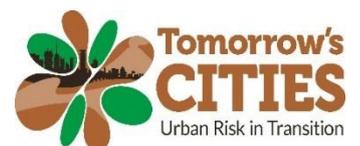


Adaptation Research in Africa: Progress and Gaps

Insights from the COP26 Africa-Led Consultative Workshops



Recommended Citation

ARIN & UKRI (2021). Adaptation Research in Africa: Progress and Gaps Insights from the COP26 Africa-Led Consultative Workshops 2021. Technical Report No. 015. Africa Research and Impact Network Nairobi, Kenya.

Contributors

Joanes Atela (ARIN), Charles Tonui (ARIN), Sarah Blackburn (UKRI), Sara Webb (UKRI), Henry Gandhi (ARIN)

About ARIN

The ARIN is a network of over 200 researchers and policy makers across 36 African countries aimed at promoting research excellence and dialogue on best research and impact practices. The ARIN provides one of the unique convening platforms for science policy interface in Africa building on evidence. It recognises that Africa is home to multiple researchers, innovation, and best policy practices but these remain poorly shared, learnt from to inform impactful Research and Development Agenda. The ARIN therefore provides a peer review platform where best research and impact practices from different African contexts are shared, profiled, and leveraged to inform transformative policy actions.

www.arin-africa.org

ARIN Secretariat: P.O. Box 53358-00200, Nairobi – Kenya;

Phone: + +254 020 7126895; Email: info@arin-africa.org

Tweeter: [@arin_africa](https://twitter.com/arin_africa)

LinkedIn: The Africa Research and Impact Network

First published in 2021 © ARIN

Rights reserved as per the ARIN's copyright policy

Executive Summary

Adaptation to climate change is a fundamental intervention in tackling the unequal impacts of climate change and addressing wider concerns around climate justice. The 2020 adaptation gap report (UNEP, 2020) shows that adaptation actions are growing worldwide but there is still very limited evidence that these actions contribute to climate risk reduction thus limiting any conclusion on adaptation progress as a whole.

In the lead-up to UNFCCC COP 26 in Glasgow this year, there are efforts to upscale climate action as countries will renew their commitment to the Paris Agreement through enhanced Nationally Determined Contributions (NDCs), building on the first phase and second round of NDCs. The evolving experiences with the first phase of NDC implementation have driven new efforts to step-up adaptation ambitions and pay attention to climate justice as a fundamental basis for achieving the Paris targets.

Several global climate action initiatives have been established to redefine and reprofile adaptation. These include multinational institutions, political initiatives, grassroots level initiatives, research, and academic initiatives, and corporate initiatives. These initiatives have varying mandates including research, advocacy data, technology development, and implementation, among others. The [State and Trend on Adaptation in Africa \(2020\)](#) that analysed a lot of research in Africa reveals massive gaps. These include among others, the failure to incorporate adaptation into planning processes, the inability to promote opportunities for African countries to fully incorporate climate risks into large infrastructure projects, and gaps in access to services and transformative adaptation programmes for food security. The latter includes the consideration of irrigation systems, drought-resistant crops, and making crop insurance more widely affordable and available.

The recently released report by the UK Collaborative on Development Research ([UKCDR, 2021](#)), for instance, shows that Africa has been home to several impactful UK-funded research programmes. African countries such as Kenya, Egypt, and Ethiopia are among the top partner countries with a significant number of UK-funded climate-related research projects compared

to other regions.¹ However, there is little understanding of the impacts and sustainability of these projects, especially the potential and/or actual reduction of climate risks. This has been attributed to the lack of adequate learning and impact platforms to showcase impact stories, best practices, sustained learnings, and connections to the broader global picture.

The Africa-Led Adaptation Event

There is an opportunity to profile the impacts of various existing projects and to understand some of the emerging lessons, gaps, and opportunities, even as countries aim to raise adaptation ambitions during and beyond COP 26. Therefore, the Africa Research and Impact Network (ARIN) (www.arin-africa.org) in collaboration with UK Research and Innovation (UKRI) and wider partners, co-organized the UKRI COP26 Adaptation and Resilience Africa Launch virtual event, which was held on 29 July 2021. This event was part of the preparatory dialogues to mark the UK's presidency of the 26th United Nations Climate Change Conference of the Parties (COP26) in Glasgow, in November 2021. This event brought together a range of different stakeholders including UK-funded research consortia and projects based in Africa, policymakers, Africa Group of Negotiators (AGN), think tanks, and climate change stakeholders. The overall aim was to showcase some of the on-going adaptation and resilience research projects based in Africa and to gain insights on opportunities for up scaling them. The discussions were centred on four key questions, from which the key insights were drawn.

Key Insights from the discussions

In terms of *adaptation research gaps*, Africa is experiencing an increasing amount of adaptation research that is largely supported by the international community. However, a number of strategic research gaps still exist. These include the lack of a comprehensive database and platform to provide disaggregated information for easy access and sharing. Data-driven adaptation initiatives are potentially transformative in the African context. Additionally, adaptation impact research is evolving but remains a major gap. There seems to be a lack of clear understanding of the impacts of adaptation research currently on-going in

¹ <https://www.ukcdr.org.uk/news-article/uk-invested-half-a-billion-pounds-on-climate-development-research-since-2015-says-new-report-from-ukcdr/>

different parts of Africa. Specifically, both the short-term and long-term impacts of adaptation research are not properly documented or profiled for potential up scaling. A lot of impacts are reported in projects largely as aspirations. This is partly because most research projects have a relatively short time frame to realize tangible impacts. Therefore, some of the outputs and outcomes from these research projects require new interventions to assess and maximise opportunities for tangible impacts. According to the majority of the participants, there is a need to build sustainable adaptation research systems. This includes building capacity that could help strengthen impact research.

The issue around the different scales in adaptation research was highlighted as another gap, with participants noting some disintegration in adaptation research taking place in Africa. Most of the adaptation research activities fail to account for environmental flows across geographical/ecological scales, thus resulting in maladaptation, limited desired positive impacts, and/or co-benefits. Additionally, adaptation research in Africa has focused more on addressing climate hazards such as floods, rising sea levels, and droughts, among others. The implications are actions that are more reactive rather than informing proactive adaptation planning. Consequently, much of the adaptation actions in Africa are reactive to climatic events. One option recommended by the delegates is the risk approach to adaptation research, which enhances our understanding of the dynamics of adaptation by unpacking holistic components of adaptation, including vulnerability, exposure, and adaptive capacity. The risk approach to adaptation research potentially enables preparedness to not just address the climate risks but also the various shocks such as natural disasters and pandemics (e.g. COVID), that are either exacerbated by climate change or exacerbate climatic impacts.

