



SPARC

Supporting Pastoralism
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REPORT

TRANSBOUNDARY CLIMATE AND ADAPTATION RISKS IN AFRICA: PERCEPTIONS FROM 2021

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Initiatives exploring transboundary risks

This project is part of the Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) and grew out of the Adaptation Without Borders (AWB) initiative. SPARC aims to generate evidence and address knowledge gaps to build the resilience of millions of pastoralists, agro-pastoralists and farmers in these communities in sub-Saharan Africa and the Middle East. SPARC examines trade and finance through research on agricultural value chains, and how agro-pastoralism mobility can support sustainable land and water resource management and enable economic resilience. SPARC builds upon policy and scientific knowledge of the importance of considering the interdependencies between subnational, national and regional policies around diverse themes ranging from economic planning, shared resource management and disaster and climate change risk management.

AWB was born out of a shared realisation by several organisations that it would not be possible to meet the global adaptation challenge without enhancing international cooperation on adaptation. It aims to create visibility of transboundary climate and adaptation risks, gather evidence, build connections between planners and governments and inspire action to advance transboundary climate risk management. The vision of AWB is that countries, communities and companies are empowered to effectively and justly manage the full range of climate risks to which they are exposed.

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ACRONYMS

AAI	African Adaptation Initiative
AfCFTA	African Continental Free Trade Area
AGSP	African Green Stimulus Programme
BRICs	Brazil, Russia, India, China and South Africa
CEMAC	Central African Economic and Monetary Community
CILSS	Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (Permanent Inter-State Committee for Drought Control in the Sahel)
EAC	East African Community
ECOWAS	Economic Community of West African States
FDI	Foreign direct investment
GDP	Gross domestic product
GGW	Great Green Wall
IGAD	Intergovernmental Authority for Development
INDCs	Intended Nationally Determined Contributions
LCBC	Lake Chad Basin Commission
NAPs	National Adaptation Plans
NAPAs	National Adaptation Programmes of Action
PIGE	Partners for Inclusive Green Economies
RECs	Regional Economic Communities
REEs	Rare earth elements
TCARs	Transboundary climate and adaptation risks
UNFCCC	United Nations Framework Convention on Climate Change
UNCCD	United Nations Convention to Combat Desertification
WASCAL	West African Science Service Centre on Climate Change and Adapted Land Use
WTO	World Trade Organization

EXECUTIVE SUMMARY

In *Transboundary Climate and Adaptation Risks in Africa: Perceptions from 2021*, we document how African policy-makers and experts perceive climate change and adaptation risks that have the potential for multi-country to regional consequences. Transboundary climate change and adaptation risks (TCARs) are the potential consequences or outcomes that could occur as the result of transboundary climate change impacts, the transboundary effects of adaptation decisions made by one or more countries or the transboundary effects of mitigation actions on countries' adaptation options.



TCARs can spread via a number of pathways: **biophysical** (potential impacts on ecosystem services and natural resources); **finance** (the flow of capital, such as investments in another country and foreign direct investment, international mitigation actions that reduce national adaptation options through knock-on environmental-economic impacts, etc.); **trade** (import and export of climate-sensitive goods, such as rice/grains, livestock and livestock products, etc.); **people-centred** (cross-border movement, ranging from extreme event displacement to transhumance); and **geopolitical** (laws and policies around movement, regional cooperation, border sovereignty, etc.).




A risk perception survey and interviews were conducted to understand what transboundary risks individuals working at the frontline of adaptation – whether at the national or regional level – perceive to be the most likely and severe. Participants rated 24 TCARs for their likelihood of occurrence in the next 10 years and perceived severity should they occur. These TCARs were drawn from national policies and regional and continental initiative documents.

TCARs along all five pathways that affect agricultural value chains are of particular concern, given the socioeconomic importance of these to so many African countries. The intersection of climate change with ongoing land and water degradation threatens agricultural production. This in turn could exacerbate resource competition and create additional challenges for cross-border livestock movement. Extreme climate event-induced damage to transportation infrastructure could disrupt agricultural trade. The emergence of new and/or increased range of livestock or crop disease could trigger import or export bans. Both of these trade risks would trigger cascading financial risks. And finally, how all of these TCARs are managed can generate geopolitical risks for multiple countries and Regional Economic Communities (RECs).

It emerged from the policy review, survey and interviews that key to addressing TCARs is the strengthening and implementation of national and regional coordination activities through the RECs and linking these with African Union agencies, activities and frameworks. The African Union's *Agenda 2063* serves as a visionary framework for implementing seven aspirations with goals related to enhancing equitable and sustainable socioeconomic prosperity, peace and stability, culture and stronger governance – elements for building climate resilience across the continent. The individual RECs' aims, strategies and policies focus heavily on promoting regional economic cooperation and development and address climate change impact issues. Without stronger regional coordination and implementation, nations are unlikely to be able to effectively manage such risks that respect no boundaries.

TABLE 1: TRANSBOUNDARY CLIMATE AND ADAPTATION RISKS EXPLORED
IN THE PERCEPTIONS SURVEY

	RISK	DESCRIPTION
 BIOPHYSICAL	Anti-desertification failures	Regional and multi-country plans and interventions to combat desertification through planting trees, shrubs and grass promote species that cannot survive changing climate conditions. This undermines regional efforts to reduce land degradation.
	Livestock and crop disease	Climate change-related temperature and precipitation shifts facilitate the emergence of new and/or increased range and spread of livestock and crop pests, diseases and invasive species.
	Impacts on shared fisheries	Fish stocks already under pressure from overfishing in shared inland lakes and rivers, or marine waters, are further impacted by climate change, such as rising water temperatures that trigger algal blooms and fish die-offs.
	Cross-border bushfires	Warmer temperatures and heat waves cause traditional pasture and agricultural field burning practices to lead to out-of-control bushfires in regional drylands.
	Shared water resources	Climate changes impact transboundary rivers, lakes, connected wetlands and melting of mountain snowpack and glaciers. Changing hydrologies could drastically reduce water availability for all countries that share the water, alter flood and drought risks and impact ecosystem resilience.
 TRADE	Food disruptions	Importation of staple food supplies becomes more expensive or is disrupted due to climate impacts in source countries.
	Energy disruptions	Importation of energy becomes more costly or is disrupted due to climate impacts in source countries.
	Agricultural trade bans	Climate change facilitates livestock or crop disease outbreaks or food safety concerns that require export bans or trigger trade partners to block imports.
	Foreign land grabs	Foreign investors buy up agricultural and pastoral lands to grow crops for export to their own countries. This might reduce local access to land and water resources and contribute to further ecosystem degradation and resource competition, thereby reducing subnational to national adaptation options.
	Trade hinders adaptation	Trade rules and pacts reduce sub-national to regional adaptation options, such as through tariffs or restrictions limiting access to climate resilient agricultural inputs and technologies.
	Infrastructure damage impacts trade	Regional and international trade of agricultural products disrupted due to damage to key regional infrastructure (e.g. roads, railways, ports, electricity, communications, etc.) by an extreme event.
	Non-resilient trade pacts	Trade agreements do not prioritise or anticipate the need for climate resilience, locking countries into maladaptation.

	RISK	DESCRIPTION
 FINANCIAL	Stranded fossil fuels	Demand for fossil fuels in transitions to green economies lead to stranded assets and impact subnational to national revenues for investing in adaptation action.
	Green economy mining	Increased global demand for rare earth elements (REEs) leads to unregulated mining booms and social, environmental and economic challenges that increase subnational to national climate vulnerability.
	Infrastructure damage and economies	Disruption or damage to regional infrastructure by a climate extreme cause cascading regional and multi-country economic impacts beyond disruption to agricultural trade.
	Foreign direct investment (FDI) and debt	Climate extreme disruption or damage to infrastructure built with FDI increases national debt and undermines national capacity to invest in adaptation.
	Climate finance	International climate adaptation and mitigation funding sources restrict fund access due to perceptions of conflict and fragility.
 PEOPLE	Displacement	Extreme climate events or shifting climates stimulate multi-country or regional displacement. Some displacement could become long-term or permanent.
	Resource-based competition	Resource-based competition in cross-border areas increases as climate change exacerbates existing land, water and other natural resource degradation and can contribute to insecurity and mobility.
	Insecurity	Regional conflicts contribute to resource and financial insecurity, reducing local, national and regional adaptive capacities.
 GEOPOLITICAL	Maritime borders	Sea level rise shifts coast lines and maritime borders with implications for fishing, extraction rights and other Blue Economy activities.
	River borders	Climate change shifts in temperature and precipitation compound with human pressures to alter rivers that form national borders, potentially leading to litigation and conflict over borders.
	National and regional coordination	Poor coordination and implementation of national policies with regional policies and initiatives undermines the climate adaptation goals of both.

1 INTRODUCTION: TRANSBOUNDARY CLIMATE CHANGE AND ADAPTATION RISKS

The Covid-19 pandemic illustrates how risks can spread across national borders, directly between neighbouring countries or cascading across distant countries. The pandemic has also highlighted that such transboundary risks cannot be managed without international cooperation. There are parallels between the Covid-19 pandemic and the climate change crisis. Climate change has global consequences and reducing its severity requires international cooperation on emissions reduction and reversing land degradation. Building resilience to prepare for a dynamic future also demands coordinated international action. The failure to think locally to globally creates risks that go beyond national borders, hence the term, transboundary risks.

Transboundary climate and adaptation risks (TCARs) are the potential consequences or outcomes that can cross national boundaries; 'the consequences [of which] ... occur remotely from the location of their initial impacts'.¹ These risks may be due to 'the transboundary impacts of climate change, the transboundary effects of adaptation – positive or negative – made by one or more countries that have repercussions for other countries' national to international actions in sectors such as finance, trade² or even climate mitigation that influence the adaptation options of particular countries or a combination of these elements.

Scientific evidence, as summarised in the earliest Intergovernmental Panel on Climate Change (IPCC) assessments, long recognised that climate change impacts could cross national boundaries. The climate science community called for coordinated international mitigation action to reduce such wide-reaching risks. The UN Framework Convention on Climate Change was established in 1992 to provide an international framework for countries to work together in addressing the climate change challenge through establishing binding commitments to emissions reductions and negotiating ways of achieving them.

Concerted and coordinated international action on climate adaptation has been slower in comparison to international action on mitigation. Adaptation has historically been treated as a local to national concern, whereas mitigation actions have been, and still are, promoted at subnational to international scales. In the 3rd IPCC Assessment, this historical view was evident; 'risk management is an approach that is being pursued for the management of climate change risks...from the global (mitigation...), to the local (adaptation at the scale of impact)'.³

¹ Carter, T., Benzie, M., Campiglio, E., Carlsen, H., ... and West, C. (2021) 'A conceptual framework for cross-border impacts of climate change' *Global Environmental Change* 69 (102307): 2 (<https://doi.org/10.1016/j.gloenvcha.2021.102307>)

² AWB – Adaptation Without Borders (2019) *Transboundary climate risks: An overview*, p. 1. (https://adaptationwithoutborders.org/sites/weadapt.org/files/2017/transboundary_climate_risks_web-2.pdf)

³ Parry, M., Canziani, O., Palutikof, J., van der Linden, P. and Hanson, C. (eds.) (2007) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contributions of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*: 140-141. Cambridge: Cambridge University Press.

However, evidence is emerging that adaptation policies and actions at the local to national level might actually create risks and/or opportunities that could spread beyond localities and country borders. Even inaction by certain countries to adapt will lead to repercussions at multiple geographic and time scales.⁴ It is not just adaptation actions by one nation that could lead to unintended consequences for others. Current financial and trade systems and international trends in certain climate change mitigation efforts may influence subnational to regional adaptation options, as will be explored in this paper. That some international mitigation efforts or trade pacts could inadvertently create subnational to regional adaptation challenges might not be that obvious at first. However, exploring their potential knock-on environmental and financial impacts indicates that we need to try to anticipate both direct and indirect transboundary adaptation risks.

Momentum is growing to explicitly investigate not only the transboundary risks associated with climate change, but also risks resulting from adaptation at different scales. The 2015 Paris Agreement established the Global Goal on Adaptation in Article 7 and its provisions, recognising that adaptation is a global challenge with local, subnational, national, regional and international dimensions. That said, there is much to be done to improve evidence around transboundary adaptation risks and to ensure a commitment to work toward dealing with climate risks and adaptation dimensions at regional and international scales.

