutions would then have the choice to purchase additional insurance to cover smaller losses.

Box 7 Minimum Quality Standard for Index Insurance

The University of California, Davis, in collaboration with the Nairobi-based Regional Center for Mapping of Resources for Development (RCMRD), and with the support of USAID, is partnering to establish Quality Index Insurance Certification (QUIIC) in East Africa. QUIIC aims to bring significant improvements to the safety of agricultural index insurance through provide transparency, distinguishing between index insurance contracts that offer value and those that do not. It also enables donors and governments to invest in certified products that have the potential to enhance and safeguard economic growth.

National governments hold substantial influence in requiring QUIIC certification for all agricultural index insurance products that they subsidize or directly purchase to protect farmers. QUIIC applies to index insurance products of all sizes, ensuring that national investments in index insurance as a tool to mitigate disaster risks are worthwhile and yield the desired outcomes.

Source:
<https://quiic.ucdavis.edu/about-quiic>

Additional recommendations include bundling insurance with drought tolerant technologies, to provide protection against risk at different risk levels (risk layering), Drought tolerant crop varieties typically offer protection against a smaller range of weather outcomes, and thus provide limited protection against risks. Stress tolerant varieties and index insurance can therefore be seen as complements in reducing exposure to risk. The authors also recommend combining insurance with other financial mechanisms for disaster risk reduction, such as contingent credit schemes. A final recommendation is to build on the experience of livestock insurance schemes to explore the use of improved technologies to achieve early assessment toward mitigation of catastrophic impacts (Fava et al., 2021).

4.3 Support for insurance policies versus other types of aid

Price (2018) compares different interventions for disaster risk reduction to find their value-for-money, based on a review of existing literature. There is limited evidence for the value-for-money of risk insurance instruments, and the study calls for more research. The few existing reports on such instruments in the study gives a benefit-cost ratio of 2, which is lower than disaster risk management (4-5), capacity building for response/recover (13-28), and flood defenses (2-50), but higher than investments in resilient infrastructure (<1) and climate smart agriculture (<1). Note, however, that the empirical evidence for several of these estimates is moderate or weak, and that most of the studies are more than a decade old. Cost-benefit analyses may be better suited for

assessing individual schemes rather than comparing them (Ward, Weingärtner & Panwar, 2022). Close stakeholder engagement and independent expert involvement can enhance the analysis.

Considering insurance policies for individual households, the literature review by Nshakira-Rukundu et al. (2021) shows mixed evidence on which social protection instruments (reducing the cost of credit, subsidizing inputs, cash transfers or subsidizing insurance premiums) aimed at farmers that offer the best returns to public funds. However, there is evidence that access to insurance may have impacts on longer term prospects for poverty reduction through improving investment incentives, compared to cash transfers. On the other hand, the review also points to evidence showing that livestock insurance may protect households that are better off, while poorer households may require other instruments, and may benefit more from cash transfers.

Recent developments in agricultural index insurance may contribute to the relative value of providing insurance to vulnerable households compared to other social protection mechanisms. The evolution towards early trigger approaches to protecting assets rather than compensating losses in IBLI's insurance products for pastoralists is one example (Fava et al., 2021). While humanitarian responses will continue to be important in drought crises, they can be complemented by anticipatory financial instruments.

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Attachment 1: Description of task³⁰

As part of its portfolio work on climate adaptation and expansion of the portfolio, Norad needs to gather knowledge about insurance arrangements specifically aimed at climate change. There is a need to answer some overarching questions about insurance arrangements based on relevant literature, research, evaluations, etc. We primarily want to look at insurance arrangements aimed at larger actors such as national states, city/state authorities or aid organizations, but we are also interested in insurance arrangements for individuals, especially food producers. Here are some of the questions to be answered, ranked in order of priority:

1. What is a good/best model for subsidizing insurance arrangements? When is the arrangement profitable?
2. If the need is security for vulnerable populations, are insurance policies the most effective use of aid funds? Do insurance arrangements have a security effect on individuals and at the national level?
3. Is there an economic basis for such weather-related insurance arrangements? That is, is the risk insurable? If so, is it likely that losses and damages from climate change will continue to be insurable in a scenario of accelerating climate change and more unpredictable extreme weather events?
4. Do the arrangements contribute to risk assessment and risk reduction, e.g. by offering lower premiums for actors who implement risk-reducing measures such as building flood protection, etc.?
5. What challenges are there regarding moral hazard, and how can these be reduced?
6. How to counter corruption in arrangements/payments and how to link such arrangements to social safety nets?
7. How to ensure that insurance arrangements do not lead to an unfair distribution within and between local communities? How are recipients of insurance payouts selected?
8. Which arrangements in sub-Saharan Africa have had the most promising results and what do they cover? Are there arrangements that cover coastal populations and workers in the informal sector?
9. Would it be possible with public, international aid efforts to build a market for such insurance arrangements (with private insurance companies) aimed at developing countries?

Other questions can be added in dialogue with the supplier. The assignment will result in the following products:

³⁰ Translated from Norwegian

1. A note that answers the questions indicated by the customer and provides advice on what Norad should look for in insurance arrangements and be aware of when an arrangement is being considered for support.
2. A quick survey of insurance arrangements that may be relevant for Norad to support within the portfolio, based on the findings and conclusions in the note.

The supplier cannot promise to answer questions 6, 7 and 9 within the framework of the assignment but may be able to address these questions after the survey. It should be noted that the portfolio has a sub-goal of increased financing for prevention and management of losses and damages where insurance arrangements are intended to contribute as an innovative financing mechanism. The geographical focus of the portfolio is primarily countries in sub-Saharan Africa and Asian countries particularly vulnerable to climate change. There will be close dialogue between the supplier and the customer during the assignment to ensure that the assignment is as relevant and useful as possible for the customer.

CICERO is Norway's foremost institute for interdisciplinary climate research. We help to solve the climate problem and strengthen international climate cooperation by predicting and responding to society's climate challenges through research and dissemination of a high international standard.

CICERO has garnered attention for its research on the effects of manmade emissions on the climate, society's response to climate change, and the formulation of international agreements. We have played an active role in the IPCC since 1995 and thirteen of our scientists contributed the IPCC's Sixth Assessment Report.

CICERO was founded by Prime Minister Syse in 1990 after initiative from his predecessor, Gro Harlem Brundtland. CICERO's Director is Kristin Halvorsen, former Finance Minister (2005–2009) and Education Minister (2009–2013). Jens Ulltveit-Moe, CEO of the industrial investment company UMOE is the chair of CICERO's Board of Directors. We are located in the Oslo Science Park, adjacent to the campus of the University of Oslo.