Grantham Research Institute on Climate Change and the Environment

Centre for Climate Change Economics and Policy

Insurance as a catalyst for government climate planning?

A framework for analysing drivers and barriers, tested against evidence emerging from Sub-Saharan Africa

Swenja Surminski, Jonathan Barnes and Katharine Vincent

October 2019

Centre for Climate Change Economics and Policy Working Paper No. 359
ISSN 2515-5709 (Online)

Grantham Research Institute on Climate Change and the Environment Working Paper No. 327
ISSN 2515-5717 (Online)

NERC SCIENCE OF THE ENVIRONMENT

FUTURE CLIMATE FOR AFRICA

UKaid from the British people

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

The Grantham Foundation for the Protection of the Environment

UNIVERSITY OF LEEDS

LSE The London School of Economics and Political Science

The Centre for Climate Change Economics and Policy (CCCEP) was established by the University of Leeds and the London School of Economics and Political Science in 2008 to advance public and private action on climate change through innovative, rigorous research. The Centre is funded by the UK Economic and Social Research Council. Its second phase started in 2013 and there are five integrated research themes:

1. Understanding green growth and climate-compatible development
2. Advancing climate finance and investment
3. Evaluating the performance of climate policies
4. Managing climate risks and uncertainties and strengthening climate services
5. Enabling rapid transitions in mitigation and adaptation

More information about the Centre for Climate Change Economics and Policy can be found at: www.cccep.ac.uk

The Grantham Research Institute on Climate Change and the Environment was established by the London School of Economics and Political Science in 2008 to bring together international expertise on economics, finance, geography, the environment, international development and political economy to create a world-leading centre for policy-relevant research and training. The Institute is funded by the Grantham Foundation for the Protection of the Environment and a number of other sources. It has six research themes:

1. Sustainable development
2. Finance, investment and insurance
3. Changing behaviours
4. Growth and innovation
5. Policy design and evaluation
6. Governance and legislation

More information about the Grantham Research Institute on Climate Change and the Environment can be found at: www.lse.ac.uk/grantham

The Future Climate for Africa UMFULA project is a four-year research project that aims to improve climate information for decision-making in central and southern Africa. More information about UMFULA can be found at: www.futureclimateafrica.org/umfula/

Insurance as a catalyst for government climate planning? A framework for analysing drivers and barriers, tested against evidence emerging from Sub-Saharan Africa

Swenja Surminski[1], Jonathan Barnes[2] and Katharine Vincent[3]

Abstract

In this paper we investigate the potential catalyst role of insurance for climate adaptation. We explore how climate risk information emanating from insurance processes can support a move towards anticipatory climate risk management, which includes loss prevention and adaptation. We consider and identify the boundaries, conditions and influencing factors for using climate risk information, learning from the experience with climate services and take this concept into a developing country context, characterized by low insurance penetration and relatively low level of government planning. The problem is first analysed from the perspective of insurers in Africa through survey data and expert discussion and then underpinned by evidence emerging from three case studies from South Africa, Malawi and Tanzania. Our analysis offers a new perspective on the catalyst role of insurance by focusing on underpinning political economy factors, particularly incentives and relationships that influence this process. Overall there appears to be clear scope for a dynamic interaction between insurers and other actors such as governments, planners, property developers, investors, farmers, or individuals where symbiotic use and generation of climate risk information can advance mutual goals. However, that ambition can face many challenges that go beyond availability and suitability of data: limited trust, unclear risk ownership or lack of incentives can provide key barriers, even if there is motivation, risk-awareness and overall buy-in into the need to manage climate risks. All three cases show the importance of sustained engagement and capacity building to increase awareness of the role of insurance-related climate risk information and its potential benefits and uses. Importantly, a key consideration when building technical capacity targeting the correct actors who can make decisions and have the agency to alter processes.

1. Introduction

Climate change is already negatively impacting on human life and a wide range of human activities; nowhere more than in Sub-Saharan Africa (SSA). These countries will experience some of the most extreme exposure whilst having the least resources and adaptive capacity to reduce negative impacts (IPCC, 2014). While global efforts to limit the causes of climate change are essential, there is also an urgent need to enhance

[1] Grantham Research Institute on Climate Change and the Environment, London School of Economics
[2] Grantham Research Institute on Climate Change and the Environment, London School of Economics
[3] Kulima Integrated Development Solutions, Postnet Suite H79, Private Bag x9118, Pietermaritzburg, 3200, South Africa

the adaptive capacity to respond to current and future climate change risks in these countries (IPCC, 2018). In addition to finance, a supportive policy environment, political will and technical capacity of decision-makers as well as buy-in from key stakeholders and climate awareness, are key enabling factors for holistic climate risk management that combines immediate crisis responses with long-term adaptation (Pardoe et al, submitted). Appropriate information on current and future climate risk is one of the key ingredients for design and implementation of these strategies and therefore central to planning and executing activities including international development cooperation, national and local government planning, and private enterprise: an understanding of likelihood and effect of impacts is the starting point for strategic responses and risk management. It follows logically that accessible and usable information should improve outcomes as opportunities and risks are better understood leading to reduced impact (Clarke & Dercon, 2016). In an urban context this might influence building and infrastructure, in a rural context the choice of crop and timing of planting.

Indeed, the application of climate risk information[4] to enable adaptation to climate change has been embodied in the growth of climate services, which transform climate risk information into customized products such as projections, trends, economic analyses and services that are tailored for and targeted at different user communities (Vaughan & Dessai, 2014). There are examples of tailored climate services from developed countries (Bruno Soares & Dessai, 2016; Haigh et al., 2014), and increasing evidence in developing country contexts (Golding et al., 2017). However, data availability remains still poor in many parts of the world, despite growing scientific understanding of hazards and their impact. And where data exists it tends to stay siloed within one organization or lacks comparability because of methodological challenges (Dinku, 2018). While political commitments for adaptation and climate resilience exist across the world, for example via National Adaptation Plans (NAPs) and the Sustainable Development Goals (SDGs), lack of climate risk information continues to be mentioned as a key barrier for real action (Lisa Goddard, 2016; Hewitt, Stone, & Tait, 2017).

Furthermore, evaluations of utility and value-add are so far lacking, while up-take remains very limited leaving climate risk information under- used by decision-makers (Wall, Meadow, & Horganic, 2017). There are various reasons for the lack of uptake of climate information: Some are technical, related to the appropriateness of information, whilst others are related to the political economy and the structures which shape access to, and control of, information. (L Goddard et al., 2010; Kirchhoff, Lemos, & Dessai, 2013; Lemos, Kirchhoff, & Ramprasad, 2012; Vincent, Dougill, Dixon, Stringer, & Cull, 2016). Motivation and political will to consider and use the information is important: decision-makers often face the trade-off between short-term gains versus longer-term investments (Surminski & Tanner, 2016). As such the use of climate risk information for decision-making is not neutral: Knowledge is often construed as a source of power, and therefore access to it is rarely universal. Power is central to this process, with involvement, translation and dissemination as key steps within (Miles et al., 2006). This highlights the need to interrogate the politics of adaptation and climate risk management (Eriksen, Nightingale, & Eakin, 2015; Tanner

[4] We define climate risk information in this paper as information that can help decision makers to adapt to current and future risks associated with both slow-onset climate impacts as well as increased variability, frequency and intensity of extreme events.

& Allouche, 2011). At its most basic level this relates to the challenges of moving to a decision-making approach that applies an anticipatory risk-based planning approach rather than relying on costly ex-post responses. However, internationally just 12% of funds for disaster management are put into risk reduction and prevention (adaptation/resilience) prior to a disaster, while 88% go into response during, and repair or reconstruction after an event (Tanner et al., 2015).

One potential catalyst for the use of climate risk information for wider decision-making planning and adaptation action is insurance (Clarke & Dercon, 2016; Linnerooth-Bayer, Surminski, Bouwer, Noy, & Mechler, 2019; Surminski, Bouwer, & Linnerooth-Bayer, 2016; Vincent, Besson, Cull, & Menzel, 2018). This financial instrument depends on availability and use of risk information for its own operations, particularly for the pricing of risks, both in terms of current and to a lesser extent also future risks, with climate change posing a threat to sustainability of risk transfer products. Insurers themselves promote their role as supporting 'an organizing framework for risk management that allows decision-makers to compare the cost of different risk mitigation programs and assess the economic and social trade-offs'. (IDF, 2017) This implies that climate risk information generated for or by insurance could also be used to encourage risk-based planning and decision-making – either by those insured or by those who make decisions about risk creation and risk management, such as governments, planners or individuals.

In this paper we investigate this potential catalyst role of insurance for use of climate risk information. Rather than focusing on the risk information itself we investigate how climate risk information emanating from insurance processes can support a move towards anticipatory climate risk management, which includes loss prevention and adaptation. We consider and identify the boundaries, conditions and influencing factors for using climate risk information, learning from the experience with climate services and take this concept into a developing country context, characterized by low insurance penetration and relatively low level of government planning. The problem is first analysed from the perspective of insurers in Africa through survey data and expert discussion and then underpinned by evidence emerging from three case studies from South Africa, Malawi and Tanzania. We conclude with a discussion about the potential catalytic role that insurance can play for the use of climate risk information.

2. The role of climate risk information and the insurance context

Risk information is a fundamental part of the insurance business-model, as products rely on risk information, data and insights from past events to develop hazard and vulnerability models which in turn inform the development of catastrophe models and underwriting. Countries with disaster and climate risk insurance markets have seen the development of catastrophe modelling as one of the main tools that insurers are using for underwriting purposes, and these have rapidly developed in scope and granularity, in-line with improved earth observations and climate systems modelling.