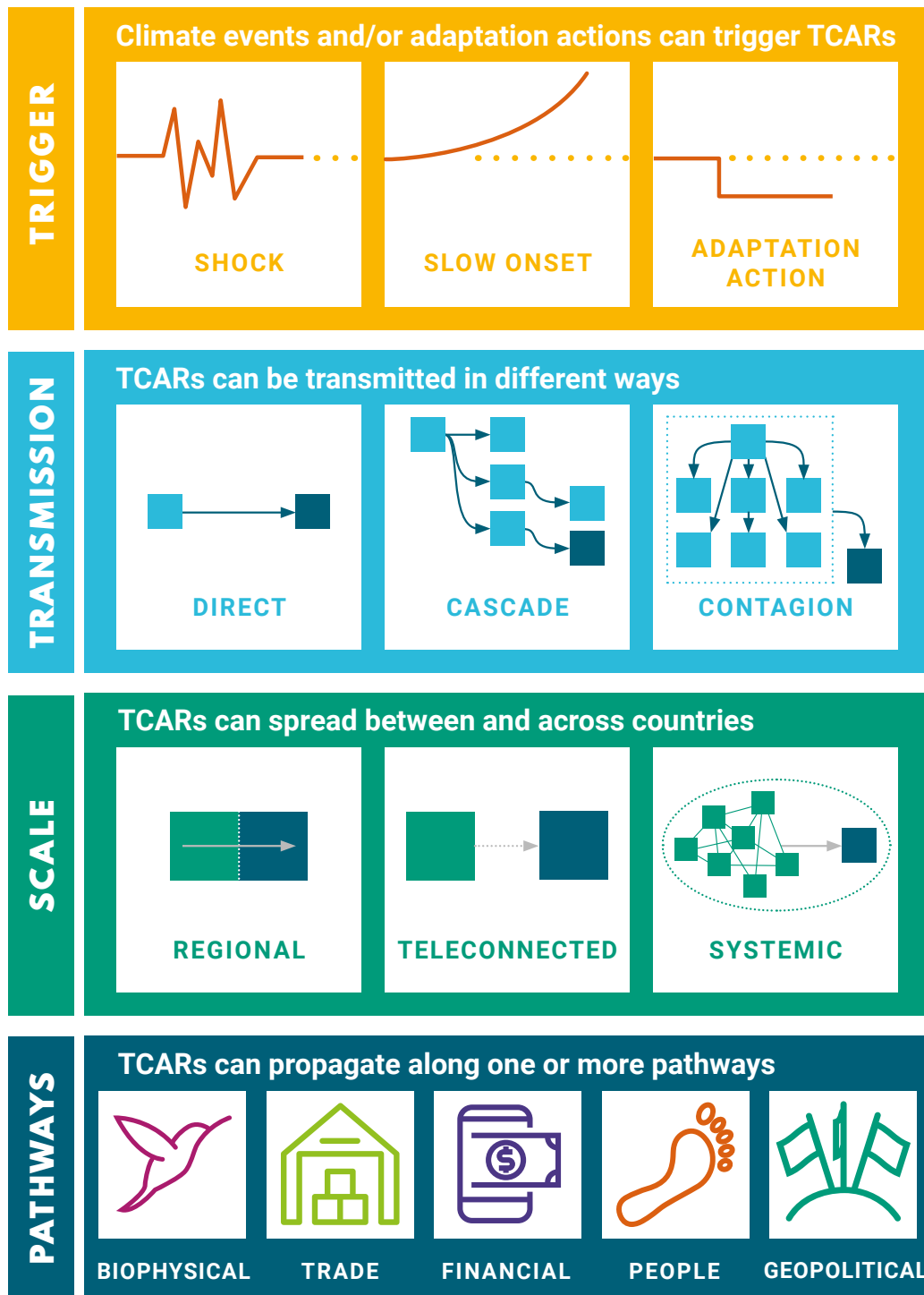
TCARs can be transmitted along a number of different pathways⁵ as shown in Figure 1. This report focuses on five risk pathways: **biophysical** (potential impacts on ecosystem services and natural resources); **finance** (the flows of capital: investments in another country and foreign direct investment; international mitigation actions that reduce local to national adaptation options through lost revenues (e.g. from stranded fossil fuel assets), etc.); **trade** (import and export of climate-sensitive goods, e.g. rice/grains; livestock and livestock products; etc.); **people-centred** (cross-border movement, ranging from extreme event displacement to transhumance); and **geopolitical** (e.g. laws and policies around movement or regional cooperation or border sovereignty). The propagation of TCARs across different pathways depends on multiple elements, such as triggers, vulnerability, capacity and exposure interdependencies between and among countries and the timeframes it takes for consequences to reach a location or sector.⁶

⁴ Nadin, R. and Roberts, E. (2018) *Moving towards a global discourse on transboundary adaptation*. ODI Briefing Note. London: ODI (<https://cdn.odi.org/media/documents/12139.pdf>)

⁵ Other pathways beyond the five might be possible. We drew these five pathways from existing research such as that supporting the Adaptation Without Borders Initiative, national and regional policies and plans, and scientific literature. For more background on cross-border climate risks, see Carter et al. (2021) or Nadin and Roberts (2018)

⁶ Carter et al. (2021)

FIGURE 1: TRANSBOUNDARY CLIMATE AND ADAPTATION RISKS – WHAT TRIGGERS THEM AND HOW DO THEY SPREAD?



This figure modified with permission from Adaptation Without Borders Initiative (AWB, 2019)

Transboundary climate change and adaptation risks (TCARs) are the potential consequences or outcomes that could occur as the result of transboundary climate change impacts, the transboundary effects of adaptation decisions made by one or more countries or the transboundary effects of mitigation actions on countries' adaptation options. Such risks have multi-country, regional and international implications.

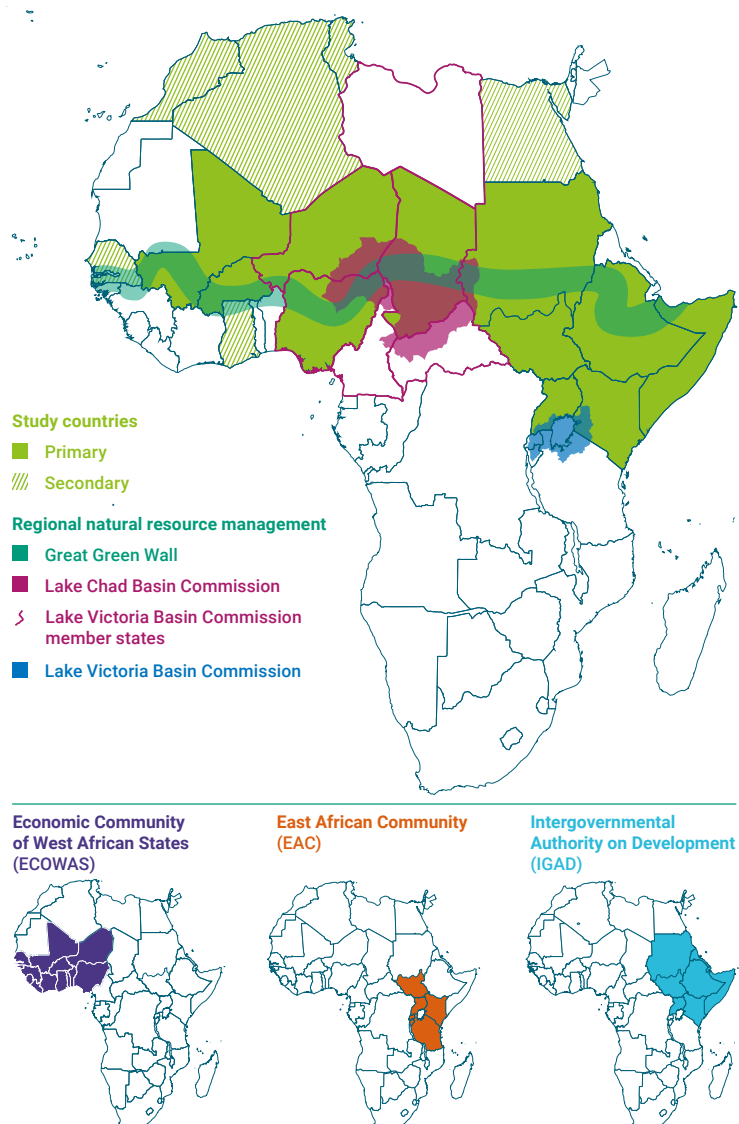
Sources: authors' interpretation of AWB concept

TCARs that are perceived as most likely and severe to national and regional interests are often reflected in policy and practice. This paper takes a two-pronged approach to understanding TCARs in Africa. Firstly, existing policies and initiative documents are analysed for whether and how TCARs are addressed. The mention of such risks is seen an indication of decision-makers' awareness and concern for the topic, whilst also shedding light on what kinds of solutions are currently being proposed and what challenges may be expected for managing transboundary risks. Secondly, based on the document review 24 risks (see Table 1) were selected that could be transmitted along one or more of the five risk pathways and policy-makers were surveyed on the perceived likelihood and severity of the risks should they occur in the next 10 years (chapter 3). The report closes with a discussion of ways forward for addressing TCARs across Africa.

2 TCARS IN AFRICAN POLICIES AND STRATEGIES

This chapter explores how current national and regional policies identify and frame TCARs within the five pathways. The risks highlighted in this chapter were drawn from National Adaptation Plans (NAPs), National Adaptation Programmes of Action (NAPAs), Intended Nationally Determined Contributions (INDCs), and national economic and agricultural policies of the following countries: Burkina Faso, Chad, Ethiopia, Kenya, Mali, Niger, Nigeria, Senegal, Somalia, South Sudan, Sudan and Uganda. We also examined African Union and regional initiative plans and documents from the Regional Economic Communities (RECs) and from natural resource management initiatives like the Great Green Wall (GGW) as shown in Figure 2. The regional overview is presented first as it provides perspectives around transboundary risk management into which national policies are working toward alignment. The overviews of national policy landscapes, grouped by East and West African countries, are then presented.

FIGURE 2: TCAR STUDY COUNTRIES



2.1 Continental and regional policy framings

The African Union and the RECs have long been concerned with and active in areas around transboundary risk and the need for more cooperative and coherent regional risk management approaches. Sustainable socioeconomic development, sharing of natural resources, peacebuilding and security, good governance and financial management are some of the key transboundary objectives of the African Union. The African Union established the *Agenda 2063* as a framework for implementing seven aspirations with goals related to enhancing equitable and sustainable socioeconomic prosperity, peace and stability, culture and stronger governance.⁷

Climate change is increasingly interlinked with the aspirations and recognised as presenting challenges from subnational to continental scales. A pan-African climate change vision to bolster the Agenda's goals and flagship programmes is outlined in the draft *Africa Climate Change Strategy*.⁸ The African Adaptation Initiative (AAI) was launched in 2015 in response to a mandate by the Committee of African Heads of State and Government on Climate Change.

Concerns with the cascading and linked nature of global risks and their subnational, national and regional implications to various African countries have also been recently highlighted in the 2021 *African Green Stimulus Programme* (AGSP), which notes how economic pressures and pandemic protection measures have contributed to:

*... a sharp rise in rural poverty and the phenomenon of reverse migration caused by migrant labourers being forced to temporarily leave urban areas under lockdown, resulting in additional pressures on natural resources, wildlife and ecosystems. The Pandemic has exacerbated the multitude of inter-related crises that African and other developing countries are facing, including exacerbating already unsustainable debt levels... [it] has underscored the importance of strengthening the nexus between public health, pollution abatement, climate action, biodiversity and ecosystems, desertification and land degradation, social equity and economic prosperity.*⁹

In keeping with African Union goals, the socioeconomic cooperation goals of RECs such as the Economic Community of West African States (ECOWAS) and the Intergovernmental Authority on Development (IGAD) focus on a number of linked elements under the five transboundary risk pathways.

⁷ AUDA-NEPAD, African Union Development Agency (2021) 'Agenda 2063: Africa's Aspirations, Goals and Targets' (<https://www.nepad.org/agenda-2063>)

⁸ African Union (2020) Draft Africa Climate Change Strategy: 2020-2030. Addis Ababa: African Union

⁹ African Union (2021) African Green Stimulus Programme 2021: 9. Addis Ababa: African Union AUDA

Biophysical risks

Biophysical risk management is a priority of regional bodies, particularly related to multi-country desertification, land degradation and transboundary water management. A number of regional cooperative natural resource management initiatives have been set up to address multi-country land and water resource management.

One of the preeminent multi-country initiatives is the GGW, which is an anti-desertification initiative spanning the Sahel drylands on the border of the Sahara Desert stretching from West to East Africa. The GGW was launched in 2007 and is led by the Pan-African Agency of the GGW (of the African Union) through the support of international partners such as the United Nations Convention to Combat Desertification (UNCCD). The GGW is a coordinated effort of multiple countries along the Sahel to restore lands degraded through deforestation, unsustainable agriculture and overgrazing. Degradation is due to complex interactions between poor governance, population pressures and inadequate land management in fragile drylands areas.^{10 11}

The intensification and growing frequency of extreme weather events like droughts or slow-onset shifts to warmer temperatures and more variable precipitation, due to climate change, will exacerbate and accelerate processes of land and water degradation. The 2019 *IPCC Special Report on Climate Change and Land* notes that land degradation and climate change:

... act as threat multipliers for already precarious livelihoods (very high confidence), leaving them highly sensitive to extreme climatic events, with consequences such as poverty and food insecurity (high confidence) ... Climate change will have detrimental effects on livelihoods, habitats and infrastructure through increased rates of land degradation (high confidence) and from new degradation patterns (low evidence, high agreement).¹²

The GGW aims to reduce 'socio-economic impacts in terms of food and water security and malnutrition' while making agriculture and pastoralism more sustainable and improving land management.¹³ Land restoration and management efforts under the GGW are explicitly recognised for their importance in national climate change adaptation as mentioned in individual NAPAs, such as Nigeria and Burkina Faso's.

