



Financing Adaptation in Zambia

Suggestions based on the AGRICA
Climate Risk Analysis

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Contents

Contents	iii
Boxes and tables	iv
Acronyms	v
1 Background of the project	1
1.1 Context of adaptation finance in Zambia	2
1.2 Zambia's adaptation needs and priorities	3
1.3 Description of the identified adaptation measures	5
1.3.1 Conservation agriculture, including water availability	5
1.3.2 Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation	5
2 Review of financing options for the identified adaptation measures	7
2.1 Estimated financing need of the identified adaptation measures	8
2.1.1 Investment potential	8
2.2 Financing options for the identified adaptation measures	11
2.2.1 Conservation agriculture, including water availability	11
2.2.2 Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation	12
2.3 Mapping potential adaptation financing options	13
2.3.1 Scoring the most suitable financing options for the context of Zambia	13
2.3.2 Selected financing options	14
3 Recommendations on the selected financing options	15
3.1 National Climate Fund or National Financing Vehicles (NFVs)	16
3.2 Terra Fund	19
3.3 Sale of Carbon Credits	22
3.4 Climate Risk and Early Warning Systems Initiative (CREWS)	29
4 Concluding remarks	32
Annex 1: Database of selected financing options and scoring	36
Annex 2: Relevant examples & cases in Africa of National Climate Funds or National Financing Vehicles	40
About GIZ	43
About Genesis	43

Boxes and tables

Boxes

Box 1. Tracked climate finance in Zambia, sectorial & use of funds (in millions USD)	2
Box 2. Tracked climate finance in Zambia, international vs domestic (in millions USD)	3
Box 3. Mainstreaming of CC and CSA in key government policies	4
Box 4. Benefits and challenges in conservation agriculture	5
Box 5. Spatial distribution of CA practices in Zambia	6
Box 6. Method for estimating market potential for adaptation investments	8
Box 7. Summary of the e-PICSA approach proposed for Zambia to scale up conservation agriculture and use of CIS	10
Box 8. Examples of layered capital structures	11
Box 9. Financing initiatives on early warning systems	12
Box 10. Distribution of national climate funds across the globe	16
Box 11. Structure of a TerraFund	19
Box 12. Map of carbon taxes and ETS across the world	23
Box 13. General structure of carbon credits	24
Box 14. Development benefits of trading in carbon credits	26
Box 15. Safeguards and principles for high-quality carbon projects	26
Box 16. Structure of CREWS	29

Tables

Table 1. Financing need for conservation agriculture.	9
Table 2. Financing need for provision of seasonal weather forecasts to inform climate adaptation.	10
Table 3. Initial list and taxonomy of financing options mapped	13
Table 4. Criteria and scoring approach	14
Table 5. Matrix of shortlisted financing options by sources and recipients of financing	14
Table 6. Potential applications of NFFs in Zambia	18
Table 7. Potential applications of TerraFund in Zambia	21
Table 8. Relevant examples of carbon sequestration projects in Africa	24
Table 9. Potential applications of Carbon Credits in Zambia	27
Table 10. Potential applications of CREWS in Zambia	31

Acronyms

AGRICA	Climate Risk Analyses for Adaptation Planning in Sub-Saharan Africa	IRR	Internal Rate of Return
BF	Blended Finance	LDCs	Least Developed Countries
BCR	Benefit-Cost Ratio	MDAs	Ministries, Departments and Agencies
CA	Conservation Agriculture	MHEWS	Multi-hazard EWS
CBA	Cost-benefit analysis	MoFNP	Ministry of Finance and National Planning
CC	Climate Change	NAPs	National Adaptation Plans
CCA	Climate Change Adaptation	NDCs	Nationally Determined Contributions
CIS	Climate Information Services	NGOs	Non-Governmental Organisations
CO_{2e}	Carbon dioxide equivalent	NFVs	National Financing Vehicles
COMACO	Community Markets for Conservation	NMHSs	National Meteorological and Hydrological Services
CRA	Climate Risk Analysis	NPV	Net Present Value
CREWS	Climate Risk and Early Warning Systems Initiative	PIK	Potsdam Institute for Climate Impact Research
CSA	Climate Smart Agriculture	PPPs	Public-Private Partnerships
CSOs	Civil society organizations	SHF	Smallholder farmers
DBZ	Development Bank of Zambia	SIDS	Small Island Development States
DFI	Development Finance Institutions	SMEs	Small and medium sized enterprises
DMMU	Disaster Management and Mitigation Unit	SOFF	The Systematic Observations Financing Facility
DRM	Disaster Risk Management	SSA	Sub-Saharan Africa
EAP	Early Action Protocol	SPV	Special purpose vehicle
e-PICSA	electronic Participatory Integrated Climate Services for Agriculture	UN	United Nations
ETS	Emissions trading system	UNDP	UN Development Programme
EWS	Early Warning Systems	UNDRR	UN Office for Disaster Risk Reduction
FAO	Food and Agriculture Organization of the UN	UNEP	UN Environment Programme
FCDO	UK Foreign, Commonwealth & Development Office	UNFCCC	UN Framework Convention on Climate Change
FIs	Financial Institutions	WARMA	Water Resource Management Authority
FISP	Farmer Input Support Programme	WMO	World Meteorological Organization
GCA	Global Commission on Adaptation	WRI	World Resources Institute
GCF	Green Climate Fund	ZANACO	Zambia national commercial bank
GEF	Global Environment Facility	ZICTA	Zambia Information and Communications Technology Authority
GHG	Greenhouse Gas	ZMD	Zambia Meteorological Department
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	ZMW	Zambia Kwacha (local currency, 1 US\$ = 18.06 ZMW; 1 EUR = 19.93 ZMW at time of study)
GRZ	Government of the Republic of Zambia		
IFAD	International Fund for Agricultural Development		
IFIs	International Financial Institutions		

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1 Background of the project



The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) contracted Genesis Analytics to supplement the Climate Risk Analysis (CRA) in Zambia - implemented by the Potsdam Institute for Climate Impact Research (PIK) and GIZ as part of the "Climate Risk Analyses for Adaptation Planning in Sub-Saharan Africa (AGRICA)" project - with a risk financing component. The risk financing component serves as a concept for bringing resilience goals closer to implementation by 1) analysing financing options for identified adaptation measures and 2) paving the way to better manage residual risk through pre-arranged finance instruments.

The aim of this report is to **tie together financing needs and options for the adaptation measures prioritized within the AGRICA climate risk analysis in Zambia**. Specifically, the report presents the context for the adaptation financing needs in the agriculture and (partly) water sectors in Zambia, proposes financing instruments for risk reduction methods, suggests sources of adaptation financing from both public and private sectors, and identifies key adaptation finance actors, from domestic (national and sub-national), international, public, and private sectors. The importance of identifying these actors is to understand the potential stakeholders who can be engaged in the operationalisation of the proposed financing options. The

proposed financing options have been validated by relevant stakeholders in a workshop taking place in Lusaka on 07 February 2023.

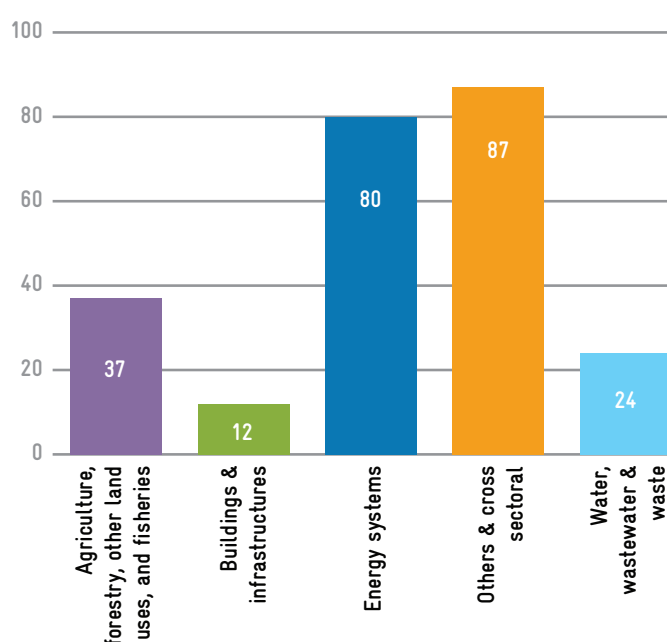
1.1 Context of adaptation finance in Zambia

According to the Climate Policy Initiative, Zambia accessed US\$ 241 million of climate finance from international and domestic resources¹, on average in the years 2019 and 2020. Out of this, 36% is dedicated to cross-sectoral sectors (US\$ 87 million), 33% to energy systems (US\$ 80 million), and 15% to Agriculture, Forestry, Other Land Uses and Fisheries (AFOLU) (US\$ 37 million). Adaptation has received the major focus with 50% of financing, while mitigation had 45% of financing².

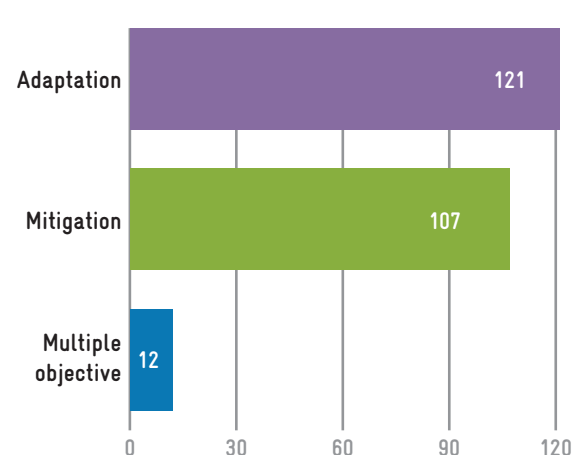
Most climate finance came from public sources – US\$ 222.26 million – while only US\$ 18.73 million came from private sources. Of the public sources, the government provided 42% of financing (US\$ 109 million), followed by multilateral development finance institutions (DFIs) providing 31% (US\$ 75 million), bilateral DFIs providing 13% (US\$ 31 million), and multilateral climate funds providing 3% (US\$ 8 million).

Box 1. Tracked climate finance in Zambia, sectorial & use of funds (in millions USD)

Sectorial focus of tracked climate finance in Zambia



Use of tracked climate finance in Zambia

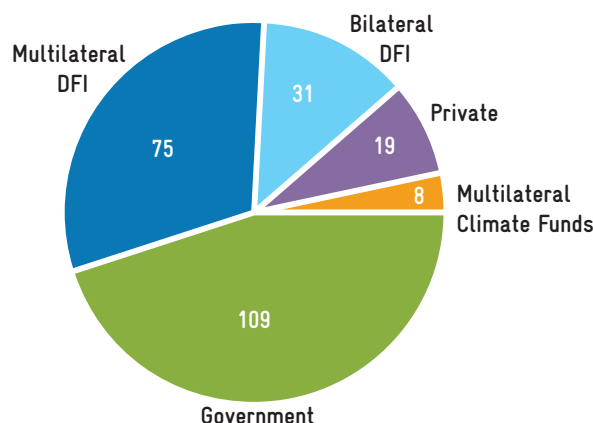


Source: <https://www.climatepolicyinitiative.org/publication/landscape-of-climate-finance-in-africa/>

1 Domestic flows pertain to climate finance that was raised and spent within the same country, while international flows pertain to climate finance flows that were raised in a specific country but spent in another.

2 <https://www.climatepolicyinitiative.org/publication/landscape-of-climate-finance-in-africa/>

Box 2. Tracked climate finance in Zambia, international vs domestic (in millions USD)



Source: <https://www.climatepolicyinitiative.org/publication/landscape-of-climate-finance-in-africa/>

1.2. Zambia's adaptation needs and priorities

Within the AGRICA climate risk analysis two adaptations measures have been prioritized: (i) **Conservation agriculture, including water availability; and (ii) Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation.** These two priority adaptation measures were validated by PIK together with representatives of relevant Zambian partner ministries and institutions as the main adaptation response for the agriculture sector in Zambia.

Climate Change (CC) and climate smart agriculture (CSA) has been mainstreamed across several national policies, strategies, and other planning documents, with adaptation strongly identified in 10 out of 12 key government planning documents (see Box 3). Furthermore, once the country's Climate-Smart Agriculture Strategy Framework is finalised, priorities and mechanisms to strengthen CSA initiatives across the country will be established under the leadership of the Ministry of Agriculture (MoA). Three key steps have been identified under the Climate-Smart Agriculture Strategy Framework to scale up CSA in Zambia: (a) developing an institutional mechanism and strategic operational framework allowing effective coordination and communication among CSA stakeholders; (b) identifying CSA approaches and practices that respond to CC and can attract the needed budgetary support; and (c) strengthening mechanisms for dissemination of information, knowledge, and skills about appropriate CSA practices in Zambia³.

Zambia's adaptation needs and priorities are presented in its National Adaptation Plan of Action (NAPA) with the main

objective being to “protect its people, infrastructure, and other national assets against disasters and climatic hazards such as drought and floods”. To achieve this, the following needs and priorities are listed:

- i. **Strengthen early warning systems to improve services for preparedness and adaptation to climate change in all the sectors (agriculture, health, natural resource, and energy),**
- ii. Promote alternative sources of livelihoods,
- iii. Adapt to the effects of drought in the context of climate change in Agro-Ecological Region I of Zambia,
- iv. Manage critical habitats,
- v. Promote natural regeneration of indigenous forests,
- vi. **Adapt land-use practices (crops, fish, and livestock) considering climate change,**
- vii. Maintain and provide water infrastructure in communities to reduce human-wildlife conflict,
- viii. Eradicate invasive species,
- ix. Build capacity to improve environmental health in rural areas, and
- x. Climate-proof sanitation in urban areas.

³ World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector. World Bank, Washington, DC.

Box 3. Mainstreaming of CC and CSA in key government policies

	Climate Change	Adaptation	Mitigation	CSA
Vision 2030	✓	✓	✓	✓
National Adaptation Programme of Action on Climate Change (2007)	✓	✓		
National Energy Policy (2008)	✓			
National Policy on Environment (2009)	✓			
National Forest Policy (2009)	✓			✓
National Climate Change Response Strategy (2010)	✓	✓	✓	
National Agricultural Investment Plan (NAIP) - 2013-2015	✓	✓	✓	✓
Nationally Determined Contributions (2015)	✓	✓	✓	✓
National Disaster Management Policy (2015)	✓	✓		
Reduced Emissions from Deforestation and Forest Degradation (REDD+) (2015)	✓	✓	✓	✓
National Policy on Climate Change (2016)	✓	✓	✓	✓
Second National Agriculture Policy (2016)	✓	✓	✓	✓
National Agricultural Advisory and Extension Strategy (NAAES) (2016)	✓	✓	✓	✓
Seventh National Development Plan (2017-2021)	✓	✓	✓	✓
Eighth National Development Plan	✓	✓	✓	✓
National Agricultural Investment Plan (NAIP) - 2014-2018	✓	✓	✓	✓
2nd National Agricultural Investment Plan (NAIP) - 2016-2023	✓	✓	✓	✓
Climate-Smart Agriculture Strategy Framework (forthcoming)	✓	✓	✓	✓

Source: Author adopted from World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector, Page 22; PMRC (2020) Climate Smart Agriculture Strategies for Zambia -Analysis Of Policies And Programmes. Retrieved from <https://pmrczambia.com/wp-content/uploads/2020/04/Climate-Smart-Agriculture-Strategies-for-Zambia-Analysis-of-Policies-and-Programmes.pdf> [April 2023]

1.3. Description of the identified adaptation measures

1.3.1. Conservation agriculture, including water availability

Conservation agriculture (CA) is a farming system that promotes minimum soil disturbance, maintenance of a permanent soil cover, and diversification of plant species⁴. These three main principles focus on:

- a. zero (ideal) and controlled tillage with no more than 25% of soil cover disturbance,
- b. retaining crop residues and any other soil cover with 30% of permanent organic soil cover as a minimum; and
- c. use of crop rotation involving at least three different crops to build prevention against weeds, pests, and diseases⁵.

In Zambia, minimum soil disturbance is practised by 7.8% of smallholder farmers retention of crop residues is practised by 59% of smallholder households; and 8.5% of smallholder farmers practise legume rotations while 13% practice legume intercropping⁶. Furthermore, Zambia has been considered a leader in promotion of CA in Sub-Saharan Africa despite the adoption of CA by smallholder farmers has been generally low. This has been characterized by partial adoption with dis-adoption rates of up to 95% of farmers in some locations⁷. These figures

underline the need and potential for implementing CA at a much broader scale throughout Zambia.

CSA builds upon the principles of CA by incorporating additional strategies to address climate change, such as the use of climate-resilient crop varieties and more efficient irrigation systems. This in turn helps in buffering against drought through increased water storage in the soil profile.