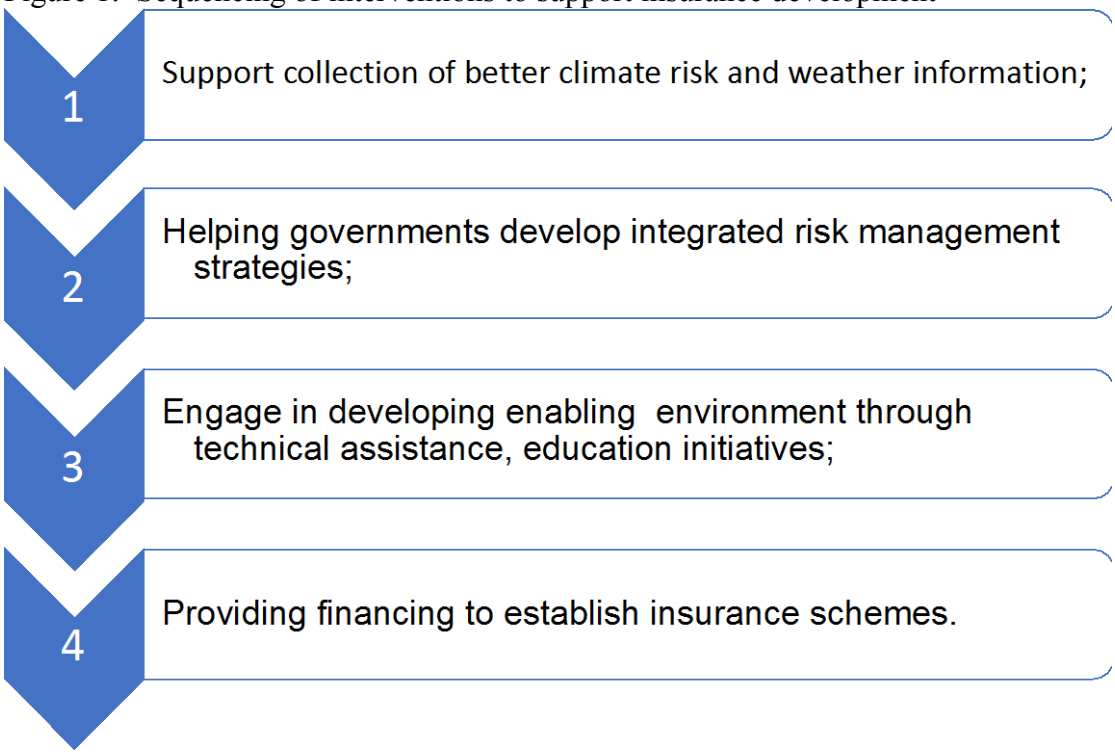
While the main purpose of insurance-related risk information is to serve the industry in their understanding and pricing of risks, there is the possibility that the use of insurance can instil a risk perspective into planning and decision-making processes, particularly at government level (Clarke & Dercon, 2016). As such the insurance sector can also be

a source of information: observations, models, datasets and forecasting tools are often developed by or at the request of insurers, which might be more widely used for social benefits beyond insurance, particularly with regards to reducing current and future risks through risk-based planning and decision making (ACRI, 2017; The Geneva Association, 2016).

However, from a climate risk perspective there is a key temporal challenge: risk data collected and analysed in the context of insurance tends to focus on the insurance period - usually 12 months, or determined by next harvest- and less on future risk trends (Surminski, 2017). While recent developments such as forecast based finance attempt to instil a more forward-looking perspective, the norm is still very much framed around current risks. For insurers the drive for greater climate risk disclosure for example via the Financial Stability Board's Task Force on Climate-related Disclosure (FSB-TCFD) recommendations might lead to a greater incorporation of forward-looking information about risk into their models – with regulators and investors growing concerned about sustainability of business models in the light of climate change. However, for most insurers this still presents technical challenges, even in well established markets.

In countries with nascent insurance sector and low penetration rates the availability and accuracy of current risk information poses a key barrier, while future risk analysis is even less common. Several initiatives attempt to address this to increase the supply of insurance products, such as the OASIS loss modelling platform. However, countries with low insurance penetration often also have very limited experience in risk-based planning and lack adequate risk information, or do not have skills and expertise for using it in broader decision-making processes. This suggests that risk information sharing could be an entry point, where the knowledge and expertise of the insurance industry is used to build risk management and planning capacity prior to any transactional activities (Surminski and Vivid Economics for KfW 2018). This argument is illustrated in figure 1– where climate risk information is the starting point for establishing enabling conditions for risk management and adaptation, which is then supplemented by education and capacity building work to eventually create the conditions for introduction of insurance products.

Figure 1: Sequencing of interventions to support insurance development



Source: Surminski and Vivid Economics for KfW 2018

This strategy, originally proposed for development partners who are contemplating investments in climate resilience and insurance mechanisms, could also involve insurers from the beginning as advisors and facilitators before finally moving to the transactional provision of insurance in step 4. In this context steps 1-3 are investments in capacity building. This can include development of models, collection of data as well as engagement with prospective clients to identify risks and risk management strategies. However, for private sector insurers this can be a somewhat risky strategy, as product transactions (e.g. underwriting insurance policies) may never be achieved or may take very long to materialize. This is why delivering these initial steps often falls onto development partners such as multilateral development banks or is supported by sector initiatives such as UNEP-FI or ClimateWise rather than individual insurers.

Another possibility for using insurance-related risk information for decision making is in the context of already existing insurance relationships: During the process of designing and implementing insurance schemes a range of risk information including disaster and climate risk data is collected or generated. The content of that climate risk information is prima facie relevant to many other actors: If sensibly designed and implemented, climate risk information collated in the context of insurance can play an important role in mitigating losses incurred (Surminski et al., 2016) and could help to transform the efficacy and impact of disaster response by removing ambiguity about who owns the risk, who needs to respond, and how it is financed (Clarke & Dercon, 2016). Indeed the insurance sector is claiming a role in advising society about risk, urging its customers to manage risk as a way to keep impacts and costs of risks low: "We have to create a world in which it is unacceptable not to have planned in advance" (Lloyds of London, 2017).

This role expands beyond the traditional view of risk transfer as a financial service, where increased insurance take-up is considered as an important stimulus for fiscal resilience in the face of shocks (ILO, 2016; Kunreuther, 2015) and focuses on government planning and ex-ante climate risk management supported by better risk information. While availability of and access to climate risk information is of course important for this process, this also depends on more general conditions that can be described as 'political economy factors'. This includes trust in risk information and incentives to internalize and act upon it, as well as the processes through which ideas, power and resources are negotiated, conceptualized and implemented (Tanner and Allouche, 2011).

3. Analytical Framework and underlying data

In this paper we develop an analytical framework to explore the potential for insurance to help catalyse the use of climate risk information in order to create a more anticipatory approach when dealing with climate risks. Building on the climate services literature, this analytical framework brings together climate risk information and the actors which produce, facilitate and eventually use it.

Climate risk information is the central unit of analysis, proposing that information produced by one actor can have a catalytic effect, leading to more ex-ante planning and anticipatory climate adaptation. For example risk information can provide a picture or a narrative for stakeholders to congregate around and to find solutions. In this context, catalysis refers to an acceleration towards a desired outcome or outcomes. Fostering improved outcomes via behaviour change is the objective of a data-driven approach to development. The outcome here is anticipatory planning and adaptation action.

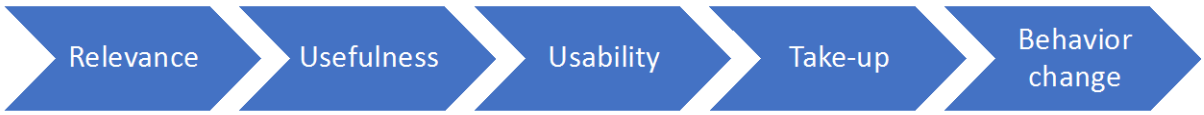
The extent to which climate risk information can perform a catalysing role depends on a range of factors which can broadly be expressed in terms of supply and demand for that information. There is an opportunity for catalysis whenever an actor produces information that is relevant to another. In this view, climate risk information can be said to have a catalytic effect if it sufficiently aligns supply and demand between producers and users, leading to it being utilised for a specified purpose. The extent to which it can have a catalytic effect will depend on the barriers, risks, opportunities and incentives that surround it and the actors. The potential for climate risk information to become knowledge and eventually influence behaviour in a user can be re-framed as five sequential questions:

- Is the information relevant?
- Is the information useful?
- Is the information useable?
- Is the information taken-up?
- Is there a behaviour change?

The framework identifies where a piece of climate risk information sits along this continuum: for example, information might be useful to the work of another actor but not in a form that is readily useable. It seeks to understand what might advance a piece of climate risk information towards a situation where it is taken-up, catalysing a behaviour change. Climate risk information is closer to an end-use when the barrier or

blockage presents at a later stage, so can be understood to improve, or valorise, as it moves along this continuum. To frame this another way, actors must work together, reflexively with the climate risk information in order to adapt and align themselves with each other, around that information. Figure 2 describes the dynamic process.

Figure 2. The catalytic transformation process.



Importantly in reality this is not a linear process and there are several feedback loops including learning cycles that can take place.

Rather than focusing on the risk information itself, the analytical framework explores this transformation process. It interrogates what determines uptake, usage, sharing and implementation of climate risk information. We use the framework to explore the potential for insurance to help catalyse the use of climate risk information in decision-making. It is based on the hypothesis that insurance has the potential to be a catalyst for greater use of climate information by relevant actors either through existing insurance transactions (where products are already available and customer relationships exist) or through capacity building and investment in data sharing and engagement with decision-makers (where products are lacking or are only emerging, and little or no customer relationships exist).