Regional land restoration initiatives are bolstered by regional bodies to coordinate transboundary water management. The East African Community (EAC) and IGAD – both East African RECs – recognise water stress to be a regional climate risk of concern. IGAD's *Regional Strategy 2016-2020* calls for a framework for transboundary water, land, seascape and ecosystem resources management and the implementation of existing multilateral

¹⁰ Owuor, S., Butterbach-Bahl, K., Guzha, A., Jacobs, S., Merbold, L., ... and Breuer, L (2018) 'Conversion of natural forest results in a significant degradation of soil hydraulic properties in the highlands of Kenya' *Soil and Tillage Research* 176: 36–44

¹¹ Balehegn, M., Kebreab, E., Tolera, A., Hunt, S., Erickson, P., Crane, T.A. and Adesogan, A. (2021) 'Livestock sustainability research in Africa with a focus on the environment' *Animal Frontiers* 11(4): 47–56

¹² IPCC (2019) *Climate change and land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security and greenhouse gas fluxes in terrestrial ecosystems* [P. Shukla, J. Skea, et al. (eds.)]. Cambridge: Cambridge University Press

¹³ Climatekos (2020) *The Great Green Wall: Implementation status and way ahead to 2030*. Bonn: UNCCD

environmental agreements, and the need for bringing disaster risk reduction and climate change adaptation into programmes.¹⁴ The EAC *Climate Change Policy* (2011) also calls for support to regional transboundary lake and river basins management initiatives.

Regional transboundary water initiatives link back with REC policies and strategies. In East Africa, for example, the Lake Victoria Basin Commission refers to the EAC strategy. Its *Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan (2018-2023)* outlines institutional coordination strategies and implementation actions needed for coordinating member states' water, aquatic and land management under a changing climate through the EAC and other existing transboundary collaboration mechanisms.¹⁵ In West Africa, the Lake Chad Basin Commission (LCBC) provides a framework for multi-country joint management responsibilities of the connected ground-surface water and wetlands system that supports (and includes) the lake.¹⁶ Its strategies link back with those of ECOWAS on regional resource management frameworks. The LCBC acknowledges the need to consider climate change impacts on basin hydrologies and the knock-on impacts this could have for inter-basin water transfers, agricultural livelihoods, land management and regional peace and security.

Trade risks

Pan-African and regional trade cooperation also figure heavily in African Union and REC policies, and climate change impacts to trade are acknowledged. Some key goals and flagship projects under the *Agenda 2063* include: the modernisation of agriculture, particularly the reduction of rainfed agriculture; the improvement of agricultural value chains to produce finished commodities over raw goods for trade within the continent and global markets; and the African Continental Free Trade Area (AfCFTA) – slowly commencing in 2021 after delays due to the Covid-19 pandemic.

The African Union, RECs and national governments note that biophysical risks can trigger and transmit cascading risks through trade and finance pathways across Africa. Transboundary trade risks of concern are impacts related to the volatility of rainfed agricultural production, food insecurity and price disruptions due to climate change. Within the AfCFTA, food safety (phytosanitary) concerns, economic diversification away from the extractive sector and the development of infrastructure to support trade are mentioned, but neither climate change risks, mitigation nor adaptation risks (at any scale, subnational to continental) are explicitly addressed within the agreement.^{17 18}

The AGSP seeks to bring pan-African climate mitigation and resilience into trade and finance through adopting the Partners for Inclusive Green Economies (PIGE) principles. The PIGE principles, if fully adopted and implemented, promote building resilient infrastructure to reduce the impacts of 'external shocks' and would help reduce cascading trade risks due to regional infrastructure damage or failure during climate events. The AGSP also acknowledges that the emergence of new, or alteration of the range of livestock and plant diseases could be exacerbated by climate change and have cascading trade impacts. It calls for OneHealth

¹⁴ IGAD (2016) IGAD Regional Strategy: Implementation Plan 2016-2020 Vol. 2. Djibouti: IGAD Secretariat

¹⁵ Lake Victoria Basin Commission (2018) Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan: 2018-2023. Kisumu: LVBC

¹⁶ Lake Chad Basin Commission (2012) Water Charter for the Lake Chad Basin. Chad: LCBC

¹⁷ African Union (2012) Agreement establishing the African Continental Free Trade Area. Addis Ababa: African Union

¹⁸ African Union (n.d.) African Continental Free Trade Area: Questions and Answers. Arusha: African Trade Policy Centre of the EAC

approaches to be integrated with natural resource and land restoration and management initiatives, biodiversity frameworks, drawing on existing international and regional frameworks and strengthening coordinated action.

Climate change impacts on regional social and economic development are also mentioned in various RECs' strategies and climate plans. IGAD's recent regional strategy, for instance, explicitly recognises the need for 'climate smart' agricultural commodity value chains, facilitating regional fish trade, improving animal disease surveillance and procedures to reduce trade disruptions and improve livestock exports. The *EAC Climate Change Master Plan 2011-2031* notes that European consumer trends to reducing carbon footprints in horticultural imports could negatively impact flower exports from the region.¹⁹ Yet, the transboundary implications of regional climate resilient infrastructure and trade have yet to be made. Capacity building to assess and regionally manage TCARs within and between these trade areas requires bolstering in REC strategies and greater coordination between member countries.

Financial risks

Transboundary financial risks associated with climate change, adaptation or mitigation impacts on adaptation options are entering African Union and RECs' policies and plans, some explicitly and some indirectly. The AGSP notes the global trend towards divestment in fossil fuels and that this is creating stranded assets for a number of African countries,²⁰ leading to cascading economic impacts for those countries for whom extractive industries contribute significantly to GDP. While at first this might not seem like an adaptation issue, countries with a high degree of economic reliance on extractive sectors may find that foregone revenues could decrease their abilities to invest in subnational to national adaptation measures. Additionally, the AGSP touches on the issue of rare earth elements (REEs) for transitioning to green economies. While the need for strengthening electronics recycling and reuse is mentioned in the AGSP, it does not address the growing global demand for REEs and the environmental, social and economic risks this could pose to communities who host formal or informal mines and how this could reduce local adaptation capacities in the absence of risk management.

This is not to say, however, that mitigation should not proceed just because there will be transition risks! The science is clear that failure to mitigate and achieve net-zero economies will lead to catastrophic consequences globally. These transition risks need to be addressed in climate financing programmes to ensure that countries have sufficient funds to pivot their economies to low carbon and climate resilient activities.

The AGSP also explicitly recognises growing levels of debt amongst countries with the growth of conditional and co-financed loans for funding infrastructure and other projects, though it does not discuss the debt implications and cascading economic risks of non-climate 'proofed' infrastructure.

¹⁹ EAC- East African Community (2011) Climate Change Master Plan 2011-2031. Arusha: EAC

²⁰ African Union (2021) African Green Stimulus Programme 2021: 14, Addis Ababa: African Union

Securing climate mitigation and adaptation finance is a key priority under multiple pan-African initiatives, such as the *Addis Ababa Action Agenda* on sustainable financing and the AAI. One of AAI's four pillars of work is related to 'increasing access to and mobilising additional climate finance and investment for adaptation and addressing loss and damage'.²¹ Yet developed countries have failed to meet the \$100 billion in climate finance commitments by 2020 that were pledged at the 15th Conference of Parties in 2009.²² Additionally, allocation of climate finance to fragile and conflict-affected areas has to date been limited, possibly due to perceptions of higher risk to funders and donors.²³

The individual RECs' aims, strategies and policies focus heavily on promoting regional economic cooperation and development. The potential impacts of climate change on regional economies are being explored along biophysical risk pathways to natural resources and implications for agricultural sectors. In West Africa for example, ECOWAS has partnered with the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL) to understand climate risks to agriculture, land use, water resources and renewable energy. However, exploration of direct and cascading impacts along other financial pathways remains nascent in REC policies and programmes and in individual countries' loss and damage calculations in the INDCs. The AAI is working to strengthen subnational to national adaptation planning and implementation in coherence with regional and continental institutional and policy frameworks, as well as promoting transboundary cooperation.

People-centred risks

Transboundary people-centred risks – mobility and security – are not separable from geopolitical risks or transboundary biophysical risks. Peace and stability concerns feature prominently in African Union and RECs' policies and priority action areas. The African Union and RECs make clear that continental and regional approaches to peace building, good governance and security are necessary. This is irrespective of any potential, indirect influence of climate change on conflict. *Agenda 2063* identifies 'a peaceful and secure Africa' as one of its seven aspirations, recognising the need to address development and resource inequalities and governance as part of eliminating insecurity – from inter-community conflict to transnational terrorism and criminal networks – through the other aspirations.

Transboundary insecurity and conflict in fragile areas of countries in East and West Africa are driven by a multitude of actors and through complex factors. IGAD describes factors, such as poor governance, discrimination, inequality, resource scarcity and poverty contributing to insecurity and furthering civil conflicts and violent extremism. There are concerns that increasing resource competition (land, water, food) and the ongoing degradation of land, particularly for extractive industries, could fuel tensions and conflicts further.²⁴ Some of these factors could be exacerbated further by climate change.

²¹ AAI - Africa Adaptation Initiative (2017) Enhancing action on adaptation and addressing loss and damage in Africa. Africa Adaptation Initiative Framework Document 2017-2020

²² Colenbrander, S., Cao, Y., Pettinotti, L. and Quevedo, A. (2021) *A fair share of climate finance? Apportioning responsibility for the \$100 billion climate finance goal*. ODI Working Paper. London: ODI (https://cdn.odi.org/media/documents/ODI_WP_fairshare_final0709.pdf)

²³ Cao, Y., Alcayna, T., Quevedo, A. and Jarvie, J. (2021) *Synthesis Report: Exploring the conflict blind spots in climate adaptation finance*. SPARC (www.sparc-knowledge.org/sites/default/files/documents/resources/exploring-the-conflict-blind-spots-in-climate-adaptation-finance.pdf)

²⁴ IGAD (2016) *IGAD State of the Region Report: A Popular Version*. Djibouti: IGAD Secretariat

The transboundary mobility of people, whether via displacement by an extreme weather event or conflict, traditional transhumance or rural to urban migration for economic opportunities, has implications for sending and receiving countries. Some individual African countries have policies designed to limit the cross-border movement of people (as outlined previously), while other countries view mobility as potentially beneficial.

However, there are shifts in perceptions of mobility as an opportunity to be harnessed to further economic cooperation and integration and social development throughout the broader African Union and the RECs. There are multiple African Union frameworks and conventions specifying aspirations and goals for transboundary mobility, such as the *Migration Policy Framework for Africa*. A flagship project of *Agenda 2063* is the establishment of an African passport and freedom of movement, which are further reinforced in the AfCFTA and the AGSP.

The various RECs call for implementing protocols for freedom of movement as part of regional policies in line with those of the African Union. ECOWAS established its protocol on the freedom of movement, residence and establishment of economic activities for citizens of member states in 1979;²⁵ member countries had 15 years to fully implement it, although some still have not. IGADs *Development Strategy* (2016-2020) calls for such a protocol for reducing travel restrictions through the region and facilitating the rights of residence and employment, access to work permits, pastoral mobility and the right to establish business. Plus, it notes that having regulated and managed movement can reduce resource competition that contribute to conflict and insecurity. Its 2020 protocol on freedom of movement also explicitly recognises that those displaced across borders due to disasters require special protections and calls for member states to permit 'movement across borders in anticipation of, during or in the aftermath of a disaster'.²⁶ Much work remains to be done to overcome some national policy barriers and negative perceptions around freedom of movement, such as related to transhumance, in order to achieve coherence in approaches to managing transboundary risks that are transmitted along people-centred pathways.

Geopolitical risks

While the transboundary geopolitical implications of risks along people-centred pathways are acknowledged in African Union and RECs' policies and strategies, at a higher level, the Union and the regional bodies are grappling with a far more entrenched transboundary geopolitical risk – the challenge of working with individual nations to achieve agreements on multi-country and regional management of land and water resources, energy, trade, finances, peace and security and movement of people.

While there are numerous NAPs, INDCs and national trade, agricultural, livestock and environmental management plans, the transboundary issues of multi-country natural resource management (land and water), migration, conflict and displacement are sensitive issues between many African countries. Multi-country and regional cooperation are stronger in some sectoral areas, such as land restoration and addressing desertification through the GGW. In other transboundary resource issues, such as water resources, cooperation is sometimes contentious between watershed countries as each one grapples with issues of population growth, water demand management and the need to reduce reliance on rainfed agriculture while transitioning to less fossil fuel intensive energy generation. Individual country's national policies and priorities in these areas may not align with those of neighbouring countries, the RECs or the African Union.