1.3.2. Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation

Early warning systems (EWS) can be defined as “an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities, systems and processes that enable individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events”⁸. Effective EWS are systems that are multi-hazard, people-centred and impact based, with four key elements: (i) hazards are detected, monitored, forecasted with hazard warnings developed; (ii) risks are analysed and the information is incorporated in an understandable way in warning messages; (iii) warnings are issued by a designated authoritative source and disseminated in a timely manner to authorities and the public; and (iv) community level emergency plans (response) are activated to reduce impact on lives and livelihoods.⁹

Box 4. Benefits and challenges in conservation agriculture

According to FAO, conservation agriculture’s main goal is to produce favourable crop yields while reducing production costs and maintaining soil fertility. Thus, conservation agriculture’s basic principles are to minimize soil disturbance, maximize soil cover and crop rotation.

- Minimum tillage (planting basins and ripping) is a usual entry point of conservation agriculture. However, the main challenge of minimum tillage is weed growth.
- Ripping, another conservation agriculture practice, involves creating a small trough without turning the soil. This is more familiar than using planting basins - small pockets of soil which are hoed and filled with seed and

fertilizer. Basins are typically applied to smaller pieces of land compared to ripping and are more labour intensive.

- Maintaining crop residues in fields through mulching increases soil cover from 25% to 50%, over burning that is still common practice.
- Crop rotation in Zambia is mainly done using legumes. It has been found that farms that have dedicated to legume production increase soil fertility from replenishment of nitrogen in soil.

Source: Author based on World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia’s Agriculture Sector, Page 22; FAO & UNDP (2020) Conservation agriculture for climate change adaptation in Zambia: A cost-benefit analysis. Rome, FAO

4 <https://www.fao.org/conservation-agriculture/en/>

5 Sapkota, R.M. et al (2014) Conservation agriculture: Implementation guidance for policymakers and investors. Climate-Smart Agriculture Practice Brief. Denmark: CCAFS. <https://cgspace.cgiar.org/rest/bitstreams/34456/retrieve>

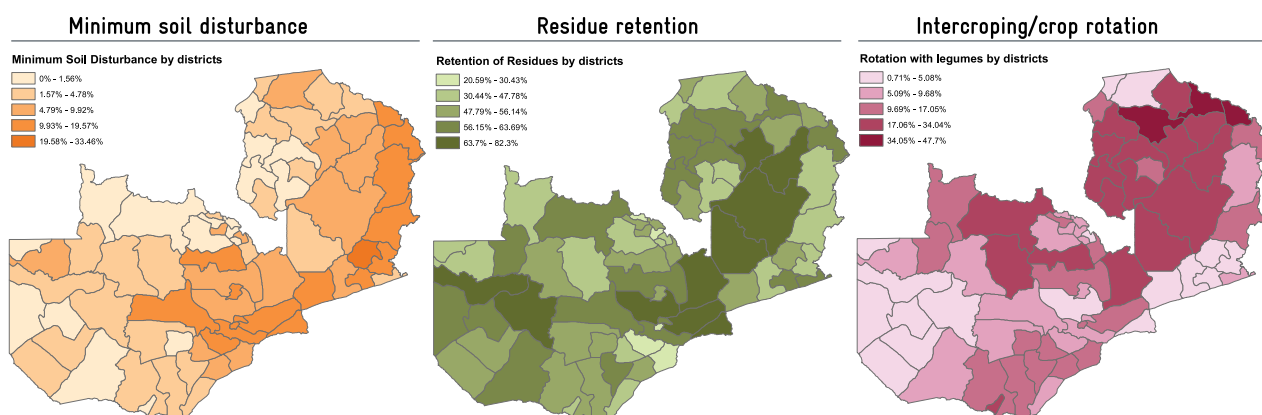
6 World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia’s Agriculture Sector

7 Ministry of National Development Planning-Zambia, Seventh National Development Plan -2017-2021

8 Agreed Member States of the United Nations definition of EWS: UN General Assembly A/RES/71/276

9 https://library.wmo.int/doc_num.php?explnum_id=5460

Box 5. Spatial distribution of CA practices in Zambia



Source: World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector, Page 36

Several barriers still exist in the development, deployment, access, and use of EWS in providing climate information:

- gaps in legal, institutional and coordination frameworks that inhibit the operationalisation of EWS,
- a lack of technology, infrastructure and forecasting capabilities,
- a lack of technical experience and skills in the operation and maintenance of EWS,
- gaps in past events and historical data to identify and model climate trends,
- difficulties in implementing a standardised solution for public engagement,
- poor public and institutional preparedness for risk reduction reaction to warnings; and
- **huge investments needed for developing, resourcing, and deploying EWS.**

2 Review of financing options for the identified adaptation measures



This section briefly describes the estimated financing need for the two prioritised adaptation measures and maps the potential financing options. This as well as the following chapter then offers a detailed analysis regarding which of these financing options are most suitable and the way they could potentially be funded and/or structured.

2.1. Estimated financing need of the identified adaptation measures

Estimated financing for the prioritised adaptation measures for Zambia provides a framework for identifying the financial resources required to support these measures. This estimation allows policymakers, financial service providers and donors to have a better understanding of the resources required to implement conservation agriculture, strengthen early warning systems and inform the selection of suitable financing options. Additionally, the estimation of financing needs provides a basis for allocating funds to the most impactful and cost-effective interventions. This helps to maximize the efficiency and effectiveness of adaptation financing, ensuring that resources are used to achieve the greatest possible outcomes.

For this report, the estimated financing need is based on a market analysis to demonstrate how much financing is required to implement/scale up the prioritised adaptation measures. This also informs the selection of financing options to ensure that they are suitable to cover the estimated financing needs. The outcomes of the market analysis are an estimation of the market size, in million US\$. Furthermore, the market analysis also provides a brief assessment of the economic viability of each of the analysed climate adaptation investments, as estimated financing needs, proxied by the market potential. The market analysis methodology is presented in **Box 6** below.

2.1.1 Investment potential

Conservation agriculture, including water availability

In Zambia, conservation agriculture is practiced in three main ways: minimum soil disturbance, retention of crop residues, and legume rotation and intercropping (diversification). As mentioned earlier, minimum soil disturbance is practised by 7.8% of smallholder farmers using planting basins or ripping to break up the soil hardpan¹⁰; while retention of crop residues is practised by 59% of smallholder households who leave their residues in the field for mulching or livestock grazing; 8.5% of smallholder farmers practise legume rotations while 13% practice legume intercropping.¹¹ **Overall, conservation agriculture is practised by more than 300,000 smallholder farmers in Zambia (translates**

Box 6. Method for estimating market potential for adaptation investments

The method applied is summarised below:



Note: the market potential presented herein is based on the number of smallholder farmers in Zambia.

The calculations are defined as:

- ‘Total market size’ is the initial market for adaptation measures without any reductions made. Here, we have used the estimated number of smallholder farming households (SFH) in Zambia, estimated at 1,608,696[1]
- ‘Market share’ is the assumed share of the total market (smallholder farmers) that will invest in the adaptation measure. This focuses on the farmers who have not yet adopted the proposed adaptation measures.
- ‘Share financing’ is the share of the needed adaptation investment that can be financed. As we are focusing on total financing needs, 100% of financing is used.
- ‘Unit costs’ are the unit cost of the adaptation investments.

Source: Author adopted from [1] World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector, Page 22; [2] Chilangwa W. (2018). The Management of Capital Structure and Profitability. Retrieved from https://www.academia.edu/43979618/Capital_Structure_and_Profitability_warren_Chilangwa_Zambia [April 2023]; PMRC (2020) Climate Smart Agriculture Strategies for Zambia – Analysis of Policies and Programmes. Retrieved from <https://pmrczambia.com/wp-content/uploads/2020/04/Climate-Smart-Agriculture-Strategies-for-Zambia-Analysis-of-Policies-and-Programmes.pdf> [April 2023]

¹⁰ Plant basins and ripping are tilling methods used instead of ploughing and harrowing as a way to conserve soil cover

¹¹ World Bank. (2019). Zambia Climate-Smart Agriculture Investment Plan: Analyses to Support the Climate-Smart Development of Zambia's Agriculture Sector

Table 1. Financing need for conservation agriculture.

Adaptation measure: Conservation agriculture	Market Share, % of SHF who would need to convert to CA	Total Market Size (no. of SHF)	Share of financing	Unit cost, in US\$, p.a.	Investment potential, in US\$ p.a.
60% of SHF practicing CA	51.7%	3,600,000	100%	10.82	19.9 million
100% of SHF practicing CA	91.7%	3,600,000	100%	10.82	35.7 million

to 8.3% of smallholder farmers¹²), covering an estimated 330,000 hectares of land. This indicates that there has been some progress in promoting and scaling up conservation agriculture practices in Zambia¹³ but even more must be achieved in the future. However, it is important to note that the adoption of conservation agriculture practices can vary depending on various factors such as availability of resources, awareness, and access to technical support as illustrated in the varying percentages of smallholder farmers practising different conservation agriculture approaches.

Key literature that was used to derive the unit cost of conservation agriculture is FAO & UNDP (2020). The unit cost was estimated from 268,137 farmers directly benefitting from the Conservation Agriculture Scaling-up Project (CASU) project across all of Zambia's Agro Ecological Regions during the 5-years of project implementation. The costs for conservation agriculture, that includes electronic voucher investments costs, operating farm input costs and labour (hired and family) costs were estimated at US\$ 14,511,974.59 for the 268,137 farmers, resulting in annualised unit costs of US\$10.82.¹⁴

Thus, given this annualised unit cost and the 91.7% of farmers who are not yet practising conservation agriculture in Zambia, **the estimated annualised investment potential (herein referred to as financing need) is approximately US\$ 35.7 million per year to realize that all smallholder farmers (SHF) in Zambia are practicing CA¹⁵.** If the aim would be to have 60% of SHF practicing conservation agriculture (resulting in 51.7% of farmers who still need to convert their practices to CA), the financing need is approximately US\$ 19.9 million per year. The results are presented in table 1.

Focusing on water availability, proxied by irrigation, Zambia currently has only about 10% of economically irrigable land,

translating to about 155,000 hectares. This irrigable land uses existing dams. The low percentage is mainly attributed to lack of investments in water storage and distribution infrastructure.¹⁶ According to Lou (2008), Zambia's investment need¹⁷ for small-scale and large-scale irrigation is estimated at **US\$ 267 million for a possible 308,000 hectares of irrigable land** out of a potential 523,000 hectares of economically viable irrigable land.¹⁸ **This is estimated at a 0.1% annualised share of Zambia's GDP.¹⁹**

Provision of seasonal weather forecasts to inform climate adaptation

The unit cost of climate information services (CIS) in sub-Saharan Africa (SSA) can vary depending on several factors, such as the type of service, the technology used to deliver it, the target audience, and the geographic location. In general, the cost of providing CIS can be high due to the need for sophisticated technology and expert personnel to collect, process, and disseminate accurate and reliable information. However, the exact cost can vary widely based on the specific service being provided. For instance, a basic weather forecast service may cost less than an agricultural advisory service that provides tailored information on crop selection, planting, and harvesting based on climate patterns. Furthermore, there are insufficient monitoring systems of hydrometeorological variables influencing agricultural production in Zambia limiting the delivery of EWS and relating CIS.²⁰

According to a report by the CGIAR Research Programme on Climate Change, Agriculture, and Food Security (CCAFS), the cost of providing CIS in SSA can range from US\$ 0.50 to US\$ 20 per farmer per year, depending on the geography, service and the delivery mechanism.²¹ Cost of providing CIS includes fixed costs such as software design and development, training and office equipment including servers, and variable costs such as CIS

12 Total number of smallholder farmers in Zambia are about 3.6million | Data obtained from the Ministry of Agriculture

13 FAO. (2019). The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction. Rome.

14 FAO & UNDP (2020) Conservation agriculture for climate change adaptation in Zambia: A cost-benefit analysis. Rome, FAO.

15 Annualised estimation is based on a 5-year period

16 Scheumann, W., Houdret, A., and Brüntrup, M. (2017). Unlocking the Irrigation Potential in Sub-Saharan Africa: Are Public Private Partnerships the Way Forward? Retrieved from https://www.idos-research.de/uploads/media/BP_7.2017.pdf [April 2023].

17 assumptions underlying this include a 12% discount rate, on-farm investment costs of US\$ 600 per hectare, and operations and annual maintenance costs of US\$ 25 per hectare (See You, 2008)

18 Irrigable land in Zambia is approximated to be 2.75 million hectares with 19% (523,000 hectares) considered economically viable. See Government of the Republic of Zambia (GRZ) (2013). National Agriculture Investment Plan 2014–2018. Lusaka, Zambia: Ministry of Agriculture and Livestock, Government of the Republic of Zambia

19 You, L.Z. (2008). Irrigation Investment Needs in Sub-Saharan Africa. Part of Africa Infrastructure Country Diagnostic (AICD). World Bank

20 Kokwe, M., Chama, T., Pali, P., Ramasamy, S. (2022) Establishment of multi-stakeholder and functional interdisciplinary technical network for sustainable access to weather and climate information services by agricultural users in Zambia. Rome, FAO. <https://doi.org/10.4060/cb9135en>

21 Timu A. G., & Kramer, B. (2022). A new methodology for estimating costs and benefits of Climate Information Services (CIS) among smallholder farmers. Accelerating Impacts of CGIAR Climate Research in Africa (AICCRA). Retrieved from <https://cgspage.cgiar.org/bitstream/handle/10568/119814/CIS%20Cost%20and%20Benefits%20Analysis.pdf?sequence=1&isAllowed=y> [April 2023].

training, CIS data processing and analysis, CIS data packaging and communication, and overhead costs. However, it should be noted that CIS is usually provided as bundle of information and advisories making it difficult to distinct costs. Thus, a lump sum cost is used to estimate CIS provision.²² Overall, while the cost of CIS can be significant, the benefits of providing such services in terms of increased productivity, resilience, and improved livelihoods for farmers and communities can far outweigh the costs, as illustrated in the demand of CIS in West Africa (see Ouedraogo et al (2022)).²³ It is further estimated that over 170,000 farmers in 16 districts across five provinces have had access to climate information since 2019 under the Strengthening climate resilience of agricultural livelihoods in Agro-Ecological

Regions I and II in Zambia (SCARLA) project. This number has been used as a proxy of the farmers currently accessing CIS, 10.6% of smallholder farmers in Zambia.

Thus, given this cost range and the 89.4% of farmers without access to CIS, **the financing need has been estimated to be between US\$ 719,000 to US\$ 29 million per year;** results are presented in table 2.

Within the AGRICA climate risk analysis, stakeholders identified the e-PICSA approach²⁴ as a suitable adaptation measure that can combine both conservation agriculture and the use of CIS to strengthen EWS. The e-PICSA approach is explained in detail in **Box 7**.

Table 2. Financing need for provision of seasonal weather forecasts to inform climate adaptation.

Adaptation measure: Use of CIS in Zambia	Market Share, % of smallholder farming households	Total Market Size (no. of smallholder farming households)	Share of financing	Unit cost, in US\$, p.a.	Investment potential, in US\$ p.a.
Lower estimate of CIS	89.4%	1,608,896	100%	0.50	719,000
Upper estimate of CIS				20	29 million

Box 7. Summary of the e-PICSA approach proposed for Zambia to scale up conservation agriculture and use of CIS

The electronic Participatory Integrated Climate Services for Agriculture (e-PICSA) is an extension of the PICSA approach, which is a participatory approach to help smallholder farmers in developing countries make climate-informed decisions. The e-PICSA approach uses digital tools and platforms to facilitate the delivery and use of climate information services by smallholder farmers. It involves working with farmers and agricultural extension workers to co-develop and co-deliver climate information services that are tailored to their needs and local context. This approach combines participatory approaches with digital tools, such as mobile phone applications and web-based platforms, to enhance the accessibility and usability of climate information by smallholder farmers. Furthermore, the approach empowers smallholder farmers by providing them with the knowledge and tools necessary to make informed decisions about their agricultural practices in the face of climate variability and change. It also supports the scaling up of climate information services to reach more farmers and improve their adaptive capacity to climate risks.

In Zambia, e-PICSA approach has been proposed to deliver both adaptation measures, conservation agriculture and use of CIS to strengthen EWS. The conducted cost-benefit analysis (CBA) reveals the approach to be economically beneficial after one year with increasing returns in the future under Shared Socioeconomic Pathways (SSP) 1²⁵ - Representative Concentration Pathways (RCP) 2.6²⁶ and SSP3²⁷-RCP7.0²⁸ climate change scenarios.

	Adaptation under SSP 1 - RCP 2.6	Adaptation under SSP 3 - RCP 7.0
IRR	115%	114%
NPV	19 786 ZMW	18 402 ZMW
BCR	3.83	3.64

Disclaimer: In a previous version of the study the IRR, NPV, and BCR were slightly different and have now been adjusted to align with the final results of the analysis.