The value of this approach lies in the granular examination of the role of climate risk information and the steps producers and consumers can take to proactively collaborate or indeed co-produce more suitable information that can result in behaviour changes. The end-goal of the framework is to have producers and users sharing climate risk information that is mutually intelligible and operable. This then meets a demand and is readily taken-up, resulting in a behaviour change in response to the risk information such as building a bridge at a different location to avoid risks of landslide or tidal surges; planning an irrigation system that considers longer-term trends in river water levels; or investing in agricultural innovation to make farmers more climate resilient. The associated political economy lens is applied to provide insight into the drivers, incentives, barriers and constraints to this process, and can lead to suggested changes and inputs to facilitate progress.

For the question about the catalyst role of insurance driving this process two considerations are important:

- Temporal: To what extent does the risk information also relate to future risks and thus increase the ability to plan and implement adaptation measures beyond short-term risk management?
- Relationship: What role does the nature of the relationship between decision-makers and insurers play – considering insurance in a transactional as well as advisory context.

Our evidence is based on interviews undertaken between June 2015 and October 2018, and a key informant meeting and insurance survey in April 2019 (Table 1). In addition secondary literature was consulted to provide context (Actionaid, 2017; CISONECC, 2016; Hirsch & Schäfer, 2017).

Table 1: Sources of primary data

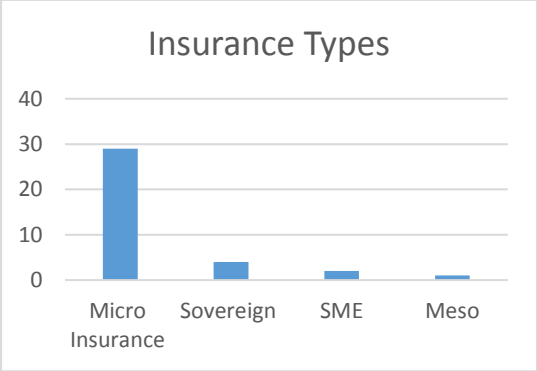
	Evidence base
African insurance sector	Key informant meeting in Lagos in April 2019 as part of UNEP Finance Initiative (FI) Africa market event, survey of 40 insurers/reinsurers (who are operating in Africa and have membership of UNEP PSI) conducted in April 2019.
Malawi	Interviews with 9 government staff and 5 international donors connected to the African Risk Capacity sovereign drought insurance scheme, some of whom were interviewed up to 3 times between June 2015 and August 2016 plus other evidence from the Future Climate For Africa UMFULA project on climate information usage conducted between June 2015 and December 2016.
Tanzania	Interviews with 5 participants in the 2016 City Innovation Platform for African Infrastructure Risk and Resilience (CIP AIRR) in Dar es Salaam, Tanzania conducted in October 2018.
South Africa	Interviews with 2 staff members from a major South African private insurer conducted in October 2018.

4. The insurance context examined

The study considers insurance and the use of climate risk information in the context of three sub-Saharan countries and is informed by discussions with and survey of African insurance companies. Overall the use of insurance across Africa is very low, particularly for non-life risks, with penetration levels ranging from around 2.7 in South Africa (premium volume as a percentage of GDP) to 1.08 in Malawi and 0.79 in Tanzania (Swiss Re Sigma – 2013 and 2018). A recent empirical assessment of disaster and climate risk insurance schemes in Africa by the Grantham Research Institute[5] provides a snapshot of the current use of insurance across the continent. Figure 3 shows that insurance applications spread from micro – to macro level, with micro insurance schemes being by far the most common type.

[5]This analysis is based on an empirical assessment of schemes in Africa—based on data from the *Grantham Research Institute on Climate Change and the Environment's Disaster Risk Transfer Scheme Database* (2012–2018). (formerly known as the Climate Wise Compendium on Disaster Risk Transfer Schemes in emerging and developing countries) http://www.lse.ac.uk/GranthamInstitute/evaluating-the-resilience-impact-of-climate-insurance-erici/

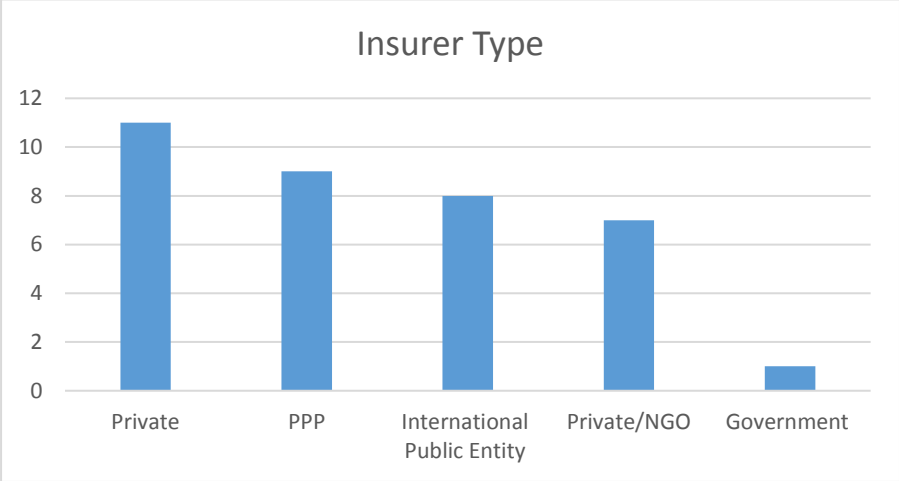
Figure 3. Number of schemes by type of insurance



Source: Grantham Research Institute, http://www.lse.ac.uk/GranthamInstitute/evaluating-the-resilience-impact-of-climate-insurance-erici/

Figure 4 shows the role of public and private players in delivering the insurance schemes – however, there is likely to be a bias towards public or Public Private Partnership (PPP) schemes, as purely private insurance is often not featured publicly, with little data available.

Figure 4. Number of schemes by supply-side actor



Source: Grantham Research Institute, http://www.lse.ac.uk/GranthamInstitute/evaluating-the-resilience-impact-of-climate-insurance-erici/

Against this backdrop of low penetration and uptake there is growing interest from domestic insurers to expand coverage and scope of their operations. While traditional areas of insurance such as motor or funeral cover are more widespread, products for climate –related hazards are still relatively uncommon for private insurers, and many of the pilots or products on offer at the moment rely on significant support from donors or government. However, a number of African insurers have identified climate change and wider sustainability as an area of concern, as highlighted by the UNEP-FI PSI-Africa initiative, which encourages domestic insurance companies to transform their business models into a more sustainability-focused approach. The second PSI market event hosted in Africa took place at the end of April 2019 in Lagos, Nigeria and was attended by around 60 representatives of African insurers, technical experts and donor organisations. It provides the backdrop to the survey of insurers' own data use and perceptions of their role with regards to supporting government climate risk management.

The three case studies symbolize different types of relationship between insurance and government (Table 2):

- As an existing insurer (Santam) of private assets located across a municipality along the Vaal river in South Africa);
- In the context of multi-country sovereign risk transfer through the African Risk Capacity (ARC) drought insurance scheme in Malawi, where the underlying risk information tool Africa RiskView (ARV) represents an effort by ARC, and the international community, to make climate related information more useable for governments;
- As a risk advisor without any existing product relations in the case of the City Innovation Platform for African Infrastructure Risk and Resilience (CIP AIRR) in Dar es Salaam, Tanzania), which represents an innovative collaborative model aimed at improving the management of risks from the start of public infrastructure development projects as opposed to only entering the process once many of the development decisions had already been made.

Table 2: overview of the cases

Case description	Context	Actors
South Africa: sharing risk information between an insurer and a municipality to inform the design and sustainability of insurance products as well as support land-use planning decisions. The work is led by Santam, South Africa's largest insurer. Its portfolio is predominantly focussed on fire and flood cover, which cause approximately 85% of claims. Flood insurance, in particular, is very data-driven, as it is a technical and complex type of insurance. For the insurer collaboration with a municipality provides an opportunity to gain new insights into location of assets such as boats, in exchange for sharing its own assessment of flood risk along the river and assist the municipality in applying that risk knowledge to planning and early warning processes. In this example, a municipality along the Vaal river in South Africa entered into a data sharing agreement with Santam to improve understanding of flood risk and location of assets along the river.	**Flood risk to private assets:** Existing insurance products in place for some private asset owners in the municipality, but no prior engagement between those managing risks at municipal level and insurers. Repeated flooding and increasing claims costs pose challenge to insurability/ affordability. Municipality lacks risk information and skills to run early warning system, has planning processes and risk management in place.	Insurers, municipality and district governments, private asset owners who are insured and live in municipality.
Malawi: Risk information is provided by insurance pool ARC to Malawi Government - The Ministry of Agriculture, Irrigation and Water Development (MOAIWD) holds and monitors the Africa Risk View (ARV) software. This provides the standard methodology to quantify weather related food security costs in Africa. It generates drought information throughout the growing season and combines existing operational precipitation observations in an early warning model on rainfall with population data in order to propose an estimate for food insecurity. ARV can support planning for response to food security issues. The model provides expected as well as probable maximum costs for drought related response activity prior to any growing season for the entire of SSA, broken down to the district level. It incorporates a range of climate risk information and weather data from other models to produce accessible, composite food security risk measures.	**Drought risk and national budget implications:** Sovereign risk transfer product for national government against drought risk, very little national planning. Risk data can support national decision-making on food security and climate adaptation, but little experience and capacity	ARC and its Africa RiskView, Ministry of Agriculture, Irrigation and Water Development (MOAIWD) and different entities across national government and development partners