²⁵ ECOWAS (1979) Protocol A/P.1/5/79 Relating to Free Movement of Persons, Residence and Establishment

²⁶ IGAD (2020) Protocol on Free Movement of Persons in the IGAD Region: 11, Djibouti: IGAD Secretariat

2.2 Policy framings in East Africa

The East Africa policy landscape exhibits a mixed recognition of transboundary climate and adaptation risks. The region has diverse transboundary ecosystems whose management remains a challenge because of conflicting uses and varied management frameworks.²⁷ The rising temperatures and precipitation shifts in the region are key drivers for adaptation measures. However, such measures may induce a myriad of TCARs within the five identified pathways. This section will discuss the TCARs alluded to in the NAPs, NAPAs, INDCs, socioeconomic policies, agriculture and livestock policies for Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda.

Biophysical risks

In the national policy document review, biophysical TCARs mentioned included siltation in shared water resources, declining fish stocks and increased livestock pests and diseases.

Transboundary water resources in East Africa include shared catchment areas, lakes, rivers and wetlands. Lake Victoria and the Nile River basin – which support the fisheries sector, water supply, agriculture and livelihoods of millions of people – are critical water resources that show notable transboundary adaptation risks in the reviewed policies. The siltation rate in the Nile River basin has increased as a result of additional cultivation along the riverbanks. Climate change has contributed to further encroachment of cultivation in fertile riparian zones as land degradation and water scarcity are impacting the productivity of arable lands.²⁸ Risks associated with siltation include flooding, eutrophication (excessive mineral content in bodies of water), reduced water quality and quantity and loss of aquatic life. While cultivation along the riverbanks may lead to short-term benefits in agricultural productivity, its impacts downstream are long-term and spread beyond national boundaries.²⁹ As a response measure, the Uganda NAPA, the *Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan*³⁰ and Kenya's environment policy³¹ highlight the need to coordinate climate change initiatives, including mainstreaming agricultural and environmental initiatives.

The inland fisheries sector is highly climate sensitive and increasing droughts are reducing inflows into Lake Victoria.³² In addition, rising water temperatures and evaporation are also reducing breeding and fishing grounds.³³ With dwindling fish stocks and growing demand for Lake Victoria fish, overfishing will remain a threat to the sector. Planned interventions include

²⁷ Ministry of Lands (2009) National Land Policy. Nairobi: Government of Kenya

²⁸ The Republic of Uganda (2007) Uganda National Adaptation Programmes of Action. Entebbe: Republic of Uganda

²⁹ *ibid.*

³⁰ LVBC (n.d.) Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan 2018-2023. Kisumu: LVBC

³¹ Republic of Kenya (2013) Kenya National Environment Policy 2013. Nairobi: Ministry of Environment, Water and Natural Resources

³² Republic of Uganda (2007) Uganda National Adaptation Programmes of Action. Entebbe: Republic of Uganda

³³ *ibid.*

improving transboundary cooperation in fisheries and aquatic ecosystem management³⁴ and improving the adaptive capacity of fisher-folk to adverse climate change impacts through upscaling climate smart fish culture and fish capture technologies, integrating water needs of fish farmers in new irrigation designs and promoting sustainable fish harvesting in fresh waters, among others.³⁵

The increased spread and emergence of new livestock diseases, pests, and invasive species as a result of climate change-related temperature and precipitation shifts are also noted as transboundary climate risks. Reduced rainfall and drought are precursors to increased livestock diseases and pastoralist migrations.³⁶ The transboundary nature of livestock migration proliferates the spread of animal diseases across national borders. Additionally, invasive species are contributing to the loss of grazing land, reduced mobility and spread of pests and diseases.^{37 38}

Several East African livestock-related policies acknowledge that transboundary diseases are one of the challenges affecting livestock productivity, exports and livelihood security in the rangelands. The Kenya draft livestock policy specifically notes that the expansive, porous borders with its neighbouring countries facilitate animal movements to traditional seasonal grazing grounds and to trade routes, but at the same time also accelerates the spread of livestock diseases. An example is given of rinderpest, which has been eradicated in most parts of Kenya except a small corridor along the Kenya-Somalia border, where cross-border livestock movement is high.³⁹ Ethiopia has proposed to increase the resilience of its livestock population by monitoring and preventing the spread of disease by livestock movements across the country's border.⁴⁰ This way, disease resilience will increase and the livestock population will better cope with climate-related weather shocks.

Poor coordination and weak legal frameworks for cross-border livestock disease control are major challenges for countries in East Africa.⁴¹ However, there are proposed initiatives to coordinate prevention and management of livestock diseases through surveillance, partnerships and collaboration.^{42 43} Kenya's draft *Livestock Policy* and the *Climate Smart Agriculture Strategy 2017-2026* provide for the development of contingency plans to address transboundary animal diseases by coordinating disease control initiatives and ensuring compliance of animal trade to international sanitary requirements.

³⁴ Republic of Uganda (n.d.) Uganda Green Growth Development Strategy 2017-2030. Kampala: National Planning Authority

³⁵ Republic of Kenya (2017) Kenya Climate Smart Agriculture Strategy 2017-2026. Nairobi: Ministry of Agriculture, Livestock and Fisheries

³⁶ Republic of the Sudan (2016) National Adaptation Plan. Khartoum: Ministry of Environment, Natural Resources and Physical Development

³⁷ Republic of Uganda (2018) Uganda Rangeland Management and Pastoralism Policy. Entebbe: Ministry of Agriculture, Animal Industry and Fisheries

³⁸ Republic of Kenya (2019) Kenya National Livestock Policy draft. Nairobi: Ministry of Agriculture, Livestock, Fisheries and Irrigation

³⁹ Republic of Kenya (2017) Kenya Climate Smart Agriculture Strategy 2017-2026. Nairobi: Kenya Ministry of Agriculture, Livestock and Fisheries

⁴⁰ FDRE- Federal Democratic Republic of Ethiopia (n.d.) Ethiopia Multi-Sector Investment Plan for Climate Resilient Agriculture and Forest Development 2017- 2030. Addis Ababa: Ministry of Finance and Economic Cooperation

⁴¹ Republic of Kenya (2011) Kenya National Policy for the Sustainable Development of Northern Kenya and other Arid Lands. Nairobi: Ministry of Devolution and the ASALs

⁴² Republic of Sudan (n.d.) Sudan Twenty-Five Year National Strategy 2007-2031. Khartoum: National Council for Strategic Planning

⁴³ Republic of Kenya (2017) Climate Smart Agriculture Strategy 2017-2026. Nairobi: Ministry of Agriculture, Livestock and Fisheries

Trade risks

Transboundary risks within the trade pathways that are acknowledged in East African policy documents deal with renewable energy disruptions, livestock export bans and resource-based competition in cross-border rangelands.

In terms of renewable energy disruptions, Ethiopia is planning to export renewable energy generated from solar, hydro, wind and geothermal to neighbouring countries.⁴⁴ Sudan already receives some power from Ethiopia, and construction of the Eastern Electricity Highway Project to connect Kenya is underway.⁴⁵ Renewable energy sources are sensitive to various climate extremes. Hydropower generation can be reduced during periods of heatwave and drought, while solar power generation is also sensitive to temperature extremes and requires sufficient water for cleaning panels.⁴⁶ Wind production is dependent upon sufficient wind, but turbines must be locked and generation suspended during storms in which wind speeds exceed turbine safety thresholds. Energy transmission, regardless of generation source, also becomes less efficient in extreme heat events. Impacts on generation and transmission during heatwaves and/or drought often correspond with increased demand for cooling, placing additional strain on grids.⁴⁷ Thus, disruptions in source countries can affect energy supply across regions. Additionally, there are regional geopolitical uncertainties surrounding investment co-financing and long-term power trade commitments.⁴⁸

The issue of livestock trade and livestock export bans has also garnered policy attention. Ethiopia and Kenya have experienced trade bans due to livestock diseases and high food safety standards imposed by the World Trade Organization (WTO) and importing countries.^{49 50} Climate change-facilitated livestock diseases will continue to be the main limiting factor for accessing international livestock markets. In response to the challenge, both countries acknowledge the need for harmonised livestock disease control and prevention efforts with neighbouring countries along the common border to unlock the livestock export market opportunities.⁵¹ Ethiopia also plans to improve border livestock markets by enhancing the protection of livestock corridors, providing necessary infrastructure along the corridors and empowering communities to govern and protect the corridors.

⁴⁴ FDRE (2011) Ethiopia's Climate-Resilient Green Economy Strategy 2011. Addis Ababa: FDRE

⁴⁵ Africa Energy Portal (2019) 'Ethiopia: CET opens electricity transmission line linking country to Kenya'. 27th September. (<https://africa-energy-portal.org/news/ethiopia-cet-opens-electricity-transmission-line-linking-country-kenya>)

⁴⁶ Opitz-Stapleton, S., Khan, F., Cao, Y., Tanjangco, B. and Nadin, R. (2021) *BRI energy projects in Pakistan: environmental and climate risks and opportunities*. London: ODI

⁴⁷ *ibid.*

⁴⁸ FDRE (2011)

⁴⁹ Republic of Kenya (2019) Kenya National Livestock Policy draft. Nairobi: Ministry of Agriculture, Livestock, Fisheries and Irrigation

⁵⁰ FRDE (2015) Ethiopia Livestock Master Plan. Addis Ababa: Ministry of Agriculture, Livestock Resources Development Sector

⁵¹ *ibid.*

Financial risks

The East African policies reviewed for this research had few explicit mentions of financial risks associated with transboundary climate and adaptation risks. The Ethiopia NAP notes that attracting international capital will not be easy and acknowledges that it is difficult because least-developed countries must compete for scarce international resources.

Kenya's *National Policy on Climate Finance* (2016) notes that infrastructure investments need to internalise climate proofing. This is also noted in the country's NAP, which states in a section on the private sector that climate proofing of investments is important. The Kenya NAP notes that the private sector can help build climate change resilience, and that robust international trade will become a critical instrument to alleviate weather-induced food supply shortages. While not framed as a risk within the NAP, by looking at this from a different angle, it is possible to see that disruptions in international food trade may lead to supply shortages. The Kenya NAP goes on to acknowledge that climate change has potential to harm the Kenyan economy through supply chain disruptions, leading to the need for specific adaptation actions.

Uganda's *Third National Development Plan 2020/21 – 2024/25* (NDPIII) recognises the emerging opportunities to exploit deposits of minerals and metals that will be in higher demand due to the commitments to keep global average temperature rise below 2°C but admits that 'the window for profitable exploitation of oil is narrowing as concerns over climate change increase'.⁵² This speaks to the risk of stranded fossil fuel revenue. Uganda's NDPIII proposes the possibility of negotiating multi-country funding of development projects, such as a jointly funded power grid to serve Uganda and its neighbouring countries, which would reduce the amount of financing each country would have to mobilise. It does not mention any climate risks associated with such a project.

People-centred risks

Many of the national documents framed resource-based competition in cross-border rangelands as an increasing risk due to climate change exacerbation of ecosystem degradation; this may worsen if regional natural resource management initiatives are not climate-resilient. Pastoral and agro-pastoral systems are characterised by migrations within and sometimes across national borders. Migration is associated with increased competition over limited natural resources such as water and pasture in the rangelands in policy documents.^{53 54} National documents view competition as often leading to increased stress and conflicts in the rangelands. Migration is then further linked in policy to cattle rustling, armed conflicts and insecurity in the region.⁵⁵ However, not all countries view migration as a negative. Uganda's NAPA presents migration as an option for coping with climate-induced stress, especially in drought-prone areas where victims migrate to urban areas or resource-endowed neighbourhoods. With the conflicting views about migration amongst countries in the region, regional coordination and collaboration initiatives could be a challenge.

⁵² Republic of Uganda (2020) *Third National Development Plan (NDPIII) 2020/21 - 2024/25*. p 18, Kampala: National Planning Authority

⁵³ Republic of Uganda (2018) *Rangeland Management and Pastoralism Policy*. Entebbe: Ministry of Agriculture, Animal Industry and Fisheries

⁵⁴ Republic of Kenya (2011) *Kenya National Policy for the Sustainable Development of Northern Kenya and other Arid Lands*. Nairobi: Ministry of Devolution and the ASALs

⁵⁵ Republic of Kenya (2019) *Kenya National Livestock Policy draft*. Nairobi: Ministry of Agriculture, Livestock, Fisheries and Irrigation

2.3 Policy framings in West Africa

Adaptation to climate change is no longer a choice but represents a mandatory and unavoidable option for the search for sustainable development.⁵⁶

The West Africa policy landscape also exhibits a mixed recognition of transboundary climate and adaptation risks. Rising temperatures and precipitation shifts in the region are the key drivers for adaptation measures, which must be balanced against TCARs along multiple pathways. This section will discuss the TCARs alluded to in the NAPs, NAPAs, INDCs, socioeconomic policies, agriculture and livestock policies for Burkina Faso, Chad, Mali, Niger and Nigeria.