On the topic of *transformative adaptation*, discussions revealed that most of the stakeholders are not entirely aware of what transformative adaptation research potentially looks like. While most of the participants had ideas around various best practices, it was not clear how these best practices constitute transformations. The understanding of best adaptation practices in an African context is necessary for replicating these in other contexts. Further, focusing on best practices has only meant replication of ideas rather than pursuing real change that can enhance the resilience of vulnerable communities. The limited understanding of how to achieve transformative adaptation is an impediment to the continent's adaptation pursuit as this limits the ability to develop transformative ideas and Africa-led concepts.

Consequently, most adaptation research activities are driven by conceptual framings from elsewhere, with few African voices influencing the transformation agenda.

In the run-up to COP-26, there are major global efforts towards enhancing adaptation action. There are already major concerns that these initiatives might fail to bring the required transformation. The African research and policy actors' fraternity, through the Africa Research and Impact Network (ARIN), has raised several issues around the financial architecture and the weak African voice in the initiatives. The petition raising these issues can be accessed [here](#). Nonetheless, participants highlighted a number of ideas that they believed could constitute transformative adaptation research. These include, among others, the co-creation of adaptation knowledge with local communities, and adaptation research that explores low carbon development as an opportunity. Additionally, research that integrates impact testing and experimentation to enable practical testing and incubation of research findings and outputs was noted to have potential for transformation.

While adopting the lens of *partnerships for adaptation*, a key point raised by the delegates is the need to enhance Africa's leadership in adaptation research. In this, there were calls that partnership in adaptation research needs to enhance equity, transparency, and fair contribution from Africa. There is a need for an enhanced leadership role for African researchers in international adaptation research while leveraging support from the Global North. Strengthening multi-stakeholder partnerships in adaptation research was also highlighted as key to building transformative partnerships. Calls to prioritize long-term partnerships that are made up of diverse actors have also been made in order to foster the common-but-differentiated-responsibilities (CBDR) in adaptation research. Partnerships that bring together researchers, knowledge producers, communities and beneficiaries, governments, and the overall knowledge consumers, are likely to enhance robust research uptake, learning, and complementary knowledge sharing. There emerged concerns that most research partnerships have (un)consciously neglected the private sectors who are the key knowledge consumers. The role of the private sector in adaptation action, funding, and knowledge and data generation is appreciable. This, therefore, needs to be harnessed as part of transformative partnerships.

Regarding *profiling adaptation actions* in Africa at the global scale, several strategic challenges were raised. There are useful adaptation actions and research that are generated across the continent, some of which continue to attract significant international attention. However, these are not yet effectively connected to the global decision-making spaces owing to certain challenges. The lack of targeted skills to help translate local adaptation actions into the global space remains a huge challenge. While the majority of the African countries have established agencies and climate change directorates to help with tracking and national reporting of adaptation actions, the reporting process often focuses more on just outputs. There is, therefore, a need for institutional strengthening to embed skills sets that can undertake comprehensive inventories and help accelerate translation of reported outputs into stronger global impacts. Additionally, Africa still runs short of dedicated adaptation platforms to profile best practices and on-going resilience actions. There is a major concern that even researchers and policymakers are sometimes oblivious of the cutting-edge adaptation research projects taking place in their own research contexts. Similarly, there is little showcasing of the existing adaptation expertise in the continent. The need for a responsive adaptation platform for Africa is urgent so as to help profile adaptation research and expertise while creating stronger connections with the global platforms.

Overall, the Africa-led adaptation event generated key insights that are useful in informing the negotiations and enhancing adaptation progress in Africa, post-COP 26. The discussions and key insights point to several gaps in adaptation research as observed in partnerships and adaptation research communication across Africa. These gaps, wide as they are, not only present new opportunities for rethinking adaptation in Africa but could also impede African adaptation action progress and ambitions. The COP26 provides an opportunity for actors to express their views on these issues, rally knowledge, expertise, funds, and collective agency for transformative adaptation in Africa. As indicated in the outline draft of the sixth intergovernmental report on climate change (IPCC AR6), these would ensure that emerging programmes targeting Africa do not reproduce the past bad practices but truly deliver for the more vulnerable communities across the continent.

Table of Contents

Executive Summary	iii
Introduction	1
Setting the Workshop Context: A Brief Review of Trends in Adaptation Research in Africa	3
The UK-Funded Adaptation Research in Africa	5
Key Highlights from the Workshop	9
Adaptation Research Gaps	9
a. Adaptation Data Gaps	9
b. High Costs of Adaptation Research	10
c. Impact Research and Adaptation Scenarios	11
d. Integrated Scale in Adaptation Research and Methods	14
e. Inclusive Adaptation Knowledge Systems.....	15
f. Risk Approach to Adaptation Research.....	16
g. Governance of Adaptation Technologies.....	17
Transformative Adaptation Research.....	18
c. Payment for Ecosystem Services (PES) as Low-Carbon Development.....	19
d. Integrated Skills Development	19
e. Integrated Impact Testing, Experimentation, and Up-scaling	19
f. Transdisciplinary in Research Design and Implementation	20
Partnerships for Adaptation Research.....	21
Profiling Adaptation Actions to the Global Scale.....	24
a. Limited Capacity to interpret Local Actions into a Global Context	24
b. Weak Integration of Local Voices in Adaptation Research Projects	24
c. The Urgency to Speak in One Voice	25
d. The Donor Dependency	25
e. Lack of Explicit Distinction between Development and Adaptation.....	25
f. Lack of Responsive Adaptation Platforms to Profile Best Practices and On-going Actions	26
Conclusion	27
Useful Links.....	28

Introduction

Adaptation to climate change impacts is a fundamental intervention in tackling the unequal impacts of climate change and restoring wider climate justice. The 2020 adaptation gap report (UNEP, 2020) shows that adaptation actions are growing worldwide but there is still very limited evidence that these actions would reduce climate risk or temper any conclusion on adaptation progress as a whole.

The assessment of the adaptation situation in Africa shows that there is an increasing need for adaptation actions that can match the scale of climatic risks as reported in the IPCC AR6 WGII draft outline. In the run-up to the COP-26, most of the African countries are focusing on enhancing their adaptation ambitions, especially in the second iteration of Nationally Determined Contributions (NDCs). Global reports such as the Adaptation Gap Analysis Report, the Trends and the State of Adaptation, and lately, the UK Climate Development Research (UKCDR) in their review of the status of adaptation in Africa, identify insufficient consultative reflections on adaptation trends as a significant weak link. Understanding what gaps exist and what needs to be done for a more transformative adaptation outcome post-cop-26 remains paramount.

To achieve this, the Africa Research and Impact Network (ARIN) in collaboration with UK Research and Innovation (UKRI) and wider partners co-organized the UKRI COP26 Adaptation and Resilience Africa Launch event, held on 29 July 2021. A high-level panel discussion that generated cutting-edge thoughts around the adaptation issues in Africa had representations from research, policy, and practice domains. This event was built on outcomes of the High-Level Global Launch event earlier led by the UKRI with key insights that targeted the regional workshops in Africa and other regions. The material from this high-level global launch event can be accessed from [here](#).