Source: CBA of e-PICSA approach conducted for the AGRICA climate risk analysis in Zambia

22 List, G., Kramer, B., Timu, A.G., Zebiak, S.E. and Rose, A. (2022). AICCRA Info Note: Costs of Climate Information Services Development and Implementation. Accelerating Impacts of CGIAR Climate Research in Africa (AICCRA). Retrieved from <https://cgispace.cgiar.org/bitstream/handle/10568/119814/CIS%20Cost%20and%20Benefits%20Analysis.pdf?sequence=1&isAllowed=y> [May 2023].

23 Ouedraogo, A.; Egyir, I.S.; Ouedraogo, M.; Jatoo, J.B.D. (2022) Farmers' Demand for Climate Information Services: A Systematic Review. Sustainability 2022, 14, 9025. <https://doi.org/10.3390/su14159025>

24 AGRICA PICSA Factsheet and <https://research.reading.ac.uk/picsa/>

25 This pathway envisions "a relatively optimistic trends for human development, with "substantial investments in education and health, rapid economic growth, and well-functioning institutions".

26 keeping global mean temperature increase below 2°C

27 This pathway is "more pessimistic in their future economic and social development, with little investment in education or health in poorer countries coupled with a fast-growing population and increasing inequalities".

28 represents the medium-to-high end of the range of future emissions and warming and is a baseline outcome rather than a mitigation target.

2.2. Financing options for the identified adaptation measures

2.2.1. Conservation agriculture, including water availability

Besides the traditional barriers to lending for agriculture (insufficient enabling environments, lack of capacity to manage risk exposure, high transaction costs), the integration of adaptation and risk reduction into the agriculture space faces additional barriers. These include:

- difficulty in demonstrating short-term “quick wins”,
- limited capacity to assess what is needed to finance adaptation,
- the fragmentation of adaptation finance sources,
- broken links between financiers and farmers; and
- lack of capacity and readiness at the country level.^{29, 30}

Even as both climate-aware agricultural practices, such as CA, and climate finance have increased, it is still the case that financial services (e.g. lending, short-term for working capital loans and longer-term for investment capital loans; equity capital; leasing; mobilization of savings and deposits; and financial intermediation, such as mobile financial services, transfers, payments, and insurance) focus on greater scale/corporate actors, while smallholder farmers are left behind. To address some of these barriers, the World Bank proposes innovative ways to attract additional capital to CSA³¹:

a. **Public-Private Partnerships³² (PPPs)** tend to have a multiplier effect by leveraging diverse types of expertise, skills, resources (technical and financial), and networks. Partners in PPPs may be public donors, international and non-governmental organisations (NGOs); foundations; research institutions; UN organisations; development finance institutions (DFIs); International FIs; private companies; and impact or institutional investors.

b. **Well-designed layered capital structures (a mix of financial securities used to finance activities)** are often essential for leveraging additional capital while meeting the different expectations of each potential investor. These can increase the amount of capital available but also diversify risk and investment returns and add flexibility to the terms (maturity) and uses of the capital. A good understanding of what potential investors are looking for, and alignment of interest and incentives in the use of funds, helps ensure a successful layered capital structure (See **Box 8**).

c. **Bundling financial instruments** with technical assistance can be an effective way to utilise adaptation finance. Furthermore, bundling several instruments at a time may prove critical to providing more comprehensive solutions to financiers and private actors while also increasing the efficacy and efficiency of the resources allocated to each intervention.

In the context of Zambia, all the CA financing practices seem relevant. Concerning the innovative ways to attract capital, it is important to keep in mind that unnecessarily complex structures increase transaction costs, which can become prohibitive, especially in developing countries like Zambia. The more participants and the more complexity, the higher the costs, and therefore the higher the minimum-scale threshold for a particular financial instrument to be feasible.

Box 8. Examples of layered capital structures

Sources of capital	General structure	Ex. of structure 1	Ex. of structure 2	
Private investors	Debt: Senior and subordinated	Notes	Senior notes	
DFIs, IFIs	Hybrid financing e.g., convertible debt or equity	Senior shares	Subordinated loans	Subordinated notes
DFIs, IFIs	Preferred equity	Mezzanine shares	Senior shares	
Donors	Common equity	Junior shares	Junior shares	

Carries lowest risk, highest priority on repayment
Lowest return
Strict recovery rules

Carries highest risk, lowest priority on repayment
Preferred return
Expectation of growth

Source: Adapted from World Bank, Discussion Paper. Making Climate Finance Work in Agriculture. Page 17.

29 World Bank, Discussion Paper. Making Climate Finance Work in Agriculture. <https://documents1.worldbank.org/curated/en/986961467721999165/pdf/ACS19080-REVISED-0UO-9-Making-Climate-Finance-Work-in-Agriculture-Final-Version.pdf>

30 CPI and IFAD, 2020 https://www.ifad.org/documents/38714170/42157470/climate-finance-gap_smallscale_agr.pdf/34b2e25b-7572-b31d-6d0c-d5ea5ea8f96f

31 World Bank, Discussion Paper. Making Climate Finance Work in Agriculture. Page 17. Retrieved from <https://documents1.worldbank.org/curated/en/986961467721999165/pdf/ACS19080-REVISED-0UO-9-Making-Climate-Finance-Work-in-Agriculture-Final-Version.pdf> [April 2023]

32 Defined as a long-term arrangement between government and private sector institutions where private capital is used to finance government projects and services up-front, and then drawing revenues from taxpayers and/or users of the service over the course of the PPP contract

2.2.2. Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation

Financial investment flows to EWS projects are also low – data from 138 World Meteorological Organization (WMO) members highlight that only 40% of them have a people-centred multi-hazard EWS (MHEWS)³³. Even in countries with MHEWS, warning dissemination and communications is poor and communication technology advancements are not being fully used to reach out to people at risk. Africa faces the largest gaps in this regard – only 44,000 people in every 100,000 people in Africa are covered by early warnings. Also, despite all weather, hydrological and climate services relying on data from systematic observations, these observing networks are often inadequate – data from 2019 in Africa noted that only 26% of meteorological stations reported according to WMO requirements.³⁴

Adaptation finance for disaster risk management (DRM) interventions, which include early warning and rapid response systems, has been on an upward trend, from US\$ 1.9 billion

in 2013-2014 and US\$ 2.9 billion in 2015-2016 to US\$ 6.6 billion on-year average in 2020³⁵. However, EWS tracking, and enhancement is not sufficient and requires one to investigate individual projects to estimate the total investments made in EWS, rather than the accumulated total of DRM interventions. Thus, despite the significant investments around EWS related DRM interventions, there is still scarce available information on hydro-met finance flows, and socio-economic benefits from early warnings.

In the context of Zambia, strengthening the EWS system, including dissemination of climate information, is highly relevant and offers significant socio-economic benefits. Currently, Zambia has not reported having an MHEWS³⁶ but there exists National Meteorological (ZMD) and Hydrological (WARMA) Services³⁷. Investments in MHEWS are expensive and require high upfront costs, which may not be favourable for governments despite the long-term benefits it can offer – according to a GCA 2019 report, spending US\$800 million on such systems in developing countries would avoid losses of up to US\$16 billion per year³⁸. Thus, there is a need to look for innovative ways to attract financing for MHEWS which is difficult to estimate as most projects around EWS have been either UN-led and/or donor funded through the financing initiatives laid out in **Box 9**.

Box 9. Financing initiatives on early warning systems

- **The Systematic Observations Financing Facility (SOFF)** is a UN Multi-Partner Trust Fund, providing long term, technical and financial support to the countries with the largest capacity gaps in order to close their Global Basic Observing Network (GBON) data gap, with a focus on least developed countries (LDCs) and small island developing states (SIDS). The new mechanism (yet to be operationalised) contributes to achieving the adaptation and systematic observation goals of the Paris Agreement through the improved climate and weather observations essential for effective climate services and early warnings.³⁹
- **The Climate Risk and Early Warning Systems (CREWS)** is an initiative established in 2015 to protect lives, assets, and livelihoods of people living in the LDCs and SIDS by increasing the access to early warnings on adverse weather conditions and risk information. CREWS is implemented with support of WMO, UNDRR, and the World Bank/Global Facility for Disaster Reduction and Recovery (GFDRR).⁴⁰
- **UNDP's Signature Programme "Strengthening Climate Information and Early Warning Systems (SCIEWS)** for

Climate Resilient Development and Adaptation to climate change" is a comprehensive programme operating across Africa, Asia and the Pacific. Its main objective is to "deliver accessible, credible, appropriate and actionable weather and climate information, at time and space scales that can be used for decision making in project-relevant sectors and areas". Since 2008, the project has delivered 69 projects across 46 countries of which 28 are LDCs and 8 are SIDS.⁴¹

- **UNEP's CLIM-WARN project** seeks to identify ways to improve communication of early warning information to the vulnerable population as well as ensuring an action is made on the warnings. The project is working in three case study countries: Burkina Faso, Ghana, and Kenya, with funding from BMZ and partnership with country organisations – Kenya (National Drought Management Authority & World Vision); Ghana (University of Ghana & National Disaster Management Authority) and Burkina Faso (SP/CONASUR).⁴²

Out of all the listed financing initiatives for EWS, Zambia received financing from UNDP's Signature Programme.

33 WMO (2020) 2020 State of Climate Services: Risk Information and Early Warning Systems. Geneva, Switzerland

34 Ibid

35 Ibid

36 UNDRR and WMO (2022) Global status of multi-hazard early warning systems: Target G. United Nations Office for Disaster Risk Reduction

37 It is important to note that ZMD does not use probabilistic scenarios from prediction systems of regional or global centres, such as European Center for Medium-Range Weather Forecasts (ECMWF) and National Oceanic and Atmospheric Administration (NOAA). Also, Zambia uses their own Water Research and Forecasting (WRF) model.

38 <https://gca.org/reports/adapt-now-a-global-call-for-leadership-on-climate-resilience/>

39 <https://alliancehydromet.org/soff>

40 <https://www.crews-initiative.org/en>

41 <https://www.undp.org/sites/g/files/zskgke326/files/publications/UNDP-Issues-Brief-Climate-Information-and-Early-Warning-Systems-EN.pdf>

42 https://www.adaptation-undp.org/sites/default/files/downloads/unep_zinta_zommers_nina_raasakka.pdf

2.3. Mapping potential adaptation financing options

2.3.1. Scoring the most suitable financing options for the context of Zambia

The guiding question in the scoring of financing options is: **What financial solution(s) can be feasibly/effectively deployed to finance the adaptation measures identified within the CRA?**

We first list as many options as we believe could potentially be relevant for the context, then score these based on agreed upon criteria.

In the context of this project, “financing options” are understood as monetary contracts between parties, which can be created, traded, modified, and settled. Our understanding of financing options also entails ownership interest in an entity or a contractual right to receive or deliver (currency; debt; equity; derivatives), but also results-based contracts, as well as financial facilities (such as lending vehicles). Notably, for the purpose of this work, Blended Finance (BF) and Public-Private Partnerships (PPPs) are ways of funding more than financing options *per se*. This is to say that many of the options listed can in fact be financed by blending concessional and non-concessional debt or equity capital (BF),

and/or can be designed and used by a combination of public and private actors through PPPs. Since there is a potential for the financial solution that is ultimately selected, to be funded by either BF or PPPs, they are not hereby considered as separate options.

Listing of financing options for adaptation

As mentioned above, we listed all the options we believed could potentially be relevant for addressing the proposed adaptation measures for the agriculture sector in Zambia: (i) Conservation agriculture, including water availability; and (ii) Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation. We divided such options in three different groups, according to our proposed taxonomy. Table 3 summarises the taxonomy and the options that were initially considered.

Criteria and scoring methodology of the financing options

From the initial pool (Table 3), we then scored the different financial instruments assigning a score spanning from 1 to 4 according to the following criteria and weights:

For each of these criteria, a score of “1” was given if the answer to the question is “most probably not”, and “4”, if the answer is “very much so”.

Table 3. Initial list and taxonomy of financing options mapped

Taxonomy	Description	Options considered
Funding/ Investment	These are essentially institutions offering financing via different facilities that themselves, or the services they provide, will constitute a financial liability for the entity receiving funding, or an investment/ financial asset from the perspective. This comprises debt and equity.	<ul style="list-style-type: none"> Climate Fund or National Financing Vehicles (NFVs) Green Banks Labelled bonds (e.g., Green, Social and Sustainable Bonds / Sustainability-Linked Bonds (SLB Bonds) / Blue Bonds) West African Initiative for Climate-Smart Agriculture (WAICSA)* GROVE - Forestry Smart Ledger (FSL)* Sustainable Agriculture Finance Facility* Terra Fund (previously known as Rural Prosperity Bond (RPB))*
Results-based financing and/or payment mechanisms	Programmes, instruments, or interventions that provide rewards to individuals or institutions after agreed-upon results are achieved and verified. It holds out the promise of tackling spending inefficiencies and making more effective use of education resources.	<ul style="list-style-type: none"> Systematic Observations Financing Facility (SOFF) Climate Risk and Early Warning Systems Initiative (CREWS) Impact Bonds (social and/or development) Climate Adaptation Notes* Adaptation Benefit Mechanism (ABM) Sale of Carbon Credits Monetizing Water Savings (MWS)* TerraFund (previously known as Rural Propensity Bond (RPB)*) Africa Rural Climate Adaptation Finance Mechanism (ARCAFIM)
Other financing options	Any other instrument identified that not closely matches the former two groups.	<ul style="list-style-type: none"> Any other instrument identified that not closely matches the former two groups.

Note: Options marked with an asterisk (*) are ideas that were identified in the Climate Finance Lab. These include structures that are already fully developed in some regions or that might be in the piloting stage but were potentially relevant for the case of Zambia.

Table 4. Criteria and scoring approach

Criteria		Description	Weight (%)
Feasibility & actionability	Operational	<ul style="list-style-type: none"> Are similar financing structures in place in Zambia? Would the financing option mobilise finance without requiring the construction of new financial infrastructure? 	20%
	Legal	<ul style="list-style-type: none"> Is there any existing regulation supporting the deployment of the financing option? Are guidelines/draft laws in place to support the financing option? 	20%
	Political	<ul style="list-style-type: none"> Is there a possibility of a high buy-in for the financial option? What is the influence level of the opposition? 	20%
Impact & Additionality		<ul style="list-style-type: none"> Can the deployment of this solution significantly contribute to: <ul style="list-style-type: none"> increasing the implementation of adaptation measures / achieving resilience additionality / mobilization of additional funds 	20%
Cost		<ul style="list-style-type: none"> Is the upfront and/or opportunity cost associated with the financing option low? Are there existing mechanisms that can absorb the cost? 	20%

Source: Author

2.3.2. Selected financing options

After a process of scoring and shortlisting based on desktop analysis, and a validation workshop with Zambia ministries and institutions⁴³ in multiple domains, the following selected financing options were prioritisation:

For Conservation agriculture, including water availability.

- National Climate Fund or National Financing Vehicles (NFVs)
- TerraFund
- Sale of Carbon Credits

For Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation

- National Climate Fund or National Financing Vehicles (NFVs)
- Climate Risk and Early Warning Systems Initiative (CREWS)

Table 5 maps the shortlisted financing options by the sources and recipients of financing (noting that, in some cases, there may be multiple options for either the source and/or the recipient).

Table 5. Matrix of shortlisted financing options by sources and recipients of financing

Shortlisted financing options		Climate Fund or National Financing Vehicles (NFVs)	Terra Fund	Sale of Carbon Credits	Climate Risk and Early Warning Systems Initiative (CREWS)
Level of entity providing financing	International/global	✓	✓	✓	✓
	International/regional	✓	✓	✓	
	International/bilateral	✓		✓	
	Domestic/Sovereign	✓		✓	✓
	Domestic/Sub-sovereign		✓		
	Domestic/microlevel				
Level of entity receiving financing	International (regional)				✓
	Domestic (sovereign)	✓		✓	✓
	Domestic (sub-sovereign)	✓		✓	
	Domestic (microlevel)		✓	✓	

Source: Author based on taxonomy and identified financing options

43 Annex 1 showcases the database with stakeholder contributions during the validation workshop on 07 February 2023 at Taj Pamodzi Hotel, Lusaka, Zambia.

3 Recommendations on the selected financing options



3.1. National Climate Fund or National Financing Vehicles (NFVs)

Taxonomy: Funding/Investment (financial facility via an institution)

Level of entity providing finance	Level of entity receiving finance	Existing in Zambia
International/Regional/Domestic Donors, DFIs, Long term investors, governments	Domestic: Government MDA	Mature process of institutionalising a NFV

Definition

A financial facility providing finance, from both international and domestic sources, in the form of grants, concessional loans, equity investment, etc. to initiatives that aim to strive towards mitigation and/or adaptation activities.