Biophysical risks

Cross-border climate risk has mixed characterisation in West African policy documents, which often focus on subnational to national risks, rather than transboundary risks. Adaptation options presented are often specific to landscapes within individual countries and their particular modes of natural resource management. Some countries have identified some TCARs – namely bushfires, competition in grazing areas and watering points and the impacts of increasingly variable precipitation extremes (floods and droughts) on transboundary water resources.

Geographical position plays an essential role in the perception of climate change risks to natural resources and resource-sensitive livelihoods. For example, Burkina Faso's position in the semi-arid to arid Sudanian zone is listed in its NAPA as contributing to greater agricultural and livestock vulnerability to precipitation variability. Across the Sahel, cross-border transhumance has been a long-standing livelihood strategy as pastoralists migrate herds in constant search of water and pasture. These herds circulate across Burkina Faso, Niger, Mali and Mauritania. Growing population pressures, hardening borders and the uneven distribution of water points is creating significant natural resource pressure. These pressures, from both transhumance and sedentary agriculture, are seen as leading to soil degradation, desertification, overexploitation of forest resources and numerous bushfires that have subnational to multi-country implications.^{57 58} Climate change shifts in temperature and precipitation are likely to exacerbate ongoing land and natural resource challenges.

⁵⁶ République du Burkina Faso (2015) Plan National d'Adaptation aux Changements Climatiques (PNA). Ouagadougou: Ministère de l'Environnement et des Ressources Halieutiques

⁵⁷ République du Mali (2016) Troisième Communication nationale du Mali à La Convention Cadre des Nations unies sur les Changements Climatiques. Bamako: Ministère de l'Environnement de l'Assainissement et du Développement durable

⁵⁸ République du Tchad (n.d.) Stratégie nationale et Plan d'action pour la mise en œuvre de l'initiative Grande Muraille verte au Tchad. N'djamena: Ministère de l'Environnement et des ressources halieutiques

Some national policies⁵⁹ on developing climate resilient agriculture tend to focus on solutions promoting agricultural intensification and diversified crops adapted to climate risks. However, these place-based agricultural solutions have implications for transboundary climate adaptation risks, largely because pastoralism in the Sahel relies on mobility across settled agricultural spaces and often national boundaries. This can contribute to conflict, including in border regions, as described in the upcoming people-centred and geopolitical sections. Biophysical risk management to transhumance often focuses on improving grazing areas and land restoration and reforestation through national and regional programmes such as the GGW.^{60 61} In the livestock sector, Burkina Faso's NAPA proposes combating bushfires to avoid the destruction of fodder reserves in the dry season, delimiting and planning the development of pastoral areas and water points. It also outlines actions to reforest with palatable fodder species, widen grazing routes and implement good zootechnical and pastoral practices. Fodder crops are identified as an activity to be promoted in the Inner Niger Delta in order to boost the livestock sector to limit transhumance.⁶² These programmes represent national and regional implementation of the UNCCD.⁶³

Trade risks

Transboundary trade risks prioritised in various West African national policies focus significantly on the reliance on food imports for meeting domestic food requirements, coupled with the inability to export at quality levels required for market success. Senegal, for example, is heavily dependent upon rice imports. Nigeria imports two-fifths of the rice it consumes, and its 2013 *National Policy on Climate Change* expresses concerns about future food security as demand for rice continues to increase and imports might not be sufficient.⁶⁴ These are not idle transboundary climate trade risks. Reductions in rice crop yields in source countries due to widespread droughts and flooding in 2007–08 and subsequent export bans caused significant rice price increases in Senegal and triggered food insecurity.⁶⁵ Imports of food commodities tend to rise further in years of local agricultural deficits, which are frequently triggered by shocks such as drought or locust plagues. In Niger, imports and food aid needs are noted to increase with these shocks.⁶⁶ Globally, rice production could decrease by up to 51% by 2100 due to temperature rises, increasing rainfall variability and losses due to growing numbers of flood, storm and drought events.⁶⁷

⁵⁹ Republic of Burkina Faso (2015) Intended Nationally Determined Contributions (INDC). Ouagadougou: Republic of Burkina Faso

⁶⁰ République du Burkina Faso (2015) Plan National d'Adaptation aux Changements Climatiques (PNA). Ouagadougou: Ministère de l'Environnement et des Ressources Halieutiques

⁶¹ République du Burkina Faso (2012) Stratégie et Plan d'Actions de l'Initiative grande Muraille verte Burkina Faso. Ouagadougou: Ministère de l'Environnement, de l'Assainissement et du Développement

⁶² *ibid.*

⁶³ United Nations (2017) United Nations Convention to Combat Desertification. Ordos: ICCD

⁶⁴ Federal Republic of Nigeria (2013) National Policy on Climate Change. Abuja: Ministry of Environment, Department of Climate Change

⁶⁵ Adams, K., Benzie, M., Croft, S. and Sadowski, S. (2021) *Climate change, trade, and global food security. A global assessment of transboundary climate risks in agricultural commodity flows*. Stockholm: SEI. Widespread flooding and drought, and subsequent food price hikes led to rice export restrictions from Vietnam and export bans from India. Rice exports from the Philippines also reduced. The three-country export reductions led to rice price hikes in Senegal and contributed to food insecurity.

⁶⁶ République du Niger (2015) Contribution Prévue Déterminée au niveau national - CPDN (INDC) du Niger. Niamey: République du Niger

⁶⁷ Hussain, S., Huang, J., Huang, J., Ahmad, S., and Zhang, J. (2020) 'Rice production under climate change: Adaptations and mitigations strategies', pp 659-686 in *Environment, Climate, Plant and Vegetation Growth* [Fahad, S., Hasannuzzaman, M., et al. (Eds.)]. Cham: Springer Nature Switzerland

The particular transboundary trade risk of reliance on food imports in order to meet domestic food requirements has led to a policy emphasis in Chad, Niger and Nigeria promoting food self-sufficiency and a focus towards economic diversification and job creation through agricultural reform.⁶⁸

Regarding exports, Chad's recent national development policy shows that livestock products from West African countries have difficulty accessing markets in the Economic Community of Central African States (ECCAS) and Nigeria.⁶⁹ Chad and Nigeria's livestock policies link concerns around food prices and food insecurity to weak regional financial transaction and trade structures needed facilitate the export of livestock products with ECCAS countries.^{70 71} Some countries are taking action to address food import and export risks. Nigeria is prioritising high value crops and acknowledges the need to deal with 'phytosanitary requirements'⁷² set by importing countries in order to achieve export standards.

Financial risks

Policy documents from West African countries address financial risks stemming from TCARs. Nigeria notes transboundary financial risks related to declining revenues from the sale of crude oil and the knock-on fiscal impacts,⁷³ as extractives currently account for ~90% of export revenues.⁷⁴ Chad also notes that much of its economic growth after 2003 has been driven by oil revenues and is seeking to diversify its economy into higher value agricultural commodity production, including livestock products. This highlights the need for building climate resilience into agricultural chains to reduce biophysical, trade, financial and people-centred risks.⁷⁵ Niger has considerable oil, natural gas and coal reserves and announced in 2019 that it intended for petroleum industries to 'become the engine of the national economy'.⁷⁶ Stranded fossil fuel assets due to an international green energy transition could reduce these countries' abilities to invest in climate adaptation and to transition to a lower carbon economy in the absence of accelerated economic diversification and access to climate finance.

Other TCAR risks transmitted along financial pathways are related to FDI in infrastructure. Nigeria has been courting FDI to meet its water, transportation, energy and ICT infrastructure needs as part of its overall approach. Extreme events can have economic impacts through infrastructure and asset destruction, and the government has noted with concern that climate change could lead to 'damaging and irrecoverable effects on infrastructure' as well as cascading economic impacts. For example, economic losses from the 2012 flood were

⁶⁸ République Du Niger (2016) Politique Agricole. Niamey: Ministère de l'agriculture et de l'élevage. Also, Nigeria (2016) and République du Tchad (2008)

⁶⁹ République du Tchad (2008) Plan national de développement de l'élevage: 2009-2016. N'Djamena: Ministère de l'Élevage et des Ressources Animales

⁷⁰ Federal Republic of Nigeria (2019) National Livestock Transformation Plan. Abuja: Ministry of Agriculture and Rural Development

⁷¹ République du Tchad (2008) Plan national de développement de l'élevage: 2009-2016. N'Djamena: Ministère de l'Élevage et des Ressources Animales

⁷² Federal Republic of Nigeria (2016) The Agricultural Promotion Policy. p. 24. Abuja: Federal Government of Nigeria

⁷³ Federal Republic of Nigeria (2020) Bouncing Back: Nigeria Economic Sustainability Plan. Abuja: Economic Sustainability Committee and National Economic Council

⁷⁴ Lloyds Bank (2021) 'Foreign direct investment (FDI) in Nigeria'. (<https://www.lloydsbanktrade.com/en/market-potential/nigeria/investment>)

⁷⁵ République du Tchad (2017) Plan National de Développement 2017-2021. N'Djamena: Ministère de l'Economie et de la Planification du Développement

⁷⁶ République du Niger (2018) Politique Pétrolière Nationale. Rapport Final. Niamey: Ministère du Pétrole

estimated at 2% of GDP. Chad and Niger have also been attracting FDI, much of which has been used to construct infrastructure to support the petroleum sector. What is not clearly articulated in government documents is the connection between infrastructure built with FDI, its damage or destruction by a climate extreme event and the implications for loan repayment terms and debt.

Finally, formal and informal policies can create transboundary financial risks that impact livestock production and transhumance at local to multi-country scales. Burkina Faso's NAPA⁷⁷ describes illegal taxation as presenting such risks to transhumance and security.

People-centred risks

Transboundary risks along the people-centred pathway are framed in many West African policies as relating to the cascading impacts of biophysical climate change hazards (e.g. flood, recurrent droughts and decreasing rains). The increasing occupation of agricultural and grazing areas, due to strong demographic pressures and land tenure insecurity, creates competition over land and causes the displacement of populations to other more favourable areas.⁷⁸ As noted in the biophysical risk section, countries like Burkina Faso are concerned with the vulnerability of pastoralism to climate change – including those practicing cross-border transhumance – as this sector already faces increasing competition through a reduction in grazing areas and agricultural occupation of strategic pastoral areas.⁷⁹ The reduction in pastoral spaces drives the national and cross-border transhumance of many herds to coastal countries, which constitute good markets.

The NAPAs of Burkina Faso, Mali and Niger also note that climate change and adaptation impacts place cascading stress on the agricultural sector, household food security and the national economy due to ecological pressures. Within these countries, aridity and competition over water resources is pushing herders to migrate to more humid areas. Specifically, Burkina Faso's NAPA describes resource competition over land and water as contributing to conflict between herders and farmers, which elevates the risk of livestock capital losses.⁸⁰ As such, Burkina Faso's NAPA has suggested the creation of artificial water lakes for wildlife, an underground dam and the adoption of integrated water resource management for transboundary water resources. Likewise agricultural intensification, including drip irrigation, is suggested in order to reduce resource competition pressures and economic impacts.⁸¹

⁷⁷ *ibid.*

⁷⁸ Arcanjo, M. (2019) Risk and Resilience: Climate Change and Instability in the Sahel. Washington DC: Climate Institute (<https://climate.org/risk-and-resilience-climate-change-and-instability-in-the-sahel/>)

⁷⁹ République du Burkina Faso (2015) Plan national d'adaptation aux changements climatiques (PNA) du Burkina Faso. Ouagadougou: Ministère de l'environnement et des ressources halieutiques

⁸⁰ *ibid.*

⁸¹ République du Mali (2007) Programme d'action national d'adaptation aux changements climatiques. Bamako: Ministère de l'équipement et des transports

Transhumance and cross-border migration are viewed as potential problems in the NAPAs and other national policies of Burkina Faso,⁸² Chad,⁸³ Mali⁸⁴ and Niger.⁸⁵ For example, while transhumance has a long history as a livelihood strategy in the semi-arid and arid regions of these countries, Chad's INDC⁸⁶ notes that increasing competition over pasture, land for agriculture and water resources has contributed to conflict between herders and farmers, and there are cases of discrimination against mobile populations. This is exemplified by the rapidly diminishing resources in Lake Chad, which has played a role in the instability identified in the Sahel.⁸⁷ This instability is amplified by economic problems in Niger and conflict in Mali.

In the river basins of Niger, Senegal and Guinea, there is competition over water resources between users, including power plants, pastoralists, farmers and for ecosystem services. Climate change will further impact on ecosystem services. Various West African countries are undertaking or planning initiatives to protect transboundary ecosystems as a means of reducing transboundary risks to people, such as impacts on transhumance or conflict. To better manage water resources in the Inner Niger Delta area, Mali plans the strengthening of sub-regional cooperation.⁸⁸ Niger's policies prioritise projects for the development of protected transhumance routes and pastoral areas as a means to reduce conflicts between farmers and herders.⁸⁹ The Burkina Faso INDC⁹⁰ further recommends the installation of pastoral water plans and points and the delimitation and development of pastoral areas.⁹¹

Geopolitical risks

TCARs along the people-centred pathway also have geopolitical implications. The NAPAs and socioeconomic policies of Burkina Faso, Chad, Niger and Nigeria acknowledge ongoing challenges related to security, conflict and the complexity of factors contributing to displacement and cross-border movement.