The Pan-Africa Launch event was part of the preparatory dialogues to mark the UK's presidency of the 26th United Nations Conference of the Parties (COP26) in Glasgow, in November 2021. The aim of the event was to bring together a range of different stakeholders to showcase the on-going adaptation and resilience research projects based in Africa. It was also aimed at gaining insights on opportunities for up scaling these adaptation projects and

best practices. The discussions between stakeholders generated insights into the landscape, extent, and effectiveness of adaptation and resilience initiatives in Africa. Potentially, it will inform the development of the new innovative UK Government Foreign, Commonwealth, and Development Office (FCDO)-led Adaptation Research Alliance (ARA).

The design of this event involved keynote speeches delivered by high-level representatives, followed by a high-level panel discussion, focused on the various aspects of African climate adaptation and resilience. A breakout session followed to enable participants to share their research experiences in Africa and the lessons for COP26. The discussion was guided by four key questions (available on [the series launch webpage](#)) that were developed by a panel of IPCC experts to help coordinate programme workshops and contribute to the structure of a final panel/online event at the COP26 Conference. The questions were further re-framed for the African context as follows:

Key questions which were discussed during the session

1. What are the major adaptation research gaps in Africa and what research is needed to respond to the adaptation gaps in Africa?
2. What examples are there of transformative adaptation research, enabling action through addressing social justice, capacity building, and governance? And why are these considered transformative, i.e. what is considered transformative in an Africa context?
3. What forms of research partnerships are required to achieve these transformations? How best should the UK engage African researchers and policymakers in pursuing these transformative opportunities? How has COVID-19 and the resultant shifts in UK funding affected adaptation research in Africa?
4. Evidence shows that Africa is registering a relatively low presence at the global UNFCCC climate action platforms such as the Non-State Climate Action (see here: <https://climateaction.unfccc.int/>). How can we best profile adaptation research and actions taking place in various African countries to the global scale? And what support is required to achieve this?

Setting the Workshop Context: A Brief Review of Trends in Adaptation Research in Africa²

Climate change adaptation research has grown and evolved significantly over the past 20 years (Arnell, 2010; Vincent and Cundill, 2021). Ford, et al. (2015) and Lwasa (2015) found that the nature of adaptation research involved vulnerability and impact assessments, tangible adaptation, and adaptation policy, particularly at the national level. However, Vincent and Cundill (2021) noted that a significant amount of adaptation research effort looks at vulnerability assessments and it exhibits geographical variation in the Global South just like the rest of the world. Despite the provision in the UNFCCC for financial and technical support for adaptation in developing countries, and the regular global stock take (GST), the findings from Africa's Adaptation Gap (AAG) Technical Report (2021) reveal certain key gaps. According to the report, the capacity of African communities to cope with the effects of climate change on the human and ecological dimensions is expected to be significantly weighed down. Potentially, these systems are overwhelmed by the magnitude and rapidity of these impacts.

The costs of adaptation, as has been highlighted by many estimations remain high. For example, the AAG analysis shows that the adaptation costs attributable to past emissions are revealed to be between USD 7-15 billion annually by 2020 (*see Figure 1*). Based on this, the projected adaptation costs are poised to soar even higher, under the current practices.

The findings by Vincent and Cundill (2021) on aggregate data reveal the total number of empirical adaptation papers in the Global South as published in the journals Global Environmental Change (GEC), Regional Environmental Change (REC), and Climate and Development (CD). Specifically, there has been an increasing trend in the total number of publications from 2010 to 2020 (*see figure 1*). However, in sub-Saharan Africa, about one-third of countries do not appear in any empirical adaptation research. The “big five” African

² For detailed context analysis please see the [Context of Adaptation Research in Africa: A review \(2021\)](#). ARIN Report. Nairobi

countries with considerably larger economies are shown to bear significant numbers of research institutions, with each appearing in at least 12 papers. They include South Africa, Tanzania, Kenya, Ethiopia, and Ghana. In the same vein, there is an uneven and skewed geographical distribution of sectors covered in empirical adaptation research. Agriculture and rural dynamics remain predominantly bold – reflecting the economic dependence of many African countries on these sectors.

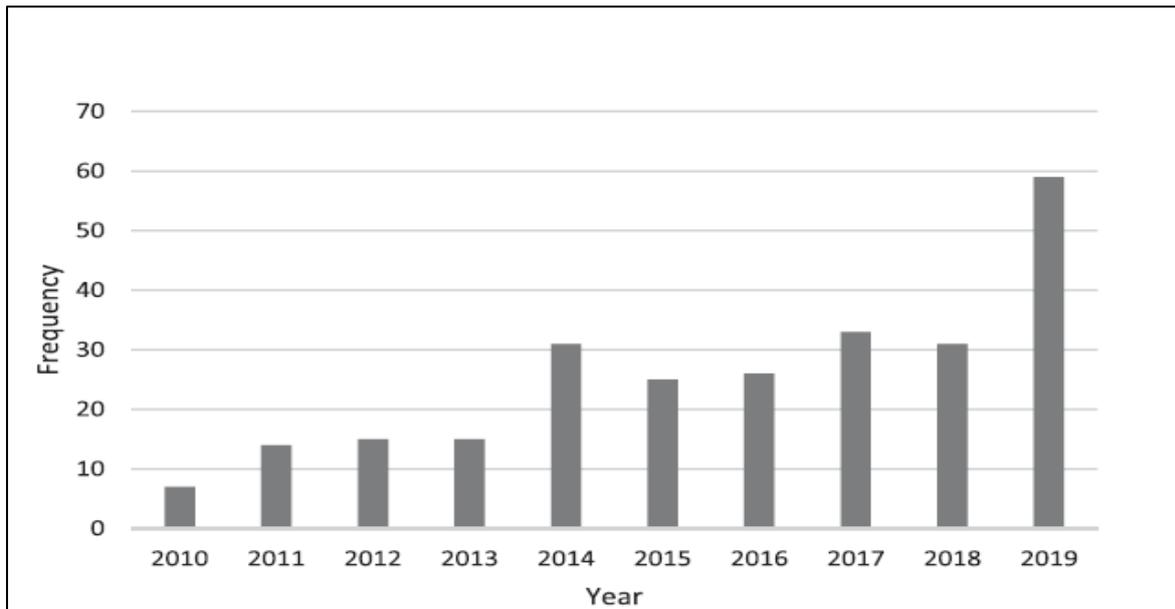


Figure 1: Distribution of empirical adaptation papers in the global South by year (Vincent and Cundill, 2021)

Several studies on climate change policy formulation in Africa show that most African countries have climate change policies with a fairly good focus on adaptation. At the continental level, the AU commission and partners are fast-tracking the finalization of a comprehensive [African Strategy on Climate Change 2020-2030](#), which is still at the draft stage but has undergone several [regional consultations](#). A systematic review that was done by Sorgho et al. (2020) on climate change policies in West Africa identified 19 policies in 12 countries. In addition, the majority of African countries incorporated adaptation into their revised NDCs as shown in Figure 2.