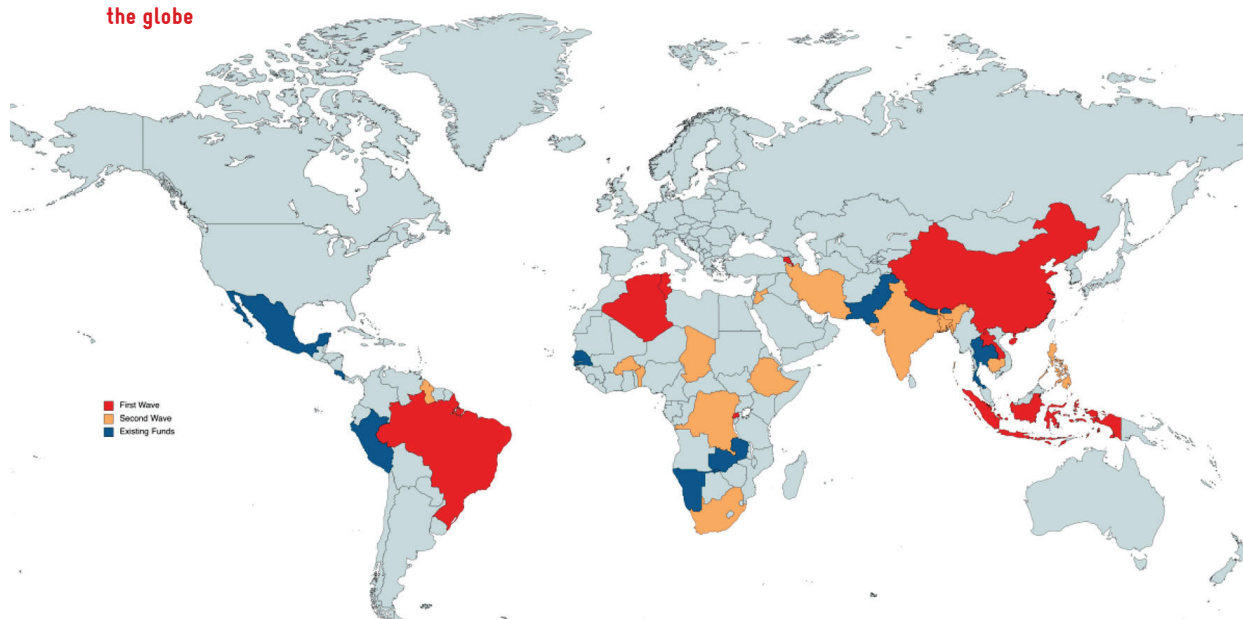
Structure

The National Climate Fund or NFV process is largely demand-driven, with strong political support required from the national government. NFVs have the effect of creating (a) stronger alignment with national priorities, (b) reduced barriers to access climate finance for smaller organisations that do not have the capacity to access international climate finance directly, (c) the

rapid deployment of climate funds into projects in sectors of strategic national importance, and (d) an expanded capital base for scale-up following the initial phase of NFV.

According to a study on National Climate Funds by Bhandary (2022)⁴⁴ almost half of all national climate funds have an independent legal personality with financial and administrative autonomy. These funds can be distinguished between those that have clearly specified scopes that anchor them into national policies e.g., Ethiopia's Climate Resilient Green Economy (CRGE) Facility developed as part of the CRGE strategy in 2011; as opposed to those with bounded mandates, e.g., South Africa's Green Fund that explicitly focuses on demonstrating new climate technologies. On engagement with the private sector, the fund's objectives, risk tolerance level of its contributing parties, and its legal form define the extent to which it engages with the private sector.

Box 10. Distribution of national climate funds across the globe



Source: Bhandary, R.R. (2022) National climate funds: a new dataset on national financing vehicles for climate change. *Climate Policy*, 22 (3), 401–410, DOI: 10.1080/14693062.2022.2027223

Note: In the map, Zambia is shown to have an existing national climate fund. This fund is the Zambia Rural Electrification Fund established in 2003 under the Rural Electrification Act 2003.

⁴⁴ Bhandary, R.R. (2022) National climate funds: a new dataset on national financing vehicles for climate change. *Climate Policy*, 22 (3), 401–410, DOI: 10.1080/14693062.2022.2027223

Relevant examples in Africa and Zambia Context

Annex 2 summarises relevant examples of National Climate Funds or National Financing Vehicles in Africa, with a rough description of the funds. **An overall assessment of the financial instrument finds that the key success factor is in having an independent legal personality of the Fund with financial and administrative autonomy.** Other climate funds and/or national financing vehicles are not mentioned here as their scope is largely mitigation (e.g., Algeria's Renewable Energy National Fund, Democratic Republic of Congo (DRC)'s National REDD+ Fund (FONAREDD), Namibia's Revolving Solar Fund, and the **Zambia Rural Electrification Fund**).

In the context of Zambia, the country is developing a robust national climate financing vehicle (NFCV) to support the process of institutionalising a climate resilient economy. Zambia's NFCV will be operated as a climate fund and would play a catalytic role to both public and private sectors in structuring innovative climate financing mechanisms. Furthermore, the facility can unlock a wide range of financing from public and private as well as domestic and international sources. Zambia has recently facilitated the accreditation of its second bank with the Green Climate Fund (GCF) – Development Bank of Zambia (DBZ) in 2021⁴⁵ and Zambia National Commercial Bank Plc (ZANACO) in 2022⁴⁶ and is also developing a policy and legislative review process to align with the new national strategic direction under the Eighth National Development Plan (8NDP). Zambia Industrial Commercial Bank (ZICB) is undergoing accreditation review process with the Adaptation Fund (AF).

Sources of finance and actors

The main source of financing of climate funds or NFCVs are part of the country's development budgets from government (national budgets, carbon tax revenue, pollution tax); DFIs, multilateral funds, and private capital. Relevant stakeholders in the development of climate funds or NFCVs include government (and/or sub-national governments); sectoral ministries; donors; financial institutions (some); and/or an independent entity for governance arrangements.

Potential applications in Zambia

One of the key characteristics of NFCVs is that they can be a powerful instrument to crowd in climate finance from a variety of sources – multilaterals, bilateral, capital markets, private sector as well as domestic budgets. As mentioned earlier, Zambia is currently setting up a NFCV to institute a climate resilient economy and has three DFIs who have accreditation (or are getting ready for accreditation) to access financing from multilateral climate funds. Furthermore, Zambia's Ministry of Finance and National Planning (MoFNP) is seeking accreditation as a national implementing entity (NIE) to the Adaptation Fund (AF) and already is an accredited entity to the GCF (previously accredited as the Ministry of National Development Planning). This implies that MoFNP has the needed fiduciary standards – accurate and regular recording of transaction and balances, efficient management, and disbursement of funds according to safeguards and in a timely manner, forward looking plans and budgets, and legal status to contract with the AF, GCF and third parties making it relatively easier to access climate finance.⁴⁷

Furthermore, if a NFCV has budgetary and administrative autonomy, it has an advantage of not being classed as an extra-budgetary agency while retaining a degree of independence in its own operations and procedures. Also, a NFCV being the sole agency holding the mandate for implementation of national climate strategies and action plans is advantageous. This ensures the NFCV is accountable and effective in leading the charge of mainstreaming CC thus positioning itself more attractive to receive funding from various sources.

⁴⁵ <https://www.greenclimate.fund/ae/dbz>

⁴⁶ <https://www.greenclimate.fund/news/gcf-portfolio-reaches-usd-113-billion-new-climate-projects-approved-gcf-board>

⁴⁷ See more at: <https://www.adaptation-fund.org/page/accreditation-process> and <https://www.greenclimate.fund/countries/zambia>

Table 6. Potential applications of NFVs in Zambia

Risk Reduction Measure	Conservation agriculture	Strengthening early warning systems
Potential application	<ul style="list-style-type: none"> De-risk private sector adaptation finance investments. Mobilise private investment and direct funding to CA needs through a wide range of financial instruments such as debt, equity, guarantees etc. Use of a social enterprise model in financing CA in partnership with local organisations and private insurance companies as a way of reducing risk in the agriculture sector 	<ul style="list-style-type: none"> Loan products, for example to subnational government agencies, etc. with drawdown options which can be used to strengthen institutional frameworks and mainstream disaster risk management in the country. Financing the establishment of a MHEWS through Zambia's ZMD and WARMA. Providing finance for the implementation of the e-PICSA approach
Potential capitalisation and Funders – multilaterals climate finance initiatives⁴⁸ targeting Zambia, Africa	<p>Zambia has already benefited from the following multilateral climate finance initiatives:</p> <ul style="list-style-type: none"> IFAD's Adaptation for Smallholder Agriculture Programme (ASAP) (Ministry of Finance and National Planning (MoFNP)) Adaptation Fund (ZICB, MoFNP) Global Environment Facility (GEF), including Least Developed Countries Fund (LDCF) (Ministry of Water Development, Sanitation and Environmental Protection)⁴⁹ Green Climate Fund (GCF)⁵⁰ (DBZ, ZANACO) Pilot Programme for Climate Resilience (PPCR)⁵¹ (MoFNP) <p>African countries, excluding Zambia, have benefited from the following bilateral climate finance initiatives:</p> <ul style="list-style-type: none"> Global Environment Facility (GEF), including Special Climate Change Fund (SCCF)⁵² Global Climate Partnership Fund (GCPF) funded by Germany, the United Kingdom and Denmark Global Climate Change Alliance (GCCA) 	
Potential Partners⁵³ (different potential roles)	<ul style="list-style-type: none"> GIZ, through the project "Promotion of Agricultural Finance for Agri-based Enterprises in Rural Areas". This project, and in collaboration with <u>Community Markets for Conservation (COMACO)</u> and <u>AB Bank Zambia</u>, seeks to enable farmers receiving lower interest rates on loans taken for conservation practices such as protecting their soils, forests and even wildlife. <u>African Financial Alliance on Climate Change</u> – can help to catalyse private capital for low carbon and climate resilient development by promoting climate action through knowledge sharing, climate risk-mitigating financial instruments, climate risk disclosure, and climate finance flows. <u>Commonwealth Climate Finance Access Hub (CCFAH)</u> – helps commonwealth countries, including Zambia, unlock climate finance by "supporting the development of grant proposals and project pipelines; building human and institutional capacity; providing technical advisory services; and facilitating cross-Commonwealth cooperation and sharing of experiences and expertise by Commonwealth National Climate Finance Advisers who are deployed and embedded in relevant government ministry departments" <u>Development Bank of Zambia (DBZ)</u>, <u>Zambia National Commercial Bank (ZANACO)</u> – accredited entities to AF and GCF who can act as climate policy coordinators by providing expertise and channelling market information/feedbacks to the policymaking process and coherent and holistic array of financial services to national climate funds anchored in Zambia's climate policy and regulation⁵⁴ <u>Kukula Capital</u> has recently established a ZMW 1 billion Green Outcomes Fund in collaboration with ZANACO and WWF to invest in scalable small and medium sized businesses. Target areas include climate resilient agriculture. Kukula Capital can play a similar role as DBZ and ZANACO. Other existing climate-related funds in Zambia: Zambia Rural Electrification Fund, proposed funds such as Water Fund, Forestry Fund, whose climate-related funds can be collated and anchored to the national climate fund, thus opening several streams of climate finance. 	

Source: Author based on linked sources

48 Approx. 20% of national climate funds have received funding from the GCF, AF, etc – <https://doi.org/10.1080/14693062.2022.2027223>

49 <https://www.thegef.org/projects-operations/country-profiles/zambia>

50 <https://www.greenclimate.fund/countries/zambia>

51 <https://projects.worldbank.org/en/projects-operations/project-detail/P127254>

52 <https://www.thegef.org/projects-operations/country-profiles/zambia>

53 These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

54 <https://doi.org/10.1080/14693062.2022.2038063>

3.2. Terra Fund

Taxonomy: Funding/Investment (financial facility via an institution)

Level of entity providing finance	Level of entity receiving finance	Existing in Zambia
International/Regional/Domestic investors; Capital markets	Domestic: Small medium enterprises (SMEs)	Yes

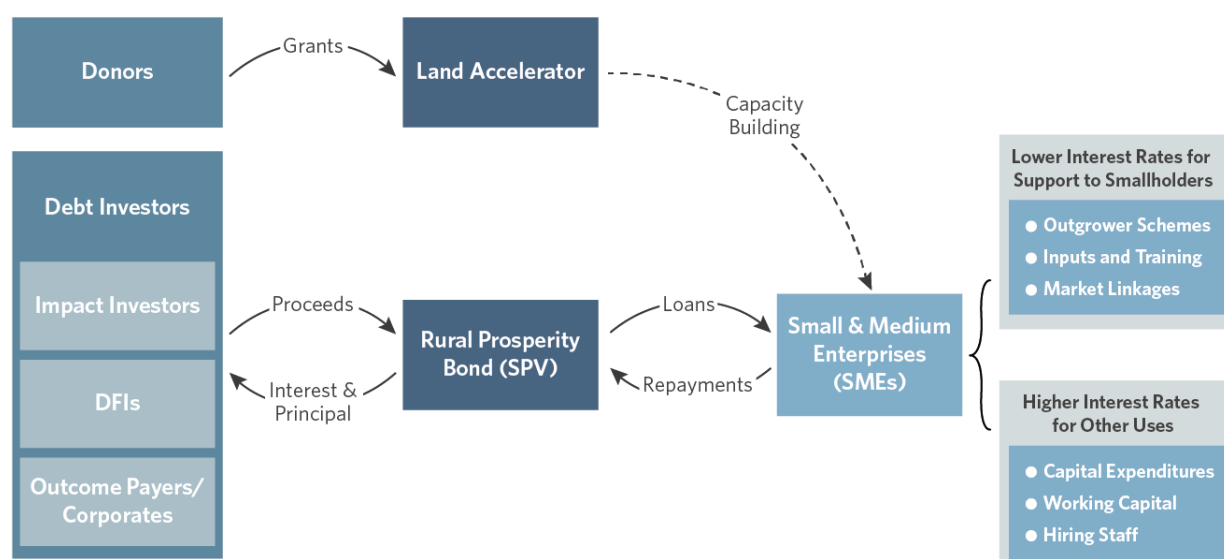
Definition

TerraFund is an innovative climate finance instrument developed under the Global Innovation Lab for Climate Finance (the Lab) to provide loans to SMEs working in land restoration in Africa, South Asia, and Latin America. TerraFund benefits from a partnership with the World Resources Institute's (WRI) Land Accelerator programme that provides tailored capacity building to land restoration enterprises. The SMEs participating in this programme are eligible to apply for credit from the TerraFund at discounted interest rates to incentivize the SMEs to boost their social and environmental impact by working closely with smallholders. Thus, TerraFund combines an accelerator programme with credit and tailored capacity building to land restoration SMEs that are too small for commercial banks and too large for microfinance.⁵⁵

Structure

The TerraFund is a special purpose vehicle (SPV) that will raise funds through debt issuance (either as a loan or a bond⁵⁶). SMEs graduating from the accelerator programme will be eligible to apply for credit from the TerraFund, with interest rates that are tied to the use of proceeds and farmer engagement. For example, if a SME dedicates 50% of a loan to provide inputs to smallholder farmers, purchase products through offtake agreements they are eligible for a 2% discount in the loan interest rate. Furthermore, smallholder farmers accessing these inputs are encouraged to adopt climate-smart agricultural practices and preserve natural ecosystems. The use of funds is assessed at the application stage with periodic reviews to track the spending.

Box 11. Structure of a TerraFund



Source: https://www.climatepolicyinitiative.org/wp-content/uploads/2020/09/Rural_Prosperty_Bond_Instrument_Overview.pdf

⁵⁵ https://www.climatepolicyinitiative.org/wp-content/uploads/2020/09/Rural_Prosperty_Bond_Instrument_Overview.pdf

⁵⁶ Bond is used in reference to social impact bonds, to deliver better social outcomes.

Currently, TerraFund is at initial capitalisation and has so far funded 100 small-scale and locally led land restoration enterprises and non-profits across Africa. After this initial capitalisation (at the commercial stage), TerraFund will be capitalised by debt investors: senior debt (80% of the capital) and first loss tranche (20% of the capital). The senior debt features lower risk and has a higher priority in capital and interest repayment, focusing on private impact investors and DFIs. The first loss tranche will carry a higher risk as it absorbs initial losses acting as a risk buffer for the senior debt, focusing on public sources and donors. The loan repaid by the SMEs are aggregated back to the TerraFund to repay investors for their capital outlay, including a stated return.