The tri-border area of northern Burkina Faso, central Mali and western Niger continues to be affected by conflict and the presence of armed groups.⁹² These groups are able to gain traction within local communities by offering security in the face of inter-community attacks. Other factors contributing to conflict include the obstruction of livestock access corridors to water points by farmers and artisanal miners, which exacerbates pastoral conflicts in the transhumance zones.⁹³

⁸² République du Burkina Faso (2015) Plan national d'adaptation aux changements climatiques (PNA) du Burkina Faso. Ouagadougou: Ministère de l'environnement et des ressources halieutiques

⁸³ République du Tchad (2009) Programme d'action national d'adaptation aux changements climatiques. N'Djamena: Ministère de l'Environnement, de l'Eau et des Ressources Halieutiques

⁸⁴ République du Mali (2007) programme d'action national d'adaptation aux changements climatiques. Bamako: Ministère de l'équipement et des transports

⁸⁵ République du Niger (2006) Programme d'Action National pour l'Adaptation au Changement Climatique (PANA Niger). Niamey: Conseil National de l'Environnement pour un Développement Durable (CNEDD)

⁸⁶ République du Tchad (2015) Intended Nationally Determined Contribution

⁸⁷ République du Niger (2015) Contribution Prévue Déterminée au niveau national - CPDN (INDC) du Niger. Niamey: République du Niger

⁸⁸ République du Mali (2007) Programme d'action national d'adaptation aux changements climatiques. Bamako: Ministère de l'Environnement de l'Assainissement et du Développement durable

⁸⁹ République du Niger (2016) Troisième Communication nationale à la Conférence des Parties de la Convention Cadre des Nations Unies sur les Changements Climatiques. Niamey: CNEDD

⁹⁰ Republic of Burkina Faso (2015) Intended Nationally Determined Contribution. Ouagadougou: Republic of Burkina Faso

⁹¹ *ibid.*

⁹² Tobie, A. and Sangare, B. (2019) *The Impact of Armed Groups on the Populations of Central and Northern Mali: necessary adaptations of the strategies for re-establishing peace.* Stockholm: SIPRI

⁹³ République du Burkina Faso (2015) Plan national d'adaptation Aux Changement Climatiques (PNA) Du Burkina Faso. Ouagadougou: Ministère de l'Environnement et du Cadre de Vie

International forums such as the UN Security Council continue to highlight the role of climate change in fuelling these tensions, pointing the increasing pressure being placed on the availability of shared resources. However, it is important to note that the access to shared water points and transhumance zones is also related to the interaction of subnational to multi-country governance, land use changes and management and poverty with environmental shocks.⁹⁴ Climate change is exacerbating pre-existing tensions and putting additional pressure on livelihoods, but it is not responsible for the underlying socioeconomic and political inequalities that create fragility and climate vulnerability. These countries are concerned with the sub-national to multi-country management of cross-border conflict, displacement and transhumance in the face of complex root drivers.

Other transboundary adaptation risks that are of concern are related to the weakness of coordination between national and regional initiatives in relation to the scale of climate change and the potential extent of various linked and cascading TCARs. There is a multiplicity of technical and financial partners in the multi-country and regional climate space (e.g. ECOWAS, the World Bank, FAO, CGIAR centres and the Comité Permanent Inter-État de Lutte Contre la Sécheresse au Sahel (CILSS)), but synergising plans and actions remains difficult given current geopolitical priorities and insufficient incentives and mechanisms for coordination.⁹⁵ These different partners are implementing initiatives on the management of natural resources at the national, sub-regional level and between certain countries with little formal interaction or a common mapping of responses according to some national policies.⁹⁶ Initiatives are multiplying regionally despite the presence of the GGW, which is meant to be the framework for coordinating actions aimed at reducing the degradation of soils and natural resources in the Sahel.

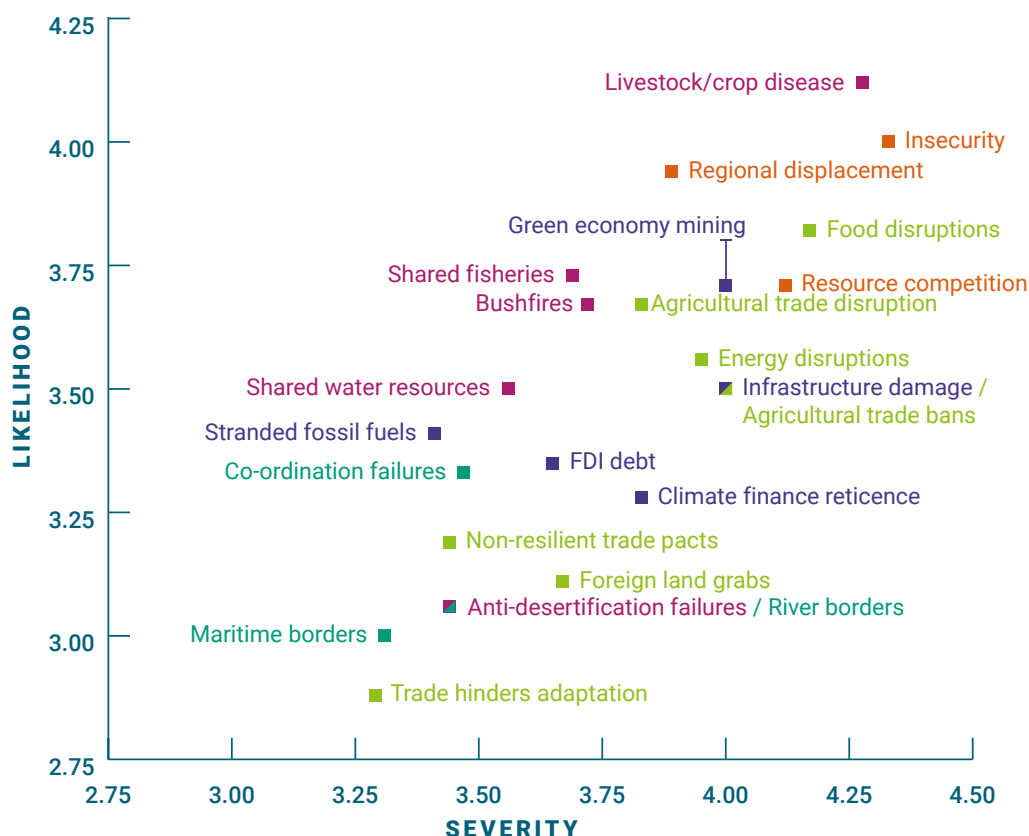
⁹⁴ Mayhew, L., McCullough, A., El Taraboulsi-McCarthy, S., Allen, M., and Levine, S. (Forthcoming) *The Intersection between socio-economic conditions and youth radicalisation: implications for programming in the G5 Sahel countries*. London: ODI

⁹⁵ République du Burkina Faso (2012) *Stratégie et Plan d'Actions de l'Initiative grande Muraille verte*. Ouagadougou: Ministère de l'Environnement et du Développement Durable



⁹⁶ *ibid.*

3 TCAR PERCEPTIONS: SURVEY AND INTERVIEWS

FIGURE 3: LIKELIHOOD AND SEVERITY RANKINGS OF 24 TCARS FROM A RISK PERCEPTION SURVEY



KEY: Risk pathway

-  **Biophysical**
-  **Trade**
-  **Financial**
-  **People**
-  **Geopolitical**

Top 5 TCARs by likelihood

-  Livestock/crop disease
-  Insecurity
-  Regional displacement
-  Food disruptions
-  Shared fisheries

Top 5 TCARs by severity

-  Insecurity
-  Livestock/crop disease
-  Food disruptions
-  Resource competition
-  Three-way tie:
Agricultural trade bans,
green economy mining,
infrastructure damage

Methodology: 24 TCARs were identified from the policy review. Survey invitations were sent to 55 potential respondents selected from government ministries, regional bodies or regional initiatives; 21 participated. Survey respondents were asked to assess the likelihood and severity of the TCAR if it were to occur in the next 10 years. The likelihood scale ranged from 1 to 5, with 1 representing 'not at all likely' and 5 corresponding to 'extremely likely'. The severity scale also ranged from 1 to 5, with 1 representing 'not at all severe' and 5 representing 'extremely severe'. The full list of risks and their description is depicted as Table 1 at the start of the report.

SOURCE: THE AUTHORS

As can be seen from the review of continental, regional and national policies and programmes, TCARs along the five pathways are already explicitly recognised in policy. We used this review to identify 24 transboundary risks for our perceptions survey and interviews. These risks were grouped into the five risk pathways: biophysical, trade, finance, people and geopolitical. We then surveyed representatives from government ministries, regional bodies and research initiatives on the likelihood of such risks occurring in the next 10 years, and if they occur, how severe the consequences might be. Figure 3 presents the 24 TCAR likelihood and severity rankings.

We also asked survey respondents who were willing to speak with us to participate in one-on-one interviews, and we spoke to a third of them to get their expert opinions on the topic. The interviews allowed a deeper discussion on which risks are perceived as being most likely and potentially most severe. We queried interviewees about their experiences with national and regional policy and planning integration around managing climate change and adaptation risks. Interviewees also explored how the linkages between regional and national planning can be strengthened, offering ways forward for managing TCARs across Africa.

3.1 Biophysical risks

TABLE 2: BIOPHYSICAL RISKS AND THEIR PERCEIVED LIKELIHOOD AND SEVERITY SCORES. RISKS WERE RATED BY SURVEY PARTICIPANTS ON A SCALE OF 1 TO 5, WITH 1 = NOT VERY (LIKELY OR SEVERE) AND 5 = EXTREMELY (LIKELY OR SEVERE). SOURCE: THE AUTHORS

Risk	Likelihood	Severity
Regional and multi-country plans and interventions to combat desertification through planting trees, shrubs and grass promote species that cannot survive changing climate conditions. This undermines regional efforts to reduce land degradation.	3.06	3.44
Climate change-related temperature and precipitation shifts facilitate the emergence of new and/or increased range and spread of livestock and crop pests, diseases and invasive species.	4.12	4.29
Fish stocks already under overfishing pressure in shared inland lakes and rivers, or marine waters, are further impacted by climate change, such as rising water temperatures that trigger algal blooms and fish die-offs.	3.73	3.69
Warmer temperatures and heatwaves cause traditional pasture and agricultural field burning practices to lead to out-of-control bushfires in regional drylands.	3.67	3.72
Climate changes impact transboundary rivers, lakes, connected wetlands and melting of mountain snowpack and glaciers. Changing hydrologies could drastically reduce water availability for all countries that share the water, alter flood and drought risks and impact ecosystem resilience.	3.50	3.56

⁹⁷ Fifty-five participants were invited to answer the risk perception survey; 21 responded.

The biophysical risk pathway is of significant concern to research participants, particularly given the importance of the agricultural sector (including livestock value chains) to local and regional economies. When interviewees were asked specifically which of the multi-country and regional climate and adaptation risks from the survey were of greatest concern, they all mentioned risks from along the biophysical pathway first. Interview respondents from both East and West Africa answered that droughts and floods are among the most serious climate change risks facing their regions. Land degradation and loss of biodiversity are ongoing challenges across the Sahel and are affecting livelihoods, water resources and human and animal health. Interviewees from both East and West Africa voiced concerns about ongoing land degradation, deforestation, desertification and multi-country management of shared ecosystems in the face of climate change.

Livestock production and value chains play a significant role in agricultural contributions to national and regional economies. In addition to land degradation impacts on farming and livestock, survey and interview participants were concerned about direct impacts to livestock. Heat stress during extreme heat events, can be particularly severe – leading to reduced feeding and weight gain, lower fertility and possibly animal death.⁹⁸ The primary biophysical risk of concern amongst the survey respondents and the interviewees is the potential for new and/or an expanding range of existing livestock diseases and crop pests as regional climates shift. This risk is perceived to be the most likely in the next 10 years of the 24 risks surveyed. It was also ranked second as the risk that could lead to the most serious transboundary consequences if realised. This particular risk could cascade across other risk pathways as it links with food security trade concerns and economic stability.

Survey participants were moderately concerned about the potential for warmer temperatures and heatwaves to contribute to cross-border bushfires in regional rangelands. There were mixed opinions amongst those interviewed on whether bush fires are a threat, with an East African respondent saying they were not a major concern but one from West Africa saying they are a pressing issue. Pasture and agricultural field burning practices are traditional land management practices for many in the agricultural sector. As vegetation dries under a warming climate, the potential for widespread bushfires could grow and could contribute to existing land degradation and erosion of natural resource bases.