However, the implementation models of these climate change policies are an area that needs more focus, especially if they are pro-adaptation. Although it is obvious that most African governments have submitted NDCs, the State and Trend on Adaptation Report (2020), in its glaring revelations, indicates that NDCs implementation is a major blow to climate resilience

for many countries. Analysis of the policy documents for West Africa on the key sectors of energy, agriculture, water resources, health, forestry, infrastructure, and education showed leanings towards community resilience, disaster risk management, institutional development, and industry development. This analysis highlights the question on the extent to which sector policies support the implementation of the adaptation policies. These need to be unpacked to ascertain policy preparedness by African countries in the implementation of adaptation practices at the sector and local levels.



Figure 2: Adaptation inclusion in the revised NDCs (WRI, 2021)

The UK-Funded Adaptation Research in Africa

The recently released report on UK-funded research shows that Africa has been home to several UK-funded research projects, with specific African countries such as Kenya, Egypt, and Ethiopia being among the top global beneficiaries. Within the continent of Africa, East Africa leads in the number of UK-funded climate projects followed by southern Africa and West Africa. Table 1 provides the analysis of some of these projects.

Despite this progress, the impact profiling and sustainability of the projects remain relatively weak. There is, therefore, an opportunity to better profile the impacts of the various existing projects and understand some of the emerging lessons, gaps, and opportunities even as countries aim to raise adaptation ambitions during and beyond COP 26. This is an opportunity for the research to connect to the global debates on climate change and sustainability that are congruent with the broader climate ambitions and specific missions such as those of the

Adaptation Research Alliance (ARA). Several development partners have continued to support other projects and identify niches for global connections and up scaling. The UK adaptation-funded projects can be categorized into four regional foci. The list in table 1 represents only a sample of projects.

Table 1: Analysis of UK-funded climate projects in Africa

Region	Description
East Africa	The East Africa region hosts the majority of the projects, most of which are domiciled in Kenya and Ethiopia. There is a strong focus on inclusive adaptation and especially targeting different social groups such as the youth and women. The projects could generate insights across the various questions even though there is a need to strengthen evidence around the areas of adaptation finance as well as technology transfers. These could be strengthened through the sharing of experiences from other contexts. For this region, the focus is on Kenya and Ethiopia while also allowing other country representations from Uganda and Tanzania to provide additional inputs.
West Africa	The West Africa projects are more focused on grassroots innovation and equity in adaptation actions. The experiences from the projects could generate insights, both for question 1 in this report in terms of what evidence gaps exist and question 2 around the feasibility of adaptation options. The focal countries are mainly Ghana and DRC.
Southern Africa	Southern Africa projects widely focus on ecosystem and infrastructure resilience, especially the urban and ecological ecosystems. The projects could generate insights into the feasibility of adaptation actions. Considering the focus on four main countries, one regional event could help gather insights into other areas.

Multi-Country

The multi-country projects provide a good overview and comparative insights around specific adaptation issues in and across African countries. While focusing on the general topics around food security and early warning systems, there are special cases such as the impacts of climate change on SMEs. The multi-country projects provide good insights for the Africa-wide launch event which could build into more specific country/regional events.

Some of the specific projects which showcased lessons at the Africa-led adaptation event include:

1. *Future Climate for Africa: Integrating Hydro-Climate Science into Policy Decisions for Climate-Resilient Infrastructure and Livelihoods in East Africa (HyCRISTAL)*
2. *Future Climate for Africa: Improving Model Processes for African Climate (IMPALA)*
3. *Future Climate for Africa: Uncertainty Reduction in Models for Understanding Development Applications (UMFULA)*
4. *Future Climate for Africa Programme: Future Resilience for African Cities And Lands (FRACTAL)*
5. *El Nino Programme: Monitoring the impact of the 2015/16 El Nino on rural water insecurity in Ethiopia: learning lessons for climate resilience*
6. *UKRI-GCRF Grow Programme: African Science for Weather Information and Forecasting Techniques (African SWIFT)*
7. *Building Resilience Programme: Enhancing Resilience to Agricultural Drought in Africa through Improved Communication of Seasonal Forecasts (ERADACS)*
8. *CLEAN-Air (Africa)*
9. *Building Resilience Programme: Socio-ecological Resilience to Soil Erosion, driven by Extreme Climatic Events: Past, Present and Future Challenges in East Africa.*

10. Unlocking the Potential for Groundwater for the Poor Programme: Building Understanding of Climate Variability into the Planning of Groundwater Supplies from Low Storage Aquifers in Africa - (BRAVE2)

Key Highlights from the Workshop

Adaptation Research Gaps

The key question addressed in this theme is: *What are the major adaptation research gaps in Africa and what research is needed to respond to the adaptation gap in Africa?* Understanding adaptation research gaps is critical for promoting targeted research and knowledge demands, for more transformative adaptation action. Some of the key gaps highlighted include:

a. Adaptation Data Gaps

Participants highlighted that most programmes and policies are not backed by wholesome data, that is, the qualitative and quantitative climate information to support adaptation programmes. Largely, the research community uses a lot of proxy data in Africa as a result of underdeveloped data infrastructure and systems. This corroborates with several studies that have identified such gaps, including adaptation inputs and impacts data.

Participants emphasized that need-based data is needed to inform decisions on adaptation interventions and adaptation resource allocation. Currently, there is a lack of comprehensive databases on critical adaptation issues including impacts and finances. Where there seems to be data availability on adaptation facets, it mainly exists at top levels and is not properly contextualized to clearly show how various adaptation practices can work in African communities.

Additionally, data on adaptation projects, technologies, interventions, and impacts, among others, remain scattered in different places, with little coordination or consolidation efforts. This is partly owing to the lack of dedicated Africa-led adaptation platforms to help convene and mobilize adaptation data and voices towards collective positioning and agenda-setting. Data gathering processes on adaptation seem to be taking place at relatively “higher” expert levels, with little interaction with communities in co-producing such data. Therefore, there is a weak link between data gathered through high-level technologies such as remote sensing stored in international databases and those in the local realities. Participants emphasized the need to enhance methods for collecting various socio-cultural and indigenous information, which play critical roles in community adaptation yet are often excluded in adaptation tracking, reporting, and profiling.