Tanzania: In October 2016 ClimateWise and the Cambridge Institute for Sustainable Leadership (CISL) South Africa supported the design and implementation of the City Innovation Platform for African Infrastructure Risk and Resilience (CIP AIRR). This two-day workshop aimed to support municipal actors in Dar es Salaam to manage the climate risk protection gap by sharing risk information associated with key public infrastructure projects planned for by the municipal government. This was not conducted within a transactional relationship but in an advisory capacity.	**Climate risk to public infrastructure projects**: Very little to no insurance cover for public infrastructure at municipal level, very little planning and risk analysis	Municipality, insurers, facilitator organisation ClimateWise, ICLEI

The three cases are considered as illustrations rather than standardised typologies and need to be considered both in the context of different insurance market stages (South Africa more advanced than Tanzania and Malawi) and different institutional strengths at the governmental side. However, they all occur against the backdrop of very acute climate risks – both in terms of current and future trends:

South Africa has the most advanced insurance market of the three, but still shows very low uptake and penetration rates. The climate hazards to which South Africa is exposed include droughts, floods, heatwaves and wild fires (Department of Environmental Affairs, 2018). Different levels of vulnerability and adaptive capacity exist, reflecting the variable socio-economic status at the local level. Whilst there are national level policies, implementation takes place at municipality level. Significant efforts have taken place to assess the nature of risk at local level in South Africa, through initiatives such as the South African Risk and Vulnerability Atlas (Mambo & Faccer, 2017) and the Green Book with its presentation of municipal risk profiles (CSIR, 2019). The second and third cases are from Malawi and Tanzania. Neither Malawi nor Tanzania has comparable institutions nor established property insurance as in South Africa but there has been sustained interest from the international community and insurers in a wider application of climate risk information in addressing climate hazards. In both countries adaptation and development agendas are closely linked high priorities. Vulnerability is acute and both countries have national policy documents that stress this and the need for targeted intervention in key sectors and vulnerable populations (GOM, 2012, 2013, 2016, 2017; URT, 2011, 2012b, 2012a, 2016).

Malawi has a high degree of vulnerability to climate change as its economy is dependent on rain-fed agricultural production dominated by small holder farming. Agriculture accounts for 30% of GDP and supports the livelihoods of 77% of the population. Natural hazards, such as floods and droughts, regularly disrupt food production and accessibility, leading to situations of hunger, malnutrition and famine. Recognising the imperative for information and early warning, several development partners have invested in climate service provision in Malawi, especially regarding weather data. At present, Malawi's meteorological forecasts are disseminated via radio, television, websites, emails and text messages. Private weather agencies also provide meteorological information so there is scope for private sector collaboration especially regarding communication. Malawi has had several experiences with sovereign insurance. Between 2008 and 2011, Swiss Re provided Malawi drought insurance. The premiums for the first 2 years were paid by DFID, and then in the 3rd year by the World Bank. The pay-out trigger was based on a single index (the Malawi Maize Index), which provided average conditions across the country and so disguised the existence of droughts in parts (which is not uncommon because of Malawi spanning a wide range

of latitude). Malawi then joined the second risk pool of African Risk Capacity for sovereign drought insurance in 2015-16.

In Tanzania, floods and erratic rainfall pose a risk to life, infrastructure and agriculture - 74% of the workforce is in agriculture, most of which is rain-fed and small scale. Under the UNDP's Climate Information for Resilient Development in Africa (CIRDA) there is a target to increase national coverage of the hydrometeorological network from 50% to 75% (UNDP, 2016) in order to strengthen the capacity for evidence based decision making. Tanzanian institutions are relatively well set-up to develop and deliver climate services, but at present the services rendered are being under-sold to private actors. Improvements in accuracy might lead to an opening-up of new markets.

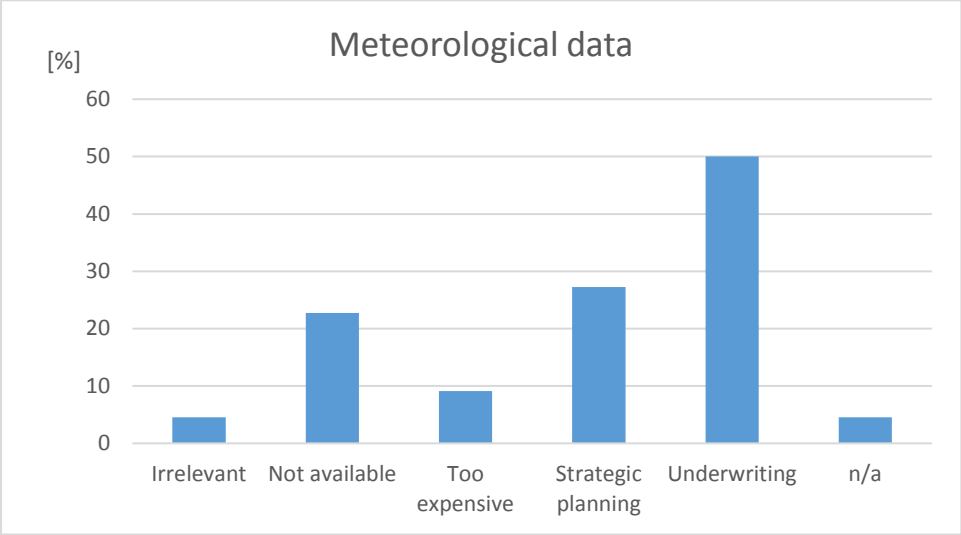
5. Findings

Our analysis of the catalyst role of insurance reveals insights at three levels:

5.1 Temporal considerations: Current or future climate risk information?

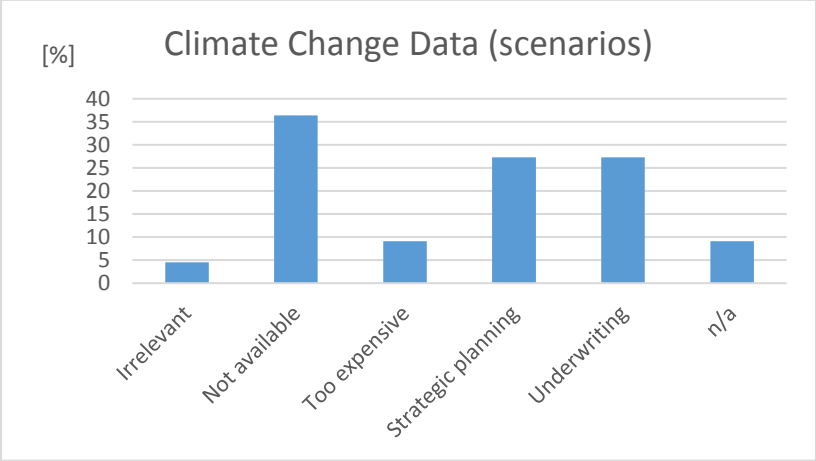
Not surprising given the traditional short-term underwriting periods, the survey of insurers underlines that there is a clear distinction between use of data about current risk versus data about future risks. Meteorological data capturing historic trends and near-term forecasts is used by 50% of respondents for transactional purposes (i.e. underwriting) and by 27% for strategic planning (Figure 5). In contrast, climate change scenarios are only used by 26% for underwriting and 26% for strategic planning, with 36% responding that this type of information is not available to them (Figure 6).

Figure 5. Use of current meteorological data by insurers in Africa



Source: author, based on survey at UNEP FI PSI event

Figure 6. Use of future climate change data by insurers in Africa



Source: author, based on survey at UNE|P FI PSI event

While reflective of a current insurance business model that is built around a short-term underwriting cycle, failure to use long-term information raises questions about the ability for insurers to plan for future climate change and their role in supporting climate adaptation and resilience building for climate change of others. Furthermore, use of data is influenced by type of activity: insurance companies in Africa do not necessarily engage in the area of climate change as underwriters: in the absence of insurance products they might be involved in discussions as consultants and risk experts. This is also highlighted by Figure 8 below.

In the three case studies climate risk information predominantly focuses on current risks but also offers a degree of modelling future risks trends. In the South African case study the municipality produces GIS data relating to the extent of current flooding along a major South African river. This climate risk information assists the insurer in the modelling of future flood risk and associated damages to private property, providing information both in terms of current and future risk trends.

The Malawi case study focuses primarily on the Africa RiskView (ARV), which is a technical product associated with the African Risk Capacity (ARC) sovereign insurance programme, developed by the United Nations World Food Programme. It estimates crop losses and the impact on populations' food security from past and future droughts for sub-Saharan African countries. It also provides the weather index that is used as trigger for ARC products. ARV is designed as a platform and can, according to ARC, use "climate change scenarios as an input in order to evaluate the future impact of climate variability and changes on critical issues such as food security and the overall performance of an envisaged risk management system, such as ARC." (ARC, n.d.)

In the Tanzania case the climate risk information introduced to municipal actors in Dar es Salaam during the engagement with insurers took the form of catastrophe risk models for planned urban infrastructure projects. This offers planners and technical specialists a greater understanding of how to factor both slow and fast-onset climatic threats into city planning and individual infrastructure projects, allowing a glimpse into the future. This can show, for example, how individual buildings might be at risk from flood or other hazards in the short-term and also how rising sea-levels or projected flooding

might manifest in the longer-term under climate change. However, one challenge, reported in the interviews, was the fact that many projects within the city had been looking at elements of risk modelling, but all with their own individual data sets and goals. There is a clear role for NGOs and funders to ensure better co-ordination and collaboration.

5.2 The risk information translation process

The results from our analysis of the information translation process are shown in the decision-tree diagram (Figure 7), framing the movement of climate risk information along the continuum as a decision tree that considers how and why information transitions (or does not).