However, survey participants did not view multi-country bushfire impacts to be as likely as climate change impacts on shared fisheries. Fishing stocks are already under multiple pressures, for example overfishing and illegal foreign fishing, pollution, and the introduction of exotic species. in some shared inland lakes, rivers and in marine waters.^{99 100 101} Risk perceptions of impacts on shared fisheries vary depending on location. A Senegalese interviewee gave an example of reduced fish catches affecting the local economy. Increasing water temperatures and greater precipitation variability due to climate change will add further pressures on shared fishing stocks and could contribute to declines in productivity.

⁹⁸ Thorton, P., Nelson, G., Mayberry, D. and Herrero, M. (2021) 'Increases in extreme heat stress in domesticated livestock species during the twenty-first century' *Global Change Biology*. (<https://doi.org/10.1111/gcb.15825>)

⁹⁹ Ndour, I., Le Loc'h, F., Kantoussan, J., Thiaw, M., Diadhiou, HD., Ecoutin, JM., Tito de Morais, L. and Thiaw, OT. (2014) 'Changes in the trophic structure, abundance and species diversity of exploited fish assemblages in the artisanal fisheries of the northern coast, Senegal, West Africa' *African Journal of Marine Science* 36(3): 361-368

¹⁰⁰ Merem, C., Twumasi, Y., Wesley, J., and Washington, J. (2019) 'Analyzing the tragedy of illegal fishing on the West African coastal region' *International Journal of Food Science and Nutrition Engineering* 9(1): 1-15

¹⁰¹ Aloo, P., Nijuru, J., Baliwa, J. and Nyamweya, C. (2017) 'Impacts of Nile Perch, *Lates niloticus*, introduction on the ecology, economy and conservation of Lake Victoria, East Africa' *Lakes and Reservoirs: Research and Management* 22: 320-333

3.2 Trade risks

TABLE 3: TRADE RISKS AND THEIR PERCEIVED LIKELIHOOD AND SEVERITY SCORES. RISKS WERE RATED BY SURVEY PARTICIPANTS ON A SCALE OF 1 TO 5, WITH 1 = NOT VERY (LIKELY OR SEVERE) AND 5 = EXTREMELY (LIKELY OR SEVERE). SOURCE: THE AUTHORS

Risk	Likelihood	Severity
Importation of staple food supplies becomes more expensive or is disrupted due to climate impacts in source countries.	3.82	4.17
Importation of energy becomes more costly or is disrupted due to climate impacts in source countries.	3.56	3.95
Climate change facilitates livestock or crop disease outbreaks or food safety concerns that require export bans or trigger trade partners to block imports.	3.50	4.00
Foreign investors buy up agricultural and pastoral lands to grow crops for export to their own countries. This might reduce local access to land and water resources, and contribute to further ecosystem degradation and competition, thereby reducing sub-national to national adaptation options.	3.11	3.67
Trade rules and pacts reduce subnational to regional adaptation options, such as through tariffs or restrictions limiting access to climate resilient agricultural inputs and technologies.	2.88	3.29
Regional and international trade of agricultural products disrupted due to damage to key regional infrastructure (e.g. roads, railway or ports, electricity, ICT, etc.) by an extreme event.	3.67	3.83
Trade agreements do not prioritise or anticipate the need for climate resilience, locking countries into maladaptation.	3.19	3.44

Survey respondents and interviewees are aware of and concerned about TCARs to trade in agricultural commodities and disruption of agricultural value chains. The agricultural sector, for both local consumption and primary commodity export, plays a significant role in the national economies of many East and West African countries^{102 103} and features prominently in REC trade frameworks. For example, in Chad and Ethiopia, the agricultural sector contributed 47.7% and 35.5% respectively to GDP in 2020.¹⁰⁴

¹⁰² ADB - African Development Bank (2019) *East Africa Economic Outlook 2019: Macroeconomic developments and prospects. Political economy of regional integration*. Abidjan: ADB

¹⁰³ ADB (2019) *West Africa Economic Outlook 2019: Macroeconomic developments and prospects. Political economy of regional integration*. Abidjan: ADB

¹⁰⁴ The World Bank (2021) 'Data: Agriculture, forestry and fishing value added (% of GDP) - Ethiopia and Chad.' (<https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=TD-ET>)

The risks included in the trade category were considered relevant to both East and West Africa, although one of the West African interview respondents felt that the trade and export issues were less relevant to the ECOWAS region because inter-regional trade is comparatively lower¹⁰⁵ and dominated by two countries – Côte d'Ivoire and Nigeria.¹⁰⁶ Despite some perceiving inter-regional trade risks to be less important in West Africa, climate resilience in ECOWAS' expanding trade facilitation efforts is needed to guard against TCARs. For one of the East African interviewees, the trade pathway perspective was a new way of seeing climate risks. The respondent perceived that trade agreements do not prioritise climate change.

A cascading risk that could emerge from the emergence of new livestock or crop diseases, or more widespread outbreak of existing disease, is the possibility of agricultural import or export bans over the next 10 years. This is an example of a risk from the biophysical pathway causing cascading trade risks. Saudi Arabia's cancellation of the Hajj in 2020 due to the Covid-19 pandemic, though not an animal pandemic, severely disrupted the livestock export market of Sudan.¹⁰⁷ Those surveyed rated the import/export bans as potentially causing severe impacts, but not as likely as overall food supply disruptions or agricultural price distortions triggered by an extreme climate event such as a flood or drought.

Survey respondents rated supply disruptions or price distortions due to extreme events as the risk most likely and most severe under the trade category. Interview participants felt that in West Africa, in particular, livestock sales and cotton production are impacted; thus, creating cascading impacts such as contributing to an increase in internal and cross-border migration and potentially instability.

Regional infrastructure projects are also perceived to be at risk. One example given in an interview is the Lamu Port-South Sudan-Ethiopia-Transport (LAPSSET) project to connect northern Kenya and neighbouring countries. Without climate proofing, damage to this vital transportation artery will disrupt trade across several countries, potentially triggering additional financial risks. An interviewee from Senegal also expressed concerns around energy disruptions because renewable energy sources can be affected by climate extremes and overall climate shifts, for example a reduction in production of hydroelectric energy due to reduced river flows or high temperature affecting the output of energy from geothermal power stations.

¹⁰⁵ Torres, C. and van Seters, J. (2016) *Overview of trade and barriers to trade in West Africa: Insights in political economy dynamics, with particular on agricultural and food trade*. Discussion Paper No. 195. ECDPM

¹⁰⁶ ECOWAS (n.d.) ECOWAS Sectors: Trade (<https://www.ecowas.int/ecowas-sectors/trade/>)

¹⁰⁷ Humphrey, A., Jaquez, C., Levine, S., Stull-Lane, C., Suileman, H. and Wiggins, S. (2021) *Impacts of Disruptions to Livestock Marketing in Sudan*. SPARC Discussion Paper. London: SPARC (<https://www.sparc-knowledge.org/sites/default/files/documents/resources/impacts-of-disruptions-to-livestock-marketing-in-sudan-final.pdf>)

3.3 Financial risks

TABLE 4: FINANCIAL RISKS AND THEIR PERCEIVED LIKELIHOOD AND SEVERITY SCORES. RISKS WERE RATED BY SURVEY PARTICIPANTS ON A SCALE OF 1 TO 5, WITH 1 = NOT VERY (LIKELY OR SEVERE) AND 5 = EXTREMELY (LIKELY OR SEVERE). SOURCE: THE AUTHORS

Risk	Likelihood	Severity
Demand for fossil fuels in transitions to green economies lead to stranded assets and impact subnational to national revenues for investing in adaptation action.	3.41	3.41
Increased global demand for REEs leads to unregulated mining booms and social, environmental and economic challenges that increase subnational to national climate vulnerability.	3.71	4.00
Disruption or damage to regional infrastructure by climate extreme causes cascading regional and multi-country economic impacts beyond disruption to agricultural trade.	3.50	4.00
Climate extreme disruption or damage to infrastructure built with FDI increases national debt and undermines national capacity to invest in adaptation.	3.35	3.65
International climate adaptation and mitigation funding sources restrict fund access due to perceptions of conflict and fragility.	3.28	3.83

Many African countries saw their economies contract during the pandemic because it caused cascading, deleterious, impacts through multiple economic sectors. Five TCARs that could spread along financial pathways were explored in the survey. Four of the risks can originate from international sources beyond Africa, but also demonstrate how more locally generated risks can interact with risks generated internationally. Damage to major transportation, electricity or telecommunications infrastructure can trigger knock-on multi-country and regional economic impacts. This also potentially exposes countries that used FDI for such infrastructure to additional financial distress.

Interestingly, international mitigation efforts may pose indirect transboundary risks to adaptation capacities. For example, the extractive sector (natural gas, oil, coal and minerals) also continues to play a significant role in the national economies of many East and West African countries.^{108 109} Nigeria's GDP contracted by 3% as global oil prices and demand fell during the pandemic,¹¹⁰ in keeping with a longer-term trend of decreasing prices. Nonetheless, the risk of stranded fossil fuel revenue under transitions to green economies was not rated that severe or likely in the next 10 years by survey respondents. However, interviewees from countries whose economies have greater extractive sector dependencies have different views from the broader survey audience.

¹⁰⁸ ADB - African Development Bank (2019) *East Africa Economic Outlook 2019: Macroeconomic developments and prospects. Political economy of regional integration*. Abidjan: ADB

¹⁰⁹ ADB (2019) *West Africa Economic Outlook 2019: Macroeconomic developments and prospects. Political economy of regional integration*. Abidjan: ADB

¹¹⁰ ADB (2021) *African Economic Outlook 2021. From debt resolution to growth: The road ahead for Africa*. Abidjan: ADB

One interviewee gave the example of their country, Kenya, where fossil fuel reserves such as coal and crude oil have been discovered. The country may have to forego the opportunity to extract these resources due needs for global emissions reduction. Economic diversification away from fossil fuels, including into new green economy options, is needed to generate alternative revenues for improving living standards and building resilience. Additional international climate mitigation and adaptation financing is needed to support such transitions.

Another international mitigation risk that could impact upon adaptation is related to energy transitions. Survey participants perceived that the mining of rare earth metals for global green economies would likely have more severe environmental and economic consequences for individual African countries and was perceived as the most likely in the next 10 years out of the financial risks surveyed. This risk in particular shows how global demand for electronics to support mitigation activities, such as electric vehicles and solar power promotion could generate risks for countries with accessible deposits. Precious metals such as gold and copper and carbonatite deposits in which REEs are often found are scattered throughout Africa. Countries such as Ethiopia, Kenya, and Uganda have known REE deposits,¹¹¹ and formal and informal gold mining have played a role in Niger's economy.¹¹² Yet, mining and processing of metals and REEs can pose significant water and soil contamination risks; this could place additional strain on degraded lands and water resources in countries with such deposits,¹¹³ as well as contributing to human and possibly livestock health risks. One of the survey respondents from Kenya discussed the risk that artisanal gold mining in the region poses to water quality and land health. Exacerbation of existing land and natural resource degradation also has the potential to undermine local climate resilience and undermine multi-country and regional anti-desertification and natural resource initiatives.

Many African countries have also been actively courting FDI in infrastructure and manufacturing, as well as seeking new trading partners as means of accelerating economic development and diversification. Chinese investment has been quite prominent in the last 20 years.¹¹⁴ The African Union *Agenda 2063* is explicit in recognising the importance of leveraging the rapidly evolving nature of FDI available through the BRICS (Brazil, Russia, India, China and South Africa). During the pandemic, FDI and overseas development assistance decreased by an estimated 18% and 10% respectively.¹¹⁵ An example of how global events can impact national debt can be seen with Covid-19 economic impacts in Kenya, which negotiated debt service dues payment deferment with multiple foreign lenders in early 2021.¹¹⁶ Climate extremes-induced damage to regional infrastructure financed with FDI could increase national debt burdens while simultaneously reducing trade and leading to cascading economic effects.

¹¹¹ Woolley, A. and Kjarsgaard, B. (2008) Carbonite occurrences of the world: Map and database. Geological Survey of Canada. (<https://doi.org/10.4095/225115>)

¹¹² McCullough, A., Mayhew, L. and Opitz-Stapleton, S. with Abouka, A. and Botto, D.M. (2019) *When rising temperatures don't lead to rising temps: Climate and insecurity in Niger*. BRACED Working Paper. London: ODI. (<https://cdn.odi.org/media/documents/12946.pdf>)

¹¹³ Gwenzi, W., Mangori, L., Danha, C., Chaukura, N., Dunjana, N. and Sanganyado, E. (2018) 'Sources, behaviour, and environmental and human health risks of high-technology rare earth elements as emerging contaminants' *Science of the Total Environment* 636: 299-313

¹¹⁴ Caprese, L. and Tang, X. (2020) *Africa's economic transformation: The role of Chinese investments*. London: ODI (<https://degrp.odi.org/wp-content/uploads/2020/06/DEGRP-Africas-economic-transformation-the-role-of-Chinese-investment-Synthesis-report.pdf>)

¹¹⁵ *ibid.*

¹¹⁶ Yoeli, M. (2021) 'Belt and Road in Kenya: COVID-19 Sparks a Reckoning with Debt and Dissatisfaction' Council on Foreign Relations [25 March]. (<https://www.cfr.org/blog/belt-and-road-kenya-covid-19-sparks-reckoning-debt-and-dissatisfaction>)

Survey respondents were more concerned with the severity of knock-on multi-country and regional economic impacts by damage or destruction of regional transport infrastructure than they were by FDI debt implications. The lack of climate proofing of infrastructure also came out strongly in the interviews. As Thomas Lerenten Lelekoitien, Deputy Director for Climate Change Adaptation in Kenya's Climate Change Directorate, stated:

All infrastructure going forward must be climate proofed. Existing ones have to be retrofitted or make sure they comply with climate proofing designs, otherwise we'll lose them.