Propositions around strengthening the digital interventions and artificial intelligence (AI) in capturing data on payment for ecosystem services (PAYE) also emerged. There is a need to make such tools usable and available for local communities. The existing data can then be reframed and used to inform adaptation research. Some examples highlighted during discussions include the Leading Integrated Research for Agenda 2030 in Africa ([LIRA 2030 research programme](#)), which attempts to address key questions around data. These include: who designs the data collection process, how, who collects, when, for whom and/or what purpose? What is the state of knowledge generated from such processes and who owns the new knowledge? Towards this research, the programme has generated a number of lessons applicable to Africa. See [here](#).

Additionally, there is a need to revisit adaptation data quality and create standards that guide quality assurance. To date, many stakeholders collect data from different quarters, including from local communities, with little quality or process control to minimize fragmentation and redundancy. In other words, research projects could look beyond the fundamental gaps, in understanding the data puzzles highlighted above. Furthermore, strengthening adaptation data platforms is key towards enhancing data surveillance and identifying actual rather than perceived gaps.

b. High Costs of Adaptation Research

Participants emphasized the high cost of adaptation research which is attributed to: a) high expert fees; and b) duplication of projects without leveraging best research and impact practices. It was proposed that one of the ways of lowering costs without compromising the adaptation research quality is to strengthen partnerships that could enable local expertise and reduce over reliance on international expertise, in which the latter usually attracts relatively higher costs. Through the Africa Research and Impact Network, the concern around [high adaptation research costs has been raised](#) by African researchers, most of whom were part of the workshop.

The participants recommended that researchers from the developed countries including the UK should work closely with local researchers while increasing research responsibilities for African researchers and simultaneously enhancing the blending with the external expertise. Efforts to enhance local expertise could be boosted through designing international funding

programmes in ways that allow the African researchers to be the principal investigators (PIs). Currently, most of the UK-funded research is led by UK experts with African researchers playing the role of CO-Is, bearing relatively insignificant responsibilities in steering the research agenda, learning and strengthening their research management, and delivering capacity.

Strengthening Africa's adaptation research capability will add value to linking researchers' peer-to-peer learning within African countries, setting up a researchers' network that enhances continuous and dedicated interactions between international projects and local funders, businesses, and charities. Although projects can act as a catalyst for developing sustainability, this isn't always the case as many good ideas disappear once projects end, and sometimes new funding is allocated for research on the same adaptation issues. There is a need to build best practices and accelerate impacts of subsequent projects as well as have a more sustained adaptation project 'exit' strategy, otherwise known as project spin-offs. These are critical in reducing costs of adaptation research and also leverage locally available resources to continue and sustain a legacy of projects in optimal ways.

c. Impact Research and Adaptation Scenarios

Across Africa, there is still a lack of clear understanding of the impacts of adaptation research currently on-going in different parts of the continent. Both short and long-term impacts of adaptation research are not properly documented or profiled for global up scaling. Most impacts are largely reported in projects as aspirations, partly because most research projects take a short time frame to realize any tangible impacts. Yet, some of the outputs and outcomes from these research projects require new interventions to profile and assess opportunities for tangible impacts; this remains a major research gap. For most participants, paying close attention to sustainable adaptation research systems (including transformative research projects that are defined by multidisciplinary research), co-creation of evidence, impacts research, adaptation piloting, and feedback loops are all key. This will be the continent's gateway to sustainable research on impacts of adaptation research, which are not usually profiled.

“Adaptation ‘solutions’ are now being packaged as ‘expert’ provided to justify the high transaction costs of accessing adaptation finance which disproportionately leaves insignificant funds for investment in action. African communities have, for long, practised natural resource conservation which is significant in nature-based solutions, the latter now being repackaged as an expert and professional field for experts from elsewhere.”

Africa Research Scientists and Policy Actors’ Statement on Global Initiatives for Climate Action:

There are existing activities that could provide a fundamental basis for efforts towards impact research. For instance, the ICPAC works closely with stakeholders to co-produce seasonal forecasts for policy decisions. Such forecasts can be used to assess how much particular adaptation research has informed interventions that moderate or minimize the impacts of extreme weather events. Other related examples include the SWIFT and SCIPEA as highlighted above. However, it is noted that though they can inform decisions, they need to generate the desired solutions, which may take time.

As part of the impact debates, participants raised the concern that the linkages between adaptation science and the related policy implementation are still not very robust. While there are a number of policy documents informed by research, the implementation of these policies in real practice, to enhance the adaptation of vulnerable communities, remains weak. More research would be required in exploring ways that research can be transformed to not just policy, but to practice as well.

“There is an urgency to actually deliver adaptation impact research. There are different priorities for adaptation between the policy makers and the researchers. The ideal case is that the two agendas should have a common goal and supplement each other or be an enabler to each other. This is a gap that needs to be filled in the continent.”

Professor Shuaib Lwasa, University of Makerere and Global Adaptation Centre

There is the urgency to link data gathering (and model outputs) to actionable evidence, policy decisions, and implementation of projects. Some notable city-scale and project-based adaptation responses have been implemented, but institutional memory and up scaling such activities remain a challenge. In addition, a number of knowledge gaps exist in relation to the biophysical and socio-economic impacts of climate change, hence creating wider gaps between physical and social science to influence policies. For example, in the infrastructure and built environments, OpenStreetMap can support data gathering and community-level engagements while simultaneously linking them to open climate risk model outputs. The chain proceeds to policy, funding, and financing options. In the same breadth, gender and social networks responses to adaptation strategies in East Africa need to be factored in. The need for greater partnership between research and public service delivery, including the private sector, was emphasized as a pathway to research impact. There are also concerns around the significant disconnect between research carried out by independent and autonomous institutions and the public service delivery sectors.

Closely linked to the impact research and ever-evolving in the African context are the climate knowledge management, predictions, and development of projections. Prediction and modelling adaptation scenarios can inform impactful research interventions. The usage of climate data to inform predictions has been leveraged and to some extent, **indigenous knowledge** incorporated. However, as initially highlighted, there is a lack of comprehensive and vibrant African-led databases that can support climate knowledge management and predictions, especially at relatively reduced scales – such as local and sub-national levels. The national climate knowledge platforms such as the climate prediction centres have limitations

or challenges in connecting to local contexts. Therefore observed climate actions being witnessed aren't necessarily addressing projected scenarios. Thus the need for modelling science to support evidence on future adaptation scenarios is fundamental.