Figure 7. Decision tree considering the climate information translation process

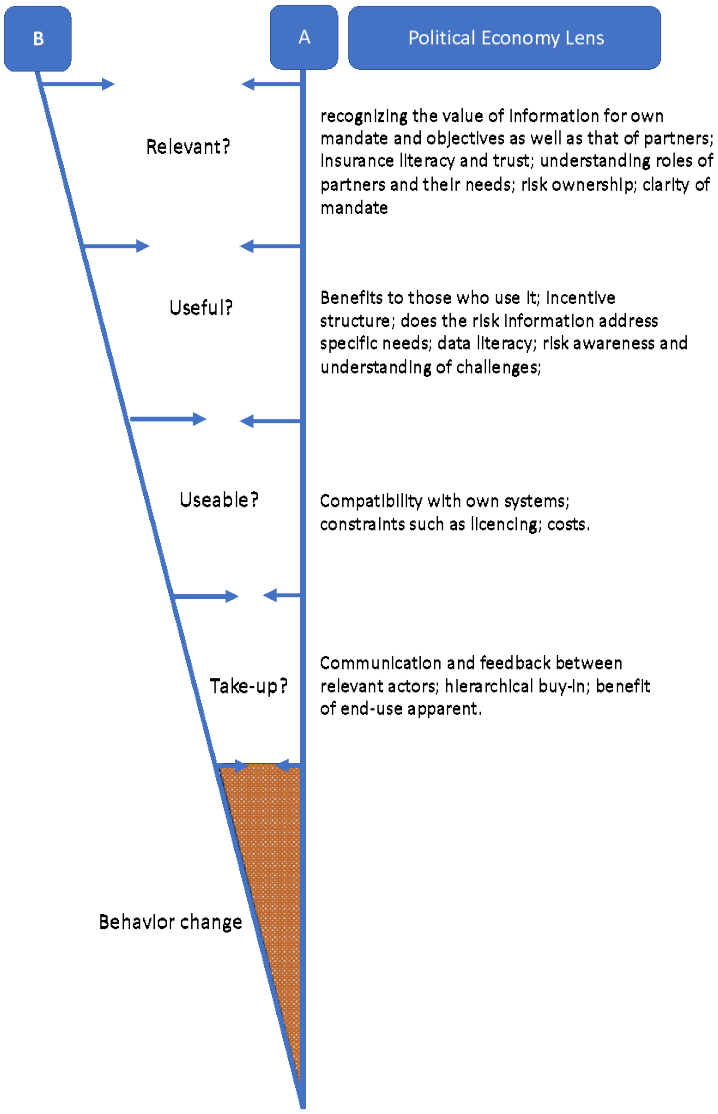


Table 3: Evidence for barriers to, and enablers of, transition from one stage to the next in the transformation.

Transition between levels	**Barriers**	**Enablers**
Relevance to Usefulness	No visible or immediate recognition of how risk information matters to individual or institution. Low insurance literacy; minimal awareness raising opportunity; turnover of personnel; low risk-ownership; ad-hoc funding; fears around corruption; mistrust of international intervention.	Insurance and financial literacy can prompt actors to frame climate risk information in terms of savings rather than costs; trust in the structures and actors.
Usefulness to Usability	Prioritisation amongst technical staff for reactive tasks; resource constraints leading to least-cost options; limited inter-sectoral collaboration; lack of direct incentive for actors and low accountability for performance; limited tailoring of data; perverse incentives to focus on disaster response ex-post.	Actors require the space and resources to proactively pursue innovative options; climate risk information must address specific need; systems and technology must be adequate; technical ability to identify and address gaps.
Usability to Take-up	Low technical and human capacity (including internet access) limits up-take; legislation and regulation can be too cumbersome or temporally out of sync which dis-empowers actors; competition and secrecy leading to protectionism; framing of risk reduction as a cost lessens any political capital linked to up-take.	Technology and infrastructure required; adequate resources and technology licensing; clear regulation around insurance incentivised action; linked incentives around cost and risk reduction.
Take-up to Behaviour change	Take-up and behaviour change are not necessarily similar in ambition and objective. Actor seniority key to empowered use of information; climate risk information that is not sufficiently reflective of end-user need and demand can be taken-up but not lead to a behaviour change; wider buy-in may be required to effect a behaviour change.	Clear feedback from climate risk information to financial performance; sensitivity to local power dynamics.

Table 3 summarises the wide range of factors that influence each stage of the transformation, below we explore this in greater detail for each step.

5.2.1 Relevance

The focus here is on how relevant the risk information is for institutional as well as individual roles and responsibilities and how it relates to the decisions that are being made. As explained in section 5.1 a key aspect is temporal: for underwriting past and current risk information is more relevant than future risk trends. For planning this could be different, however, for those who make planning decisions these tend to be influenced by current concerns and pressures.

In the South Africa example the risk information shared was directly relevant to the city officials and the insurer: By bringing in private sector partners to improve the capacity and capability of municipal staff the municipality is enabled to generate new GIS data that is relevant to the city's decision-making tools. For the insurer there is the incentive of accessing risk information relevant to their own underwriting as well as creating a collaborative relationship with the municipality, which might eventually increase viability of insurance products in the city. The data is only indirectly relevant to asset owners who will encounter this in the form of insurance quotes and planning decisions from the municipality, forming two kinds of incentives.

In Dar es Salaam one of the objectives of the workshop was to demonstrate relevance of risk information to municipal administrators. An initial barrier was limited risk and insurance literacy at the level of individual actors, with participants in the CIP process reporting that, to them, insurance was 'just an additional cost', and that they did not see how it could help with their own work. This appears important, even in the context of a non-transactional focused engagement such as in Dar. As the workshop progressed actors from different backgrounds worked together to develop shared understandings of where and how risk information could contribute to planning and budgeting. Respondents agreed that the CIP workshop saw climate risk information move from being relevant to being useful in the minds of municipal actors. However, a shift in personnel after the local elections in 2017 meant that the understanding and trust that had been built previously was lost. One lesson from Dar es Salaam is of the importance in targeting the right actors. Interventions such as the CIP workshop build understanding and trust that contributes to a recognition of the relevance of climate risk information but the political cycle can undo this progress if there is a shift in personnel. In order to mitigate this, interventions might do more to target institutions as opposed to individuals or target individuals with a skill or function that is removed from the election cycle, such as engineers or GIS specialists. In this way, the line ministries and agencies responsible for risk management can develop an institutional appreciation of the relevance of such information. Importantly staff changes within private sector partners or NGOs can also have a similar disruptive influence.

The Malawi case reiterates the importance of targeting those who have ownership of the issue: a lack of clarity around which institutional actor can benefit from climate risk information frustrates progress. There is an apparent disconnect between the manifestation of drought risk for different ministries and agencies and the responsibility to address this. Limited, ad-hoc funds appear to undermine the structures and institutions responsible for risk reduction, but there is also a coordination issue. Many agencies and development partners are represented on the ARC technical working group, and though responsibility for different domestic processes and outputs is specified, there is less clarity regarding which domestic actor should use climate risk information from ARC and use it to enhance risk reduction. ARC transmits information,

via the ARV to the Environmental Affairs Department (EAD) and Department of Climate Change and Meteorological Services (DCCMS), which are the two domestic agencies responsible for climate change. In Malawi the premium for the drought insurance was paid by an international donor – and after some to-ing and fro-ing regarding the decision to do so. Since the government was not investing in the premium-and there was high level political pressure within the government to take the insurance-there was limited incentive to ensure appropriate understanding of the insurance product and the ARV software that triggered pay-outs. This was all exacerbated by shortness of time that technical staff had awaiting negotiation and political directive from above on whether or not to proceed.

5.2.2 Usefulness

This category is based on an immediate application or use case for risk information. In the Dar case it appears that in principle, individual technical staff at city level – planners and GIS specialists for example – would have use for the climate risk information that was shared during the workshop. Their time is often diverted, however, towards completing more reactionary tasks and ex-ante risk reduction is not a priority. Until such actors have time and space to think about ex-ante risk reduction there will remain a disconnect between the use of risk information and their information requirements. A lack of clear incentives to apply the risk information can be a key barrier. Addressing this would require engagement beyond the initial risk information sharing exercise and would require sustained management and resources to support applications. One participant in the event suggested a neutral moderator would be required in order to maintain communication and continuity beyond the initial workshop. However, this may not be enough: another participant suggested that collaboration requires proper institutional relationships that can withstand ministerial or other staff changes and does not rely on NGOs with potentially vested interests.

In Malawi the ARV has been designed with government-use in mind but aligning this with incentive structures and interests within different parts of government is a key challenge. The limited uptake of the ARV can be traced back to two key aspects: inter-ministerial collaboration is disincentivised in Malawi where actors are protective of their mandates and activities. Similarly, there is a lack of incentive for government actors to incorporate the ARV information into their work and there is little repercussion for performance related outcomes. Indeed, the ex-post response to food insecurity crises is an important political tool at the highest level, further undermining progress towards risk reduction and ex-ante planning.

The South Africa example indicates the importance of active collaboration and buy-in prior to the sharing of risk information, including Memorandum of Understandings and clear governance arrangements that provide a stable framework for the collaboration. Data gaps in the planning and underwriting processes were identified at the outset, creating a workable basis for developing useful risk information to plug those gaps. Importantly parties involved appeared to have a good awareness of the direct and indirect benefits of the data to their individual mandates.

5.2.3 Usability

Once an application has been identified the key question is whether and how to use the risk information. In Malawi it became quickly clear that the ARV risk information was not useable to the national agencies in Malawi. Technical capacity constraints are a

common barrier to the usability of climate risk information. Specifically, the software that ARC provided for use of the information was not widely accessible, while there was also poor awareness of how to use it. Unreliable internet access also poses a persistent barrier. In the interviews the World Food Program – which also monitors the ARV data – claimed that the software is underutilised and that limited understanding and buy-in contributed to the confusion and misunderstandings during the pay-out controversy during the 2016/17 season. Broader issues with ownership likely account also for the limited interest in increasing usability by Malawian stakeholders. Development cooperation partners have met the costs of premiums previously. This contributes to a general lack of buy-in and understanding in government agencies when compared to more conventional private sector insurance. ARC runs training and capacity building and offers on-going support to member countries. As such, in spite of technical issues, other political economy factors likely play a larger role in limiting the up-take of climate risk information.