Regarding the risk of conflict reducing access to international climate finance, East African interviewees felt that although there are localised conflicts within the countries of the region, overall peace and stability is not likely to affect climate finance access. Interviewees from West Africa did not mention this particular risk but did acknowledge that instability and insecurity are concerns in the region. Though research is showing that access to climate finance in fragile and conflict-affected areas,¹¹⁷ as well as the incorporation of conflict-sensitivity analysis within such financing, is limited, this particular risk was viewed as being of moderately high severity and moderate likelihood.

3.4 People-centred risks

TABLE 5: RISKS CENTRED AROUND PEOPLE AND THEIR PERCEIVED LIKELIHOOD AND SEVERITY SCORES. RISKS WERE RATED BY SURVEY PARTICIPANTS ON A SCALE OF 1 TO 5, WITH 1 = NOT VERY (LIKELY OR SEVERE) AND 5 = EXTREMELY (LIKELY OR SEVERE). SOURCE: THE AUTHORS

Risk	Likelihood	Severity
Extreme climate events or shifting climates stimulate multi-country or regional displacement. Some displacement could become long-term or permanent.	3.94	3.89
Resource-based competition in cross-border areas increases as climate change exacerbates land, water and other natural resources' degradation and can contribute to insecurity and mobility.	3.71	4.12
Regional conflicts contribute to resource and financial insecurity, reducing local, national and regional adaptive capacities.	4.00	4.33

TCARs that can be transmitted to people are related to the geopolitical and financial systems in which they live and work, and that govern their access and use of natural resources. The choices individuals have (or not) in the face of climate change and subnational to regional socioeconomic and adaptation policies can transmit risks across national borders.

¹¹⁷ See Cao, Y., et al. (2021)

The potential impacts of climate change and adaptation actions on transboundary displacement, transhumance and migration were the people-centred risks of concern to both those interviewed and surveyed. However, of the people-centred TCARs sampled, interviewees and survey respondents were most concerned about climate change exacerbating existing instability and insecurity, and in turn, how insecurity reduces adaptation options. Insecurity as a TCAR was rated as presenting the most severe multi-country and regional consequences in the next 10 years out of all the 24 TCARs surveyed. It was also rated as the second most likely to occur risk across all risks. Insecurity was viewed as contributing to cascading risks related to displacement and migration.

One interviewee who works for a UN agency spoke broadly about concerns in West Africa. The interviewee noted that increased displacement is a priority for some international donors; however, it is not a component in national policies in the countries of the region. Survey participants thought that some displacement related to multi-country extreme climate events (droughts, floods, etc.) could eventually become long-term or permanent. In this context, preparation for long-term displacement (and migration) becomes paramount. One West African interviewee noted that housing is an issue related to internal and cross-border migration and that expanding villages and cities needed to have climate resilient buildings to withstand the rising temperatures, heavy rains and high winds that could occur under climate change.

The movement of people was discussed as both a people-centred and geopolitical risk by interviewees. The complexity of human mobility, its drivers and outcomes were perceived as touching on a number of issues ranging from land management and competition over natural resources, insecurity and national border sovereignty. Transhumance disruptions are likely to become worse and more severe, according to survey and interview respondents from both regions. One East African interview participant gave an example of land subdivision causing tensions and noted that there had been policies enacted to restrict the movement of pastoralists and their livestock within Kenya. Management of and access to grazing areas across borders are also concerns. These policies might actually hinder climate resilience.

Out of the people-centred TCARs, resource-based competition was of least concern to survey respondents. However, regional geopolitical risk perceptions varied among those interviewed, based on experiences of challenges. Some interviewees from East Africa noted that resource-based competition is a concern between countries in the region. An example was given around the geopolitical implications of the transboundary water management of Lake Victoria, particularly Uganda's damming of a river draining the lake that led to higher water levels on the lake shore affecting residents in Kenya and increasing flood risks, which could be potentially worsened by climate change.

3.5 Geopolitical risks

TABLE 6: GEOPOLITICAL RISKS AND THEIR PERCEIVED LIKELIHOOD AND SEVERITY SCORES. RISKS WERE RATED BY SURVEY PARTICIPANTS ON A SCALE OF 1 TO 5, WITH 1 = NOT VERY (LIKELY OR SEVERE) AND 5 = EXTREMELY (LIKELY OR SEVERE). SOURCE: THE AUTHORS

Risk	Likelihood	Severity
Sea level rise shifts coast lines and maritime borders with implications for fishing, extraction rights and other Blue Economy activities.	3.00	3.31
Climate change shifts in temperature and precipitation compound with human pressures to alter rivers that form national borders, potentially leading to litigation and conflict over borders.	3.06	3.44
Poor coordination and implementation of national policies with regional policies and initiatives undermines the climate adaptation goals of both.	3.33	3.47

Three transboundary risks were queried along the geopolitical pathway. Survey participants were less concerned with these risks in comparison to other TCARs along the other risk pathways. No interviewees felt that maritime borders shifting with sea level rise or country borders shifting because of rivers changing course were very serious risks, although rising sea and lake levels were a concern for reasons to do with people's safety and livelihoods.

However, individual interviewees expressed concern around the poor coordination of national policy and action with regional policies and initiatives. An interviewee from Mali noted that the G5 Sahel national climate bodies have no binding links with the Sahel Climate Commission based in Niamey, and that CILSS plays less of a role in climate change issues though it plays a significant role in desertification. A respondent from Burkina Faso noted that ECOWAS needed to launch initiatives to encourage country collaboration and coordinated action. A Kenyan interviewee noted that while regional climate change policies exist, such as the EAC *Climate Policy*, implementation remains lacking and that meetings and coordination between initiatives is infrequent. Reasons cited for reduced coordination included: lack of someone to head the coordination activities, insufficient resources and weak frameworks for coordination.

The 2020 draft *Africa Climate Change Strategy* notes 'weak capacities at the national, regional and continental levels to develop and implement climate change actions: [and a] lack of coherence in national and regional strategies'.¹¹⁸ Additionally, while multiple REC, regional initiatives and African Union initiatives exist, coordination between organisations on such initiatives remains weak. The transboundary geopolitical risk of competing priorities and lack of coherence in strategies and their implementation at regional and continental scales must be addressed in order to facilitate resilience in the other transboundary climate and adaptation risk pathways. In spite of these challenges, as will be seen in the concluding chapter on ways forward, interview participants felt that the regional institutions offer the most feasible way forward for managing TCARs.

¹¹⁸ African Union (2020) Draft Africa Climate Change Strategy: 2020-2030, p 47. Addis Ababa: African Union

4 WAYS FORWARD: BRIDGING POLICY AND PERCEPTION GAPS FOR TCAR MANAGEMENT

Interconnections between the five risk pathways – biophysical, trade, finance, people and geopolitical – are strong across Africa and globally. The risks highlighted in this paper are by no means unique to Africa. Climate change can trigger risks that propagate within and across the five risk pathways, spreading between neighbours sharing borders and/or to distant trading partners. The individual adaptation actions taken by one country can also create and transmit risks along the pathways for others; such transboundary adaptation risks are already starting to emerge. The Grand Ethiopian Renaissance Dam enables Ethiopia to improve its energy and water security in the face of increasing climate variability and change, while exporting electricity to neighbours. The water security implications of the dam for Egypt and Sudan, particularly under climate change and increasing demand pressures, are a matter of international contention.

Not all countries in either East or West Africa are at the same level of national policy development and implementation in terms of alignment with regional plans, policies or initiatives. A common thread amongst those interviewed was that they had not considered the transboundary trade and financial risks previously and that such risks were not adequately considered within national macroeconomic policies. In some cases, the national policies and plans align with regional policies (e.g. *Kenya's National Climate Change Framework Policy* aligning with the EAC's *Regional Climate Change Master Plan*). However, in other issues, such as transhumance and cross-border mobility, some country policies (e.g. *Nigeria's Livestock Transformation Plan 2019-2028*) seek to reduce cross-border movement and are not reconciled with REC policies (e.g. ECOWAS' protocol on freedom of movement). Tensions between national and regional priorities require reconciliation in order to facilitate TCAR management.

The key to addressing these transboundary climate and adaptation risks, as mentioned by all interview respondents, is strengthening and implementation of regional coordination activities through regional institutions – and linking these with African Union agencies, activities and frameworks. *The Africa Climate Change Strategy and Agenda 2063* seek to provide the frameworks for harmonising climate resilient and sustainable socioeconomic development across the Union in coordination with the RECs, nations and financial institutions. The RECs – ECOWAS in West Africa and EAC and IGAD on the other side of the continent – are working with member countries on transboundary climate and adaptation issues. ECOWAS is developing its regional climate strategy (to be released at COP26 in November 2021) and IGAD and EAC have regional climate strategies. There are some multi-country and regional natural resource management initiatives (e.g. Great Green Wall, Lake Chad Basin Commission and Lake Victoria Basin Commission) already in place that are actively incorporating climate change concerns. Finally, the Africa Adaptation Initiative is seeking to bring all parties together to strengthen capacities and promote coherence in subnational, national, regional and continental policies, frameworks, strategies and actions.

Interviewees indicated that if regional policies are in place and support is leveraged among member nations for their implementation, national policies can follow and align with regional bodies. Without the initiative coming from these regional bodies and the African Adaptation Initiative, however, the individual countries are not able to coordinate on their own. Boosting existing regional institutions requires capacity building and sensitisation of non-climate change staff on climate change issues, including on how climate change and adaptation can impact socioeconomic development, natural resource management, trade, finances and other sectors. Regional organisations could benefit from additional funding to support collaboration and implementation of regional adaptation actions. However, they are currently not accredited entities eligible for climate finances. Working with accredited entities like UNDP is one way to leverage support.

At national levels, involvement of the ministries of finance and planning is required to increase awareness of the impact of climate change on issues like trade and regional infrastructure. Some interview respondents noted that they had not previously considered transboundary trade risks, and that trade policies do not currently account for such risks. Additionally, while the literature indicates several transboundary financial pathway risks – such as through debt on non-climate resilient infrastructure financed with conditional FDI loans or reduced access to climate financing in fragile and conflict-affected areas – these TCARs were not sufficiently addressed in the policies reviewed nor prioritised by survey respondents and interviewees.

To guide incorporation of climate resilience into trade and finance policies, more research and evidence is needed on trade and financial risk pathways and their links to other pathways. It is not enough to focus on the transboundary biophysical impacts and cascades to primary production, but to actively consider the macroeconomic impacts that could occur from exogenous threats and trends in markets, trade pacts and financing. In particular, more research is needed around: how trade rules and regulations can hinder adaptation; how to make trade more climate resilient and lower in emissions; accounting for green economy transition risks; and connecting the climate resilience of national and regional infrastructure to financial resilience is critical. These transboundary risks are too often overlooked.

In addition to needing resources to implement the REC's and regional NRM initiatives' climate change policies and plans, respondents also indicated that decision-makers need better scientific information on future climate risks and adaptation options. One respondent raised the issue of reporting on adaptation using applicable indicators and noted that coordinating such reporting and sharing information among countries in the region would be helpful for learning from each other. Enhancing monitoring and access to data from multiple sectors (environmental conditions – soil, vegetation and water; social; economic; livestock and human health; weather, etc.) will also be important in strengthening subnational to regional responses to climate change. There are regional initiatives such as WASCAL and AGRHYMET that are working on such monitoring, data collection and dissemination. Ongoing support from national and international donors is needed to support the long-term monitoring, assessment and reporting missions of these initiatives.

Our findings indicate that Sudano-Sahelian Africa is on its way towards acknowledging and prioritising TCARs. Some risks are more visible than, and therefore prioritised above, others. However, there is increasing attention toward understanding risks along and between the five pathways, as well as coordinating multi-country action around their management. The RECs, pan-African initiatives, such as the African Group of Negotiators, and regional natural resource management initiatives offer regional visions and coordination frameworks for tackling transboundary climate adaptation risks.

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Cover: The people of Ta Kuti village (Niger State) are pastoralists and beneficiaries of Nigeria's Fadama II project. Photo: Arne Hoel/World Bank



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