The advancement in leveraging climate technologies to support climate knowledge management is continuously evolving in Africa. The revolution in computing and AI in Africa means we have a major opportunity to rapidly increase the skill of decision-relevant predictions across time scales (hours to decades) that could facilitate the co-production of solutions at scale. For example, the Inclusive Low Emission Dairy Development initiative facilitates the inclusion of perspectives that allows for the co-production of research ideas. This fits within the African context, which has a communal perspective, enhancing adaptation while improving livelihood matrices.

d. Integrated Scale in Adaptation Research and Methods

There is some disintegration in the scale of various adaptation researches taking place in Africa, catalysed by a persistent silo approach to not only adaptation but also the implementation of broader development projects linked to adaptation. Participants noted that the various adaptation research activities have failed to account for environmental flows across scales, thus sometimes resulting in maladaptation or limited impacts. For example, environmental flows like river systems cross administrative boundaries as well as downstream and upstream communities. The ecosystems should therefore be accounted for in any water-related research project being implemented. According to participants, some adaptation interventions will have a negative impact either upstream or downstream, which will then undermine the sustainability of the interventions. Thus, the need for research to consider these ecosystem flows in making intervening recommendations.

“Holistic thinking is not just about systems thinking that has been around for some time, but about bringing all disciplines together – interdisciplinary, transdisciplinary, and working together to ensure research is impactful. Listening to the local voices and ensure communities work with us.”

Dr. Sarah Webb, Director, NERC

Adaptation interventions don't exist in closed systems but are interlinked with various systems within the society, including wider development interventions and societal norms that have cascading impacts. Additionally, most research activities in Africa have assumed that adaptation solutions are homogeneous and researchers tackle research questions without considering the heterogeneous nature of adaptation across scales. Participants recommended the need for methodological innovations including new simulations and models that can capture the behaviours of systems within which adaptation is implemented. This can be enabled through adopting an interdisciplinary approach by forming interdisciplinary teams.

Participants also highlighted the lack of regionally integrated research. Most research projects focus on particular countries, with little integration across other African countries. There is an opportunity to enhance learning and scale of adaptation knowledge and practice, through regionally integrated research focus. This is a gap that needs to be filled.

e. Inclusive Adaptation Knowledge Systems

Participants highlighted how on-going research sometimes fails to recognize the various knowledge systems that underpin adaptation. More specifically, the role of indigenous knowledge systems in the adaptation process is now well understood. Research has largely focused on “community knowledge” which in many ways, has become formalized through a long line of projected interventions and formal programmes. Hence, indigenous knowledge still remains very fundamental in driving adaptation especially among local communities, local farmers, and local fisher folks, among others. There is an urgency to recognize various types of knowledge. Adaptation research needs to value and integrate indigenous knowledge in the documentation as well as the profiling of adaptation-related research. More specifically, adaptation research that considers more of both formal and indigenous evidence, is likely to create adequate connections between local realities, resources, and broader resource opportunities for greater impacts. Participants proposed the need to create platforms that could strengthen inclusive adaptation knowledge such as developing joint journals on indigenous knowledge on adaptation. Another area is the urgency to integrate indigenous knowledge and practices in coping with climate shocks such as droughts. Among the gaps that exist include inadequate understanding and/or lack of accurate climate risk information at the local level (for example, communities who need to use the information to improve their

adaptation practices). This is critical for emerging approaches to adaptation such as Nature-Based Solutions (NbS) and others that are relevant for communities in Africa.

f. Risk Approach to Adaptation Research

Adaptation research in Africa has focussed more on addressing climate hazards such as floods and rising sea levels, and this has often resulted in recommending adaptation planning actions that are more reactive rather than proactive. Consequently, much of the adaptation actions in Africa are reactive to climatic events. Some participants emphasized the need to adopt a risk approach to adaptation research. The risk approach considers the various elements that shape adaptation including vulnerability, exposure, and adaptive capacity of a particular context. This enables risk-informed adaptation planning that enables preparedness rather than an emergency response to not just climate risks but also various shocks such as natural disasters and pandemics such as COVID-19. The latter are either exacerbated by climate change or with other multiple shocks, exacerbate climatic impacts. There are projects that are already adopting the risk approach to building resilience. For instance, UKRI-GCRF funded [Tomorrow's Cities project currently focusing on risk modelling](#) in order to strengthen the decision-support environment (DSE) for risks in developing cities. The cities include Nairobi, Kathmandu, Quito, and Istanbul.

There are also evolving research efforts focusing on dynamic vulnerability with a focus on how communities' living conditions, including assets, interact with climatic impacts. However, the delegates raised concerns that these are not comprehensive enough in Africa. Additionally, a number of initiatives attempting to undertake vulnerability analysis such as the sustainable energy analysis and climate action plan (SEACAP) are still sector-focused. Therefore, there is a need for cross-sector vulnerability analysis to enhance understanding of dynamic vulnerabilities across sectors as well as their interactions in shaping climate risk and impact on sectors of the economy. Inclusion of broader sectoral targets such as impacts on health sectors, for instance, was also underscored. Overall, the need for a comprehensive risk analysis approach to adaptation research was emphasized as it has been in the State and Trend on Adaptation report in Africa (GCA, 2021) and the draft outline, IPCC AR6, 2021.

g. Governance of Adaptation Technologies

The climate governance framework has incorporated climate technology governance frameworks which include the [Climate Technology Centre and Network \(CTCN\)](#). This is designed to promote the accelerated transfer of environmentally sound technologies for low carbon and climate-resilient development as required by the Paris Agreement. The CTCN provides technology solutions, capacity building, and advisories on policy, legal and regulatory frameworks. These are tailored to the needs of individual countries by harnessing the expertise of a global network of technology companies and institutions. The parties from the Global South have at different levels, developed UN-accredited National Designated Authorities (NDAs) who then build the capacity of climate technology stakeholders at the national, sub-national, and local levels.

However, the delegates pointed out that there is weak governance of climate technologies that have potential in facilitating adaptation in the African context. Therefore, responsible governance of climate technologies in Africa needs to be strengthened. The [OECD](#) examined a set of technologies suitable for addressing specific environmental needs of African countries (here referred to as 'adaptation' technologies), between the period 1980 and 2009. The report found out that there are 56 climate adaptation technologies in Africa, which included water desalination (45%), followed by energy supply in remote locations (25%), solar water treatment (14%), rainwater collection (7%), and solar/wind-powered water pumping (7%). According to OECD, a total of 389 adaptation technologies are protected at the African Intellectual Property (IP) offices, with desalination being the most important field. The adaptation technologies patented in Africa originate predominantly in OECD countries (76%) while the proportion of Africa's own inventions is as much as 17%. The major inventor countries are led by South Africa, followed by Morocco and Egypt. This definitely shows that African home-grown adaptation and those protected by the Intellectual Property Rights (IP) are still low. The strengthening of the local governance of adaptation in ways that adequately leverage the global technological opportunities is therefore key. Likewise, there is urgency to incentivize the private sector so as to enhance their role in catalysing the development and marketing of climate technologies that support adaptation and resilience-building activities.

Transformative Adaptation Research

The key question addressed in this theme is: *What examples are there of transformative adaptation research enabling action through addressing social justice, capacity building, and governance? And why are these considered transformative i.e. what is considered transformative in an Africa context?*

The delegates shared lessons from the on-going adaptation research projects in Africa, which include asset-focused data, among others.

a. What does Transformative Research in Africa look like?