Relevant examples in Africa and Zambia Context

TerraFund for AFR100⁵⁷ is currently operating with US\$ 15 million deployed in September 2021 to 100 locally led community organisations and entrepreneurs practising tree-based restoration, broken down into individual grants and loans of US\$50,000–500,000. In Zambia, 4 locally led community organisations and entrepreneurs were part of the 100 project cohorts selected under the TerraFund for AFR100 initiative – Mooto Cashew Suppliers, Schools and Colleges Permaculture (SCOPE) Zambia, Solidaridad (Zambia), and WeForest Zambia.⁵⁸

The TerraFund is relevant for Zambia as seen from the 4 current projects and the country's proportion of agricultural activity – 60% of households engage in some form of agricultural activity, mainly for own consumption, and live in areas where poverty is high, namely equalling 82% of the rural population.⁵⁹ This holds true as Zambia's rural farming activities tie into the 4 clustered categories of SMEs in TerraFund's portfolio: (a) agroforestry; (b) agricultural inputs such as organic fertiliser (link to FISP); (c) beekeeping; and (d) timber products. Furthermore, land restoration financing facilities such as the TerraFund can ensure that the rate of conversion of forest land to agricultural land is reduced by increasing productivity per hectare of land by utilising CSA practices while providing incentives at the same time. Analysis of environmental benefits found that implementation of the TerraFund in general over 6 years (pilot for 1 year, scale up for 2 years, and commercialisation for 3 years) can result in over 100,000ha of land restored, nutrient cycling will be improved, and the trees limit will act as a natural biodiversity corridor. Furthermore, the adoption of CSA practices and preservation of the natural ecosystem will improve smallholder farmers' resilience to climate change.

Sources of finance and actors

As stated, and shown in the structure, financing for the TerraFund will be sourced from a mix of sources: Donors for the pilot phase, and during commercialisation, from debt investors, impact investors, DFIs and outcome payers and corporates. Actors include WRI Land Accelerator, SPV manager, donors, investors (debt and impact), DFIs, outcome payers, SMEs, and smallholder farmers. Currently, the financial solution is at the initial (pilot) phase, with 4 projects in Zambia.

Potential applications in Zambia

One of the key characteristics of TerraFund is in its innovativeness (targeting SMEs too big for microfinance and too small for commercial banks); actionability (existing pipeline of projects via the Land Accelerator); catalytic role (immediate replication in its approach); and financial sustainability (by reducing grant funding over 6 years while adding first loss capital and commercial debt). As mentioned earlier, Zambia has 4 existing land accelerator programmes who have accessed financing from the pilot phase of the TerraFund. Furthermore, TerraFund addresses the underlining barriers for SMEs practising CA activities such as land restoration.

A common misconception is that restoration activities focus only on agroforestry. Land restoration is defined as the *ecological process to restore a natural and safe landscape for humans, wildlife, and plant communities*.⁶⁰ Restoration activities include afforestation and CA practices such as crop rotation, water retention techniques like retention ditches and cut-off drains, and use of organic manures and mineral fertilizers.⁶¹

The TerraFund not only mobilises capital for CA activities through land restoration, but also realises social and environmental benefits. Social benefits include increase yields for smallholder farmers served by the SMEs as well as increasing smallholder farmers ability to access markets and financial products.⁶² Environmental benefits from the agricultural activities financed by TerraFund are improvement of nutrient recycling and prevention of soil erosion.⁶³

57 AFR100 (the African Forest Landscape Restoration Initiative) is a country-led effort to bring 100 million hectares of land in Africa into restoration by 2030. AFR100 contributes to the Bonn Challenge, the African Resilient Landscapes Initiative (ARLI), the African Union Agenda 2063, the Sustainable Development Goals and other targets.

58 <https://www.africa.terrarmatch.org/>

59 https://sustainabledevelopment.un.org/content/documents/dsd/dsd_aofw_ni_ni_pdfs/NationalReports/zambia/RuralDevelopment.pdf

60 <https://www.unccd.int/land-and-life/land-management-restoration/overview#:~:text=Land%20restoration%20is%20the%20ecological,soil%20productivity%20and%20food%20supplies>

61 Interview with Venkat Iyer (TerraFund)

62 Farmer Income Lab, 2018. What works to increase smallholder farmers' income? A Landscape review. Working draft for discussion. Available at: https://www.farmerincomelab.com/sites/g/files/jydpvr621/files/201909/What%20Works_FINAL_9.19.pdf

63 <https://cpilabs.wpenginepowered.com/wp-content/uploads/2020/03/RPB-Instrument-Analysis.pdf>

Table 7. Potential applications of TerraFund in Zambia

Risk Reduction Measure: Conservation Agriculture		
Potential capitalisation and funders	Commercial Investors Senior Debt	<ul style="list-style-type: none"> • Agri-Business Capital (ABC) Fund • AgDevCo (investors include FCDO, USAID, Dutch Gov, AGRA, Rockefeller Foundation) • GroFin • Rabo Rural Fund • Root Capital • eco.business Fund • The Moringa Fund (investors include La Compagnie Benjamin de Rothschild, FISEA, CAF, Finnfund, FMO, AfDB) • National Savings and Credit Bank (NatSave)
	Concessional Finance First-loss Capital	<ul style="list-style-type: none"> • African Development Bank (AfDB) • Agri-Business Capital (ABC) Fund⁶⁴ • Development Bank of Zambia (DBZ) • GAFSP Private Sector Window⁶⁵
	Donors ⁶⁶ Capital: Grants	<ul style="list-style-type: none"> • WRI Land Accelerator • Bezos Earth Fund • Facebook • Good Energies Foundation • Lyda Hill Philanthropies • DOEN Foundation • AKO Foundation • Caterpillar Foundation
Potential Stakeholders to involve ⁶⁷ (different potential roles)	<ul style="list-style-type: none"> • Government schemes: National Conservation Agriculture Task Force (NACTF) and sub-NACTFs at provincial and district levels; Zambia Integrated Agricultural Management Information System (ZIAMIS), Lima Credit Scheme (LCS), and Zambia Credit Guarantee Scheme (ZCGS) • Regulators: Bank of Zambia (BoZ), Securities and Exchange Commission (SEC) • Zambia Financial Institutions: ZANACO, Atlas Mara, Stanbic, FNB⁶⁸ • Development finance institutions (DFIs): DBZ⁶⁹, and NatSave⁷⁰ • Microfinance institutions (MFIs): Vision Fund, Madison Finance, Agora, and EFC • <u>Dutch Fund for Climate and Development</u>⁷¹ • International Fund for Agricultural Development (IFAD) • International Maize and Wheat Improvement Center (CIMMYT) • Others: Musika 	

64 ABC Fund invests in smallholder farmers and rural small and medium-sized enterprises in developing countries to support sustainable and inclusive agricultural value chains. Read more at <https://www.ifad.org/en/abcfund>

65 Uses blended finance solutions and concessional funding to support projects designed to improve the livelihood of smallholder farmers living in the world's poorest countries - <https://www.gafspfund.org/projects/agricultural-productivity-and-market-enhancement-project-apmep>

66 Donors presented here are those who are funding the AFR100/TerraWatch programme

67 These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

68 These FIs are active in the agriculture market, read more here <https://documents1.worldbank.org/curated/en/241301582041593315/pdf/Agriculture-Finance-Diagnostic-Zambia.pdf>

69 lends to large farmers and agribusiness companies in select value chains, such as maize, sugar, and poultry

70 provides savings products and smaller loans (of up to US\$5,000) to agricultural SMEs and small farmers

71 has approved a proposal to support Stewards Globe Limited ("SGL") Afriseed - Stewards Globe in building Zambia's smallholder farmers' climate resilience through the provision of climate resilient seeds and extension services.

Risk Reduction Measure: Conservation Agriculture

Potential Recipients ⁷²	<p>Current recipients of TerraFund in Zambia include:</p> <ul style="list-style-type: none"> • <u>Mooto Cashew Suppliers</u> who aim to reduce poverty, food shortages and malnutrition throughout Zambia by reviving the cashew industry. • <u>Schools and Colleges Permaculture (SCOPE) Zambia</u> whose mission is to assist schools, colleges, and communities in sustainable land use to produce a diverse range of nutritious food and other useful products. • <u>Solidaridad</u>, an international civil society organisation that develops solutions for community climate resilience. In Zambia, it partners with local organisations, encouraging farmers in rural villages to grow moringa trees as an alternative source of income, and recently, to restore Zambia's Lower Kafue Sub-Catchment. • <u>WeForest Zambia</u> that implements tree planting and forest restoration activities via agroforestry, enrichment planting and assisted natural regeneration. <p>Potential recipients of TerraFund include:</p> <ul style="list-style-type: none"> • Input suppliers and agro dealers from the FAO funded Conservation Agriculture Scaling Up (CASU) project • Smallholder farmers trained under the <u>USAID Zambia Enterprise Development and Growth Enhanced (EDGE) Activity</u> and business advisors such as MKP Farms, Namatamba Farms • Out-grower schemes such as Kaleya Smallholders Company Ltd (KASCOL), Mazabuka Sugarcane Growers Trust (MSCGT), Amatheon Agri Zambia (AAZ) Limited • CSOs such as Zambia National Farmers' Union (ZNFU), District Farmer Associations (DFAs)
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Source: Author based on linked sources

3.3. Sale of Carbon Credits

Taxonomy: Result-based financing

Level of entity providing finance	Level of entity receiving finance	Existing in Zambia
International/Regional/Domestic credit buyers	Domestic: Government, Sub-government, Private entities	Yes, with interim guidelines issued ⁷³

Definition

A carbon credit is a tradeable certificate that represents the right to emit one metric ton of carbon dioxide (CO₂) or the equivalent amount of another greenhouse gas (such as methane, nitrous oxide, etc.), called a carbon dioxide equivalent (CO₂-eq).

Carbon markets aim to turn emission reductions and removals into tradable assets and can be a powerful tool to tackle land and ecosystem degradation. Carbon markets can either be explicit or implicit. Explicit carbon markets are based on carbon pricing enacted by a government mandate and imposes a price based on the carbon content via a carbon tax or an emissions trading system (ETS)⁷⁴ via cap-and-trade and/or baseline-and-credit. Carbon markets can also be implicit where the equivalent value per tonne of carbon is associated with a specific policy instrument thus deriving an implicit carbon price; or internal – voluntary carbon pricing by corporations, organisations, and governments where

an internal carbon price⁷⁵ is used to guide investment decisions and promote efficiencies in business operations⁷⁶. Carbon credit buyers can either be:

- Compliance entities facing a carbon tax or ETS who are allowed by their regulators to use carbon credits to meet their liabilities.
- Airlines under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) scheme that offers a *"harmonised way to reduce emissions from international aviation and minimising market distortion"*⁷⁷ while respecting the special circumstances and respective capabilities of International Civil Aviation Organization (ICAO) Member States (Zambia Civil Aviation Authority is a member); and
- Voluntary buyers who use carbon credits to meet voluntary emission reduction targets i.e., to be carbon neutral.

Box 12 presents the status and trends in carbon pricing across the world.

⁷² These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

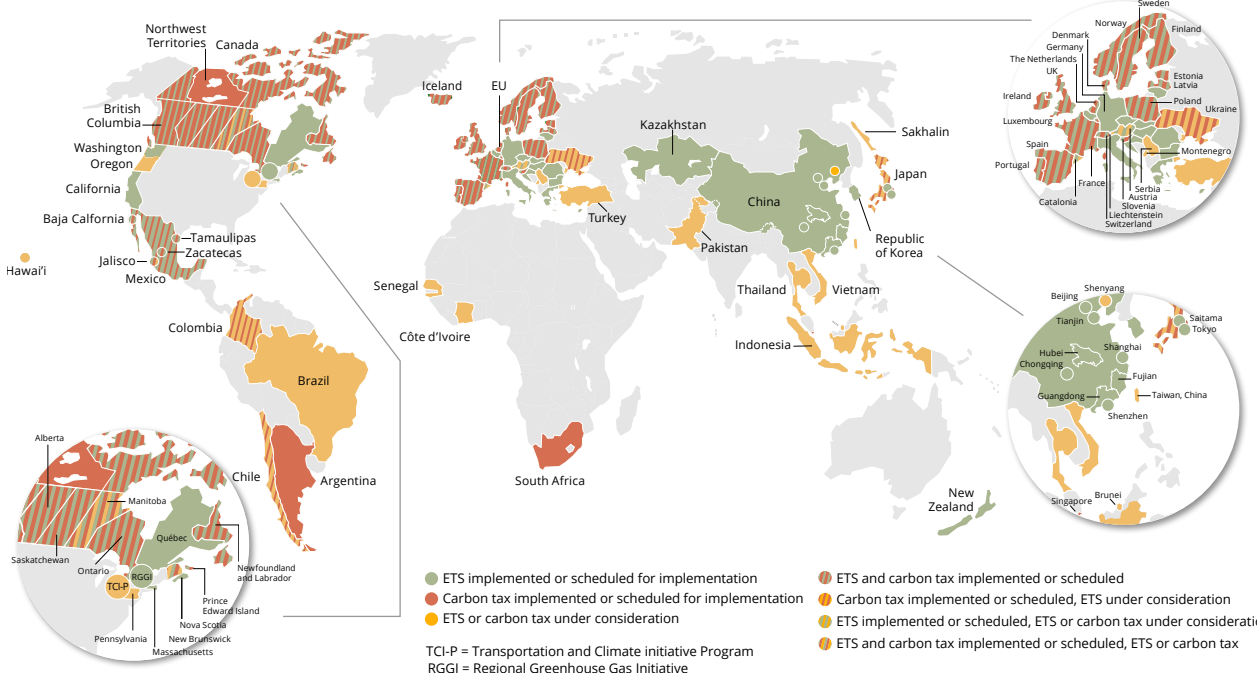
⁷³ https://www.moiramukuka.com/zambia-carbon-markets-and-trading-interim-guidelines/?utm_source=rss&utm_medium=rss&utm_campaign=zambia-carbon-markets-and-trading-interim-guidelines

⁷⁴ Governments can also add design elements such as price floors or ceilings in an ETS.

⁷⁵ Multilateral development banks, including the World Bank, and some governments use a shadow carbon price when evaluating public investments.

⁷⁶ World Bank. (2021). State and Trends of Carbon Pricing 2021. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/35620>

⁷⁷ <https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet---corsia/>

Box 12. Map of carbon taxes and ETS across the world

Source: World Bank. (2021). State and Trends of Carbon Pricing 2021. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/35620>

It has been noted that implicit carbon markets that are voluntary would facilitate the mobilisation of capital to the Global South, where there is the most potential for economical nature-based emissions-reduction projects⁷⁸. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM) estimates that demand for carbon credits could increase by a factor of 15 or more by 2030 and by a factor of up to 100 by 2050. Overall, the market for carbon credits could be worth upward of \$50 billion in 2030.⁷⁹ Article 6 of the Paris Agreement on carbon markets offers the opportunity for countries to engage in cooperative approaches to GHG emissions, resulting in more cost-effective reductions. Currently, Zambia is part of Article 6 Readiness Support Programmes that assists these countries in developing the policy and regulatory frameworks needed to participate in the global carbon market, along with increasing private sector engagement.⁸⁰

Structure

Carbon credits are tradable commodities. They are generated, sold, transferred, and purchased by private and public actors who have different roles in the carbon market. The supply and demand structure of the market is depicted in **Box 13**.

On the supply side, project and programme managers design and implement mitigation activities registered under GHG crediting standards generating carbon credits. The mitigation activities are managed by for-profit or not-for-profit private project developers, local private or community landowners, or municipalities, public agencies, subnational or national governments. The project must comply with carbon standard requirements, as well as align to the country's carbon trading guidelines, to receive certification, have an established monitoring system, and facilitate sale of credits to buyers or to intermediaries. The developers can onboard investors to provide upfront financing and/or partner with local communities while the government can mobilise advance financing from budgetary sources or donors. **Zambia's Interim Guidelines for Carbon Markets and Trading**, published by the Ministry of Green Economy and Environment (MGEE)⁸¹ ahead of an expected 2023 Climate Change Legislation, highlights an approved methodology and the following carbon standards – the UNFCCC Gold Standard, VERRA's Verified Carbon Standard and others – that must be applied for the calculation of emission reductions for eligible projects. Furthermore, there must be a measurement, reporting and verification (MRV) system in place in line with the applied methodology for any carbon trading⁸².