Technical issues appear less of an issue in Dar es Salaam: respondents report that the municipal workers were generally of a high capacity and in some cases, extremely capable. Moreover, the technical requirements to use the climate risk information generated or owned by insurers 'is not especially onerous' (informant during the interviews). In contrast, wider political economy factors appear more instrumental in Dar including trust, which, if lacking, can undermine an actor's ability to use climate risk information. While the CIP process brought together insurers, the NGO ICLEI and municipal workers, there was an inherently strained trust issue between municipal and national government: The national administration is mistrustful of cities, which are seen as 'incubators of opposition'. This national-municipal disjuncture is considered an impediment to municipal employees having either the time or the resources to do anything beyond the bare-bones of their role and almost no leeway to take any option besides the cheapest.

The South African case demonstrates that usability can be a design-feature: municipalities and the insurer brought their own decision-support tools into the collaboration and ensured that risk information is formatted and packaged so as to fit into those systems. It appears that financial and performance incentives drive usability here.

5.2.4 Take-up

Eventual take-up of climate risk information for decision making is the culmination of the prior phases. Capacity to act is important for this. Institutions, incentives and personnel all play a role in this. Sustained collaboration between individuals can lead to shared production and take-up of climate risk information but this is at risk from changes in personnel. Usable information is thus more likely to be taken-up when collaboration builds mutual understanding and commensurability between organisations rather than actors, especially those linked to the political cycle. The capacity building and sensitisation with municipal workers during the CIP workshop in Tanzania was undermined, for example, by elections the following year. This might be mitigated by building relationships with institutions rather than incumbents, and to target individuals in technical rather than political positions, such as engineers and GIS specialists. Furthermore, targeting the appropriate level of seniority and experience is also relevant: Mid-level civil servants tend to be sufficiently empowered to act, are

usually far enough away from the political flux and likely to remain in the administration for a significant period of time.

Lack of trust in and experience with risk information can also hamper take up. In Malawi, ARV risk information was foremost considered in the context of the insurance product, in this case the sovereign risk insurance cover. Tension between the World Bank, WFP and various Malawi agencies were visible and lack of buy-in and understanding culminated in a poorly calibrated cover. The Government of Malawi did not pay the premium cost and did not adequately invest in the process technically, which undermined understandings and culminated in frustration and anger when the pay-out did not come in 2016-17. Thus the challenges with the underlying product marred the trust and take up of the risk information for other, non-insurance purposes.

That said, the climate risk information that ARC produces via ARV is free to the government and ARC provides training, computers and software, to enhance the capability within government departments. And the Government has a technical inter-ministerial working group which also includes international development partners and is aimed at channelling risk information into decision making. However, the reality looks different: There appears little connection between this technical group and those tasked with contingency planning, despite involving the same government agencies. Ministry staff apparently lack incentives or are dis-empowered to try to use the information. The national political context provides perverse incentives in fact to senior politicians to benefit from a response to a drought event, whilst offering little incentive to attempt to manage risk ex-ante. Ministries are therefore dis-incentivised to adequately plan for threats and furthermore their efforts to collaborate with one another are frustrated by a competitive and secretive culture around resources and responsibility. These national characteristics prevent useful climate risk information from being made useable and taken-up.

In the South African case the insurer and the municipality have taken-up the climate risk information, having each established the value of data for their own individual purposes. As such both sides were driven by different incentives but worked together to understand their respective data-gaps, seeking out the climate risk information that each could offer. Enhanced GIS capacity in the municipality improved the insurance companies modelling output, which in turn was shared with the municipality and used for planning purposes.

5.2.5 Behaviour change

The final question in the decision-tree is whether or not the process leads to a change in behaviour. In Malawi and Tanzania this stage was not reached as the data was never fully taken-up by those who can change drought risk management processes or infrastructure investment plans. In South Africa the municipality and the insurer both saw value in the risk information for influencing their own behaviour as well as that of others – mainly asset owners and developers: the municipality used it to undertake more proactive planning in terms of new building permissions, requiring those seeking building permissions to consider risk and resilience during the planning process. Meanwhile the insurer used the newly-gained risk information to reflect on risk in its underwriting process, passing on savings to low-risk policy-holders whilst increasing costs to high-risk asset holder and incentivising others to address their risk exposure ex ante in order to reduce their insurance costs. The interviews indicate that these

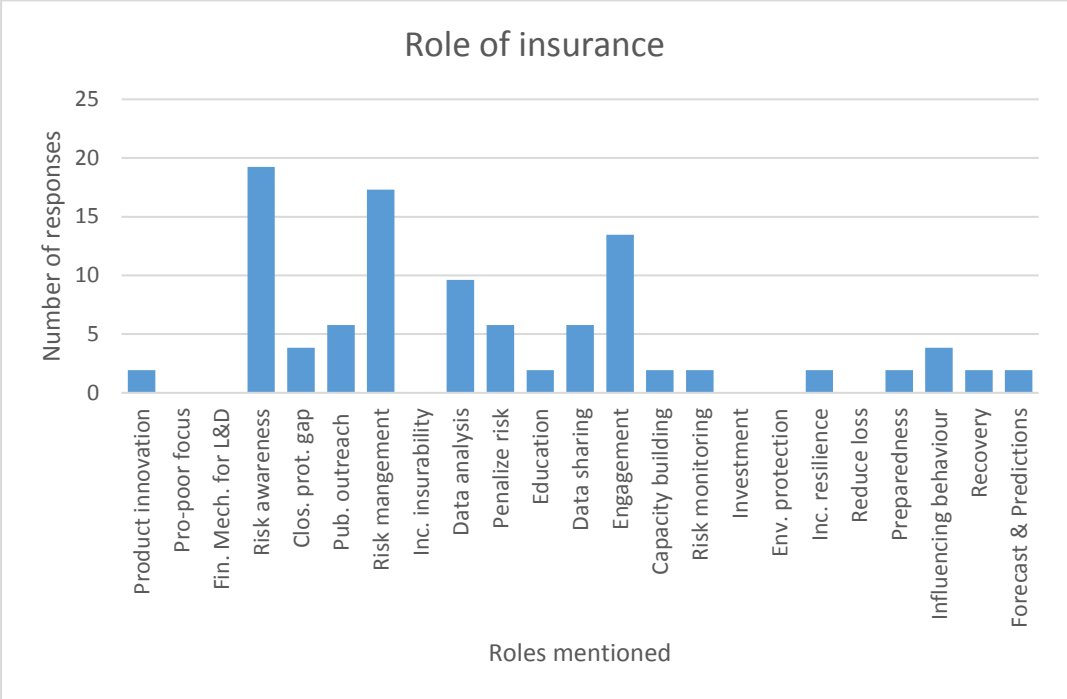
behaviour changes occurred, but this remains anecdotal and is also not tracked over time – e.g. the municipality might disregard the information if pressure to accelerate development increases. Similarly the options to act amongst asset owners are relatively limited - people could move expensive assets such as boats away from the river during expected bad weather and they could also look to purchase more expensive cover for immovable assets such as boat-houses – but these options tend to be only available for a small group of wealthy asset owners rather than to the wider population at risk of flooding.

5.3 The relationship between insurers and those at risk: transaction or advisory?

The final aspect of our analysis consider the nature of the relationship between insurers and those at risk and what implications this might have for the catalyst role.

Overall, this relationship can take different forms, depending if based on contractual transactions or broader engagement and collaboration. When asked about what role insurers see for insurance companies in supporting climate change adaptation in Africa the dominant roles expressed reveal a non-transactional focus on risk communication: 'risk awareness', 'public outreach', 'data analysis' and 'engagement' are the top categories identified. A transactional focus on insurance products is only limited, as low responses on 'product innovation' 'protection gap', and 'recovery' show (Figure 8).

Figure 8. Insurers' views on role of insurance in supporting adaptation Source: author, based on survey at UNE|P FI PSI event



This is not surprising given the low insurance penetration rates across Africa. This also indicates that insurers may lean towards the softer, advisory roles and see less potential of engaging directly with their small customer base. However, what may seem more attractive initially can be difficult as it might make the process more exposed to external factors and has less tractions in terms of incentives as the case studies show. The

findings also point towards a distinction between ‘generation of information’ and ‘communication of information’ – both are distinct, but important elements for the catalyst role.

The three examples from South Africa, Malawi and Tanzania illustrate three different degrees of relationship and engagement: In the South African example insurer Santam and local authorities collaborate in the context of existing insurance cover for individuals who live in the , but only indirectly via customers relationship as this is not with local authority but with householders; follows the risk signalling and pricing route that has been explored in established markets: building on relatively high financial literacy and structured planning processes; joint benefits for insurers and local authorities provide incentives; links in with existing decision-structures (planning and underwriting). Potential penalizing of asset owners as one of the outcomes; builds on the assumption that those at risk can take action. As such in the Santam case success mainly depends on a) willingness of insurer to invest time in this process; b) municipality identifying a clear benefit from sharing risk data with insurers; c) asset owners having financial options to take risk reduction action and see this rewarded through lower premiums. In this example the different partners share common monetary incentives and see the value added of sharing information in the context of an already existing insurance transaction. This leads to collaboration and eventual distribution of risk information – used by Santam to improve its underwriting and ultimately convincing its customers to reduce their risk, and by the city to factor this information into planning decisions, which can be expected to help reduce future risks. The results appear to indicate a capacity and willingness to take the information into account when making decisions across the three actors. However, the political economy could easily derail this, for example should there be a push back from elected officials out of concern about lost tax revenue due to planning restrictions; or if asset owners decide to not insure at all or move to a different insurer.