The discussions revealed that most of the stakeholders are not entirely aware of what transformative adaptation research potentially looks like. While most of the participants had ideas around various best practices, it was not clear how these best practices constitute transformations. The understanding of best practices in an African context is valuable in replicating best adaptation practices in different contexts. Further, focusing on best practices has only meant replication of ideas rather than pursuing real change that can enhance the resilience of vulnerable communities. The limited understanding of how to achieve transformative adaptation is an impediment to the continent's adaptation pursuit as this limits the ability to develop transformative ideas and Africa-led concepts. Consequently, most adaptation research activities are driven by conceptual framings from elsewhere, with few African voices around the transformation agenda. In the run-up to COP-26, there are major global efforts towards enhancing adaptation action. There are already major concerns that these initiatives might fail to bring the required transformation.

The African research and policy actors' fraternity, through the Africa Research and Impact Network, has raised several issues around the financial architecture and the weak African voice in the initiatives. The petition raising these issues can be accessed [here](#). Nonetheless, participants highlighted a number of ideas that they thought could constitute transformative adaptation research. These include, among others, the co-creation of adaptation knowledge with local communities and adaptation research that explores low carbon development as an opportunity. Additionally, research that integrates impact testing and experimentation to

enable practical testing and incubation of research findings and outputs was noted to hold the potential for transformation.

b. Co-creation of Adaptation Research Evidence

Transformative adaptation research should be that kind of research that contributes to innovative climate action that transforms the livelihoods of vulnerable communities, making them more resilient. In this, the focus on local vulnerable communities is key as a centre for transformation. A case example was shared reflecting on experiences from Zimbabwe, where evidence has emerged that communities perceive transformative adaptation research as that which informs actions that community members feel are changing their lives. There were calls for the co-creation of adaptation knowledge together with communities in order to ensure that emerging knowledge and associated recommendations are well aligned with the needs of communities. As such, the co-creation and especially with vulnerable communities was noted as a possible indicator of transformative adaptation research.

c. Payment for Ecosystem Services (PES) as Low-Carbon Development

Additionally, adaptation research that also contributes to low carbon development was also highlighted as transformative. This is critical in driving greater synergies with mitigating and leveraging potential adaptation and livelihood opportunities. The low-carbon outcomes should be part of adaptation co-benefits.

d. Integrated Skills Development

Transformative adaptation research should also contribute to building local research capacity, especially targeting the African researchers whose voices are still not equitably represented in adaptation knowledge platforms such as journals.

e. Integrated Impact Testing, Experimentation, and Up-scaling

Participants acknowledged that sustaining impact after the exit of an adaptation research project is also a way to perceive transformation. Such strategies could include linkage with impact and learning platforms whereby project outcomes can continue to inform new knowledge and actions in different scales and times. Additionally, participants mentioned the inclusion of an experimental component, where some of the findings and outcomes could be tested in practice and incubated for further impact. The ideas such as policy labs that have been pursued in some projects could be taken up further. A research project that can also

leverage funding for such experimentations would be considered transformative. Other suggestions include integrating business models as part of transformative research design so as to enable connection with the private sector for up scaled impacts.

f. Transdisciplinary in Research Design and Implementation

Adaptation is increasingly becoming a complex and transdisciplinary topic. Research projects that consider at all levels, the various disciplines and societies in development and implementation, are likely to result in transformation. Integrating physical science with social science as well as community knowledge could result in transformative outcomes.

Partnerships for Adaptation Research

The key question addressed in this theme is: *What forms of partnerships are required to achieve these transformations? How best should the UK engage African researchers and policymakers in pursuing these transformative opportunities? How has COVID-19 and the resultant shifts in UK funding affected adaptation research in Africa?*

a. Transformative Partnerships for Adaptation Research

A transformative partnership is a fundamental part of the Sustainable Development Goals and is a catalyst to transformative adaptation research.

This question focused on unpacking the forms of partnerships in adaptation research and actions that can facilitate the desired transformation. The coordinated climate research in Africa has enhanced partnerships between the UK and other international organizations in ways that have accelerated adaptation research with invaluable lessons learnt. As momentum toward adaptation increases, Africa-based researchers have renewed calls for equitable partnerships and strengthening local capacity, especially for early-career researchers who could take active adaptation leadership around the globe. The emergence of COVID-19 has also created some consciousness on the functionalities of existing partnerships and how best they can be enhanced.

“Collaboration is about ensuring successful negotiations, transparency, capacity building, and creating plural conditions where COP26 goals can be met.”

Dr. Helen Adams, Head of Science Engagement COP 26, British High Commission, Kenya

A key point raised by the delegates is the need to enhance Africa’s leadership in adaptation research. In this, there were calls that partnership in adaptation research needs to enhance equity, transparency, and fair contribution from Africa. There is a need for an enhanced leadership role for African researchers in international adaptation research while leveraging

support from the Global North. Strengthening multi-stakeholder partnerships in adaptation research was also highlighted as key to building transformative partnerships. Calls to prioritize long-term partnerships that are made up of diverse actors have also been made in order to foster the common-but-differentiated-responsibilities (CBDR) in adaptation research. Partnerships that bring together researchers, knowledge producers, communities and beneficiaries, governments, and the overall knowledge consumers, are likely to enhance robust research uptake, learning, and complementary knowledge sharing. There emerged concerns that most research partnerships have (un)consciously neglected the private sectors who are the key knowledge consumers. The role of the private sector in adaptation action, funding, and knowledge and data generation is appreciable. This, therefore, needs to be harnessed as part of the transformative partnership.

There were calls to strengthen the post-project partnerships. Delegates acknowledged that most research programmes are short-lived and do not give time for transformational partnerships to develop. The short project period, therefore, limits the possibility of forming deeper and sustained partnerships. There is a need to link projects to wider dedicated impact networks that provide ecosystems for continued engagement with research findings. The ARIN network is an example where lessons and best practices from past and current projects are profiled for impact and peer learning across African countries.

b. Impacts of COVID-19 on Adaptation Research Partnerships in Africa

While there is growing recognition and efforts towards building adaptation research partnerships, the advent of COVID-19 has reshuffled the way partnerships function. Delegates shared experiences, as described below, on how COVID-19 has reshuffled partnerships.

First, it was highlighted that the pandemic has created uncertainty in adaptation research funding. The COVID-19 has created a new consciousness among donors and governments that disasters are becoming more uncertain and complex thus the need to rethink funding focus. This has occasioned a review of spending on research with an impact on partnerships. The UK government specifically reduced funding available for the Official Development Assistance (ODA), which had a significant impact not only on reducing research activities but also creating uncertainty, partnerships, and reduced funding for projects in Africa. The delegates argued

that the ODA budget cuts affected budgetary allocation for adaptation-related research in Africa and also inflicted existing partnerships. Additionally, measures imposed by most governments to contain the spread of the virus such as travel bans and bans on meetings, have curtailed active engagements in existing and potential partnerships. There are preliminary findings from the recent rapid assessments and studies that COVID19 affected climate change research significantly and in many ways. These include affecting field studies, delaying revision and reporting of NDCs, re-allocation of climate finance to fighting against COVID, and addressing related emergencies.