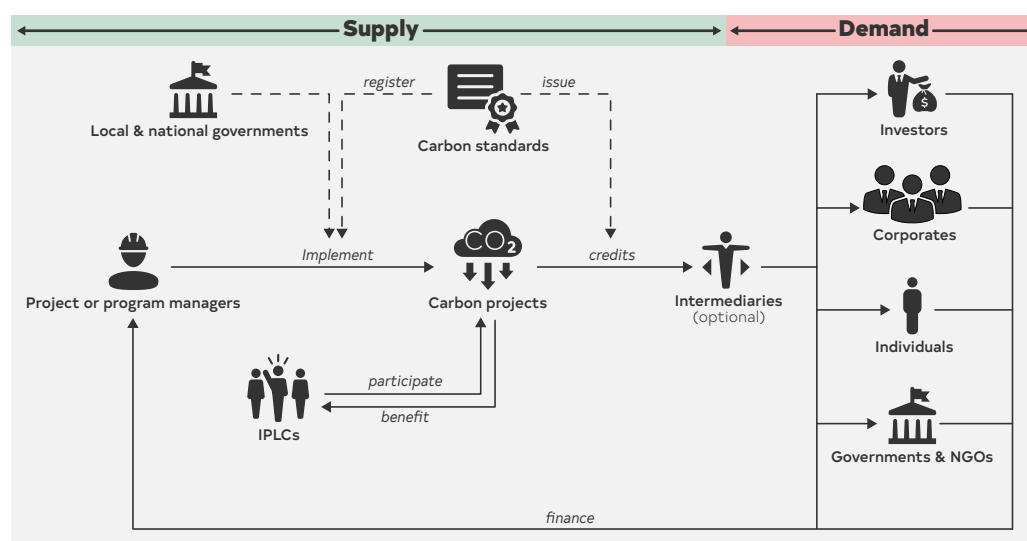
⁷⁸ See Christopher Blaufelder, Joshua Katz, Cindy Levy, Dickon Pinner, and Jop Weterings, "How the voluntary carbon market can help address climate change," December 2020.

⁷⁹ McKinsey, 2021. A blueprint for scaling voluntary carbon markets to meet the climate challenge. <https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge>

⁸⁰ Global Green Growth Institute (GGGI). (2022). Developing Carbon Markets based on Article 6 of the Paris Agreement: Challenges and Opportunities. Retrieved from https://gggi.org/wp-content/uploads/2023/01/230103_GGGI_article6_20230113_1.pdf [April 2023]

⁸¹ <https://www.mgee.gov.zm/wp-content/uploads/2023/03/Interim-Guidelines-Regulation-of-Carbon-Markets-in-Zambia-131222-Master-Copy-Media-Version.pdf>

⁸² Carbon trading in Zambia is currently regulated by Forest Act 4 of 2015 – Forest Act (Carbon Management) Regulations 66 of 2021. However, the current legislation is not sufficiently comprehensive to cover all areas of carbon trading.

Box 13. General structure of carbon credits

Source: <https://vcprimer.org/chapter-5/>

On the **demand side**, the final users of the carbon credits can be private companies, governments, NGOs, individuals who buy the carbon credits to offset emissions.

Relevant examples in Africa and Zambia Context

The following table summarises relevant examples in Africa, with the project summaries:

Table 8. Relevant examples of carbon sequestration projects in Africa⁸³

Activity	Country	Project Summary
Rabobank Acorn Agroforestry Carbon Programme	Zambia, Kenya, Nigeria, Tanzania, Colombia, Uganda, Côte d'Ivoire, India, Nicaragua, Peru	<p>Acorn has built a global, transparent, and technology-enabled marketplace for carbon sequestration to support farmers in making the transition to agroforestry at scale. This additional income generated by the carbon credits will make the transition to agroforestry more financially sustainable for the farmers.⁸⁴ So far, the programme has been launched in 10 countries worldwide. Technical training sessions have been conducted to equip smallholder farmers with the skills required for agroforestry, and the farmers have begun planting trees and cash crops on their farms with the expectation of increased crop yields. The first carbon credits trading cycle is expected to occur in three (3) years. Currently, it is envisioned that 80% of the carbon credit proceeds are going to the smallholder farmers, 10% to the local partner/intermediary of Acorn, and 10% to Acorn itself.</p> <p>Projects in Zambia, that are all in progress with no carbon removal units (CRUs) issued yet include:</p> <ul style="list-style-type: none"> Carbon Forest Zambia Limited, and COMACO Zambia

⁸³ <https://www.fao.org/3/i1632e/i1632e02.pdf>

⁸⁴ <https://acorn.rabobank.com/en/projects/>

Activity	Country	Project Summary
Afforestation/ restoration projects	Senegal	Acacia Senegal Plantation Project aiming to reforest over 17,700 hectares of Acacia Senegal over a 5-year period. <u>Green Resources</u> is the project developer. Community tree planting is promoted by giving away seedlings and providing necessary training in silviculture. Generation of Voluntary Emission Reductions (VERs) over 99-years with carbon revenues locally reinvested and 10% is spent on community projects.
Agricultural soil projects	Kenya	Kenya Agricultural Carbon Project (KACP) on 60,000 ha in Nyanza and Western Provinces reaching 60,000 farmers on 45,000 hectares are using carbon credits to support farming that is more productive, sustainable and climate friendly. The project developer (Swedish Cooperative Center-Vi Agroforestry - SCC-ViA) promotes adoption of sustainable agricultural land management (cropland management & rehabilitation of degraded land). The World Bank BioCarbon Fund will purchase the credits. Smallholder farmers and small-scale business entrepreneurs organised in common interest groups, primary level cooperatives, farmer groups and informal organisations. Funds will flow back to communities and farmers involved.

In the Zambia context, sale of carbon credits is already ongoing under the Community Markets for Conservation (COMACO). COMACO, with support from Shell and the GRZ, have successfully completed verification of 0.9 million tons of carbon credits for the nine chiefdoms that have protected customary land from destructive activities.⁸⁵ COMACO uses two globally recognized standards/mechanisms to calculate carbon credits: Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks (REDD+), and sustainable agricultural land management (SALM). The verification of both standards is data-intensive and requires technical support for the cooperatives, which COMACO provides in cooperation with an external service provider.

Despite this, one key limitation of the financial instrument in Zambia that needs to be addressed is the novel nature of carbon markets that have not yet reached their full potential. The market still needs to grow larger, more transparent, verifiable, and more environmentally robust. **Today's market is still fragmented and complex. Moreover, it is indispensable that social and environmental safeguards (see Box 15) are strictly adhered to** – a challenge that in the several carbon credit projects around the globe has not always been overcome successfully.

Sources of finance and actors

Actors include project managers/developers, regulators (private carbon standard organisation and/or governments), activity managers (for-profit or non-for-profit private project developers, local private or community landowners, or municipalities, public agencies, subnational or national governments), investors and intermediaries, and local communities who may hold the land, forest or carbon rights.

Potential applications

One of the key characteristics of Carbon Credits is in the generation of a new climate finance revenue stream - carbon finance, that is instrumental in the implementation of Zambia's NDCs⁸⁶, NAPs and other climate-related development plans. Furthermore, high integrity carbon credit projects can not only reduce emissions and remove CO₂e thus contributing to on-the-ground climate impact, but they also offer an immense socio-economic opportunity. Despite the immaturity of carbon markets, especially across Africa, carbon credits are gaining traction as an additional climate finance revenue stream for developing countries⁸⁷ such as Zambia. It also allows for the monetization of Africa's large natural capital endowment, while preserving and enhancing it.

⁸⁵ <https://itswild.org/42378-2/>

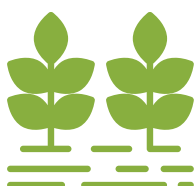
⁸⁶ Caution should be drawn on the ongoing debate on buyers of credit and their intention on its use. If Zambia sells carbon credits overseas, there is a need to understand if the emission reduction can then be counted toward achievement of Zambia's NDC (in the technical jargon, whether or not Zambia has to make a 'corresponding adjustment'). Regulators would want to make sure that the same emission reduction is not double counted.

⁸⁷ Global impact of war in Ukraine: Energy crisis, UN Global Crisis Response Group on Food, Energy and Finance, August 2022; UN Brief No. 3

Box 14. Development benefits of trading in carbon credits



Forestry and land use: About 40% of Zambia's land area is protected - 20 national parks, 39 game management areas, 432 forest reserves and 59 botanical reserves. However, these natural assets remain in the peripheral of economic development [1].



Agriculture and soil sequestration: A study of 2,100 smallholder farmers from Cipata, Choma, Kaona and Mkushi districts found out that the use of biochar, a biomass obtained from pigeon pea production, has the potential for enhancing soil moisture retention by up to 3% [2].



Livelihoods: A case study on the benefits of CA for adaptation in Zambia found that if a farmer switches from conventional farming to CA, annual net income from agricultural production would increase from US\$ 217 to 351, a 62% increase [3].

Livestock: Livestock accounted for more than 92% of GHG emissions in 2010 and is expected to increase steadily. A participatory integrated landscape management approach in livestock to reduce GHG emissions can realise 1.41 cost benefit ratio [4].



Agriculture sector: It is expected that with current adoption of CSA practice under CA (minimum soil disturbance, nutrient recycling, diversification, etc.) over 30 years can realise an annual net carbon balance of approximately -47,700 tCO₂e emission. If CSA adoption increases with 50%, annual net carbon balance is 1,137,500 tCO₂e [5].



Source: Author adapted from https://www.seforall.org/system/files/2022-11/ACMI_Roadmap_Report_Nov_16.pdf

Sources referenced in diagram: [1] <https://blogs.worldbank.org/nasikiliza/protecting-biodiversity-improve-economic-outcomes-zambia>; [2] <https://www.ndf.int/newsroom/agroforestry-shows-potential-for-climate-adaptation-in-zambia.html>; [3] FAO & UNDP. 2020. Conservation agriculture for climate change adaptation in Zambia: A cost-benefit analysis. Rome, FAO; [4] & [5] https://climateknowledgeportal.worldbank.org/sites/default/files/2020-06/CSAIP_Zambia_1.pdf

Box 15. Safeguards and principles for high-quality carbon projects

In voluntary carbon markets (VCMs), carbon credits are issued, bought, and sold by individuals, companies, and other actors outside of regulated or mandatory carbon pricing instruments. Although VCMs can provide an attractive revenue source, they have been subject to much criticism. Prominent concerns relate to additionality, permanence, leakage, and the (lack of) involvement of communities and handling of land right issues. Additionality means that GHG emission reductions or removals would not have occurred in the absence of the incentive created by carbon credit revenues. Permanence requires that carbon sequestration is permanent and not reversed in the future due to disasters or human activities. Leakage is the risk that GHG emissions or removals are not avoided but rather displaced (e.g., while the cutting down of one part of a forest is prevented, the planned deforestation simply takes place elsewhere).

To ensure high-quality carbon projects, adhering to strict guidelines, standards or principles is indispensable. Several initiatives are under way to drive certainty on good practice and improve transparency in VCMs. The nine **Core Carbon Principles (CCPs)** created by The Integrity Council for the Voluntary Carbon Market (ICVCM) are one example of this.

According to them, projects must be **governed effectively** and mitigation efforts need to be **tracked and transparent** as well as **robustly validated and verified by a third party**. Relevant internationally recognized certification standards are the “Gold Standard” (GS), the Verra “Verified Carbon Standard” (VCS) and “Plan Vivo”. CCPs also require the GHG emission reductions or removals to be **additional** and **permanent**. To account for the non-permanence risk, projects should apply a non-permanence risk buffer where credits are set aside and released after the project duration when permanence was sufficient. Moreover, projects must ensure **robust quantification of emission reductions or removals**, **no double counting**, and no leakage. Projects must adhere to strict social and environmental safeguards while delivering **positive sustainable development impacts**. Social safeguards should include a benefit sharing mechanism, continuous community involvement and ownership, and respecting land tenure rights. Lastly, carbon projects shall **contribute to a net zero transition**, i.e., avoid locking-in levels of GHG emissions, technologies or carbon-intensive practices that are inconsistent with the goal of achieving net-zero emissions by mid-century.

Table 9. Potential applications of Carbon Credits in Zambia

Risk Reduction Measure: Conservation agriculture		
Potential applications	Agriculture and soil sequestration attracts a carbon price between US\$9-15 per tCO ₂ e. ⁸⁸	<p>Avoidance offsets</p> <ul style="list-style-type: none"> Farming: Cover crops, Fertilizer/N₂O, and Grassland and sustainable land management Livestock: Rotational grazing, Food additives <p>Removal offsets</p> <ul style="list-style-type: none"> Farming: No-and low-till agriculture and Agroforestry
Potential intermediaries and buyers ⁸⁹	<p>Intermediaries active in Africa:</p> <ul style="list-style-type: none"> Africa carbon exchange initiatives: Nairobi International Financial Center (NIFC) and AirCarbon Exchange initiative in Kenya⁹⁰; Egyptian Environment Ministry and the Egyptian Exchange initiative⁹¹; and South Africa government and Johannesburg Stock Exchange (JSE) Exchanges and marketplaces: <u>cbl Markets</u>, <u>AirCarbon Exchange</u>, <u>Carbon Trade eXchange (CTX)</u>, and <u>Climate Trade</u> Brokers: <u>Climate Partner</u>, <u>south pole</u>, <u>Climate Impact Partners</u>, <u>Rabobank Acorn Agroforestry Carbon Programme</u> <p>Buyers active in Africa include Delta Airline, WE ACT, Gucci, Volkswagen, Netflix, GreenChoice, Skoda, BHP and Nespresso⁹².</p>	
Potential Financiers (for activities that then generate credits)	<p>Zambia has benefited from the following climate finance initiatives:</p> <ul style="list-style-type: none"> Norway's International Climate Forest Initiative (NICFI)⁹³ funded by Norway Reducing Emissions from Deforestation and Forest Degradation (REDD+) Early Movers (REM) funded by Germany and the United Kingdom <u>Forest Carbon Partnership Facility (FCPF)</u> <p>Other financiers to consider include:</p> <ul style="list-style-type: none"> Carbon Africa Climate Asset Management – invested US\$ 150 million to the Restore Africa programme that seeks to restore 2 million hectares of land and directly support 2 million smallholder farmers by 2026 in Zambia, Ethiopia, Kenya, Malawi, Tanzania, and Uganda. <u>World Bank BioCarbon Fund</u> – pioneered the SALM methodology with Verified Carbon Emissions Standard (VCS) approval that spells out how carbon sequestration in soils is measured. This engages farmers themselves in the monitoring process; for the first time allowing these farmers to measure the impact of their agricultural practices on crop yields. Central African Forest Initiative (CAFI) 	

88 https://www.seforall.org/system/files/2022-11/ACMI_Roadmap_Report_Nov_16.pdf

89 These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

90 Businesswire (2022) AirCarbon Exchange Signs Collaboration Agreement with the Nairobi International Financial Centre and the Nairobi Securities Exchange.

91 Enterprise: The State of the Nation (2022). Local carbon credit exchange in the works.

92 https://www.seforall.org/system/files/2022-11/ACMI_Roadmap_Report_Nov_16.pdf

93 The initiative's partner countries for development cooperation

Risk Reduction Measure: Conservation agriculture	
Potential carbon verifiers ⁹⁴ (third party service providers)	<p>Common verified emission reduction standards in the voluntary carbon market that have been used in Africa (including Zambia):</p> <ul style="list-style-type: none"> • <u>The Gold Standard</u> - originally introduced to evaluate the sustainability credentials of Clean Development Mechanism (CDM)⁹⁵ and Joint Implementation (JI) projects. It is open to any non-government, community-based organisation that comply with the UN Millennium Development Goals and be reducing one of the three GHGs: carbon dioxide, methane, or nitrous oxide (have verified 19% of voluntary credits from Africa⁹⁶). It also has the most robust environmental and social safeguards, and thus preferred. • <u>Verra</u> provides oversight to the VCS programme and is responsible for updating the VCS rules (have verified 81% of voluntary credits from Africa⁹⁷). • <u>Plan Vivo Foundation</u> quantifies ecosystem services, demonstrates good governance, and measures performance of certified projects who can then issue Plan Vivo Certificates (PVCs) (have verified 1% of voluntary credits from Africa⁹⁸). • <u>SCS Africa</u> specialises in natural resource, agriculture, and environmental claims certification. <p>Other verified emission reduction standards are:</p> <ul style="list-style-type: none"> • The <u>Climate Action Reserve</u> is a United States-based offset programme focused on ensuring transparency in North America's voluntary carbon market. • The <u>American Carbon Registry</u> oversees the registration and verification of carbon offset projects in the voluntary carbon market and California's regulated carbon market.
Potential Partners ⁹⁹ (different potential roles)	<ul style="list-style-type: none"> • GIZ in cooperation with <u>Rabobank Acorn Agroforestry Carbon Programme</u> (in Ghana) • Rabobank Acorn Agroforestry Carbon Programme – described in table 7; currently working with COMACO Zambia and Carbon Forest Zambia Limited • Africa Carbon Markets Initiative (ACMI) was inaugurated at COP27 with an aim of dramatically expanding Africa's participation in voluntary carbon markets. • Conservation International • The Nature Conservancy • <u>The Architecture for REDD+ Transactions (ART)</u> is a global initiative that seeks to incentivize governments to reduce emissions from deforestation and forest degradation (REDD), as well as restore forests and protect intact forests (+).