The Malawi case shows a direct customer relationship for sovereign risk cover between the Government and ARC – with the predominant focus on ARV in the context of trigger points for the insurance product. Here, trust and use of information also depend on experience and understanding of the technical nature of the insurance instrument: if that works well then there is a greater chance for using the risk information more broadly. Our analysis shows a degree of disconnect between a ‘transactional’ relationship (Ministry of Finance) and those ministries involved in adaptation and risk management who are not directly linked to or in some cases not even aware of the insurance transaction. Furthermore, transactional context can create incentives, but also become shadow over the wider use of risk information if there are misunderstandings or challenges at the transaction side, as highlighted by the trigger point controversy in Malawi.

In the Tanzania case the industry consortium and city officials interacted in the context of risk advisory engagement without a direct customer relationship, although there was a pre-conception on the side of government participants that the engagement was ultimately aimed at developing insurance products. Transparency about aim and objective are essential, however trust and mutual understanding are not easily established and require longer-term commitment and engagement. This is a significant investment of time and effort for both sides, with uncertain benefits, particularly if

undertaken as a pilot or one-off exercise and not embedded into a long-term plan with solid political and industry support.

6. Concluding discussion: The catalyst effect of insurance?

In this study we have explored the catalyst role of insurance in contrasting contexts: On the one hand the South Africa example of an existing market albeit only emerging, with asset owners that have the capacity to act and a city with an established planning system. All these factors seem conducive to the use of risk information. Meanwhile the other two cases studies occur against different backdrop: insurance coverage is minimal and the balance of barriers, incentives and motivations for use of risk information appear more complex. Our analysis offers a new perspective on the catalyst role of insurance by focusing on underpinning political economy factors, particularly incentives and relationships that influence this process. Several of the findings are distinctively shaped by the specific circumstances in each of the cases investigated, and this range is not exhaustive nor representative of the entire range of insurance products and audiences. For example we have not considered microinsurance and influence of insurance on farmer behaviour. In addition there are also more general aspects relevant for the understanding of the role of insurance and interactions with wider decision-making.

Overall there appears to be clear scope for a dynamic interaction between insurers and other actors such as governments, planners, property developers, investors, farmers, or individuals where symbiotic use and generation of climate risk information can advance mutual goals. In an urban context this might influence building practices and infrastructure, in an agricultural context this might influence the choice of crop and timing of planting. However, that ambition can face many challenges that go beyond availability and suitability of data: limited trust, unclear risk ownership or lack of incentives can provide key barriers, even if there is motivation, risk-awareness and overall buy-in into the need to manage climate risks.

All three cases show the importance of sustained engagement and capacity building to increase awareness of the role of insurance-related climate risk information and its potential benefits and uses. This includes technical capacity: In the South African case the municipality had the staff, hardware and software to operate GIS technology to utilise risk information in their planning, yet this is not the norm.. Investing in this capacity building would need to be an important first step when attempting a scaling up of the South African case. However, providing training and technical resources can also be challenging, even when done in the context of an insurance transaction, as seen in the Malawi case. Difficulties around the end users' understanding of the Africa RiskView software for the trigger validation became a barrier for using the risk information for other purposes. This resonates with observations in other, long established insurance markets, where often lack of trust, concern about insurance price implications or regulatory constraints prevent effective risk information sharing (Surminski, 2017). In addition, as the ARC ARV case shows there is usually a disconnect in terms of departments responsible for data in insurance context (finance/budget) and those departments that might use the data for other risk management purposes.

Importantly, a key consideration when building technical capacity targeting the correct actors who can make decisions and have the agency to alter processes. Without due consideration of this even relevant, useful and useable climate risk information is unlikely to lead to behaviour change. Political economy challenges tend to be greater when dealing with 'official' counterparts in government, and there are already known challenges of policy coherence around risk reduction, and often unclear roles and responsibilities. (England et al, 2018) Both the Dar es Salaam and Malawi case show existing mandate for those actors targeted (city administration in Dar, national government in Malawi), but limited or unclear risk ownership and lack of incentives to act.

There is a possibility that heavy reliance on development cooperation also acts as a disincentive to recognize the relevance of climate risk information for internal decision making. For example, infrastructure planning is heavily influenced by others, often foreign players, limiting the degree of ownership and relevance shown by those actors targeted in the two case studies. In Tanzania, the national government retains a large degree of control over budgets and urban planning, which undermines and disempowers municipal administration. However, the risk is owned by the municipal actors, leading to a disjuncture. In addition, perverse incentives limit the opportunities for risk owners to take-up climate risk information emanating from insurance and related processes. The Bus Rapid Transport system in Dar es Salaam, for example, was constructed with neither adequate climate planning nor attention to the traffic dynamics it is intended to address. The World Bank and African Development Bank funded project is a large scale, highly visible project which has generated positive publicity for the National Government whilst less expensive, more effective options might have been available. In Malawi, the national government used disaster response as an ex-poste political opportunity whilst there is little political ground to be gained with ex-ante risk reduction. As the premiums for drought insurance were covered by international donors, an approach which has been widely applied in SSA to in an attempt to generate demand for new approaches to risk management, targeting both individual consumers and national governments (e.g. Greatrex et al., 2015). However, there is a risk that beneficiaries not investing directly may disincentivise their willingness to fully understand the role of risk transfer in risk management. The same risk can occur in the case of farmers and microinsurance. Donors often subsidise the premium in early years to encourage uptake but, in so doing, can reduce the need for participants to fully understand the process.

Interestingly, in the South Africa case the link to an existing insurance product may not have been sufficient motivation for the insurer to engage with the local authorities: Santam's motivation to engage was also incentivised by the national government. In South Africa, the government reached out to the private sector with a Business Adopt a Municipality initiative[6] which provided an opportunity to Santam to formally showcase its efforts in this area. This was also in part driven by Santam's response to the Black Economic Empowerment drive in South Africa post the 1994 transformation process in the country: the company created an Empowerment Trust which funds stakeholder engagement activities and which is supplemented by expert time, project management, data and CSI funds through the company..

[6] http://www.durban.gov.za/resource_centre/new2/documents/index_baam_z_fold_leaflet.pdf

Indeed, regulation and legislation can either constrain or empower institutional political economy contexts. Cumbersome regulation in Dar es Salaam, for example, means that municipal planners cannot work quickly when there is a new building project proposed. In instances where building is planned in a high-risk area such as a floodplain, works are often completed before the correct regulatory processes can be enforced. Regulation also presents civil servants in both Malawi and Dar es Salaam with opportunities. If urban building codes or national resilience strategies contain a strong risk reduction rationale it could empower domestic actors to pursue ex-ante risk reduction even in instances where this incurs a short-term cost. For example, Santam's underwriting subsidairies Emerald (property) and Mirabilis (engineering)– could provide risk advisory to municipal planners during the initial stages of a project. Emerald has a wealth of risk information and risk event experience, and can assess projects in order to advise how to build to reduce risk that will reduce subsequent premium costs and further re-insurance costs. At present, insurers are consulted at the end of the process and write a policy based on the planning, rendering their input minimal. Altering the regulatory context to include a mandate for risk reduction could lead to insurers and other potential sources of risk advisory being involved in the planning process and lead to cost-savings in the medium-term.

Overall, it is clear that capacity to engage and use the data and appropriate incentive structures are essential for the transformation process of climate risk information. This applies to both insurers and governments, particularly in the context of climate change and risk information about future risks. The motivation to invest in and consider future information is low on both sides, particularly in new markets. It is therefore important to not simply assume that insurers themselves use future risk information for strategic planning. Additionally the perceived public good nature of risk information about current and future risks can clash with the insurance business model that uses risk information as a key commodity on which companies compete: Companies invest in risk models and analytics to gain a competitive advantage – sharing it and collaborating with other users can therefore also be considered a risk for an insurer, with unclear commercial benefits.

This underpins the importance of demonstrating the value of climate risk information for overall climate resilience, and to highlight the possible tangible and visible benefits that improved planning and anticipatory action driven by better risk information could provide to both sides. For example, insurers and modellers have the know-how and climate risk information that can improve understanding of urban flooding in Dar es Salaam, and one simple solution that might be attractive to government would be up-stream afforestation. This could easily be framed as a low-skilled job creation activity rather than a cost. Recognising and capitalising on these opportunities would further enable insurance, government and also development partners to catalyse the use of climate risk information to support greater climate adaptation and to look at solutions systemically and holistically. However, this needs to be part of ongoing capacity building efforts – both for governments as well as the insurance sector – without which a successful navigation through the climate risk transformation process seems unlikely.

Acknowledgement
This work was carried out under the Future Climate For Africa UMFULA project, with financial support from the UK Natural Environment Research Council (NERC), grant references: NE/M020010/1 (Kulima) and NE/M020134/1 (UKZN) and the UK Government's Department for International Development (DFID). Support from the Grantham Foundation for the Protection of the Environment and the Economic and Social Research Council through the Centre for Climate Change Economics and Policy is also gratefully acknowledged. We are grateful to the key informants who participated in this research, to all interview partners in Tanzania, Malawi and South Africa, and to UNEP FI for allowing us to survey attendees at the UNEP-FI PSI Africa Market Event in Lagos in 2019. Special thanks to Diana Chanika Mataya for her help with interviews in Malawi, to Viktor Roezer from GRI for his support analysing the survey findings, to Architesh Panda from GRI for his work under the Rockefeller-funded ERICI project, which provided the insurance stats used in this paper, and to Vanessa Otto-Mentz and Babatunde Abidoye for very useful review comments.