On the other hand, the pandemic has opened new opportunities for partnerships in a number of ways. The collective global and domestic efforts towards managing the pandemic have brought a number of partners together. Some of these partners are now forming new engagements in adaptation research. New priorities have also emerged in the adaptation research especially in the context of lessons that COVID-19 has brought. There is a shift in attention towards new priorities which might affect adaptation research, including the need to integrate health issues as a broader part of climate change research and vice-versa. COVID-19 has proved to be a pandemic that has shaped how the world will address not only the climate crisis but also future health pandemics. The emerging research area includes understanding the implication of the pandemics on adaptation strategies and their capability to yield transformation..

Profiling Adaptation Actions to the Global Scale

The key question addressed in this theme is: *How can we best profile adaptation research and actions taking place in various African countries to a global scale? And what support is required to achieve this?*

Evidence shows that Africa is registering a relatively low presence at the global UNFCCC climate action platforms such as the Global Climate Action Portal ([see here](#)). A number of challenges were highlighted to be impeding the profiling of adaptation research and actions taking place in Africa to a global scale.

a. Limited Capacity to Interpret Local Actions into Global Language

Delegates acknowledged that there are useful adaptation actions and research generated across the continent, some of which are attracting significant international attention. However, the skills to interpret these local actions in line with the global messaging and narrative are relatively weak. This impedes the ability of multiple adaptation actions taking place locally to connect with the global narrative. While most African countries have established agencies and climate change directorates to help with tracking and national reporting of adaptation action, the reporting process often focused more on outputs. There is no dedicated expertise to support the framing and interpretation of local actions into the global context. There is therefore a need for institutional strengthening to institute skills sets that can undertake comprehensive inventories and help translate reported outputs into stronger global messaging and interpretation.

b. Weak Integration of Local Voices in Adaptation Research Projects

The other key challenge is the limited participation of local communities in the implementation of climate research in Africa. Most communities in Africa have been framed as vulnerable to climate change, thus requiring support in terms of adaptation measures. In this, communities have been framed as recipients of adaptation actions but with little role in knowledge generation and designing solutions. Over years, the research community has tried to bring on board the local communities by adopting participatory approaches. A number of participatory pathways and methods such as the community-based adaptation framework and locally-led solutions approach are being used by various climate research projects. These

involve facilitating integration and scaling-up of local and indigenous knowledge. However, according to the general perception of the delegates, little has been achieved so far in enhancing the integration of local and indigenous knowledge and the aspiration of the local communities into the global climate negotiations.

c. The Urgency to Speak in One Voice

The delegates noted that the African groups of negotiators, researchers, and partners don't speak with 'One Voice' at the global climate negotiations yet the impacts of climate change happen across boundaries. The various delegations and positions at the COPs, weaken Africa's policy position at the negotiations. The delegates acknowledged the increasing number of African delegations and mobilization, which is African-led but with poor harmonization of policy positions towards and during COPs. There are pre-and post-COP events held each year towards COPs but they haven't been able to translate into a 'common voice' as anticipated. Delegates attributed it to key factors which include disjointedness that exists between researchers, policymakers, advocacy groups, and partners at all levels, hence failing to deliver a unifying text and voice.

d. The Donor Dependency

Delegates noted that climate research in Africa as well as negotiations at the COPs are largely donor-funded. The delegates believed that donor dependency inhibits or hinders ownership of climate research and actions hence domestic mobilization for climate research and actions will continue to be low. These actions risk slowing down adaptation to climate change in Africa if the dependence is wholly on international climate finance and is not locally-driven.

e. Lack of Explicit Distinction between Development and Adaptation

The delegates acknowledged that development and adaptation are obviously interlinked and continue to be increasingly so. However, at the moment, researchers and stakeholders might not be making this connection explicitly, hence affecting how it is being captured and reported at the various levels. The research needs to factor in the understanding when development is standalone, and when adaptation and development must be considered alongside each other. It is also imperative to consider what metrics and indicators should be supported and measured. While the notion of adaptation is well advanced in development, there are issues in differentiation with development which leads to other concepts such as the additionality metric. A systematic process for adaptation definition, applicable with

indicators, and disaggregated-aggregable indicators, should be led by researchers. Many institutions use 'adaptation metrics' to mean inward monitoring of outputs and less of outcomes.

f. Lack of Responsive Adaptation Platforms to Profile Best Practices and On-going Actions

While multiple adaptation actions are on-going in different parts of the continent, there are no dedicated platforms to showcase these activities. A general concern is that various researchers and policymakers are unaware of adaptation research projects taking place in their contexts. Similarly, there is little awareness about existing adaptation expertise in the continent. The need for a dedicated adaptation platform for Africa is urgent to help profile adaptation research and expertise and create stronger connections with the global platforms.

Conclusion

Overall, the Africa-led adaptation event generated key insights that are useful in informing the discussions and enhancing adaptation progress in Africa, post-COP 26. Discussions and key insights point to several gaps in adaptation research, partnerships, and communication in Africa. These gaps not only present new opportunities for rethinking adaptation in Africa but also, if not well addressed, could impede progress and ambitions in adaptation action in Africa, contrary to the global expectations. The COP26 provides an opportunity for actors to ventilate on these issues, rally knowledge, expertise, funds, and collective action. These will ensure that emerging programmes targeting Africa do not reproduce past bad practices but are truly delivering for the vulnerable communities as noted by the IPCC 2021 draft outline report.

Useful Links

- 1) <https://www.arin-africa.org/2021/10/15/africa-research-scientists-petition/>
- 2) <https://gca.org/reports/state-and-trends-in-adaptation-report-2020/>
- 3) <https://www.ukcdr.org.uk/wp-content/uploads/2021/04/01880-UKCDR-Climate-Change-Report.pdf>
- 4) <https://02229575.xleap.net/nerc-kickoff>
- 5) <https://climateaction.unfccc.int>
- 6) https://archive.uneca.org/sites/default/files/uploaded-documents/ACPC/2020/africa_climate_change_strategy_-_revised_draft_16.10.2020.pdf
- 7) <https://www.uneca.org/stories/africa-climate-change-strategy-nearing-completion>
- 8) <https://esrc.ukri.org/about-us/strategy-and-priorities/climate-change/climate-change-priority-previous-investments/>
- 9) <https://unfccc.int/topics/mitigation/resources/portal-on-cooperative-initiatives>