Source: Author based on linked sources

⁹⁴ These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

⁹⁵ The Clean Development Mechanism (CDM) allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries.

⁹⁶ https://www.seforall.org/system/files/2022-11/ACMI_Roadmap_Report_Nov_16.pdf

⁹⁷ Ibid

⁹⁸ Ibid

⁹⁹ These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

3.4. Climate Risk and Early Warning Systems Initiative (CREWS)

Taxonomy: Funding/Investment (financial facility via an institution)

Level of entity providing finance	Level of entity receiving finance	Existing in Zambia
International/bilateral donors	Domestic: Government, Sub-government	No

Definition

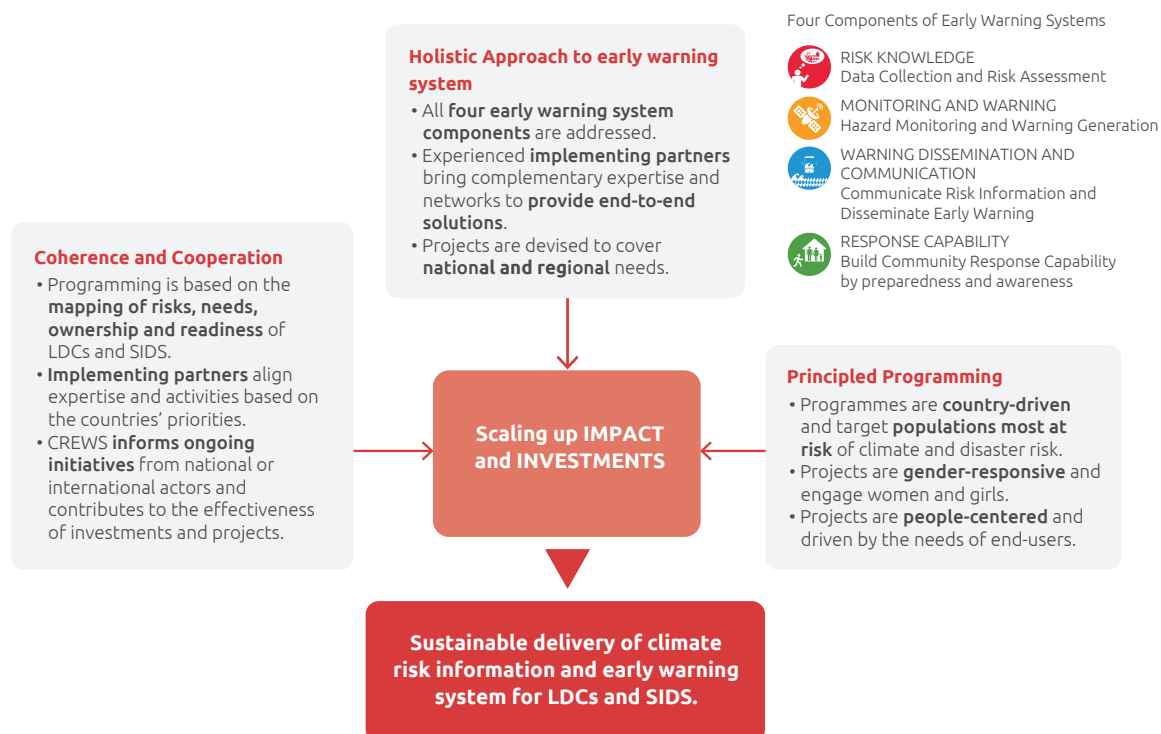
CREWS is a pooled financing mechanism that aims to “significantly increase access to early warnings and risk information in Least Developed Countries (LDCs) and Small Island Developing States (SIDS)”. It was launched at UNFCCC COP21, as a contribution to the UN Secretary-General’s Climate Change Action Agenda. Its programming is supported by the network and expertise of CREWS implementing partners, who “jointly provide analytical and advisory services, technical assistance, capacity building, and operational support to countries, through regional and national projects”. CREWS measures its results

and impact against relevant goals and targets of the Sustainable Development Goals, the Sendai Framework (Targets A, B and G) and the Paris Agreement (Adaptation Goals).

Structure

CREWS is designed to have impactful action at 3 levels: at the country level through improvement of access to effective impact-based early warning system; at the regional level through building regional institutions’ capacities; and at the global level through increased coherence of investments in EWS¹⁰⁰.

Box 16. Structure of CREWS



Source: https://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocreus/s3fs-public/ckeditor/files/20211022_Short_Version_of_the_Operating_Plan_pages_FINAL.pdf?LjFREZot3k5UoxdQ645m1U.pTMSwQkx

Since its operationalisation, CREWS and its partners have improved the state of early warning systems and capabilities in LDCs and SIDS across 57 countries globally, with 14 projects (9 countries, 4 regional and 1 global) as of 2020. This was possible through a capital investment of US\$ 66.16 million received in 2015 that has in turn leveraged US\$330 million of additional funds and a further US\$ 203 million through pipeline projects¹⁰¹.

Relevant examples in Africa and Zambia Context

In the context of Zambia, CREWS has not yet been initiated.

However, CREWS pipeline of work includes a proposal to strengthen Hydromet and Early Warning Systems as well as preparedness, early action and response by disaster management offices to hazardous hydromet events across the Southern African Development Community (SADC) region, which Zambia is a part of. The US\$ 5.5 million proposal, pending review by CREWS Trust Fund in January 2024, will leverage strategic collaboration and partnerships between UNDRR, World Bank, and WMO, to achieve¹⁰²:

- Institutional strengthening of NMHS with necessary strategic and legal frameworks, as well as standard operating for their optimal contribution to EWS.
- Enhanced capacities for the production and delivery of tailored weather, water, climate and climate change
- services as well as EWS for sustainable development.
- Institutional strengthening of existing regional coordination and cooperation mechanisms for effective EWS and climate services
- Improved in-country last-mile dissemination, preparedness, and response to multi-risk information and
- warnings through increased coordination between NMHSs and DRM authorities, and other relevant authorities at the regional, national and provincial level.
- Improved integration of gender and vulnerable groups across the early warning-early action (EW-EA) value chain in line with WMO and African Union gender policy.
- Deployment of innovative solutions for nowcasting for EW-EA, by using the latest Meteosat Third Generation (MTG) satellite, in line with the Abidjan Declaration on new generation of meteorological satellite products.¹⁰³

This is in line with the Government of Zambia announcement that it is currently putting in place measures to support the country and the SADC region's response to the United Nations' call to ensure that every citizen on the planet has access to early warning systems in the next 5 years¹⁰⁴.

Other African countries and regions that CREWS is working in include Burkina Faso, the Central Africa region, Central Africa Republic, Malawi, Niger, Senegal, Togo, and the West Africa region.

Sources of finance and actors

CREWS sources its financing from multilateral and bilateral donors from 8 contributing member states - Australia, Finland, France, Germany, Luxembourg, Netherlands, Switzerland, and the United Kingdom¹⁰⁵. Its implementing Agencies are the: World Bank/GFDRR, WMO and UNDRR and it has strategic partnerships with the GCF, the InsuResilience Global Partnership, the Alliance for Hydromet Development, the Global Commission for Adaptation (GCA), the Global Pacific and West African countries, the Risk-informed Early action Partnership (REAP), the Anticipation Hub and the International Network for Multihazard Early warning Systems (IN-MHEWS).

Potential applications

One of the key characteristics of CREWS is its application of a multi-hazard, people-centred, impact-based, EWS approach to its country projects. Despite Zambia's National Meteorological and Hydrological Services (NMHSs) as well as Zambia's Disaster Management and Mitigation Unit (DMMU) being active and functioning, there is a need to advance Zambia's NMHS to deepen their services by investing in multi-hazard hydromet and EWS services since the cost of investing US\$ 1 in these services results in between US\$ 7 - 12 benefits.¹⁰⁶ Furthermore, by developing a country-wide Multi-Hazard Early Warning System (MHEWS) in collaboration with Zambia's NMHSs and DMMU will reduce exposure of Zambia's communities, livelihoods, and infrastructure to climate-induced climate risks as well as contribute to the country's climate risk management framework.

The CREWS financial mechanism has two innovative features – private sector engagement and the accelerated support window. With its private sector engagement, CREWS helps to mobilise finance at scale, from multilateral and bilateral donors from 8 contributing member states, through fostering innovative, sustainable, and cost-effective approaches across the four key elements of an EWS: (i) Disaster risk knowledge; (ii) Detection, monitoring, analysis and forecasting of the hazards and possible consequences; (iii) Warning dissemination and communication; and (iv) Preparedness and response capabilities¹⁰⁷. **Under the accelerated support window, CREWS supports countries with short term targeted technical assistance activities – under which the prioritized risk reduction measure of the AGRICA climate risk analysis falls. Through this window, an accelerated support action budget of between US\$ 50,000 to 250,000 is provided for short-term actions, such as strengthening of early warning systems for the provision of seasonal weather forecasts to inform adaptation.**

101 Ibid

102 Stakeholder interview with Maria Lourdes Kathleen Macasil (CREWS)

103 <http://gmes4africa.blogspot.com/2018/09/the-abidjan-declaration-signed.html#:~:text=The%20Abidjan%20Declaration%20contributes%2C%20African,such%20as%20a%20Lightening%20Detection>

104 Editor in Chief (2022, September) Lusaka Times. <https://www.lusakatimes.com/2022/09/09/minister-of-lands-regrets-the-inadequacy-of-early-warning-system-in-zambia/>

105 https://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocrews/s3fs-public/ckeditor/files/20211022_Short_Version_of_the_Operating_Plan_pages_FINAL.pdf?LjFREZot3k5UoxdQ645m1U.pTmFSwQkx

106 World Bank (2021). A Regional Analysis of Weather, Climate, Water and Early Warning Services in Southern Africa: Status Quo and Proposed Actions. Washington, DC: World Bank; WMO (2020) 2020 State of Climate Services: Risk Information and Early Warning Systems

107 https://library.wmo.int/doc_num.php?explnum_id=4463

Table 10. Potential applications of CREWS in Zambia¹⁰⁸

Risk Reduction Measure	Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation
Potential applications	<p>Under the current US\$ 5.5 million project proposal to strengthen Hydromet and Early Warning Systems as well as preparedness, early action and response by disaster management offices to hazardous hydromet events across the SADC region (if approved in January 2024):</p> <ul style="list-style-type: none"> i. Draw maximum benefit to strengthen NMHS and DMMU capacities and policy frameworks for EWS, as well as enhance capacities of DMMU, WARMA and ZMD for the production and delivery of tailored weather, water, climate and climate change services. ii. Engage with Zambia Information and Communications Technology Authority (ZICTA), and other private telecoms in dissemination of the climate information. iii. Engage with Zambia Red Cross Society to embed its Early Action Protocol (EAP) for floods in national climate and disaster risk policies. <p>Unlock up to US\$ 250,000 for a 12-month financing under the accelerated support window of CREWS via an inter-government collaboration between DMMU, WARMA and ZMD to increase their capacities and technical know-how on EWS for climate information. This could include:</p> <ul style="list-style-type: none"> i. Training of extension officers of Ministry of Agriculture and staff of ZMD in the e-PICSA approach to provide EWS in all agricultural camps of Zambia¹⁰⁹. ii. Peer-to-peer learnings from countries of similar geographical profile on best practices on EWS. <p>Once Zambia has accessed the accelerated support window, it is recommendable to leverage the simplified GCF project approval process that all CREWS projects are privy to for additional financing, including EWS infrastructure.</p>
Potential in-country actors¹¹⁰	<p>Government: WARMA (Water Resource Management Authority), DMMU (Disaster Management and Mitigation Unit), ZMD (Zambia Meteorological Department), ZICTA</p> <p>International Partners: IFRC via Zambia Red Cross Society – they recently activated its <u>EAP for Floods</u> after receiving an impact-based forecast on 22 January 2023 by the <u>Global Flood Awareness System (GloFAS)</u>, that predicted a flood with 20 years return period. The flood was likely to hit 10 districts across the country, with an estimated people affected of more than 100,000. Further activation was actioned following an alert on 27 January 2023 relating to heavy rainfall that would cause flash floods in the Southern and Copperbelt Provinces.</p>
Potential Funders¹¹¹	<p>Multilateral and bilateral donors from 8 contributing member states - Australia, Finland, France, Germany, Luxembourg, Netherlands, Switzerland, and the United Kingdom.</p>
Potential Partners¹¹² (different potential roles)	<p>Any CREWS proposal needs to indicate which of these three implementing agencies will be offering the technical assistance and/or operational support: World Bank/GFDRR, WMO and UNDRR.</p> <p><i>Note: CREWS funding is provided to projects submitted by government agencies, preferably from NMHSs and/or DRM agencies.</i></p> <p>Strategic Partnerships:</p> <p>GCF, the InsuResilience Global Partnership, the Alliance for Hydromet Development, the Global Commission for Adaptation (GCA), the Global Pacific and West African countries, the Risk-informed Early action Partnership (REAP), the Anticipation Hub and the International Network for MultiHazards Early warning Systems (IN-MHEWS).</p> <p>Other related partners include <u>Practical Action</u>, the <u>Water Youth Network</u>, the <u>UK Met Office</u>, the <u>Zentralanstalt für Meteorologie und Geodynamik (ZAMG)</u>, Central Institution for Meteorology and Geodynamics, Austria), the <u>Netherlands Red Cross (Rode Kruis)</u>, <u>GIZ</u>, <u>PICSA Team at University of Reading</u>, and <u>Tonkin & Taylor Int.</u></p>

Source: Author based on linked sources

¹⁰⁸ Confirmed via a stakeholder interview with Maria Lourdes Kathleen Macasil (CREWS).

¹⁰⁹ Based on AGRICA PICSA Factsheet and <https://research.reading.ac.uk/picsa/>. Also see box 5 of this report for more information on e-PICSA.

¹¹⁰ These entities are mapped exclusively for illustration purposes. No formal conversation or agreement has been held with any of them.

¹¹¹ Ibid

¹¹² Ibid

4 Concluding remarks



General climate action financial instruments have so far failed to deliver the necessary financing scale that Sub Saharan Africa (SSA) requires. Furthermore, most of climate finance has primarily been concessional, through grants or concessional loans, mainly due to the status of SSA countries having limited fiscal space from low domestic revenue mobilization, debt distress, constricted global financial conditions, high borrowing costs, capital flight due to high inflation, and depleted foreign exchange reserves - Zambia is not a stranger to these financial conditions. However, given the magnitude of adaptation financing needs for Zambia (US\$ 50 billion estimated to meet the 2030 climate change commitments made in the Paris Agreement of 2015¹¹³), as well as Zambia's challenging domestic public financial conditions,

there is a need to seek for several climate finance revenue streams from a wide range of sources including climate funds, bilateral and multilateral partners, and the private sector.