References

ACRI. (2017). *THE ROLE OF INSURANCE IN INTEGRATED DISASTER & CLIMATE RISK MANAGEMENT: EVIDENCE AND LESSONS LEARNED*. Retrieved from http://www.climate-insurance.org/fileadmin/user_upload/ACRI__2017_Role_of_Insurance_in_ICRM_online.pdf

Actionaid. (2017). The wrong model for resilience: How G7-backed drought insurance failed Malawi, and what we must learn from it. Action Aid UK. Retrieved from: http://www. actionaid. org/publications/wrong ….

Bruno Soares, M., & Dessai, S. (2016). Barriers and enablers to the use of seasonal climate forecasts amongst organisations in Europe. *Climatic Change*, *137*(1–2), 89–103.

CISONECC. (2016). *Dialogue meeting on the national drought insurance policy, 17th August 2016*.

Clarke, D. J., & Dercon, S. (2016). *Dull Disasters? How planning ahead will make a difference*. Oxford University Press.

Dinku, T. (2018). Overcoming challenges in the availability and use of climate data in Africa.

Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, *35*, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014

Goddard, L, Aitchellouche, Y., Baethgen, W., Dettinger, M., Graham, R., Hayman, P., … Conrad, E. (2010). Providing Seasonal-to-Interannual Climate Information for Risk Management and Decision-making Meinke h with additional contributions. *Procedia Environmental Sciences*, *1*, 81–101. https://doi.org/10.1016/j.proenv.2010.09.007

Goddard, Lisa. (2016). From science to service. *Science*, *353*(6306), 1366–1367.

Golding, N., Hewitt, C., Zhang, P., Bett, P., Fang, X., Hu, H., & Nobert, S. (2017). Improving user engagement and uptake of climate services in China. *Climate Services*, *5*, 39–45.

GOM. (2012). *National Environment and Climate Change Communication Strategy 2012-16, Ministry of Environment and Climate Change Management.* Lilongwe.

GOM. (2013). *National Climate Change Investment Plan 2013-18, Ministry of Environment and Climate Change Management.* Lilongwe.

GOM. (2016). *National Climate Change Management Policy, Ministry of Natural Resources, Energy and Mining.* Lilongwe.

GOM. (2017). *Malawi Growth and Development Strategy III, 2017-22, Government of Malawi.* Lilongwe.

Greatrex, H., Hansen, J., Garvin, S., Diro, R., Le Guen, M., Blakeley, S., … Osgood, D. (2015). Scaling up index insurance for smallholder farmers: Recent evidence and insights.

Haigh, T., Morton, L. W., Lemos, M. C., Knutson, C., Prokopy, L. S., Lo, Y. J., & Angel, J. (2014). Agricultural Advisors as Climate Information Intermediaries: Exploring Differences in Capacity to Communicate Climate. *Weather, Climate, and Society*, *7*(1), 83–93. https://doi.org/10.1175/WCAS-D-14-00015.1

Hewitt, C. D., Stone, R. C., & Tait, A. B. (2017). Improving the use of climate information in decision-making. *Nature Climate Change*, *7*(9), 614.

Hirsch, T., & Schäfer, L. (2017). *STOCK-TAKE REPORT & POLICY RECOMMENDATIONS: THE POSSIBLE ROLE OF THE AFRICAN RISK CAPACITY & CLIMATE RISK IN-SURANCE APPROACHES FOR SMALL-SCALE FARMERS IN MALAWI*. Retrieved from www.climate-development-advice.de

ILO. (2016). *INSURANCE AND ECONOMIC DEVELOPMENT: GROWTH, STABILIZATION AND DISTRIBUTION*. Retrieved from http://www.impactinsurance.org/sites/default/files/MP46 final.pdf

IPCC. (2014). *IPCC, 2014: Summary for policymakers. In: Climate Change 2014: Impacts,Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. *Cambridge University Press*. Cambridge: Alistair Woodward. Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/03/ar5_wgII_spm_en-1.pdf

IPCC. (2018). *PCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. Retrieved from https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

Kirchhoff, C. J., Lemos, M. C., & Dessai, S. (2013). Actionable knowledge for environmental decision making: broadening the usability of climate science. *Annual Review of Environment and Resources*, *38*.

Kunreuther, H. (2015). The role of insurance in reducing losses from extreme events: The need for public–private partnerships. *The Geneva Papers on Risk and Insurance-Issues and Practice*, *40*(4), 741–762.

Lemos, M. C., Kirchhoff, C. J., & Ramprasad, V. (2012). Narrowing the climate

information usability gap. *Nature Climate Change*, *2*, 789. Retrieved from http://dx.doi.org/10.1038/nclimate1614
Linnerooth-Bayer, J., Surminski, S., Bouwer, L. M., Noy, I., & Mechler, R. (2019). Insurance as a Response to Loss and Damage? In *Loss and Damage from Climate Change* (pp. 483–512). Springer.
Mambo, J., & Faccer, K. (2017). *South African Risk and Vulnerability Atlas: Understanding the Social & Environmental Implications of Global Change. 2nd edition*. Retrieved from https://www.csir.co.za/sites/default/files/Documents/CSIR Global Change eBOOK.pdf
Miles, E. L., Snover, A. K., Whitely Binder, L. C., Sarachik, E. S., Mote, P. W., & Mantua, N. (2006). An approach to designing a national climate service. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(52), 19616–19623. https://doi.org/10.1073/pnas.0609090103
Surminski, S. (2017). Fit for the future? The reform of flood insurance in Ireland: resolving the data controversy and supporting climate change adaptation. *Policy Paper, The Centre for Climate Change Economics and Policy, The Grantham Research Institute on Climate Change and the Environment. Available At*.
Surminski, S., Bouwer, L. M., & Linnerooth-Bayer, J. (2016). How insurance can support climate resilience. *Nature Climate Change*, *6*(4), 333–334.
Surminski, S., & Tanner, T. (2016). *Realising the'triple dividend of resilience': a new business case for disaster risk management*. Springer.
Tanner, T., & Allouche, J. (2011). *Towards a New Political Economy of Climate Change and Development*. Retrieved from https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/7606/IDSB_42_3_10.1111-j.1759-5436.2011.00217.x.pdf?sequence=1
Tanner, T., Lewis, D., Wrathall, D., Bronen, R., Cradock-Henry, N., Huq, S., … Rahman, M. A. (2015). Livelihood resilience in the face of climate change. *Nature Climate Change*, *5*(1), 23.
The Geneva Association. (2016). *An Integrated Approach to Managing Extreme Events and Climate Risks: Towards a concerted public-private approach*. Retrieved from https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public//20160908_ecoben20_final.pdf
UNDP. (2016). *A NEW VISION for Weather and Climate Services in Africa*. Retrieved from https://www.thegef.org/sites/default/files/publications/WeatherAndClimateServicesAfrica.pdf
URT. (2011). *National five year development plan 2011/2012–2015/2016. President's Office, Planning Commission.* Dar es Salaam.
URT. (2012a). *National Climate Change Communication Strategy (2012-2017) United Republic of Tanzania Vice President's Office, Division of Environment.* Dar es Salaam.
URT. (2012b). *National Climate Change Strategy. United Republic of Tanzania Vice President's Office, Division of Environment.* Dar es Salaam.
URT. (2016). *National five year development plan 2016/17–2020/2021. Ministry of Finance and Planning.* Dar es Salaam.

Vaughan, C., & Dessai, S. (2014). Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *Wiley Interdisciplinary Reviews: Climate Change*, *5*(5), 587–603.
Vincent, K., Besson, S., Cull, T., & Menzel, C. (2018). Sovereign insurance to incentivize the shift from disaster response to adaptation to climate change–African Risk Capacity's Extreme Climate Facility. *Climate and Development*, *10*(5), 385–388.
Vincent, K., Dougill, A. J., Dixon, J. L., Stringer, L. C., & Cull, T. (2016). Identifying climate services needs for national planning: insights from Malawi. *Climate Policy*, *17*(2), 189–202. https://doi.org/10.1080/14693062.2015.1075374
Wall, T. U., Meadow, A. M., & Horganic, A. (2017). Developing evaluation indicators to improve the process of coproducing usable climate science. *Weather, Climate, and Society*, *9*(1), 95–107.

Appendix

National/structural characteristics	History, geography, politics and economic character influence contemporary contexts. The diversity and composition of industry, the tax-base and the labour force influence the policy landscape. Regional and international integration, including the colonial legacy and other historical factors shape institutions and values today. Geographical features influence trade prospects. These factors must all be contextualised however and related to other political economy factors. For example, small states suffer from structural economic disadvantages, but other political economy factors might combine to result in favourable conditions, as is observed with the development success of Singapore.
Sectoral/institutional characteristics	Sectors, industries and goods intersect with political, governance and economic structures creating unique political economy relations. Cost-benefit and risk decision making is informed along sectoral lines along with opportunities and incentives for profit or savings within operational budgets. The salience and visibility of different sectors is also influential, where proactive risk management activities offer less political reward than effective response for example. Public expectation can shape the political economy in a sector; public and private sectors might be held to different standards for example. Private actors might bundle more and less competitive products together whilst public actors have a range of regulatory sanctions and incentives to call upon for example.
Organisations/agents	Formal and informal institutional arrangements dictate the rules that surround any political economy analysis. Norms, values and beliefs inform and interact with formal rules and mechanisms. How public and private actors conform with relevant regulation is shaped by informal and cultural factors linked to incentives to act and individual and shared ethics. Related to this, actors are empowered to act within the structures of institutions, and in turn shape these. Knowledge, information and data are closely linked to power and agency. Growing individual and shared knowledge bases, understanding other actors and institutions and capitalising on shared opportunities offers the chance to grow and develop and is at the heart of political economy analysis. Trust is central to investment and collaboration.