Focusing on the adaptation / risk reduction measures proposed, we found that conservation agriculture projects do not conform with typical investor return profiles and can be expensive in the near term, making it difficult for them to attract financing. The same can be said for strengthening of EWS for climate information - the upfront costs are high due to infrastructure costs making them difficult in attracting government and private sector financing. It is against this backdrop that we recommend the following proposed actions in actualisation of the four selected financing options:

Financing Option	Proposed Actions	Proposed stakeholders
National Climate Funds/ National Financing Vehicle	<ul style="list-style-type: none"> Once the proposed National Climate Fund/National Financing Vehicle has been designed and instituted, there is a need to identify the strategic priorities of the fund while rationalising how the Fund will contribute to both climate and development goals. <ul style="list-style-type: none"> This should include defining the targeted financing for CA and strengthening of EWS for the agriculture sector. Design a business plan to identify the types and sources of financing in alignment with the Fund's framework as well as budgetary gaps for the strategic priorities defined. Given the Fund's framework, develop a governance and management model reflecting the regulatory environment it operates under, as well as the monitoring, evaluations, reporting and accountability requirements. Best practice recommends the framework to have budgetary and administrative autonomy. 	<p>Led by the Ministry of Finance and National Planning (MoFNP), with oversight from Ministry of Green Economy and Environment (MGEE)</p> <ul style="list-style-type: none"> Key line ministries and departments: Ministry of Agriculture (MoA), Zambia Disaster Management and Mitigation Unit (DMMU) Local governments - provincial and district Academic institutions both public and private Private sector Development Partners
TerraFund	<ul style="list-style-type: none"> Develop a contextualised taxonomy of land restoration projects that support conservation agriculture. This will increase consistencies in classification of projects and commitments across Zambia's accelerators as well as easing the monitoring of how the money is spent especially where there are concerns over issuer commitment levels. Improve communication across all actors of TerraFund, especially with financiers on their preferred adaptation objectives. This in turn informs SMEs on the viability of their projects, and thus reduces transaction costs. 	<p>Led by the Ministry of Agriculture (MoA) and Ministry of Green Economy and Environment (MGEE) and facilitated by TerraFund</p> <ul style="list-style-type: none"> World Resources Institute (WRI) Key line ministries and departments: Ministry of Fisheries and Livestock (MFL) and Ministry of Green Economy and Environment (MGEE) - Forestry Department, Ministry of Water Development and Sanitation (MWDS) Local governments - provincial and district Zambia Financial Institution Regulators - Bank of Zambia (BoZ), Local financial institutions and associations: Association of Microfinance Institutions in Zambia (AMIZ), Bankers Association of Zambia (BAZ), and local banks and microfinance institutions (MFIs) Development Partners

Financing Option	Proposed Actions	Proposed stakeholders
Sale of carbon credits	<ul style="list-style-type: none"> Develop and implement incentives for carbon credit suppliers (can be government, private sector, community organisations) to produce credits and specially to deal with instances when prices are low relative to production costs. This helps in ensuring preservation of Zambia's carbon sinks e.g., Zambia's Miombo Woodland. Develop a national registry to track projects and credit issuances given the change in emissions absorbed relative to a base year for both conservation and reforestation projects¹¹⁴. <ul style="list-style-type: none"> Strengthen Zambia's interim carbon regulations and increase capacity development for a sustainable carbon credit industry. Establish, implement, enforce, and monitor environmental and social safeguards, e.g., to protect land rights. 	<p>Led by Ministry of Green Economy and Environment (MGEE) with support from regulators - Zambia's Capital Markets Authority (ZCMA)</p> <ul style="list-style-type: none"> Key line ministries and departments: Ministry of Green Economy and Environment (MGEE) - Forestry Department, Ministry of Fisheries and Livestock (MFL), Ministry of Agriculture (MoA), Ministry of Finance and National Planning (MoFNP) Zambia's Financial Institutions' Regulators - Bank of Zambia (BoZ), Pensions and Insurance Authority (PIA), Private entities seeking to buy carbon credits. Local project developers seeking to sell carbon credits e.g., COMACO Platforms such as Rabobank's Acorn that connects SHF transitioning to agroforestry to the carbon market
CREWS	<p>Engagement of CREWS with DMMU as well as relevant partners to initiate establishment of MHEWS in Zambia by:</p> <ul style="list-style-type: none"> Following up on the status of the current proposal submitted for the SADC region pending review in January 2024. If the SADC region proposal is financed, utilise the Community to: <ul style="list-style-type: none"> Develop a holistic and all-inclusive legal and regulatory framework for the access, processing, and dissemination of EWS. Create well-established institutional arrangements with vertical and horizontal communication and coordination protocols to encourage local decision-making at provincial and district levels. Activate and deepen the role of Zambia's NMHS - Zambia Meteorological Department (ZMD) and Zambia Water Resources Management Authority (WARMA) to establish a MHEWS in Zambia. Utilise the accelerated support window financing to access 12-month funding of up to US\$ 250,000 to use as Government of Zambia's contribution in the implementation of the e-PICSA approach to promote a local, 'bottom-up' approach to early warning, coupled with active participation of local communities' (the approach is currently in the pipeline in Zambia and would benefit from a scale up as well as financial support).¹¹⁵ Unlock additional financing with GCF under a fast approval track given to CREWS projects to further deepen MHEWS in Zambia. 	<p>Led by Zambia Disaster Management and Mitigation Unit (DMMU), with support from Ministry of Finance and National Planning (MoFNP) and Ministry of Technology and Science</p> <ul style="list-style-type: none"> Key line ministries and departments: Ministry of Green Economy and Environment (MGEE), WARMA, ZMD, Ministry of Agriculture (MoA), Ministry of Fisheries and Livestock (MFL), Ministry of Water Development and Sanitation (MWDS) Regulators - Zambia Information and Communications Technology Authority (ZICTA) Local governments - provincial and district Private sector, especially telecommunication providers Development Partners such as Africa Risk Capacity (ARC), Africa Disaster Risk Financing (ADRFi) Strategic Partners such as World Bank, WMO, and UNDRR

Source: Author

114 projects for reforestation are favoured over those for forest preservation.

115 See Box 5 and https://research.reading.ac.uk/picsa/sample-page__trashed/history/

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Annex 1 Database of selected financing options and scoring

The below snapshot of the database showcases the financing options prioritised during the validation workshop, with their new scores allocated by workshop participants. The database can be provided by GIZ upon request.

Climate Fund or National Financing Vehicles (NFVs)

Adaptation measure proposed	#	Financial Instrument	Taxonomy	Need addressed	Definition	Key characteristics	Risk owner
1. Conservation agriculture, including water availability 2. Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation	Rank 1 for both CA and EWS	Climate Fund or National Financing Vehicles (NFVs)	Funding/ Investment	Financial - Funding	A financial facility with provides finance in the form of grants, concessional loans, equity investment, etc to initiatives that aim at address the challenges related with climate change; initiatives that strive towards mitigation and or adaptation activities.	The NFV process is largely demand-driven, with strong political support required from the national government. NFVs have the effect of creating (1) stronger alignment with national priorities, (2) reduced barriers to access for smaller organisations that do not have the capacity to access international climate finance directly, (3) the rapid deployment of climate funds into projects in sectors of strategic national importance, and (4) an expanded capital base for scale-up following the initial phase of NFV.	Government

20%	20%		20%		20%		20%		20%		20%		Total Score
Operational Feasibility / Actionability	Comment	Legal Feasibility / Actionability	Comment	Political Feasibility / Actionability	Comment	Impact & Additionality	Comment	Cost	Comment				
4.0	Zambia is currently developing its Climate Change Fund to pool all climate finance into one place	4.0	The country is advancing its CC legislation that will feature the functionalities of a NFV	4.0	/During 2023 budget speech, reference was made in the use of NFV for adaptaion and mitigation activities in Zambia /Capacity building has been provided to government	4.0	/By pooling all climate finance to a central location, it can be easier to allocate CF to necessary initiatives to increase financial resilience /There is proven cases that having a single pool of CF from public and private sources unlocks additional financing from accountability and/or transparency / Used to de-risk private sector green finance investments /Easier to access funding for individual projects	2.0	/Given Zambia's fiscal opposition, there is high opportunity cost in setting aside % of development budget to the fund, despite of the large benefits the fund can offer /Opportunity cost could be significant			3.6	

TerraFund

Adaptation measure proposed	#	Financial Instrument	Taxonomy	Need addressed	Definition	Key characteristics	Risk owner
Conservation agriculture, including water availability	Rank 2 for CA	TerraFund (previously known as Rural Prosperity Bond) *Climate Finance Lab	Funding / Investment	Land restoration	<p>/provide loans to small and medium enterprises (SMEs) working in land restoration in Africa, South Asia and Latin America.</p> <p>/ target SMEs too big for microfinance, and yet too small for commercial banks.</p> <p>/ an existing investment pipeline in Africa, built through the Land Accelerator and already counting 26 SMEs</p> <p>/ focuses on land restoration SMEs with small ticket sizes (US\$100K-US\$200K) and capacity building through the Land Accelerator program</p>	<p>/ target SMEs graduating from the Land Accelerator TA to apply for credit from the Rural Prosperity Bond envisioned to be a special purpose vehicle (SPV) managed in collaboration with a third party</p> <p>/ loan structure would be the most conducive for the instrument given the planned timing of capital deployment and the risk/return profile of cash flows.</p>	SPV Manager

20%	20%	20%	20%	20%	20%	20%	Total Score
Operational Feasibility / Actionability	Comment	Legal Feasibility / Actionability	Comment	Political Feasibility / Actionability	Impact & Additionality	Cost	Comment
3.0	With majority of vulnerable population in rural Zambia, the feasibility of the RPB is moderate-high. Furthermore, 4 Zambia projects have been shortlisted thus currently being piloted in the country	3.0	As the financial tool is currently operational, there is no legal barrier in its piloting. The same cannot be said for the scale-up	3.5	3.0	3.0	Relies mainly on the financial architecture of the country, and indirectly to the government
					The financial tool is embedded with forestry which Zambia has a strategic focus on its conservation. However, indebtedness of the Zambian government may make Bond financing	The tool is being piloted in East Africa with its impact not yet known	3.1
					The tool is being piloted in East Africa with its impact not yet known		

Sale of Carbon Credits

Adaptation measure proposed	#	Financial Instrument	Taxonomy	Need addressed	Definition	Key characteristics	Risk owner
Conservation agriculture, including water availability	Rank 3 for CA	Sale of Carbon Credits	Results-based payment mechanisms	Funding	Businesses can buy permits – or carbon credits – generated by projects that are cleaning up our atmosphere, to compensate for the emissions they haven't yet eliminated. There's scepticism around the quality of some carbon offsetting projects but, when done well, they support local economies and fund work that is making a real impact.	Buying a credit gives the holder the right to offset one tonne of carbon or greenhouse gas equivalent. Buyers can approach suppliers directly, which is challenging as they're located across the planet. Alternatively, they can purchase through brokers or intermediaries who bring buyers and suppliers together, creating pools of liquidity in specific niches.	Supplier

20%	Operational Feasibility / Actionability	Comment	20%		Comment	20%	Total Score
			Legal Feasibility / Actionability	Political Feasibility / Actionability		Cost	
2.0	Zambia is currently setting up the frameworks needed for carbon credits	Interim guidelines for carbon trading have been issued as at 2022, pending approval	3.0	3.0	There is a general political buy-in for sale of carbon credits with an existing 0.9 million tons of verifiable carbon credits for issue	2.5	2.7
					The impact of carbon credits is highly dependent on the regulations as well as the existence of a climate change fund and/or REDD+ fund The tool is able to crowd in additional investments from carbon markets	3.0	
						Upfront costs including creating an enabling environment and monitoring of the carbon trading platforms for alignment to domestic laws	

Climate Risk and Early Warning Systems Initiative (CREWS)

Adaptation measure proposed	#	Financial Instrument	Taxonomy	Need addressed	Definition	Key characteristics	Risk owner
Strengthening of early warning systems, in particular the provision of seasonal weather forecasts to inform climate adaptation	Rank 2 for EWS	Climate Risk and Early Warning Systems Initiative (CREWS)	Funding / Investment	financial support to LDCs and SIDS to establish risk-informed early warning services	<p>CREWS leverage investments by the World Bank, the Green Climate Fund (GCF), the Systematic Observation Financing Facility (SOFF) and other development partners:</p> <ul style="list-style-type: none"> • Creating awareness and advocacy about the need for early warning systems. • Triggering new financing, delivering capacity and favorable environment for effective additional financing. • Ensuring investments are programmatically informed and optimally utilized 	The socio-economic benefits of weather prediction are estimated to amount to at least US\$160 billion per year. Further improvements in forecasting and early warning systems could provide additional benefits of US\$30 billion per year. Investing in additional surface-based observations is highly economically efficient with an estimated global cost-benefit ratio of 1:26. This means for every dollar invested, at least twenty-six dollars in socio-economic return could be realized.	CREWS Steering Committee

20%	20%	20%	20%	20%	20%	20%	Total Score
Operational Feasibility / Actionability	Comment	Legal Feasibility / Actionability	Comment	Political Feasibility / Actionability	Comment	Impact & Additionality	Cost
2.0	<p>/The financing tool was operationalised in 2018 with 57 countries accessing the mechanism as at 2021. Several African countries have accessed the financing, but Zambia has not.</p> <p>/EWS systems are not connected needing infrastructure support that CREWS does not cover</p> <p>/No operational procedures are currently in place - will need to be set up</p>	2.0	<p>Zambian is currently putting in place measures to support the regions response to the United Nations' call to ensure that every citizen on the planet has access to early warning systems in the next 5 years</p> <p>Nations' call to ensure that every citizen on the planet has access to early warning systems in the next 5 years</p>	2.0	<p>/Zambian is currently putting in place measures to support the regions response to the United Nations' call to ensure that every citizen on the planet has access to early warning systems in the next 5 years</p> <p>/Aligns with current SADC CREWS proposal to strengthen NMHSs and DRM agencies at regional, national, local and provincial levels</p>	4.0	4.0
					<p>/There is a potential of socio-economic benefits with a cost-benefit ratio of 1:26.</p> <p>/Yes, it would have a sizeable effect on the baseline as EA systems can be developed with the facility as well as knowledge transfer</p>		2.8

Annex 2

Relevant examples & cases in Africa of National Climate Funds or National Financing Vehicles

Country and Fund	Managing entity	Parties involved	Source of financing	Financing mobilised	Legislation
Rwanda FONERWA ^{116, 117} <i>is described as a national Basket Fund and an instrument to facilitate direct access to international environment and climate finance, as well as to streamline and rationalise external aid and domestic finance</i>	Rwanda Environment Management Authority	FCDO, KFW, SIDA, UNDP, the World Bank and AfDB, the CIF, GEF and GCF	Budget (domestic) and external (international and regional sources)	US\$ 216.4 million as of 2021	N39/2017 - Law establishing the fund; Minister of Environment establishes eligibility of activities
Ethiopia Climate Resilient Green Economy (CRGE) Facility ¹¹⁸ <i>serves as the primary vehicle via which international finance is accessed and channelled to climate action</i>	Ministry of Finance and Economic Development and Environment, Forests and Climate Change	Adaptation Fund (AF), Austria, Climate and Development Knowledge Network (CDKN), Denmark, UK/FCDO, Global Green Growth Institute (GGGI), Green Climate Fund (GCF), Norway, World Bank, UNCT, UNDP, UNECA	External aid (international and regional sources)	US\$ 200 million ¹¹⁹	CRGE Strategy and Vision 2011

¹¹⁶ FONERWA. (2022). FONERWA: About. FONERWA. <http://www.fonerwa.org/private-sector/about>

¹¹⁷ http://www.fonerwa.org/sites/default/files/2022-02/FONERWA%202020-2021%20Annual%20Report_0.pdf

¹¹⁸ <https://www.mofed.gov.et/programmes-projects/crge-facility/#>

¹¹⁹ Expected to receive an earmarked 2% share of Ethiopia's development expenditure

Country and Fund	Managing entity	Parties involved	Source of financing	Financing mobilised	Legislation
South Africa South African Green Fund ¹²⁰ <i>explicitly focuses on demonstrating new climate technologies</i>	Department of Environmental Affairs; Development Bank of South Africa (DBSA)	DBSA, GCF, Department of Environmental Affairs (DEA)	Budget and external aid (international and regional sources)	US\$ 72.71 million ¹²¹	National Environmental Management Biodiversity Act 10/2004
Green Outcomes Fund ¹²² <i>incentivise local fund managers to use new approaches and financing models to target high potential and fast-growing SMMEs operating in South Africa's green economy</i>	Independent entity	National Treasury's Jobs Fund, FirstRand Foundation's RMB Trust, GreenCape, UCT GSB's Bertha Centre for Social Innovation, WWF-SA, and The World Bank's Climate Technology Programme	Budget	US\$ 32.36 million ¹²³	Department of National Treasury's Jobs Fund
Benin National Fund for Environment and Climate (FNEC)* <i>funding mechanism for programmes and projects within the scope of protecting and rationally managing the environment, combating the harmful effects of climate change and promoting sustainable development in Benin</i>	Independent entity	Ministry of Living Environment and Sustainable Development; African Development Bank, UNCDF LoCAL's Performance Based Climate Resilience Grant system;	Eco-tax from imports of items - pre-owned and used vehicles, tyres, clinker and disposable plastic packaging, annual grants, international donors		94-009 law
Burkina Faso Le Fonds d'Intervention pour l'Environnement (FIE)	Ministry of Environment and Ministry of Finance	United Nations Capital Development Fund (UNCDF)	Budget and external aid (international and regional sources)	US\$ 0.16 million ^{124, 125}	Decree No 2015-883/PRES-TRANS/PM/MEF/MERH
Chad Special Fund for the Environment (Fonds Spécial pour			Domestic taxes		Law N 014/PR/98

* Indicates climate funds and/or national financing vehicles with GCF accreditation

120 <https://www.dffe.gov.za/projectsprogrammes/greenfund>

121 EXR used was 1 ZAR = 0.0661 USD for December 2020

122 <https://thegreenoutcomesfund.co.za/>

123 EXR used was 1 ZAR = 0.0661 USD for December 2020

124 <https://burkina24.com/2022/08/17/burkina-un-fonds-pour-lutter-contre-le-changement-climatique/>

125 EXR used 1 XOF = 0.0016 USD as of 31 August 2022

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